



RAMP

**Regional Aquatics
Monitoring Program**



2008 Technical Report Final Appendices



REGIONAL AQUATICS MONITORING PROGRAM

2008 Technical Report – Appendices

FINAL

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Appendix A

Estimating Area of Land Change for the RAMP Focus Study Area

A.0 ESTIMATING AREA OF LAND CHANGE FOR THE RAMP FOCUS STUDY AREA

A.1 INTRODUCTION

This appendix documents the methodology used to quantify the location, extent, and type of land change in the RAMP Focus Study Area (FSA) as of 2008 related to:

- focal projects (i.e., those projects owned by 2008 RAMP funders, which were under construction or operational in 2008 in the RAMP FSA); and
- oil sands projects within the RAMP FSA that were under active development in 2008 by companies that were not funders of RAMP in 2008.

This land change information was used to designate RAMP sampling stations and locations as *baseline* and *test* and to provide information to the hydrologic analysis of effects of focal project activities.

A.2 METHODOLOGY

A.2.1 Satellite Imagery Acquisition

A total of eight SPOT-5 10-meter resolution scenes were obtained by RAMP (Figure A.2-1); these images were acquired on 27 May, 12 and 23 July, and 8, 23, and 24 August 2008.

A.2.2 Ortho-Rectification of Image Data

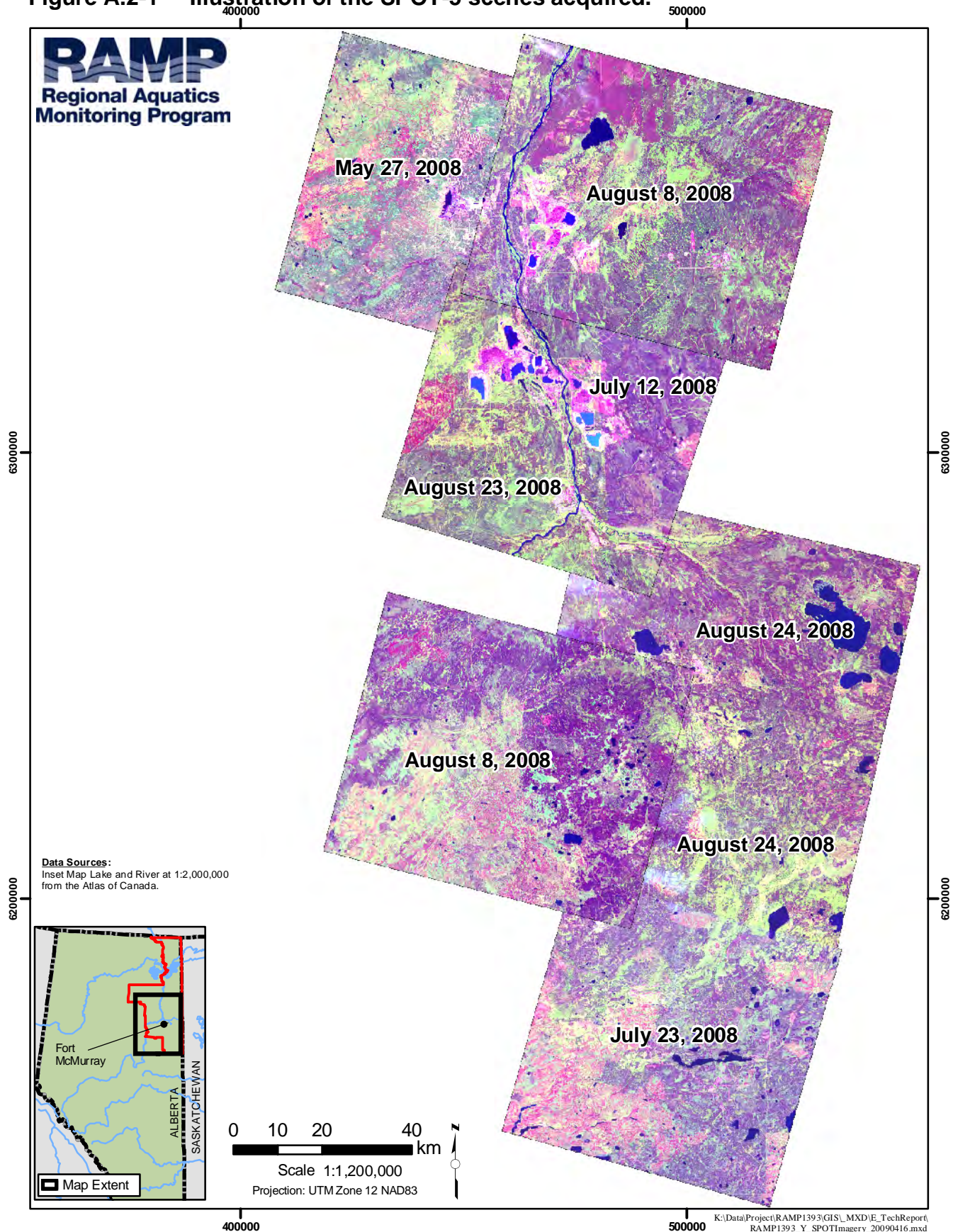
To ensure that the assessments made from the EO imagery were spatially correct, the imagery was first geometrically corrected. The procedure was undertaken using PCI Geomatica image processing software and entailed the alignment of the image data to a known map projection, essentially georeferencing all pixel values in the data to a known location on the Earth's surface.

The procedure for ortho-rectifying the image data to a map projection involved the application of previously-collected control points, topographic maps, existing ortho-rectified satellite imagery¹ and a digital elevation model (DEM)² to identify common ground control points (GCPs, known reference locations that can be identified on the satellite image). A total of 20 to 30 GCPs for each satellite image were identified to provide enough input values for the image processing software to solve the ortho-rectification algorithm. Once the collection of GCPs was complete, the ortho-rectification model was executed, creating a copy of the image, with the new positions, aligned to the reference maps and the elevation data.

¹ Geobase Landsat 7 ETM+ ortho-rectified images from 1999, 2000 and 2001

² Geobase 1:50 000 scale Digital Elevation Model

Figure A.2-1 Illustration of the SPOT-5 scenes acquired.



A.2.3 Atmospheric Correction

Atmospheric correction³ was applied to the SPOT-5 images using an automated routine within the PCI Geomatica image processing software using a spatially-adaptive fast atmospheric correction model for flat terrain.

A.2.4 Classification of Land Change

Two classes of land change were distinguished and delineated: closed-circuited; and not closed-circuited.

The 2008 areas of land change were digitized based on the results of the 2007 classification (RAMP 2008, Appendix A). New land change areas were added and changed areas were modified based on 2008 SPOT-5, and the activity polygons were coded to a certain land change class, or re-coded to a new class where it was applicable. Draft land change maps were then distributed to the RAMP Technical Program Committee in fall 2008 for review and comment, and a final set of land change maps was then prepared.

A GIS overlay analysis was then performed to estimate the area of each land change class in each of the RAMP FSA watersheds. The results of the overlay analysis were exported to MS Excel® for data summary.

A.3 RESULTS

Table A.3-1 and Table A.3-2 provide tabular summaries of the land changes in each of the main watersheds by each land change type, for focal projects and non-RAMP oil sands projects within the RAMP FSA. 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 2008 within the RAMP FSA is estimated at approximately 73,000 ha for focal projects and slightly more than 3,000 ha for oil sands projects operated by non-RAMP funding companies, for a total of slightly more than 76,000 ha. This represents approximately 2.2% of the area of the RAMP FSA. The percentage of the area of watersheds with land change as of 2008 varies from less than 1% for many watersheds (MacKay, Ells, Christina, Hangingstone, Horse, and Firebag), to 5% to 10% for the Muskeg and Upper Beaver watersheds, to more than 10% for the Fort Creek, Mills Creek, Tar, Shipyard Lake, and McLean Creek watersheds, as well as the smaller Athabasca River tributaries from Fort McMurray to the confluence of the Firebag River.

³ Optical satellite imagery captures solar radiation reflected from the earth's surface. As visible light is susceptible to interference created by the presence of water vapor in the atmosphere, it is necessary to correct the imagery to remove these effects.

Table A.3-1 Area of watersheds with land change as of 2008, summarized by land change type.

Watershed	Total Watershed Area (ha)	Watershed Area with Land Change (ha)						
		Focal Projects		Other Oil Sands Projects in RAMP FSA		Total		Watershed Total
		Not-Closed Circuited	Closed-Circuited	Not-Closed Circuited	Closed-Circuited	Not-Closed Circuited	Closed-Circuited	
Minor Athabasca River Tributaries ¹	159,240	9,694	23,113			9,694	23,113	32,807
Mills Creek	2,380		252				252	252
Shipyard Lake	4,046		3,751				3,751	3,751
Calumet	17,354	40	175			40	175	215
Christina	1,303,805	1,328	112	2,072	535	3,400	647	4,047
Ells	245,000	295	161			295	161	456
Firebag	568,174	967	436			967	436	1,404
Fort Creek	3,193	1,953	30			1,953	30	1,983
Hangingstone	106,641			17	47	17	47	64
Horse	215,741			321	104	321	104	426
MacKay	557,000	1,101	278			1,101	278	1,379
McLean	4,712	87	1,080			87	1,080	1,167
Muskeg	146,000	4,357	9,895			4,357	9,895	14,253
Original Poplar ²	13,856	127	299			127	299	427
Steepbank	135,491	2,518	961			2,518	961	3,479
Tar	33,261	826	6,395			826	6,395	7,220
Upper Beaver ²	28,711	773	1,935			773	1,935	2,708
FSA Total	3,544,606	24,068	48,873	2,410	687	26,478	49,560	76,038

Only land changes within the RAMP FSA were delineated.

¹ Refers to Athabasca River tributaries from Fort McMurray to the mouth of the Firebag River excluding the watersheds explicitly listed in this table. All land change areas in the minor Athabasca River tributaries in 2008 were above RAMP hydrology station S24.

² 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 provided in Syncrude Canada Ltd. (1977).

Table A.3-2 Percent of total area of watershed with land change as of 2008, summarized by type of land change.

Watershed	Total Watershed Area (ha)	Percent of Watershed Area with Land Change						Watershed Total
		Focal Projects		Other Oil Sands Projects in RAMP FSA		Total		
		Not-Closed Circuited	Closed-Circuited	Not-Closed Circuited	Closed-Circuited	Not-Closed Circuited	Closed-Circuited	
Minor Athabasca River Tributaries ¹	159,240	6.09	14.51			6.09	14.51	20.60
Mills Creek	2,380		10.59				10.59	10.59
Shipyard Lake	4,046		92.71				92.71	92.71
Calumet	17,354	0.23				0.23	1.01	1.24
Christina	1,303,805	0.10	0.01	0.16	0.04	0.26	0.05	0.31
Ells	245,000	0.12	0.07			0.12	0.07	0.19
Firebag	568,174	0.17	0.08			0.17	0.08	0.25
Fort Creek	3,193	61.17	0.93			61.17	0.93	62.10
Hangingstone	106,641			0.02	0.04	0.02	0.04	0.06
Horse	215,741			0.15	0.05	0.15	0.05	0.20
MacKay	557,000	0.20	0.05			0.20	0.05	0.25
McLean	4,712	1.85	22.92			1.85	22.92	24.77
Muskeg	146,000	2.98	6.78			2.98	6.78	9.76
Original Poplar ²	13,856	0.92	2.16			0.92	2.16	3.08
Steepbank	135,491	1.86	0.71			1.86	0.71	2.57
Tar	33,261	2.48	19.23			2.48	19.23	21.71
Upper Beaver ²	28,711	2.69	6.74			2.69	6.74	9.43
FSA Total	3,544,606	0.68	1.38	0.07	0.02	0.75	1.40	2.15

Only land changes within the RAMP FSA were delineated.

¹ Refers to Athabasca River tributaries from Fort McMurray to the mouth of the Firebag River excluding the watersheds explicitly listed in this table. All land change areas in the minor Athabasca River tributaries in 2008 were above RAMP hydrology station S24.

² 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 provided in Syncrude Canada Ltd. (1977).

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Figure A.3-1 RAMP land change classes derived from SPOT-5 satellite imagery of May, July, and August 2008, north of Fort McMurray.

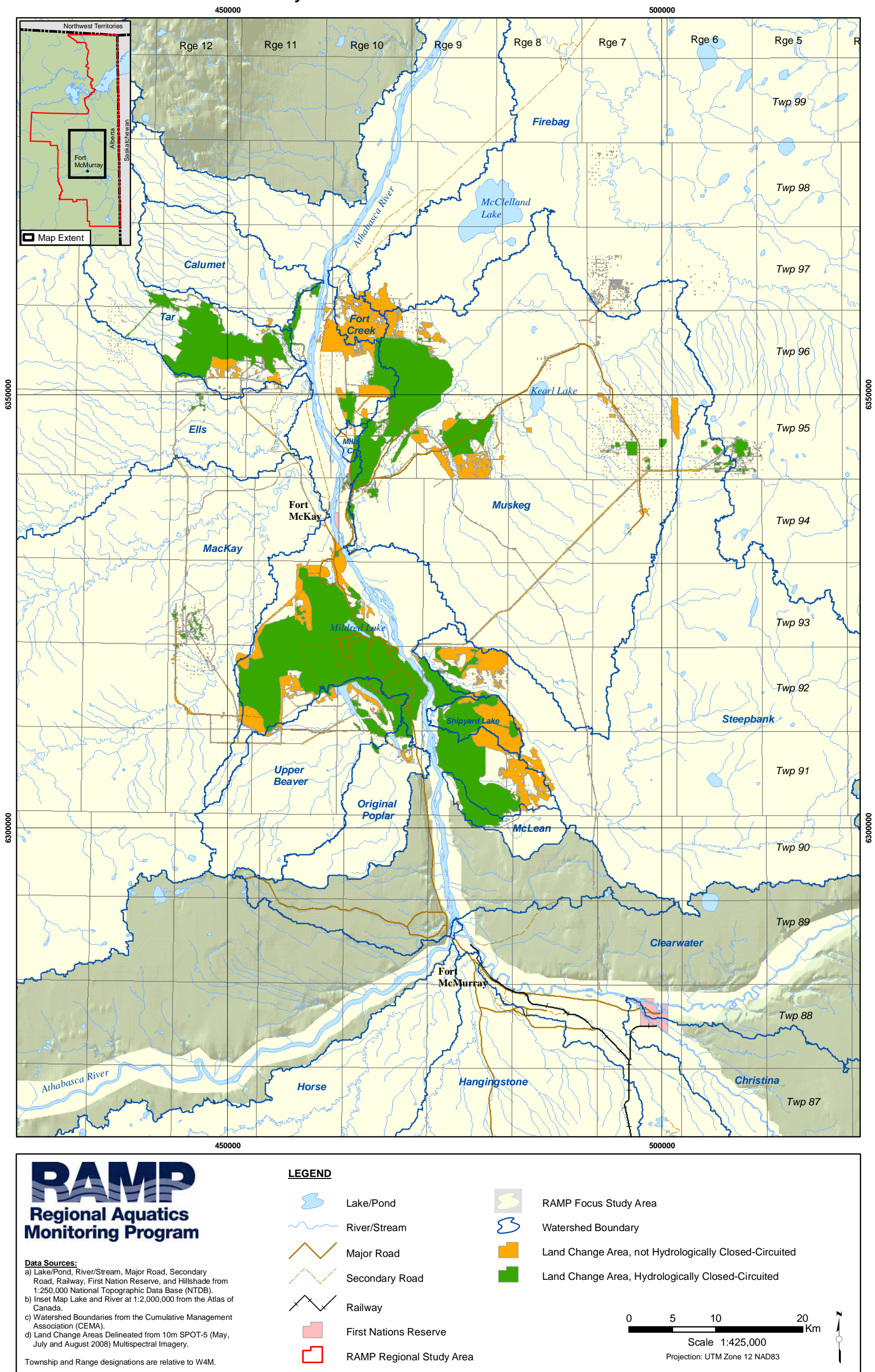


Figure A.3-2 RAMP land change classes overlaid on a composite of SPOT-5 satellite imagery from May, July, and August 2008, north of Fort McMurray.

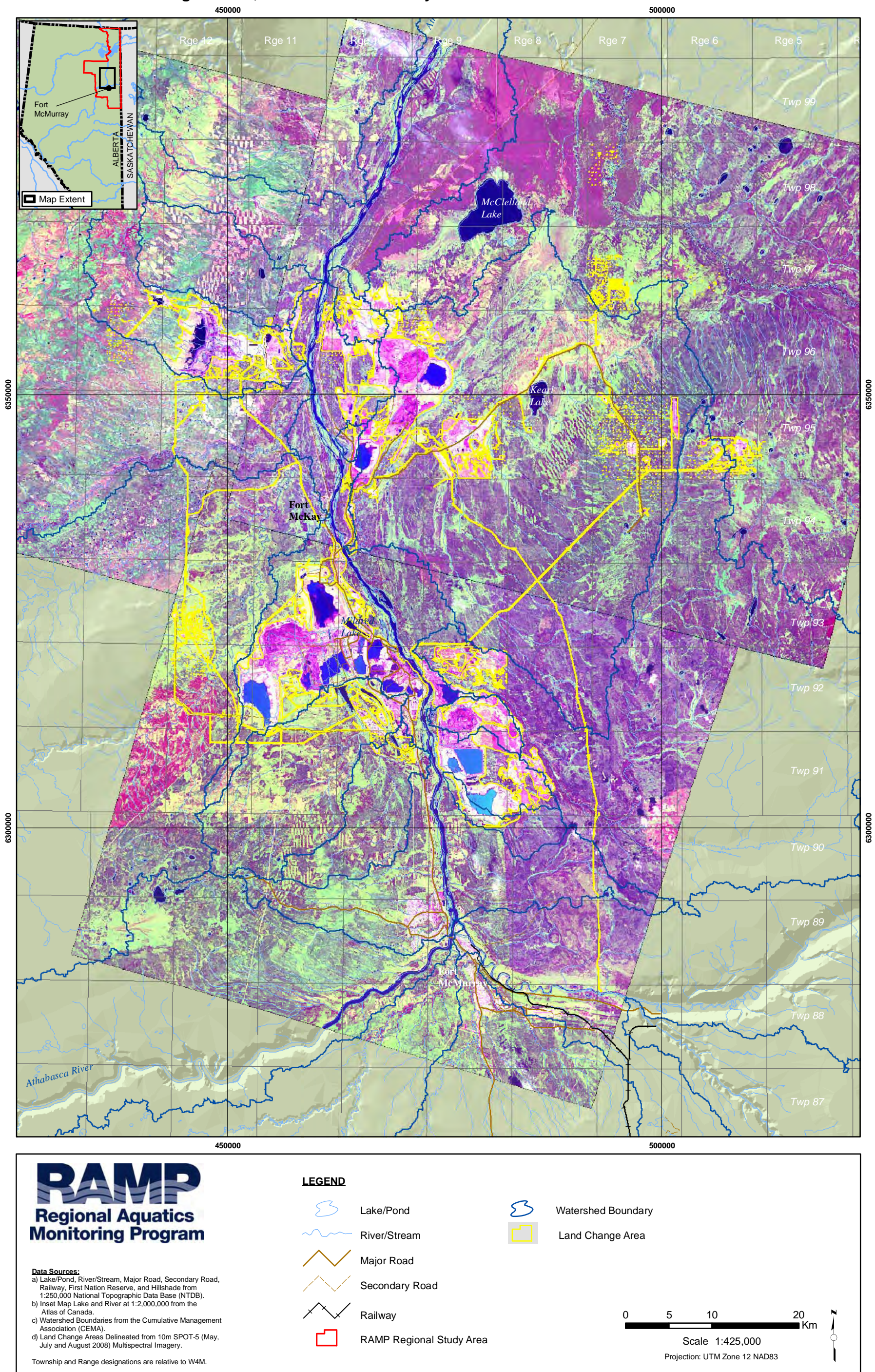


Figure A.3-3 RAMP land change classes derived from SPOT-5 satellite imagery of July and August 2008, south of Fort McMurray.

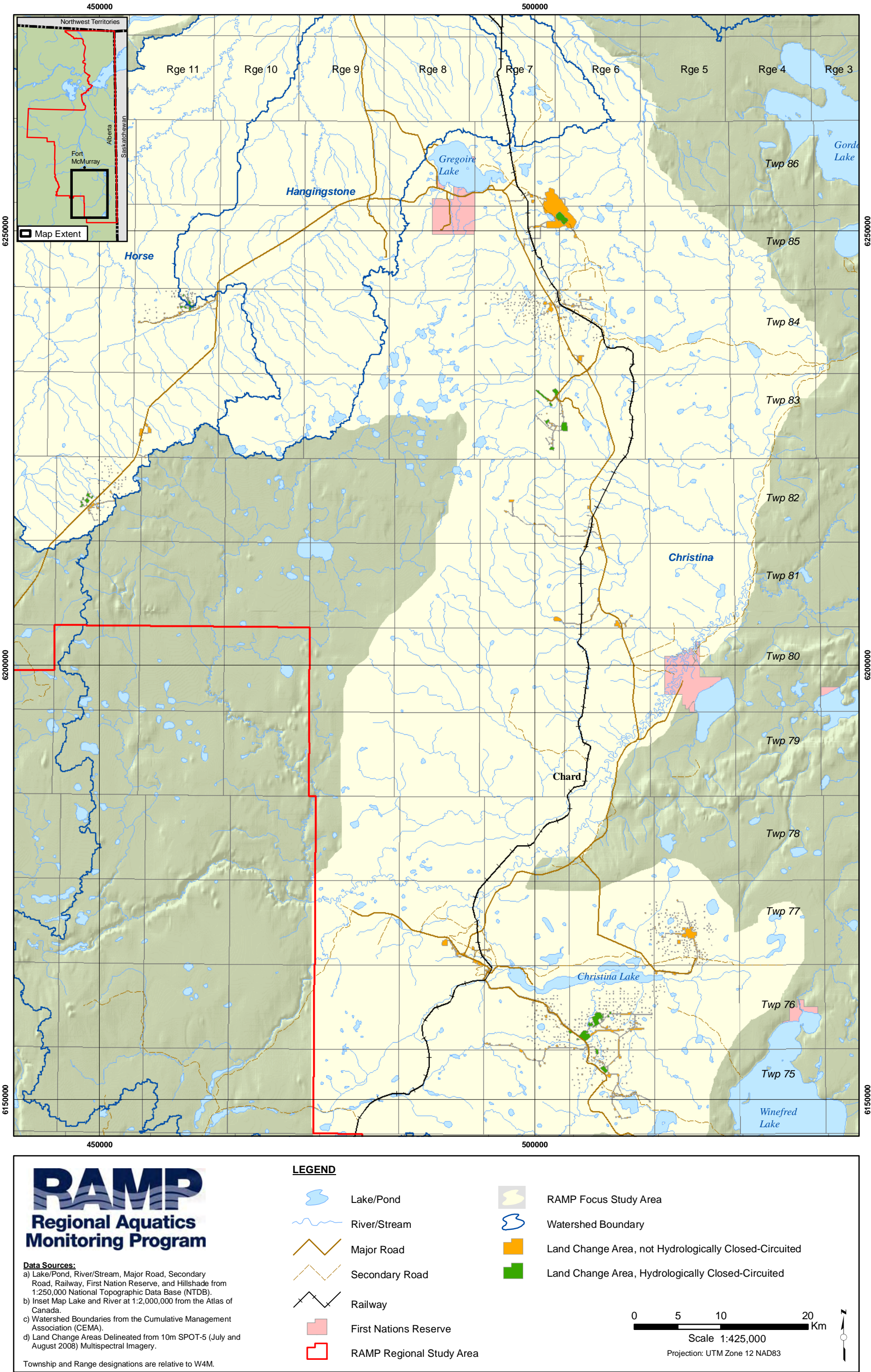
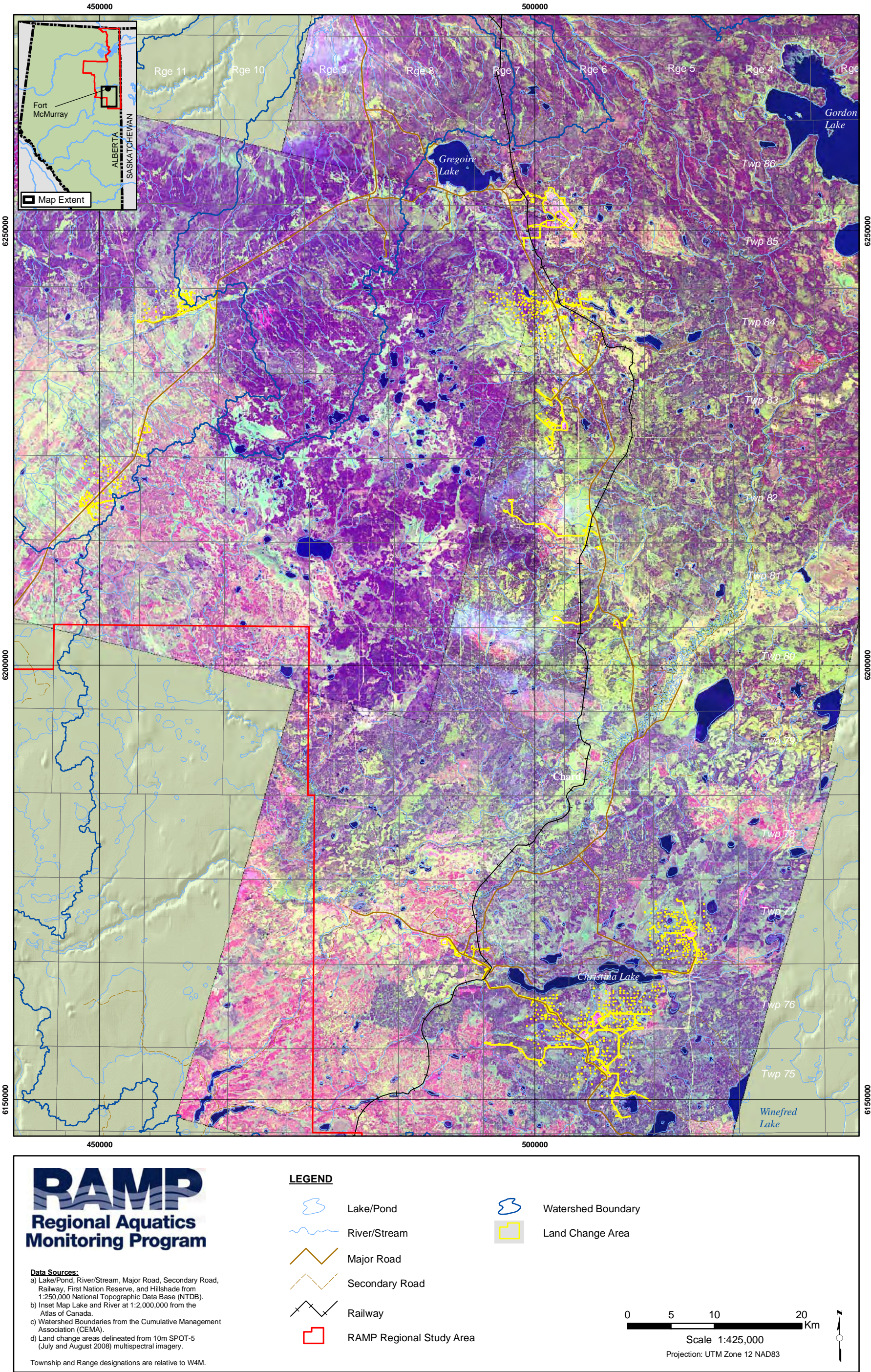


Figure A.3-4 RAMP land change classes overlaid on a composite of SPOT-5 satellite imagery of July and August 2008, south of Fort McMurray.



Appendix B

Quality Assurance and Quality Control Procedures for 2008

B.0 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES FOR 2008

B.1 QUALITY ASSURANCE PROCEDURES

Each technical component under RAMP is required to complete a series of procedures to facilitate the collection of a high level of data quality. Environment Canada (1998) 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 Hatfield RAMP team for all RAMP-related data collection, handling and management. More detailed information regarding quality control for each technical component of RAMP follows the presentation of this general information.

B.1.1 Field Staff Training

All personnel participating in 2008 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 Master's- or Ph.D.-level professional and a trained environmental field technician (B.Sc. or Dip. Tech.). All 2008 field-crew members had experience conducting data collection 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 methodology, 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).

2008 crewmembers 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 sites. In many cases, field personnel have additional training on the Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods (TDG) Regulations, Small Boat Safety (as required by the Coast Guard) and wilderness first aid.

B.1.2 Field Operations

B.1.2.1 Equipment

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

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

- Provincial sampling permits (e.g., fish collection permits from Alberta Sustainable Resource Development);
- 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 45, 45XL, 12XL or GPSII Global Positioning System (GPS) for obtaining data on sampling station position (latitude and longitude; accurate to approximately ± 15 m);
- Camera and film (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, current velocity and depth;
- Miscellaneous equipment: tarpaulin, rope, measuring tape, coolers, plastic buckets, and tool box;
- Waterproof clothing, including rain suits, rubber boots, etc.;
- Floater jackets and/or survival suits, first aid kit and other safety equipment (including boat safety equipment);
- IBM-compatible portable (lap-top) computer, Intel Celeron 550 MHz, with 128 MB RAM. Typical programs installed include Microsoft Windows, Microsoft Excel and Microsoft Word; and
- Publications and previous reports for reference.

Field operations were coordinated through the Hatfield Fort McMurray office. This role 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 RAMP program is provided in the following sections and in Appendices C to H for specific components.

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

The following general data were typically recorded for field sampling activities conducted for RAMP (with some minor variability among technical components):

- Date and time of sampling;
- Sample numbers;
- Station location (UTM coordinate, datum, zone);
- Initials 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 composite;
- Handling techniques, preservation methods, sampling containers used; and
- Photographs of sampling stations.

Field data collection was conducted according to procedures used for all previous RAMP studies (as described in Golder 1999a).

B.1.3 Laboratory Analyses

Laboratories used to analyze water, sediment and fish tissue samples collected under the RAMP program are required to be accredited by the Canadian Association for Environmental Analytical Laboratories (CAEL). Responsibilities associated with this accreditation include participation in an annual performance evaluation assessment of the laboratory's procedures, methods and internal quality control.

Other samples, such as benthic invertebrate sorting and taxonomy, and fish aging, are conducted for RAMP 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 meet or exceed guidelines established by Environment Canada (Glozier *et al.* 2002) 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, entered data were checked for transcription errors.

B.1.5 Sample Management

All samples were handled (including preservation, storage and shipping) in accordance with established procedures (Golder 1999a) 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. Data 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 confirm (via fax and/or e-mail) samples received, date, and analyses to be performed. To facilitate this process, a standard RAMP COC form was used by the Hatfield team, which simplified the management of sample processing and analysis.

B.1.6 RAMP 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 2008 by the Hatfield RAMP team to ensure consistency of methods among years. Activities covered in the RAMP QAP include:

- 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) or the RAMP project manager during field work, as required;
- Designation of 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 field crew return (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 Golder 2003b). QC activities for each RAMP technical component used in 2008 are described below.

B.2.1 Climate and Hydrology Component

B.2.1.1 Quality Control Activities – Field

Climatic and hydrologic data collection and processing were subject to the following quality control field 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 contained in RAMP (2009), based on observations of site conditions and analysis of the collected data;
- Sensors from 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. Pressure transducers at year-round monitoring stations were checked on a less frequent basis, but consistency between water level surveys and pressure transducer readings was checked during every field visit;

- 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;
- Vertical velocity distributions were collected at representative locations for ice-covered discharge measurements to derive and verify ice correction factors; and
- Snow course surveys were performed according to standard protocols as presented in RAMP (2009).

B.2.1.2 Quality Control Activities – Office

Climatic and hydrologic data collection and processing were subject to the following quality control office procedures to ensure that the published data were as accurate as possible:

- 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 site 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 computed from continuous water level measurements and the stage-discharge rating curve were compared with 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.
- Hydrographs computed 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 Methods

Sample Collection

The following precautions were used in the field to prevent sample contamination:

- All sample bottles and caps were not rinsed with site water prior to sample collection, given all bottles have been “certified clean” by labs (ultra-trace mercury bottles were filled using specific procedures stipulated by ARC);
- Grab samples were collected upstream of the boat and the person collecting the sample to avoid disturbing the substrate;
- Latex powder-free gloves were worn during sample collection;
- Sample containers were kept covered during collection of composite samples;
- Winter samples were collected from approximately 20 cm below the ice where possible to minimize potential contamination from auger disturbance; and
- Samples for analysis of dissolved metals were filtered in the lab instead of in the field.

Potential contamination of samples during collection, handling, and transport was assessed using field blanks and trip blanks. Field blanks were used to assess potential contamination from sample handling, and were prepared in the field by filling sample bottles with deionized water provided by the lab. Trip blanks were prepared in the analytical laboratory prior to sampling and kept sealed for the duration of the sampling trip, and were used to evaluate potential contamination from the sample container and the efficacy of sample preservation and storage conditions. Field blanks and trip blanks were utilized in all four seasons of sampling, and were analyzed for the same variables as RAMP samples. Field and trip blanks were labeled with dummy RAMP-style codes (e.g., FBS-1, ATR-DD-T) to ensure “blind” laboratory analysis.

Field and trip blank analytical results were compared to analytical detection limits. Analyte concentrations greater than five times the detection limit in the blank samples may demonstrate potential contamination of samples during sample collection or analysis or analytical error. Blanks with analyte concentrations below or near detection limits represent samples that were collected, handled, and analyzed without contamination or potential errors.

A split sample was collected during the fall (one sample) to assess analytical precision. In 2008, the split sample was collected from the Tar River (TAR-1, fall). Duplicate samples were collected from the Muskeg Creek (MUC-1, winter), the Tar River (TAR-2, spring), the west bank of the Athabasca River “downstream of development” (ATR-DD-W, summer), Kearl Lake (KEL-1, fall) and the Hangingstone River (HAR-1, fall). Duplicate samples were taken to assess environmental heterogeneity. Analytical results for split and duplicate samples were compared, and relative percent difference (difference between data values/average of data values, multiplied by 100%) was calculated for each analyte. Relative percent differences of greater than 20% were noted as potentially unacceptable levels of precision. However, because precision decreases as the analyte concentration approaches the detection limit, relative percent differences greater than 20% were considered to be of significance only if analyte concentrations in both samples were greater than five times the detection limit.

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 (duplicate sample) was used to assess the precision of the analyses. Spiked samples, reference standards, and laboratory controls were used to establish the accuracy of the analyses.

The toxicological laboratory also used a number of QA/QC samples to ensure that the results reported were precise and accurate. For each set of tests, a control group and reference toxicant test were used to assess the accuracy of the toxicity test and health of the test organisms. In addition, five replicates of each treatment group were used in each test to assess the precision of the results.

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. Any deviations from QA/QC criteria were identified in the laboratory reports and are noted in the results section that follows.

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.

B.2.2.2 Results and Discussion

Field and Trip Blanks

Field blanks were completed during all sampling seasons—one field blank was filled for the winter, spring and summer sampling, and three field blanks were filled for fall sampling. Concentrations of all conventional variables, major ions, nutrients, and hydrocarbons in field blanks were less than five times the detection limit (Table B.2-1); except for conductivity (winter). The concentration of several dissolved and total metals were greater than five times the detection limit in field blanks from all seasons except spring and one fall sample. The highest number of metals greater than five times the detection limit (4) occurred in winter, while the lowest number of metals with such concentrations (1) occurred in one fall sample. Concentrations of total and dissolved antimony in field blanks exceeded the detection limit by up to 30 times in the winter field blank; although all other metal concentrations were less than 6.6 times the detection limit.

Trip blanks were analyzed for all sampling seasons: one trip blank was taken for winter, spring and summer sampling, and two trip blanks were taken for fall sampling. Conductivity in trip blanks analyzed in the spring and fall was greater than five times the detection limit; however, concentrations of all other conventional variables, major ions, nutrients, and hydrocarbons were less than five times the detection limits (Table B.2-2). The summer trip blank was the only sample with concentrations of metals greater than five times the detection limit; trip blank concentrations of total and dissolved metals were less than five times the detection limit for all other seasons. Total and dissolved antimony concentrations were over seven times the detection limit in the summer trip blank.

Split Samples

One split sample taken at the Tar River station TAR-1, was submitted for laboratory analysis in the fall 2008 season (Table B.2-3). The relative percent difference (RPD) for all conventional variables, major ions, nutrients, and hydrocarbons was less than 20% for

those analytes where concentrations in both samples were greater than five times the detection limit. The RPD for total suspended solids in the Tar River split sample exceeded 20%; however, concentrations of total suspended solids in one sample was less than five times the detection limit.

The RPD for all metals between split samples was less than 20% for all analytes with concentrations greater than five times the detection limit, except dissolved manganese, total aluminum and total titanium (Table B.2-3). RPD for total and dissolved chromium, dissolved lead, total cadmium, total silver and total vanadium in the split sample also exceeded 20%; however, concentrations of these analytes in one sample were less than five times the detection limit.

Duplicate Samples

Duplicate samples were collected at five stations in 2008: MUC-1 in winter, TAR-2 in spring, ATR-DD-W in summer and HAR-1 and KEL-1 in fall (Table B.2-4; Table B.2-5; Table B.2-6; Table B.2-7; Table B.2-1). Conventional variables, major ions, nutrients, and hydrocarbon concentrations were generally quite similar in the duplicate samples. Most RPDs exceeding 20% were for analytes with concentrations less than five times the detection limit, with the exception of sulphate in the fall sample at Hangingstone River, and total phenolics in the fall duplicate sample at Kearl Lake and in the winter duplicate sample from Muskeg Creek. Generally, analytes with high RPDs between duplicates had concentrations near the detection limit, even if these concentrations. However, the Tar River spring duplicate showed numerous variables with high RPDs, including dissolved organic carbon, true color, sulphate, dissolved phosphorus and total nitrogen (Table B.2-4).

The number of metals with concentrations that differed by more than 20% relative percent difference varied by site, indicating that the different rivers exhibited varying degrees of environmental heterogeneity. Two stations were sampled in duplicate in the fall: Hangingstone River, where dissolved lead showed a difference over 20% between samples (Table B.2-7); and Kearl Lake, where dissolved lithium, dissolved and total vanadium and total aluminum differed by over 20% (Table B.2-8). In the summer (Athabasca River) duplicate sample, total titanium concentrations varied by over 20% between samples (Table B.2-6). In the spring (upper Tar River) duplicate sample, total and dissolved copper, and total arsenic, cadmium and uranium concentrations (not their dissolved fractions) varied by more than 20% between samples (Table B.2-4). In the winter (Muskeg Creek) duplicate sample, only total phenolics showed a >20% relative percent difference between samples. In all samples, additional analytes differed by >20% between samples, but at concentrations less than five times their analytical detection limit.

B.2.2.3 Conclusions and Recommendations

Results from the QA/QC evaluation of water quality data indicate that overall, data collected for the water quality component was of high quality. Results of trip and field blank analyses suggest that laboratory-generated concentrations of conductivity and antimony may not be reliable at low concentrations. Results of split sampling indicated good general agreement between results, suggesting that the analytical laboratories return consistent results from repeated analyses. Analysis of duplicate samples indicated either that some metals present at low concentrations in water may exhibit relatively high between-sample variability at stations (e.g., beryllium, bismuth, copper, cadmium, thallium, and mercury), or that the analytical laboratory (in this case, ARC) may experience difficulties with analytical precision when analyzing some metals when present at low concentrations in particular samples.

Table B.2-1 Concentrations of water quality variables in field blanks, 2008.

Variable	Unit	Detection Limit	Concentration in Field Blank					
			25-Mar-08	14-May-08	15-Jul-08	3-Sep-08	9-Sep-08	9-Sep-08
Conventional Variables								
Conductivity	µS/cm	0.2	1.3	1	0.8	<0.2	<0.2	<0.2
Dissolved Organic Carbon	mg/L	1	<1	1	1	<1	<1	<1
Hardness (as CaCO ₃)	mg/L		<1	<1	<1	<1	<1	<1
pH	pH units	0.1	5.4	5.6	5.8	5.6	5.9	6.1
Total Alkalinity	mg/L	5	<5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	10	20	<10	50	<10	<10	<10
Total Organic Carbon	mg/L	1	<1	<1	<1	<1	<1	<1
Total Suspended Solids	mg/L	3	<3	5	<3	<3	<3	<3
True Colour	T.C.U.	2	<2	<2	<2	<2	<2	<2
Major Ions								
Bicarbonate (HCO ₃)	mg/L	5	<5	<5	<5	<5	<5	<5
Calcium (Ca)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbonate (CO ₃)	mg/L	5	<5	<5	<5	<5	<5	<5
Chloride (Cl)	mg/L	1	<1	<1	<1	<1	<1	<1
Hydroxide (OH)	mg/L	5	<5	<5	<5	<5	<5	<5
Magnesium (Mg)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium (K)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium (Na)	mg/L	1	<1	<1	<1	<1	<1	<1
Sulfate (SO ₄)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5
Sulphide (S ₂)	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nutrients and BOD								
Ammonia-N	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Biochemical Oxygen Demand	mg/L	2	<2	<2	<2	<2	<2	4
Chlorophyll a	mg/L	1						<1
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phosphorus, dissolved	mg/L	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, total	mg/L	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Nitrogen	mg/L		0.3	0.3	0.3	0.3	0.3	0.3
Hydrocarbons								
Naphtenic Acids	mg/L	1	<1	<1	1	<1	<1	<1
Total Phenolics	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003
Total Rec. Hydrocarbons	mg/L	1	<1	<1	<1	<1	<1	<1
Dissolved Metals								
Aluminum (Al)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	mg/L	0.000001	0.0000299	0.00000337	0.0000028	0.0000044	0.0000011	0.0000044
Arsenic (As)	mg/L	0.00004	<0.00004	<0.00004	<0.00004		<0.00004	<0.00004
Arsenic (As)	mg/L	0.00006				<0.00006		
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)	mg/L	0.00001	<0.00001	0.0000148	<0.00001	<0.00001	<0.00001	<0.00001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	<0.000006	<0.000006	<0.000006	<0.000006
Calcium (Ca)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.55	0.505	<0.3	0.79
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	0.000006	<0.000006	<0.000006	0.0000079	0.0000097	<0.000006	<0.000006
Lithium (Li)	mg/L	0.0002	0.00023	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.000198
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum (Mo)	mg/L	0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006

indicates sample concentration greater than five times the detection limit.

Table B.2-1 (Cont'd.)

Variable	Unit	Detection Limit	Concentration in Field Blank					
			25-Mar-08	14-May-08	15-Jul-08	3-Sep-08	9-Sep-08	9-Sep-08
Dissolved Metals (Cont'd.)								
Selenium (Se)	mg/L	0.0002				<0.0002		<0.0002
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003		<0.0003	
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Strontium (Sr)	mg/L	0.000008	0.0000421	0.0000259	0.0000409	0.0000082	0.000049	0.0000092
Sulphur (S)	mg/L	0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Titanium (Ti)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Uranium (U)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium (V)	mg/L	0.00005	<0.00005	<0.00005	0.0000564		<0.00005	
Vanadium (V)	mg/L	0.0002				<0.0002		<0.0002
Zinc (Zn)	mg/L	0.0002	0.00024	<0.0002	0.00028	0.000254	<0.0002	<0.0002
Total Metals								
Aluminum (Al)	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Antimony (Sb)	mg/L	0.000001	0.0000302	0.0000034	0.0000028	0.0000044	0.0000012	0.0000044
Arsenic (As)	mg/L	0.00004	<0.00004	<0.00004	<0.00004		<0.00004	<0.00004
Arsenic (As)	mg/L	0.00006				<0.00006		
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)	mg/L	0.00001	<0.00001	0.0000149	<0.00001	<0.00001	<0.00001	<0.00001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	<0.000006	<0.000006	<0.000006	<0.000006
Calcium (Ca)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	<0.3	0.742	0.65	0.54	<0.3	0.79
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	0.000006	<0.000006	<0.000006	0.0000283	0.0000135	<0.000006	<0.000006
Lithium (Li)	mg/L	0.0002	0.00023	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Mercury (Hg), ultra-trace	ng/L	1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Molybdenum (Mo)	mg/L	0.000008	0.0000117	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	0.0000878	<0.00006	<0.00006	<0.00006
Selenium (Se)	mg/L	0.0002				<0.0002		<0.0002
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003		<0.0003	
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Strontium (Sr)	mg/L	0.000008	0.0000425	0.0000278	0.0000413	0.0000173	0.000051	0.0000093
Sulphur (S)	mg/L	0.6	<0.6	<0.6	<0.6	0.62	<0.6	<0.6
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Titanium (Ti)	mg/L	0.00007	<0.00007	0.000072	<0.00007	<0.00007	<0.00007	<0.00007
Uranium (U)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium (V)	mg/L	0.00005	<0.00005	<0.00005	0.000069		<0.00005	
Vanadium (V)	mg/L	0.0002				<0.0002		<0.0002
Zinc (Zn)	mg/L	0.0002	0.000341	<0.0002	0.000304	0.000362	<0.0002	0.000231

indicates sample concentration greater than five times the detection limit.

Table B.2-2 Concentrations of water quality variables in trip blanks, 2008.

Variable	Unit	Detection Limit	Concentration in Trip Blank				
			25-Mar-08	14-May-08	14-Jul-08	3-Sep-08	9-Sep-08
Conventional Variables							
Conductivity	µS/cm	0.2	0.6	1.9	0.6	2.8	<0.2
Dissolved Organic Carbon	mg/L	1	<1	<1	<1	<1	<1
Hardness (as CaCO ₃)	mg/L		<1	<1	<1	<1	<1
pH	pH units	0.1	5.4	5.2	5.9	6.1	5.6
Total Alkalinity	mg/L	5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	10	10	<10	<10	<10	<10
Total Organic Carbon	mg/L	1	<1	<1	<1	<1	<1
Total Suspended Solids	mg/L	3	<3	<3	<3	<3	<3
True Colour	T.C.U.	2	<2	<2	<2	<2	<2
Major Ions							
Bicarbonate (HCO ₃)	mg/L	5	<5	<5	<5	<5	<5
Calcium (Ca)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbonate (CO ₃)	mg/L	5	<5	<5	<5	<5	<5
Chloride (Cl)	mg/L	1	1	<1	<1	<1	<1
Hydroxide (OH)	mg/L	5	<5	<5	<5	<5	<5
Magnesium (Mg)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium (K)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium (Na)	mg/L	1	<1	<1	<1	<1	<1
Sulfate (SO ₄)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphide (S ₂)	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nutrients and BOD							
Ammonia-N	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Biochemical Oxygen Demand	mg/L	2	<2	<2	<2	<2	<2
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phosphorus, dissolved	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, total	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Nitrogen	mg/L		0.3	0.3	0.3	0.3	0.3
Hydrocarbons							
Naphthenic Acids	mg/L	1	<1	<1	<1	<1	<1
Total Phenolics	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Rec. Hydrocarbons	mg/L	1	<1	<1	<1	<1	<1
Dissolved Metals							
Aluminum (Al)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	mg/L	0.000001	0.00000243	<0.000001	0.00000713	0.00000108	0.0000045
Arsenic (As)	mg/L	0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	<0.000006	<0.000006	<0.000006
Calcium (Ca)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.337	<0.3	<0.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	0.000006	<0.000006	<0.000006	0.0000122	<0.000006	<0.000006
Lithium (Li)	mg/L	0.0002	0.000286	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum (Mo)	mg/L	0.000008	<0.000008	<0.000008	<0.000008	0.0000082	<0.000008
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006

indicates sample concentration greater than five times the detection limit.

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

Variable	Unit	Detection Limit	Concentration in Trip Blank				
			25-Mar-08	14-May-08	14-Jul-08	3-Sep-08	9-Sep-08
Dissolved Metals (Cont'd.)							
Selenium (Se)	mg/L	0.0002				<0.0002	<0.0002
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003		
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Strontium (Sr)	mg/L	0.000008	0.0000138	<0.000008	0.0000178	<0.000008	0.0000165
Sulphur (S)	mg/L	0.6	<0.6	<0.6	0.671	<0.6	<0.6
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Titanium (Ti)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Uranium (U)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium (V)	mg/L	0.00005	<0.00005	<0.00005	0.0000555	<0.00005	<0.00005
Zinc (Zn)	mg/L	0.0002	0.000203	<0.0002	0.000217	<0.0002	<0.0002
Total Metals							
Aluminum (Al)	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Antimony (Sb)	mg/L	0.000001	0.0000025	<0.000001	0.0000072	0.0000011	0.0000045
Arsenic (As)	mg/L	0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	<0.000006	<0.000006	<0.000006
Calcium (Ca)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.48	<0.3	<0.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	0.000006	<0.000006	<0.000006	0.000021	<0.000006	<0.000006
Lithium (Li)	mg/L	0.0002	0.00031	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Mercury (Hg), ultra-trace	ng/L	1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Molybdenum (Mo)	mg/L	0.000008	<0.000008	<0.000008	<0.000008	0.0000083	<0.000008
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006
Selenium (Se)	mg/L	0.0002				<0.0002	<0.0002
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003		
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Strontium (Sr)	mg/L	0.000008	0.0000139	<0.000008	0.000019	0.0000115	0.0000219
Sulphur (S)	mg/L	0.6	<0.6	<0.6	0.678	<0.6	<0.6
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Titanium (Ti)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	0.000224	0.000074
Uranium (U)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium (V)	mg/L	0.00005	<0.00005	<0.00005	0.0000624	<0.00005	<0.00005
Zinc (Zn)	mg/L	0.0002	0.000384	0.000257	0.00033	0.000281	0.000288

indicates sample concentration greater than five times the detection limit.

Table B.2-3 Relative percent difference between split water quality samples collected from the Tar River (TAR-1), fall 2008.

Variable	Unit	Detection Limit	TAR-1 4-Sept-08	Split 4-Sept-08	Relative Percent Difference (%) ¹
Conventional Variables					
Conductivity	µS/cm	0.2	875	873	0.2
Dissolved Organic Carbon	mg/L	1	17	17	0.0
Hardness (as CaCO ₃)	mg/L		321	325	1.2
pH	pH units	0.1	8.4	8.4	0.0
Total Alkalinity	mg/L	5	171	171	0.0
Total Dissolved Solids	mg/L	10	590	580	1.7
Total Organic Carbon	mg/L	1	18	18	0.0
Total Suspended Solids	mg/L	3	7	9	25.0
True Colour	T.C.U.	2	40	41	2.5
Major Ions					
Bicarbonate (HCO ₃)	mg/L	5	201	200	0.5
Calcium (Ca)	mg/L	0.5	88.5	90	1.7
Carbonate (CO ₃)	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	50	50	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	24.3	24.4	0.4
Potassium (K)	mg/L	0.5	6.6	6.5	1.5
Sodium (Na)	mg/L	1	50	50	0.0
Sulfate (SO ₄)	mg/L	0.5	173	173	0.0
Sulphide (S ₂)	mg/L	0.002	0.011	0.011	0.0
Nutrients and BOD					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	3.5	3.6	2.8
Phosphorus, dissolved	mg/L	0.001	0.125	0.127	1.6
Phosphorus, total	mg/L	0.001	0.205	0.208	1.5
Total Kjeldahl Nitrogen	mg/L	0.2	0.8	0.9	11.8
Total Nitrogen	mg/L		4.3	4.5	4.5
Hydrocarbons					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	0.006	0.006	0.0
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
Dissolved Metals					
Aluminum (Al)	mg/L	0.001	0.00557	0.00466	17.8
Antimony (Sb)	mg/L	0.000001	0.0000981	0.000101	2.9
Arsenic (As)	mg/L	0.00004	0.000838	0.000819	2.3
Barium (Ba)	mg/L	0.0001	0.0711	0.0702	1.3
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.123	0.126	2.4
Cadmium (Cd)	mg/L	0.000006	0.0000109	0.0000112	2.7
Calcium (Ca)	mg/L	0.1	88.3	89	0.8
Chlorine (Cl)	mg/L	0.3	46.2	45.2	2.2
Chromium (Cr)	mg/L	0.0003	0.000705	0.000461	41.9
Cobalt (Co)	mg/L	0.00001	0.000328	0.000328	0.0
Copper (Cu)	mg/L	0.0001	0.00118	0.00122	3.3
Iron (Fe)	mg/L	0.004	<0.004	<0.004	0.0
Lead (Pb)	mg/L	0.000006	0.0000207	0.0000134	42.8
Lithium (Li)	mg/L	0.0002	0.0226	0.0235	3.9

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 mean differences is valid only for analytical values that are at least five times the detection limit.

indicates variables differ by > 20% between splits but one or both concentrations are < 5 times the detection limit.

indicates variables differ by > 20% between splits and concentrations are > 5 times the detection limit.

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

Variable	Unit	Detection Limit	TAR-1 4-Sept-08	Split 4-Sept-08	Relative Percent Difference (%) ¹
Dissolved Metals (Cont'd.)					
Manganese (Mn)	mg/L	0.00003	0.0111	0.0156	33.7
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000706	0.000689	2.4
Nickel (Ni)	mg/L	0.00006	0.00233	0.00241	3.4
Selenium (Se)	mg/L	0.0003	0.00102	0.00104	1.9
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.435	0.443	1.8
Sulphur (S)	mg/L	0.6	64.4	65.4	1.5
Thallium (Tl)	mg/L	0.000003	0.0000085	0.0000077	9.9
Thorium (Th)	mg/L	0.00003	0.0000351	0.00003	15.7
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00115	0.00106	8.1
Uranium (U)	mg/L	0.000003	0.000864	0.00088	1.8
Vanadium (V)	mg/L	0.0002	0.000469	0.000381	20.7
Zinc (Zn)	mg/L	0.0002	0.00571	0.00466	20.3
Total Metals					
Aluminum (Al)	mg/L	0.002	0.384	0.21	58.6
Antimony (Sb)	mg/L	0.000001	0.0000991	0.000102	2.9
Arsenic (As)	mg/L	0.00004	0.00115	0.00115	0.0
Barium (Ba)	mg/L	0.0001	0.0826	0.0811	1.8
Beryllium (Be)	mg/L	0.00001	0.0000196	0.0000193	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.126	0.128	1.6
Cadmium (Cd)	mg/L	0.000006	0.000011	0.0000142	25.4
Calcium (Ca)	mg/L	0.1	89.2	91	2.0
Chlorine (Cl)	mg/L	0.3	46.7	46.5	0.4
Chromium (Cr)	mg/L	0.0003	0.000712	0.000466	41.8
Cobalt (Co)	mg/L	0.00001	0.000478	0.000465	2.8
Copper (Cu)	mg/L	0.0001	0.00118	0.00122	3.3
Iron (Fe)	mg/L	0.004	1.4	1.24	12.1
Lead (Pb)	mg/L	0.000006	0.000164	0.000144	13.0
Lithium (Li)	mg/L	0.0002	0.0227	0.0239	5.2
Manganese (Mn)	mg/L	0.00003	0.102	0.0979	4.1
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	<1.2	<1.2	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000706	0.000696	1.4
Nickel (Ni)	mg/L	0.00006	0.00235	0.0025	6.2
Selenium (Se)	mg/L	0.0003	0.00121	0.00111	8.6
Silver (Ag)	mg/L	0.000005	0.0000196	0.000005	118.7
Strontium (Sr)	mg/L	0.000008	0.442	0.451	2.0
Sulphur (S)	mg/L	0.6	64.9	66.3	2.1
Thallium (Tl)	mg/L	0.000003	0.0000131	0.0000109	18.3
Thorium (Th)	mg/L	0.00003	0.0000936	0.000075	22.1
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.0115	0.00725	45.3
Uranium (U)	mg/L	0.000003	0.000906	0.000917	1.2
Vanadium (V)	mg/L	0.0002	0.00121	0.000829	37.4
Zinc (Zn)	mg/L	0.0002	0.00577	0.00585	1.4

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 mean differences is valid only for analytical values that are at least five times the detection limit.

indicates variables differ by > 20% between splits but one or both concentrations are < 5 times the detection limit.

indicates variables differ by > 20% between splits and concentrations are > 5 times the detection limit.

Table B.2-4 Relative percent difference between duplicate water quality samples collected from the Tar River (TAR-2), spring 2008.

Variable	Unit	Detection Limit	TAR-2 14-May-08	Duplicate 14-May-08	Relative Percent Difference (%) ¹
Conventional Variables					
Conductivity	µS/cm	0.2	142	142	0.0
Dissolved Organic Carbon	mg/L	1	24	24	0.0
Hardness (as CaCO ₃)	mg/L		66	69	4.4
pH	pH units	0.1	7.9	7.9	0.0
Total Alkalinity	mg/L	5	56	54	3.6
Total Dissolved Solids	mg/L	10	100	110	9.5
Total Organic Carbon	mg/L	1	19	21	10.0
Total Suspended Solids	mg/L	3	68	64	6.1
True Colour	T.C.U.	2	110	110	0.0
Major Ions					
Bicarbonate (HCO ₃)	mg/L	5	68	66	3.0
Calcium (Ca)	mg/L	0.5	17.8	18.6	4.4
Carbonate (CO ₃)	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	2	3	40.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	5.3	5.5	3.7
Potassium (K)	mg/L	0.5	1.5	1.6	6.5
Sodium (Na)	mg/L	1	4	4	0.0
Sulfate (SO ₄)	mg/L	0.5	14.1	14.7	4.2
Sulphide (S ₂)	mg/L	0.003	0.003	0.005	50.0
Nutrients and BOD					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.039	0.041	5.0
Phosphorus, total	mg/L	0.001	0.133	0.139	4.4
Total Kjeldahl Nitrogen	mg/L	0.2	1.4	1.3	7.4
Total Nitrogen	mg/L		1.5	1.4	6.9
Hydrocarbons					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.004	0.012	0.011	8.7
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
Dissolved Metals					
Aluminum (Al)	mg/L	0.001	0.0818	0.0828	1.2
Antimony (Sb)	mg/L	0.000001	0.0000941	0.0000905	3.9
Arsenic (As)	mg/L	0.00004	0.000658	0.000646	1.8
Barium (Ba)	mg/L	0.0001	0.0223	0.0224	0.4
Beryllium (Be)	mg/L	0.00001	0.0000146	0.0000139	4.9
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0326	0.0303	7.3
Cadmium (Cd)	mg/L	0.000006	0.0000108	0.0000144	28.6
Calcium (Ca)	mg/L	0.1	17	16.9	0.6
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.0
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.000466	0.000474	1.7
Copper (Cu)	mg/L	0.0001	0.00122	0.0021	53.0
Iron (Fe)	mg/L	0.004	0.428	0.427	0.2
Lead (Pb)	mg/L	0.000006	0.0000987	0.000116	16.1
Lithium (Li)	mg/L	0.0002	0.00965	0.00892	7.9

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 mean differences is valid only for analytical values that are at least five times the detection limit.

indicates variables differ by > 20% between splits but one or both concentrations are < 5 times the detection limit.

indicates variables differ by > 20% between splits and concentrations are > 5 times the detection limit.

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

Variable	Unit	Detection Limit	TAR-2 14-May-08	Duplicate 14-May-08	Relative Percent Difference (%) ¹
Dissolved Metals (Cont'd.)					
Manganese (Mn)	mg/L	0.00003	0.0307	0.0331	7.5
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.00058	0.000644	10.5
Nickel (Ni)	mg/L	0.00006	0.00243	0.00252	3.6
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.0665	0.066	0.8
Sulphur (S)	mg/L	0.6	5.74	5.86	2.1
Thallium (Tl)	mg/L	0.000003	0.0000052	0.0000052	0.0
Thorium (Th)	mg/L	0.00003	0.0000487	0.0000503	3.2
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00414	0.0046	10.5
Uranium (U)	mg/L	0.000003	0.000135	0.000136	0.7
Vanadium (V)	mg/L	0.00005	0.000397	0.000432	8.4
Zinc (Zn)	mg/L	0.0002	0.00264	0.00268	1.5
Total Metals					
Aluminum (Al)	mg/L	0.002	3.69	3.81	3.2
Antimony (Sb)	mg/L	0.000001	0.0000951	0.0000914	4.0
Arsenic (As)	mg/L	0.00004	0.00233	0.00183	24.0
Barium (Ba)	mg/L	0.0001	0.0658	0.0678	3.0
Beryllium (Be)	mg/L	0.00001	0.000172	0.000158	8.5
Bismuth (Bi)	mg/L	0.00001	0.0000217	0.0000219	0.9
Boron (B)	mg/L	0.0008	0.0374	0.04	6.7
Cadmium (Cd)	mg/L	0.000006	0.0000719	0.0000498	36.3
Calcium (Ca)	mg/L	0.1	17.3	17.1	1.2
Chlorine (Cl)	mg/L	0.3	2.31	<0.3	0.0
Chromium (Cr)	mg/L	0.0003	0.0046	0.00473	2.8
Cobalt (Co)	mg/L	0.00001	0.00135	0.00134	0.7
Copper (Cu)	mg/L	0.0001	0.00309	0.00214	36.3
Iron (Fe)	mg/L	0.004	2.83	2.85	0.7
Lead (Pb)	mg/L	0.000006	0.00178	0.00158	11.9
Lithium (Li)	mg/L	0.0002	0.0124	0.0116	6.7
Manganese (Mn)	mg/L	0.00003	0.107	0.101	5.8
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	6.5	7.1	8.8
Molybdenum (Mo)	mg/L	0.000008	0.000586	0.000663	12.3
Nickel (Ni)	mg/L	0.00006	0.0055	0.00451	19.8
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	0.0000254	0.0000234	8.2
Strontium (Sr)	mg/L	0.000008	0.0668	0.0714	6.7
Sulphur (S)	mg/L	0.6	6.08	6.12	0.7
Thallium (Tl)	mg/L	0.000003	0.0000602	0.0000601	0.2
Thorium (Th)	mg/L	0.00003	0.00058	0.000612	5.4
Tin (Sn)	mg/L	0.00007	<0.00007	0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.0666	0.0553	18.5
Uranium (U)	mg/L	0.000003	0.000552	0.000333	49.5
Vanadium (V)	mg/L	0.00005	0.0107	0.0107	0.0
Zinc (Zn)	mg/L	0.0002	0.0121	0.0121	0.0

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 mean differences is valid only for analytical values that are at least five times the detection limit.

indicates variables differ by > 20% between splits but one or both concentrations are < 5 times the detection limit.

indicates variables differ by > 20% between splits and concentrations are > 5 times the detection limit.

Table B.2-5 Relative percent difference between duplicate water quality samples collected from Muskeg Creek (MUC-1), winter 2008.

Variable	Unit	Detection Limit	MUC-1 25-March-08	Duplicate 25-March-08	Relative Percent Difference (%) ¹
Conventional Variables					
Conductivity	µS/cm	0.2	275	274	0.4
Dissolved Organic Carbon	mg/L	1	36	35	2.8
Hardness (as CaCO ₃)	mg/L		131	135	3.0
pH	pH units	0.1	7.7	7.8	1.3
Total Alkalinity	mg/L	5	147	147	0.0
Total Dissolved Solids	mg/L	10	230	220	4.4
Total Organic Carbon	mg/L	1	34	33	3.0
Total Suspended Solids	mg/L	3	3	<3	0.0
True Colour	T.C.U.	2	77	76	1.3
Major Ions					
Bicarbonate (HCO ₃)	mg/L	5	180	180	0.0
Calcium (Ca)	mg/L	0.5	34.3	34.9	1.7
Carbonate (CO ₃)	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	2	2	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	11.1	11.6	4.4
Potassium (K)	mg/L	0.5	1.8	1.3	32.3
Sodium (Na)	mg/L	1	14	15	6.9
Sulfate (SO ₄)	mg/L	0.5	4.4	4.0	9.5
Sulphide (S ₂)	mg/L	0.002	0.021	0.023	9.1
Nutrients and BOD					
Ammonia-N	mg/L	0.05	0.45	0.46	2.2
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	0.2	0.3	40.0
Phosphorus, dissolved	mg/L	0.001	0.012	0.012	0.0
Phosphorus, total	mg/L	0.001	0.025	0.022	12.8
Total Kjeldahl Nitrogen	mg/L	0.2	1.7	1.7	0.0
Total Nitrogen	mg/L		1.9	2	5.1
Hydrocarbons					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	0.008	0.010	22.2
Total Rec. Hydrocarbons	mg/L	1	<1	1	0.0
Dissolved Metals					
Aluminum (Al)	mg/L	0.001	0.00528	0.00535	1.3
Antimony (Sb)	mg/L	0.000001	0.000029	0.0000282	2.8
Arsenic (As)	mg/L	0.00004	0.000517	0.000488	5.8
Barium (Ba)	mg/L	0.0001	0.022	0.0213	3.2
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0535	0.0597	11.0
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	31	30.3	2.3
Chlorine (Cl)	mg/L	0.3	0.771	0.646	17.6
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.0000828	0.0000747	10.3
Copper (Cu)	mg/L	0.0001	0.000204	0.000244	17.9
Iron (Fe)	mg/L	0.004	0.551	0.523	5.2
Lead (Pb)	mg/L	0.000006	0.0000287	0.0000256	11.4
Lithium (Li)	mg/L	0.0002	0.0101	0.00976	3.4

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 mean differences is valid only for analytical values that are at least five times the detection limit.

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

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

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

Variable	Unit	Detection Limit	MUC-1 25-March-08	Duplicate 25-March-08	Relative Percent Difference (%) ¹
Dissolved Metals (Cont'd.)					
Manganese (Mn)	mg/L	0.00003	0.0319	0.0316	0.9
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.0000978	0.0000929	5.1
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	0.0
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.102	0.0998	2.2
Sulphur (S)	mg/L	0.6	1.27	1.88	38.7
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	0.0
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00137	0.00122	11.6
Uranium (U)	mg/L	0.000003	0.000048	0.0000482	0.4
Vanadium (V)	mg/L	0.00005	0.000291	0.000267	8.6
Zinc (Zn)	mg/L	0.0002	0.00112	0.000915	20.1
Total Metals					
Aluminum (Al)	mg/L	0.002	0.0313	0.0337	7.4
Antimony (Sb)	mg/L	0.000001	0.0000293	0.0000285	2.8
Arsenic (As)	mg/L	0.00004	0.000517	0.000514	0.6
Barium (Ba)	mg/L	0.0001	0.0228	0.0228	0.0
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0565	0.0605	6.8
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	32.1	31.9	0.6
Chlorine (Cl)	mg/L	0.3	0.779	0.653	17.6
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.0000977	0.0000913	6.8
Copper (Cu)	mg/L	0.0001	0.000206	0.000246	17.7
Iron (Fe)	mg/L	0.004	0.677	0.662	2.2
Lead (Pb)	mg/L	0.000006	0.000029	0.000029	0.0
Lithium (Li)	mg/L	0.0002	0.0104	0.0102	1.9
Manganese (Mn)	mg/L	0.00003	0.0478	0.045	6.0
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	<1.2	<1.2	0.0
Molybdenum (Mo)	mg/L	0.000008	0.0000988	0.000113	13.4
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	0.0
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.105	0.104	1.0
Sulphur (S)	mg/L	0.6	1.28	2.26	55.4
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	0.0
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00193	0.00187	3.2
Uranium (U)	mg/L	0.000003	0.0000511	0.0000505	1.2
Vanadium (V)	mg/L	0.00005	0.000344	0.000316	8.5
Zinc (Zn)	mg/L	0.0002	0.00113	0.000924	20.1

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 mean differences is valid only for analytical values that are at least five times the detection limit.

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

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

Table B.2-6 Relative percent difference between duplicate water quality samples collected from the Athabasca River (ATR-DD-W), summer 2008.

Variable	Unit	Detection Limit	ATR-DD-W 15-July-08	Duplicate 15-July-08	Relative Percent Difference (%) ¹
Conventional Variables					
Conductivity	µS/cm	0.2	240	239	0.4
Dissolved Organic Carbon	mg/L	1	7	7	0.0
Hardness (as CaCO ₃)	mg/L		109	108	0.9
pH	pH units	0.1	8.2	8.1	1.2
Total Alkalinity	mg/L	5	92	93	1.1
Total Dissolved Solids	mg/L	10	240	210	13.3
Total Organic Carbon	mg/L	1	7	7	0.0
Total Suspended Solids	mg/L	3	97	63	42.5
True Colour	T.C.U.	2	22	22	0.0
Major Ions					
Bicarbonate (HCO ₃)	mg/L	5	113	113	0.0
Calcium (Ca)	mg/L	0.5	29.4	29.0	1.4
Carbonate (CO ₃)	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	4	4	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	8.7	8.6	1.2
Potassium (K)	mg/L	0.5	0.9	0.8	11.8
Sodium (Na)	mg/L	1	8	8	0.0
Sulfate (SO ₄)	mg/L	0.5	21.7	21.9	0.9
Sulphide (S ₂)	mg/L	0.002	0.003	0.003	0.0
Nutrients and BOD					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.010	0.011	9.5
Phosphorus, total	mg/L	0.001	0.081	0.075	7.7
Total Kjeldahl Nitrogen	mg/L	0.2	0.4	0.4	0.0
Total Nitrogen	mg/L		0.5	0.5	0.0
Hydrocarbons					
Naphthenic Acids	mg/L	1	1	<1	0.0
Total Phenolics	mg/L	0.001	0.007	0.005	33.3
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
Dissolved Metals					
Aluminum (Al)	mg/L	0.001	0.0227	0.0224	1.3
Antimony (Sb)	mg/L	0.000001	0.000082	0.0000797	2.8
Arsenic (As)	mg/L	0.00004	0.000476	0.000475	0.2
Barium (Ba)	mg/L	0.0001	0.043	0.0436	1.4
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0193	0.0185	4.2
Cadmium (Cd)	mg/L	0.000006	0.0000108	0.0000112	0.0
Calcium (Ca)	mg/L	0.1	25.6	25.7	0.4
Chlorine (Cl)	mg/L	0.3	3.68	2.96	21.7
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.0000476	0.000121	87.1
Copper (Cu)	mg/L	0.0001	0.000679	0.000685	0.9
Iron (Fe)	mg/L	0.004	0.0701	0.0706	0.7
Lead (Pb)	mg/L	0.000006	0.0000385	0.0000379	1.6
Lithium (Li)	mg/L	0.0002	0.00615	0.006	2.5

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 mean differences is valid only for analytical values that are at least five times the detection limit.

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

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

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

Variable	Unit	Detection Limit	ATR-DD-W 15-July-08	Duplicate 15-July-08	Relative Percent Difference (%) ¹
Dissolved Metals (Cont'd.)					
Manganese (Mn)	mg/L	0.00003	0.000918	0.00092	0.2
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000561	0.000536	4.6
Nickel (Ni)	mg/L	0.00006	0.000614	0.00062	1.0
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.215	0.212	1.4
Sulphur (S)	mg/L	0.6	7.43	7.02	5.7
Thallium (Tl)	mg/L	0.000003	0.0000052	0.000006	0.0
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00121	0.00115	5.1
Uranium (U)	mg/L	0.000003	0.000309	0.000306	1.0
Vanadium (V)	mg/L	0.00005	0.000304	0.000306	0.7
Zinc (Zn)	mg/L	0.0002	0.000365	0.000322	12.5
Total Metals					
Aluminum (Al)	mg/L	0.002	2.46	2.25	8.9
Antimony (Sb)	mg/L	0.000001	0.0000828	0.0000805	2.8
Arsenic (As)	mg/L	0.00004	0.00108	0.00103	4.7
Barium (Ba)	mg/L	0.0001	0.0762	0.0732	4.0
Beryllium (Be)	mg/L	0.00001	0.000114	0.000116	1.7
Bismuth (Bi)	mg/L	0.00001	0.000015	0.0000138	8.3
Boron (B)	mg/L	0.0008	0.0208	0.0197	5.4
Cadmium (Cd)	mg/L	0.000006	0.0000304	0.0000303	0.3
Calcium (Ca)	mg/L	0.1	30.7	30.6	0.3
Chlorine (Cl)	mg/L	0.3	4.54	2.99	41.2
Chromium (Cr)	mg/L	0.0003	0.00369	0.00344	7.0
Cobalt (Co)	mg/L	0.00001	0.000929	0.0009	3.2
Copper (Cu)	mg/L	0.0001	0.0021	0.00198	5.9
Iron (Fe)	mg/L	0.004	2.3	2.24	2.6
Lead (Pb)	mg/L	0.000006	0.00117	0.00112	4.4
Lithium (Li)	mg/L	0.0002	0.00757	0.00717	5.4
Manganese (Mn)	mg/L	0.00003	0.069	0.0681	1.3
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	3.7	3.5	5.6
Molybdenum (Mo)	mg/L	0.000008	0.000562	0.000541	3.8
Nickel (Ni)	mg/L	0.00006	0.00261	0.00256	1.9
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	0.0000134	0.0000119	11.9
Strontium (Sr)	mg/L	0.000008	0.228	0.225	1.3
Sulphur (S)	mg/L	0.6	7.5	7.09	5.6
Thallium (Tl)	mg/L	0.000003	0.0000416	0.0000398	4.4
Thorium (Th)	mg/L	0.00003	0.000528	0.000472	11.2
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.082	0.0565	36.8
Uranium (U)	mg/L	0.000003	0.000418	0.000403	3.7
Vanadium (V)	mg/L	0.00005	0.00577	0.00547	5.3
Zinc (Zn)	mg/L	0.0002	0.00659	0.00628	4.8

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 mean differences is valid only for analytical values that are at least five times the detection limit.

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

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

Table B.2-7 Relative percent difference between duplicate water quality samples collected from the Hangingstone River (HAR-1), fall 2008.

Variable	Unit	Detection Limit	HAR-1 3-Sept-08	Duplicate 3-Sept-08	Relative Percent Difference (%) ¹
Conventional Variables					
Conductivity	µS/cm	0.2	231	231	0.0
Dissolved Organic Carbon	mg/L	1	34	34	0.0
Hardness (as CaCO ₃)	mg/L		85	93	9.0
pH	pH units	0.1	8.1	8.1	0.0
Total Alkalinity	mg/L	5	89	101	12.6
Total Dissolved Solids	mg/L	5	290	270	7.1
Total Organic Carbon	mg/L	1	35	35	0.0
Total Suspended Solids	mg/L	3	9	10	10.5
True Colour	T.C.U.	2	210	210	0.0
Major Ions					
Bicarbonate (HCO ₃)	mg/L	5	108	123	13.0
Calcium (Ca)	mg/L	0.5	22.3	24.4	9.0
Carbonate (CO ₃)	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	13	13	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	7.2	7.8	8.0
Potassium (K)	mg/L	0.5	0.6	0.8	28.6
Sodium (Na)	mg/L	1	25	21	17.4
Sulfate (SO ₄)	mg/L	0.5	29.3	10.6	93.7
Sulphide (S ₂)	mg/L	0.003	0.013	0.014	7.4
Nutrients and BOD					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.041	0.044	7.1
Phosphorus, total	mg/L	0.001	0.065	0.065	0.0
Total Kjeldahl Nitrogen	mg/L	0.2	0.9	1.1	20.0
Total Nitrogen	mg/L		1	1.2	18.2
Hydrocarbons					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	0.012	0.011	8.7
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
Dissolved Metals					
Aluminum (Al)	mg/L	0.001	0.0373	0.0405	8.2
Antimony (Sb)	mg/L	0.000001	0.0000528	0.0000498	5.8
Arsenic (As)	mg/L	0.00004	0.0011	0.00118	7.0
Barium (Ba)	mg/L	0.0001	0.0221	0.0225	1.8
Beryllium (Be)	mg/L	0.00001	0.0000207	0.0000255	20.8
Bismuth (Bi)	mg/L	0.00001	0.0000221	0.0000107	69.5
Boron (B)	mg/L	0.0008	0.0512	0.0535	4.4
Cadmium (Cd)	mg/L	0.000006	0.0000111	0.0000196	55.4
Calcium (Ca)	mg/L	0.1	21.6	22.1	2.3
Chlorine (Cl)	mg/L	0.3	11.9	12.5	4.9
Chromium (Cr)	mg/L	0.0003	0.000686	0.000617	10.6
Cobalt (Co)	mg/L	0.00001	0.000159	0.000164	3.1
Copper (Cu)	mg/L	0.0001	0.000824	0.00088	6.6
Iron (Fe)	mg/L	0.004	0.824	0.855	3.7
Lead (Pb)	mg/L	0.000006	0.0000836	0.00013	43.4
Lithium (Li)	mg/L	0.0002	0.00924	0.00912	1.3

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 mean differences is valid only for analytical values that are at least five times the detection limit.

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

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

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

Variable	Unit	Detection Limit	HAR-1 3-Sept-08	Duplicate 3-Sept-08	Relative Percent Difference (%) ¹
Dissolved Metals (Cont'd.)					
Manganese (Mn)	mg/L	0.00003	0.00909	0.00976	7.1
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000679	0.000682	0.4
Nickel (Ni)	mg/L	0.00006	0.00191	0.00214	11.4
Selenium (Se)	mg/L	0.0002	<0.0002	<0.0002	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.114	0.118	3.4
Sulphur (S)	mg/L	0.6	3.38	3.35	0.9
Thallium (Tl)	mg/L	0.000003	0.0000105	0.0000078	29.5
Thorium (Th)	mg/L	0.00003	0.0000696	0.0000594	15.8
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00276	0.0029	4.9
Uranium (U)	mg/L	0.000003	0.000197	0.000205	4.0
Vanadium (V)	mg/L	0.00005	0.000623	0.000594	4.8
Zinc (Zn)	mg/L	0.0002	0.00281	0.0033	16.0
Total Metals					
Aluminum (Al)	mg/L	0.002	0.464	0.485	4.4
Antimony (Sb)	mg/L	0.000001	0.0000533	0.0000503	5.8
Arsenic (As)	mg/L	0.00004	0.00151	0.00148	2.0
Barium (Ba)	mg/L	0.0001	0.029	0.0283	2.4
Beryllium (Be)	mg/L	0.00001	0.0000312	0.0000325	4.1
Bismuth (Bi)	mg/L	0.00001	0.0000223	0.000012	60.1
Boron (B)	mg/L	0.0008	0.054	0.0548	1.5
Cadmium (Cd)	mg/L	0.000006	0.0000175	0.0000198	12.3
Calcium (Ca)	mg/L	0.1	22.6	22.4	0.9
Chlorine (Cl)	mg/L	0.3	12.6	12.5	0.8
Chromium (Cr)	mg/L	0.0003	0.00107	0.00107	0.0
Cobalt (Co)	mg/L	0.00001	0.000407	0.000384	5.8
Copper (Cu)	mg/L	0.0001	0.00097	0.000892	8.4
Iron (Fe)	mg/L	0.004	1.57	1.55	1.3
Lead (Pb)	mg/L	0.000006	0.000266	0.00026	2.3
Lithium (Li)	mg/L	0.0002	0.00946	0.00946	0.0
Manganese (Mn)	mg/L	0.00003	0.0572	0.0507	12.0
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	2.3	1.2	62.9
Molybdenum (Mo)	mg/L	0.000008	0.000709	0.000689	2.9
Nickel (Ni)	mg/L	0.00006	0.00219	0.00216	1.4
Selenium (Se)	mg/L	0.0002	0.0002	0.000221	10.0
Silver (Ag)	mg/L	0.000005	0.0000216	0.0000216	0.0
Strontium (Sr)	mg/L	0.000008	0.12	0.12	0.0
Sulphur (S)	mg/L	0.6	3.38	3.38	0.0
Thallium (Tl)	mg/L	0.000003	0.0000125	0.0000125	0.0
Thorium (Th)	mg/L	0.00003	0.000124	0.000124	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.0132	0.0132	0.0
Uranium (U)	mg/L	0.000003	0.000227	0.000227	0.0
Vanadium (V)	mg/L	0.00005	0.00179	0.00179	0.0
Zinc (Zn)	mg/L	0.0002	0.00334	0.00334	0.0

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 mean differences is valid only for analytical values that are at least five times the detection limit.

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

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

Table B.2-8 Relative percent difference between duplicate water quality samples collected from Kearl Lake (KEL-1), fall 2008.

Variable	Unit	Detection Limit	KEL-1 9-Sept-08	Duplicate 9-Sept-08	Relative Percent Difference (%) ¹
Conventional Variables					
Conductivity	µS/cm	0.2	176	175	0.6
Dissolved Organic Carbon	mg/L	1	24	24	0.0
Hardness (as CaCO ₃)	mg/L		76	78	2.6
pH	pH units	0.1	8.3	8.4	1.2
Total Alkalinity	mg/L	5	89	102	13.6
Total Dissolved Solids	mg/L	10	220	190	14.6
Total Organic Carbon	mg/L	1	25	26	3.9
Total Suspended Solids	mg/L	3	4	3	28.6
True Colour	T.C.U.	2	41	41	0.0
Major Ions					
Bicarbonate (HCO ₃)	mg/L	5	108	123	13.0
Calcium (Ca)	mg/L	0.5	19.2	19.7	2.6
Carbonate (CO ₃)	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	<1	<1	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	6.8	7	2.9
Potassium (K)	mg/L	0.5	0.6	0.6	0.0
Sodium (Na)	mg/L	1	10	10	0.0
Sulfate (SO ₄)	mg/L	0.5	4.2	4.2	0.0
Sulphide (S ₂)	mg/L	0.002	0.005	0.003	50.0
Nutrients and BOD					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	2	6	100.0
Chlorophyll <i>a</i>	mg/L	0.001	5	4	22.2
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.008	0.008	0.0
Phosphorus, total	mg/L	0.001	0.025	0.024	4.1
Total Kjeldahl Nitrogen	mg/L	0.2	1.1	1.1	0.0
Total Nitrogen	mg/L		1.2	1.2	0.0
Hydrocarbons					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	0.009	0.011	20.0
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
Dissolved Metals					
Aluminum (Al)	mg/L	0.001	0.00103	0.001	3.0
Antimony (Sb)	mg/L	0.000001	0.0000232	0.0000216	7.1
Arsenic (As)	mg/L	0.00006	0.000333	0.000271	20.5
Barium (Ba)	mg/L	0.0001	0.0104	0.0109	4.7
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0484	0.0451	7.1
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	18.5	18.2	1.6
Chlorine (Cl)	mg/L	0.3	0.3	1.07	112.4
Chromium (Cr)	mg/L	0.0003	0.0003	0.00032	6.5
Cobalt (Co)	mg/L	0.00001	0.0000186	0.0000218	15.8
Copper (Cu)	mg/L	0.0001	0.000138	0.000169	20.2
Iron (Fe)	mg/L	0.004	0.0056	0.014	85.7
Lead (Pb)	mg/L	0.000006	<0.000006	<0.000006	0.0
Lithium (Li)	mg/L	0.0002	0.00563	0.00454	21.4

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 mean differences is valid only for analytical values that are at least five times the detection limit.

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

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

Table B.2-8 (Cont'd).

Variable	Unit	Detection Limit	KEL-1 9-Sept-08	Duplicate 9-Sept-08	Relative Percent Difference (%) ¹
Dissolved Metals (Cont'd.)					
Manganese (Mn)	mg/L	0.00003	0.000203	0.000198	2.5
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.0000444	0.000046	3.5
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	0.0
Selenium (Se)	mg/L	0.0002	<0.0002	<0.0002	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.0643	0.0641	0.3
Sulphur (S)	mg/L	0.6	1.24	1.51	19.6
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	0.0
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.000723	0.000775	6.9
Uranium (U)	mg/L	0.000003	0.0000086	0.0000089	3.4
Vanadium (V)	mg/L	0.00005	0.00027	0.000548	68.0
Zinc (Zn)	mg/L	0.0002	0.000526	0.000384	31.2
Total Metals					
Aluminum (Al)	mg/L	0.002	0.0153	0.0124	20.9
Antimony (Sb)	mg/L	0.000001	0.0000234	0.0000218	7.1
Arsenic (As)	mg/L	0.00006		0.000361	1.1
Arsenic (As)	mg/L	0.00004	0.000365		
Barium (Ba)	mg/L	0.0001	0.0117	0.0118	0.9
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0523	0.0506	3.3
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	19.4	19.4	0.0
Chlorine (Cl)	mg/L	0.3	0.3	1.08	113.0
Chromium (Cr)	mg/L	0.0003	0.0003	0.000323	7.4
Cobalt (Co)	mg/L	0.00001	0.0000267	0.0000307	13.9
Copper (Cu)	mg/L	0.0001	0.000139	0.000171	20.6
Iron (Fe)	mg/L	0.004	0.0795	0.0789	0.8
Lead (Pb)	mg/L	0.000006	0.0000256	0.0000248	3.2
Lithium (Li)	mg/L	0.0002	0.00589	0.00541	8.5
Manganese (Mn)	mg/L	0.00003	0.0275	0.0254	7.9
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	<1.2	<1.2	0.0
Molybdenum (Mo)	mg/L	0.000008	0.0000543	0.0000577	6.1
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	0.0
Selenium (Se)	mg/L	0.0002	<0.0002	<0.0002	0.0
Silver (Ag)	mg/L	0.000005	0.0000081	0.000005	47.3
Strontium (Sr)	mg/L	0.000008	0.0683	0.0679	0.6
Sulphur (S)	mg/L	0.6	1.39	1.8	25.7
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	0.0
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00107	0.00126	16.3
Uranium (U)	mg/L	0.000003	0.0000094	0.0000096	2.1
Vanadium (V)	mg/L	0.00005	0.000355	0.000554	43.8
Zinc (Zn)	mg/L	0.0002	0.000658	0.00052	23.4

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 mean differences is valid only for analytical values that are at least five times the detection limit.

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

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

B.2.3 Benthic Invertebrate Community Component

B.2.3.1 Quality Control Activities – Field

Field methods used for benthic invertebrate collection are considered to follow accepted methods for environmental effects monitoring (Anderson 1990, Environment Canada, 2005). Instruments used for measuring supporting variables (e.g., temperature, dissolved oxygen, conductivity, pH, current 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 Calgary, AB, who has analyzed benthic invertebrate samples on behalf of RAMP consistently since the program began. Laboratory methods used by Dr. Zloty in 2008 included resorting of 5% of samples as a confirmation of the overall sorting efficiency of all samples. In 2008, a total of 11 samples were resorted. 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 sites, a minimum removal efficiency of 90% was considered acceptable (as previous RAMP studies). This objective is considered acceptable by Environment Canada under current Environmental Effects Monitoring (EEM) strategies (Environment Canada 2002, Glozier *et al.*, 2002).

Data were received in electronic format (Microsoft Excel) from the taxonomist. 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 for the project. Printed output from statistical analyses was retained in project files in the event that analyses may be reviewed and reproduced if needed.

B.2.3.3 Quality Control Activities – Results

Results for quality control samples (5% re-sorts) from the 2008 RAMP benthic invertebrate community component indicate that this objective was consistently achieved (Table B.2-9).

Invertebrate sorting efficiency was always above 95%, and averaged 98%. Based on the criterion of 90% sorting efficiency, these results were considered acceptable and additional QC activities were not required.

Table B.2-9 Results of quality control checks on sorting efficiency of benthic invertebrate samples, RAMP 2008.

Site	% Sorting Efficiency
KEL #1	$[1-(0/(71+0))]*100 = 100$
ISL #6	$[1-(4/(111+4))]*100 = 96.5$
CLR-D1 #4	$[1-(3/(109+3))]*100 = 97.3$
BPC #4	$[1-(5/(184+5))]*100 = 97.4$
FLC #5	$[1-(6/(555+6))]*100 = 98.9$
HSR-E1 #6	$[1-(3/(91+3))]*100 = 96.8$
JAC-D2 #4	$[1-(8/(219+8))]*100 = 96.5$
MAR-E2 #10	$[1-(15/(657+15))]*100 = 97.8$
STR-E2 #5	$[1-(35/(1421+35))]*100 = 97.6$
POC-1 #6	$[1-(1/(72+1))]*100 = 98.6$

Average efficiency – 97.7% 10 samples ~ 5%

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

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.

B.2.4 Sediment Quality Component

The 2008 RAMP sediment quality QA/QC program was conducted to assess potential sample contamination during collection and analysis, the precision and accuracy of the chemical and toxicological analyses, and environmental heterogeneity.

B.2.4.1 Methods

The following field procedures were used to prevent sample contamination:

- Sampling equipment was rinsed with hexane and acetone, and triple-rinsed with ambient water prior to sample collection at a given station;
- Sampling equipment was rinsed with hexane and acetone, then washed with detergent and rinsed with ambient site water between sample collection at different stations;
- Sample grabs were kept only if they contained no large foreign objects, obtained adequate penetration depth, and were not overfilled or leaking;
- Sediments in direct contact with the grab were not used; and
- Staff wore powder-free latex gloves during sampling.

A split sample (in which a single large sample was subsampled) was collected from Jackpine Creek (JAC-1). A duplicate sample (in which two unique samples were taken from the same location) was collected from Poplar Creek (POC-D1).

The relative percent difference (RPD) in results obtained for the split and duplicate samples was calculated. Analytes for which the relative percent difference between duplicate/split sample exceeded 20% (with concentrations greater than five times the detection limit in both samples) were considered to exhibit unacceptable levels of imprecision.

In addition, sampling-equipment rinseate blanks were collected at two stations (lower Jackpine Creek [JAC-1] and Fort Creek [FOC-1]) in fall 2008. After washing the sampling equipment (i.e., Ekman dredge, stainless-steel tray, and spoons) with Liquinox soap, hexane, acetone, and ambient water, in the standard manner as done at sampling locations, rinseate samples were collected by washing down the dredge with deionized water, which was collected into the tray (containing spoons), and decanted into a sample analysis bottle. PAHs were analyzed in this rinseate (at ng/L) by AXYS Analytical Services (the same laboratory that analyzed PAHs in sediments); metals were analyzed in this rinseate (at mg/L) by ASL Environmental Ltd. in Edmonton, who also analyzed metals in sediments. Metals concentrations in sediments were compared against 5x their analytical detection limit, and PAHs were assessed against 5x laboratory blank concentration, to assess potential sample contamination related to equipment.

B.2.4.2 Results and Discussion

Duplicate Sample

Concentrations of numerous metals and several PAHs differed by over 20% between duplicate samples collected from lower Poplar Creek in fall 2008 (Table B.2-10). This result suggests relatively high within-location variability in metal and PAH concentrations at this location.

Split Sample

In the Ells River split sample, manganese and uranium were the only metals with concentrations in sediment over 5x their analytical detection limits that varied by more than 20% between split samples (Table B.2-11). However, most PAHs exhibited variable concentrations between split samples, typically by less than 30% RPD, but sometimes more (Table B.2-11). This result is consistent with split-sample analyses undertaken in previous years of RAMP, and suggests that, although metals concentrations are generally consistent within the sediment matrix in a given sample, PAHs are unevenly distributed in sediments, even within a single sample.

Rinseate Samples

Most metals and PAHs were not detected at concentrations above 5x the analytical detection limit (or 5x the laboratory-blank concentration) in rinseate blanks taken in fall 2008 (Table B.2-12). In both rinseate samples, iron was found at concentrations approximately 6x DL in both samples; molybdenum and strontium were each detected in one sample at similar concentrations relative to detection. However, concentrations of these three metals in rinseate blanks were well below that observed in ambient waters of the RAMP area (*cf.* Table 5.11-23 and results presented in Section 5 of this report). Tri-alkylated fluorenes were found at concentrations over 20x the laboratory blank in both samples; Tetra-alkylated phenanthrenes also were found at concentrations of 9x and nearly 50x the laboratory blank in respective rinseate samples. Various other PAHs also were detectable in rinseate samples, generally at concentrations less than 10x that of the laboratory blank.

B.2.4.3 Conclusions and Recommendations

Results of QA/QC samples collected for sediments by the RAMP program in 2008 were generally consistent with those collected in previous years of the RAMP program. These samples generally indicate that variability of PAHs in sediments is high within sampling locations and even within samples collected from the same sampling location. Concentrations of metals, in contrast, are generally more consistent within samples and within locations, although some variability between samples from a given station (*i.e.*, RPD of 20 to 50%) may occur.

Results of rinseate blanks collected in 2008 indicate that there is a possibility of sampling equipment contributing to observed concentrations of metals and PAHs in sediments, although this likelihood is generally low, particularly for metals, given the low concentrations of metals found in rinseate blanks relative to ambient waters in the RAMP study area, and that most metals and PAHs were not detectable at quantifiable concentrations (*i.e.*, concentrations >5x above detection limits or laboratory-blank concentrations) in rinseate water.

Table B.2-10 Relative percent difference in total metals between duplicate sediment quality samples, Poplar Creek, September 2008.

Variable	Units	Detection Limit	Sample		Relative Percent
			POC-D1	Duplicate	Difference ¹
CCME Hydrocarbons					
F1 (C6-C10)	mg/kg	5	<5	<5	0.0
F1-BTEX	mg/kg	5	<5	<5	0.0
F2 (C10-C16)	mg/kg	5	<5	54	166.1
F3 (C16-C34)	mg/kg	5	170	960	139.8
F4 (C34-C50)	mg/kg	5	54	770	173.8
Benzene	mg/kg	0.005, 0.01	<0.005	<0.01	0.0
Toluene	mg/kg	0.01	0.01	0.03	100.0
Ethylbenzene	mg/kg	0.01, 0.02	<0.01	<0.02	0.0
Xylenes	mg/kg	0.02, 0.04	<0.02	<0.04	0.0
Total Hydrocarbons (C6-C50)	mg/kg	5	220	1800	156.4
Total Metals					
Aluminum (Al)	mg/kg	50	9370	6520	35.9
Arsenic (As)	mg/kg	0.1	6.1	4.6	28.0
Barium (Ba)	mg/kg	0.5	187	137	30.9
Beryllium (Be)	mg/kg	0.2	0.7	0.6	15.4
Bismuth (Bi)	mg/kg	0.5	<0.5	<0.5	0.0
Boron (B)	mg/kg	2	13	10	26.1
Cadmium (Cd)	mg/kg	0.1	0.3	0.2	40.0
Calcium (Ca)	mg/kg	100	38300	25700	39.4
Chromium (Cr)	mg/kg	0.2	19.4	14	32.3
Cobalt (Co)	mg/kg	0.1	9.6	7.3	27.2
Copper (Cu)	mg/kg	0.5	19.1	14.1	30.1
Iron (Fe)	mg/kg	200	22100	17700	22.1
Lead (Pb)	mg/kg	0.5	12.2	9.8	21.8
Magnesium (Mg)	mg/kg	20	8680	7100	20.0
Manganese (Mn)	mg/kg	1	495	360	31.6
Mercury (Hg)	mg/kg	0.05	<0.05	0.06	18.2
Molybdenum (Mo)	mg/kg	0.1	0.7	0.4	54.5
Nickel (Ni)	mg/kg	0.5	22.8	17.9	24.1
Potassium (K)	mg/kg	100	1600	1200	28.6
Selenium (Se)	mg/kg	0.2	0.7	0.5	33.3
Silver (Ag)	mg/kg	0.2	<0.2	<0.2	0.0
Sodium (Na)	mg/kg	100	300	300	0.0
Strontium (Sr)	mg/kg	1	92	68	30.0
Thallium (Tl)	mg/kg	0.05	0.22	0.17	25.6
Tin (Sn)	mg/kg	2	<2	<2	0.0
Titanium (Ti)	mg/kg	1	55	28	65.1
Uranium (U)	mg/kg	0.05	1.11	0.95	15.5
Vanadium (V)	mg/kg	0.2	27.2	20.7	27.1
Zinc (Zn)	mg/kg	5	75	60	22.2

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 mean differences is valid only for analytical values that are at least five times the detection limit.

#	Variables differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Variables differ by > 20% between duplicates and concentrations are > 5 times the detection limit, or for PAHs, are both detectable.

Table B.2-10 (Cont'd.)

Variable	Units	Detection Limit	Sample		Relative Percent
			POC-D1	Duplicate	Difference ¹
PAHs					
Naphthalene	mg/kg	-	0.0176	0.0153	14.0
Acenaphthylene	mg/kg	-	0.000388	<0.000286	30.3
Acenaphthene	mg/kg	-	0.00282	0.00304	7.5
Fluorene	mg/kg	-	0.00583	0.00346	51.0
Phenanthrene	mg/kg	-	0.0411	0.0348	16.6
Anthracene	mg/kg	-	<0.000334	<0.000605	0.0
Fluoranthene	mg/kg	-	0.00869	0.00787	9.9
Pyrene	mg/kg	-	0.0167	0.0193	14.4
Benz[a]anthracene	mg/kg	-	0.00556	0.00526	5.5
Chrysene	mg/kg	-	0.0347	0.038	9.1
Benzo[b,j,k]fluoranthene	mg/kg	-	0.0235	0.0173	30.4
Benzo[a]pyrene	mg/kg	-	0.00817	<0.00729	11.4
Dibenz[a,h]anthracene	mg/kg	-	<0.00302	0.00432	35.4
Indeno[1,2,3-c,d]-pyrene	mg/kg	-	0.00913	0.0102	11.1
Benzo[ghi]perylene	mg/kg	-	0.0166	0.0211	23.9
C1-Naphthalenes	mg/kg	-	0.0577	0.043	29.2
Biphenyl	mg/kg	-	0.0153	0.0113	30.1
Methyl-Biphenyl	mg/kg	-	0.0182	0.0154	16.7
Dimethyl-Biphenyl	mg/kg	-	0.0234	0.0233	0.4
C2-Naphthalenes	mg/kg	-	0.0897	0.0717	22.3
C3-Naphthalenes	mg/kg	-	0.0848	0.0893	5.2
C4-Naphthalenes	mg/kg	-	0.0969	0.101	4.1
Methyl Acenaphthene	mg/kg	-	0.00622	0.00491	23.5
C1-Fluorenes	mg/kg	-	0.0449	0.045	0.2
C2-Fluorenes	mg/kg	-	0.0889	0.08	10.5
C3-Fluorenes	mg/kg	-	0.138	0.172	21.9
Dibenzothiophene	mg/kg	-	0.00531	<0.00645	19.4
C1-Dibenzothiophenes	mg/kg	-	0.052	0.0634	19.8
C2-Dibenzothiophenes	mg/kg	-	0.24	0.292	19.5
C3-Dibenzothiophenes	mg/kg	-	0.334	0.416	21.9
C4-Dibenzothiophenes	mg/kg	-	0.313	0.346	10.0
C1 Phenanthrenes/Anthracenes	mg/kg	-	0.113	0.08	34.2
C2 Phenanthrenes/Anthracenes	mg/kg	-	0.149	0.163	9.0
C3-Phenanthrenes/Anthracenes	mg/kg	-	0.173	0.203	16.0
Retene	mg/kg	-	0.108	0.118	8.8
C4-Phenanthrenes/Anthracenes	mg/kg	-	0.54	0.605	11.4
C1-Fluoranthenes/Pyrenes	mg/kg	-	0.0744	0.083	10.9
C2-Fluoranthenes/Pyrenes	mg/kg	-	0.148	0.156	5.3
C3-Fluoranthenes/Pyrenes	mg/kg	-	0.0978	0.108	9.9
C1-Benzo[a]anthracenes/Chrysenes	mg/kg	-	0.0722	0.0886	20.4
C2-Benzo[a]anthracenes/Chrysenes	mg/kg	-	0.0745	0.107	35.8
C1-Benzofluoranthenes/Pyrenes	mg/kg	-	0.0988	0.102	3.2
C2-Benzofluoranthenes/Pyrenes	mg/kg	-	0.0573	0.0519	9.9
% Moisture	%	-	35.8	32.7	9.1

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 mean differences is valid only for analytical values that are at least five times the detection limit.

#	Variables differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Variables differ by > 20% between duplicates and concentrations are > 5 times the detection limit, or for PAHs, are both detectable.

Table B.2-11 Relative percent difference in metals between split sediment quality samples, Jackpine Creek, September 2008.

Variable	Units	Detection Limit	Sample		Relative Percent Difference ¹
			JAC-D1	Split Sample	
CCME Hydrocarbons					
F1 (C6-C10)	mg/kg	5	<5	<5	0.0
F1-BTEX	mg/kg	5	<5	<5	0.0
F2 (C10-C16)	mg/kg	5	25	17	38.1
F3 (C16-C34)	mg/kg	5	790	650	19.4
F4 (C34-C50)	mg/kg	5	820	990	18.8
Benzene	mg/kg	0.005	<0.005	<0.005	0.0
Toluene	mg/kg	0.01	0.04	0.03	28.6
Ethylbenzene	mg/kg	0.01	<0.01	<0.01	0.0
Xylenes	mg/kg	0.02	<0.02	<0.02	0.0
Total Hydrocarbons (C6-C50)	mg/kg	5	1600	1700	6.1
Total Metals					
Aluminum (Al)	mg/kg	50	1420	1360	4.3
Arsenic (As)	mg/kg	0.1	0.6	0.5	18.2
Barium (Ba)	mg/kg	0.5	21.5	23.4	8.5
Beryllium (Be)	mg/kg	0.2	<0.2	<0.2	0.0
Bismuth (Bi)	mg/kg	0.5	<0.5	<0.5	0.0
Boron (B)	mg/kg	2	4	4	0.0
Cadmium (Cd)	mg/kg	0.1	<0.1	<0.1	0.0
Calcium (Ca)	mg/kg	100	1300	1500	14.3
Chromium (Cr)	mg/kg	0.2	3.4	3.4	0.0
Cobalt (Co)	mg/kg	0.1	1.5	1.4	6.9
Copper (Cu)	mg/kg	0.5	1.6	1.7	6.1
Iron (Fe)	mg/kg	200	3500	3600	2.8
Lead (Pb)	mg/kg	0.5	2.4	2.1	13.3
Magnesium (Mg)	mg/kg	20	600	630	4.9
Manganese (Mn)	mg/kg	1	73	102	33.1
Mercury (Hg)	mg/kg	0.05	<0.05	<0.05	0.0
Molybdenum (Mo)	mg/kg	0.1	0.2	0.2	0.0
Nickel (Ni)	mg/kg	0.5	3.3	3.1	6.2
Potassium (K)	mg/kg	100	300	300	0.0
Selenium (Se)	mg/kg	0.2	<0.2	<0.2	0.0
Silver (Ag)	mg/kg	0.2	<0.2	<0.2	0.0
Sodium (Na)	mg/kg	100	100	100	0.0
Strontium (Sr)	mg/kg	1	9	10	10.5
Thallium (Tl)	mg/kg	0.05	<0.05	<0.05	0.0
Tin (Sn)	mg/kg	2	<2	<2	0.0
Titanium (Ti)	mg/kg	1	29	24	18.9
Uranium (U)	mg/kg	0.05	0.43	0.31	32.4
Vanadium (V)	mg/kg	0.2	7.5	7	6.9
Zinc (Zn)	mg/kg	5	29	11	90.0

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 mean differences is valid only for analytical values that are at least five times the detection limit.

Variables differ by > 20% between splits but 1 or both concentrations are < 5 times the detection limit.

Concs. differ by > 20% between splits and are > 5x the detection limit, or for PAHs, are both detectable.

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

Variable	Units	Detection Limit	Sample		Relative Percent Difference ¹
			JAC-D1	Split Sample	
PAHs					
Naphthalene	mg/kg	-	0.000864	0.000834	3.5
Acenaphthylene	mg/kg	-	0.000308	0.000405	27.2
Acenaphthene	mg/kg	-	0.00184	0.00213	14.6
Fluorene	mg/kg	-	0.00145	0.000879	49.0
Phenanthrene	mg/kg	-	0.02	0.0205	2.5
Anthracene	mg/kg	-	<0.000887	<0.000712	0.0
Fluoranthene	mg/kg	-	<0.000979	0.00171	54.4
Pyrene	mg/kg	-	0.00958	0.00993	3.6
Benz[a]anthracene	mg/kg	-	0.0028	0.00409	37.4
Chrysene	mg/kg	-	0.0297	0.0365	20.5
Benzo[b/j/k]fluoranthene	mg/kg	-	0.0062	0.00805	26.0
Benzo[a]pyrene	mg/kg	-	0.00246	0.00336	30.9
Dibenz[a,h]anthracene	mg/kg	-	0.00259	0.00266	2.7
Indeno[1,2,3-cd]pyrene	mg/kg	-	0.00535	0.00521	2.7
Benzo[ghi]perylene	mg/kg	-	0.0148	0.0178	18.4
C1-Naphthalenes	mg/kg	-	0.00126	0.00111	12.7
Biphenyl	mg/kg	-	0.000807	0.000883	9.0
Methyl-Biphenyl	mg/kg	-	0.000209	0.000181	14.4
Dimethyl-Biphenyl	mg/kg	-	0.00225	0.00246	8.9
C2-Naphthalenes	mg/kg	-	0.0104	0.00961	7.9
C3-Naphthalenes	mg/kg	-	0.0397	0.0283	33.5
C4-Naphthalenes	mg/kg	-	0.108	0.134	21.5
Methyl Acenaphthene	mg/kg	-	0.00101	0.00108	6.7
C1-Fluorenes	mg/kg	-	0.014	0.0192	31.3
C2-Fluorenes	mg/kg	-	0.0761	0.0854	11.5
C3-Fluorenes	mg/kg	-	0.151	0.195	25.4
Dibenzothiophene	mg/kg	-	<0.00381	<0.00288	0.0
C1-Dibenzothiophenes	mg/kg	-	0.04	0.0309	25.7
C2-Dibenzothiophenes	mg/kg	-	0.265	0.29	9.0
C3-Dibenzothiophenes	mg/kg	-	0.526	0.649	20.9
C4-Dibenzothiophenes	mg/kg	-	0.388	0.579	39.5
C1 Phenanthrenes/Anthracenes	mg/kg	-	0.0894	0.107	17.9
C2 Phenanthrenes/Anthracenes	mg/kg	-	0.184	0.23	22.2
C3-Phenanthrenes/Anthracenes	mg/kg	-	0.244	0.334	31.1
Retene	mg/kg	-	0.951	0.198	131.1
C4-Phenanthrenes/Anthracenes	mg/kg	-	1.39	0.8	53.9
C1-Fluoranthenes/Pyrenes	mg/kg	-	0.0711	0.0752	5.6
C2-Fluoranthenes/Pyrenes	mg/kg	-	0.154	0.184	17.8
C3-Fluoranthenes/Pyrenes	mg/kg	-	0.0833	0.16	63.0
C1-Benzo[a]anthracenes/Chrysenes	mg/kg	-	0.0863	0.112	25.9
C2-Benzo[a]anthracenes/Chrysenes	mg/kg	-	0.107	0.136	23.9
C1-Benzofluoranthenes/Pyrenes	mg/kg	-	0.0929	0.108	15.0
C2-Benzofluoranthenes/Pyrenes	mg/kg	-	0.0538	0.0582	7.9
% Moisture	%	-	25.5	30.6	18.2

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 mean differences is valid only for analytical values that are at least five times the detection limit.

Variables differ by > 20% between splits but 1 or both concentrations are < 5 times the detection limit.

Concs. differ by > 20% between splits and are > 5x the detection limit, or for PAHs, are both detectable.

Table B.2-12 Concentration of metals in sediment sampling equipment rinseate blank, Fort Creek, September 2008.

Variable	Units	JAC-1 Rinseate		FOC-1 Rinseate	
		DL	Result	DL	Result
Total Major Metals					
Calcium (Ca)	mg/L	0.5	<0.5	0.5	<0.5
Iron (Fe)	mg/L	0.005	0.031	0.005	0.028
Magnesium (Mg)	mg/L	0.1	<0.1	0.1	<0.1
Manganese (Mn)	mg/L	0.001	0.005	0.001	0.002
Potassium (K)	mg/L	0.1	0.2	0.1	<0.1
Sodium (Na)	mg/L	1	<1	1	<1
Total Trace Metals					
Aluminum (Al)	mg/L	0.02	<0.02	0.02	0.02
Barium (Ba)	mg/L	0.0002	0.0006	0.0002	0.0006
Beryllium (Be)	mg/L	0.001	<0.001	0.001	<0.001
Boron (B)	mg/L	0.02	<0.02	0.02	<0.02
Cadmium (Cd)	mg/L	0.0002	<0.0002	0.0002	<0.0002
Chromium (Cr)	mg/L	0.0008	<0.0008	0.0008	<0.0008
Cobalt (Co)	mg/L	0.0002	<0.0002	0.0002	<0.0002
Copper (Cu)	mg/L	0.001	<0.001	0.001	<0.001
Lead (Pb)	mg/L	0.0001	<0.0001	0.0001	<0.0001
Molybdenum (Mo)	mg/L	0.0001	<0.0001	0.0001	0.0006
Nickel (Ni)	mg/L	0.0002	<0.0002	0.0002	0.0005
Silver (Ag)	mg/L	0.0004	<0.0004	0.0004	<0.0004
Strontium (Sr)	mg/L	0.0002	0.0013	0.0002	0.0006
Thallium (Tl)	mg/L	0.0001	<0.0001	0.0001	<0.0001
Tin (Sn)	mg/L	0.0004	<0.0004	0.0004	<0.0004
Titanium (Ti)	mg/L	0.005	<0.005	0.005	<0.005
Vanadium (V)	mg/L	0.0002	<0.0002	0.0002	<0.0002
Zinc (Zn)	mg/L	0.004	<0.004	0.004	<0.004
PAHs*					
Naphthalene	ng/L	0.166	19.2	0.539	120
Acenaphthylene	ng/L	0.189	< 0.189	0.155	0.499
Acenaphthene	ng/L	0.419	0.457	0.218	0.578
Fluorene	ng/L	0.173	< 0.173	0.114	0.384
Phenanthrene	ng/L	0.098	1.02	0.282	1.45
Anthracene	ng/L	0.103	< 0.103	0.296	< 0.296
Fluoranthene	ng/L	0.025	0.304	0.142	0.436
Pyrene	ng/L	0.025	0.291	0.143	0.488
Benz[a]anthracene	ng/L	0.005	0.068	0.083	0.098
Chrysene	ng/L	0.006	0.205	0.087	0.661
Benzo[b,j,k]fluoranthene	ng/L	0.048	< 0.048	0.146	< 0.146
Benzo[a]pyrene	ng/L	0.069	< 0.069	0.211	< 0.211
Dibenz[a,h]anthracene	ng/L	0.095	< 0.095	0.179	< 0.179
Indeno[1,2,3-cd]pyrene	ng/L	0.217	< 0.217	0.139	< 0.139

* Values shown for the detection limit are concentrations found in the lab blank.

Indicates the sample concentration was greater than five times the analytical detection limit or, in the case of PAHs, greater than five times the concentration in the lab blank.

Italicized text indicates that a peak was detected but did not meet lab quantification criteria.

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

Variable	Units	JAC-1 Rinseate		FOC-1 Rinseate	
		DL	Result	DL	Result
PAHs* (Cont'd.)					
Benzo[ghi]perylene	ng/L	0.202	< 0.202	0.125	0.148
C1-Naphthalenes	ng/L	0.301	9.72	0.154	20.5
Biphenyl	ng/L	0.107	1.06	0.191	2.25
Methyl-Biphenyl	ng/L	0.393	5.24	0.283	4.48
Dimethyl-Biphenyl	ng/L	0.255	24.4	0.239	15.9
C2-Naphthalenes	ng/L	0.579	5.02	0.502	7.31
C3-Naphthalenes	ng/L	0.204	23.8	0.575	13.5
C4-Naphthalenes	ng/L	0.208	13.8	0.133	9.2
Methyl Acenaphthene	ng/L	0.308	2.57	0.17	2.78
C1-Fluorenes	ng/L	1.07	< 1.07	0.725	1.94
C2-Fluorenes	ng/L	0.771	2.14	0.133	5.6
C3-Fluorenes	ng/L	0.413	8.63	0.695	13.6
Dibenzothiophene	ng/L	0.341	< 0.341	0.066	< 0.066
C1-Dibenzothiophenes	ng/L	0.283	< 0.283	0.133	< 0.133
C2-Dibenzothiophenes	ng/L	0.54	0.824	0.986	10.8
C3-Dibenzothiophenes	ng/L	0.248	2.41	0.102	24.8
C4-Dibenzothiophenes	ng/L	0.144	3.63	0.986	12.1
C1 Phenanthrenes/Anthracenes	ng/L	0.242	< 0.242	0.013	2.17
C2 Phenanthrenes/Anthracenes	ng/L	0.193	1.34	0.011	11.2
C3-Phenanthrenes/Anthracenes	ng/L	0.014	1.22	0.046	11.9
Retene	ng/L	0.362	0.723	1.56	1.78
C4-Phenanthrenes/Anthracenes	ng/L	0.362	4.64	1.56	25.9
C1-Fluoranthenes/Pyrenes	ng/L	0.007	0.59	0.283	1.73
C2-Fluoranthenes/Pyrenes	ng/L	0.164	0.948	0.522	3.74
C3-Fluoranthenes/Pyrenes	ng/L	0.13	0.49	0.348	2.2
C1-Benzo[a]anthracenes/Chrysenes	ng/L	0.1	0.607	0.104	1.55
C2-Benzo[a]anthracenes/Chrysenes	ng/L	0.167	0.31	0.269	1.53
C1-Benzofluoranthenes/Pyrenes	ng/L	0.184	0.302	0.365	0.446
C2-Benzofluoranthenes/Pyrenes	ng/L	0.382	< 0.382	0.341	0.358

* Values shown for the detection limit are concentrations found in the lab blank.

Indicates the sample concentration was greater than five times the analytical detection limit or, in the case of PAHs, greater than five times the concentration in the lab blank.

Italicized text indicates that a peak was detected but did not meet lab quantification criteria.

B.2.5 Fish Population Component

B.2.5.1 Quality Control Activities – Field

Fish and fish habitat sampling field activities were conducted in accordance with field methods considered to be standard scientific practice (e.g., Environment Canada 2005) and methods used in previous RAMP studies (Golder 1999a). Prior to every field program, fieldwork instructions (FWIs) were prepared by the Crew Leader and 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.

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, current velocity and depth) were calibrated according to recommendations from the respective manufacturer (as frequently as daily for pH and dissolved oxygen meters). Site 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 tissues sent to ALS Laboratory Group [ALS]) was conducted using lab-provided COC forms.

B.2.5.2 Quality Control Activities – Laboratory

Fish tissue analysis results from ALS and Flett Research Ltd. (Flett) include a description of QC techniques used. If relevant, comments on the results of the analyses are indicated on the printed results received from the lab. QC results meet acceptable guidelines for the lab's own internal quality procedures (a condition of membership in the Canadian Association for Environmental Analytical Laboratories [CAEAL]). In the event alternate procedures were required to achieve a result, this information is also detailed on the laboratory output. QC procedures used by ALS and Flett include laboratory duplicates, spike samples, calibration control, use of certified reference standards and internal standards. Duplicate samples for mercury analyses were completed for twenty individual tissue samples (Table B.2-13 and Table B.2-14). Ageing structures including fin rays and otoliths were taken from fish analyzed for metals and tainting compounds in fish tissue.

Data were generally received in electronic format (Microsoft Excel) from the analytical lab or entered by hand for other field programs. 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. Where used, printed output from statistical analyses was retained in project files in the event that analyses may be reviewed and reproduced if needed.

Table B.2-13 Relative percent difference between duplicate mercury fish tissue samples collected from the Regional lakes: Big Island Lake and Gardiner Lake, fall 2008.

Analyte	Waterbody	Sample ID	Unit	Sample Date	Sample	Duplicate	Relative Percent Difference (%)
Mercury	Big Island Lake	BL-LKWH-01	ng/g wet weight	27-Oct-08	30.3	28.5	5.9
		BL-LKWH-11	ng/g wet weight	27-Oct-08	55.2	53.9	2.4
		BL-NRPK-05	ng/g wet weight	27-Oct-08	70.6	66.4	5.9
		BL-WALL-03	ng/g wet weight	27-Oct-08	89.8	81.8	8.9
		BL-WALL-13	ng/g wet weight	27-Oct-08	95.4	90.1	5.6
	Gardiner Lake	GL-LKWH-01	ng/g wet weight	27-Oct-08	38.0	37.6	1.1
		GL-LKWH-11	ng/g wet weight	27-Oct-08	79.8	76.1	4.6
		GL-NRPK-01	ng/g wet weight	27-Oct-08	342	338	1.2
		GL-NRPK-02	ng/g wet weight	27-Oct-08	206	206	0.0
		GL-NRPK-07	ng/g wet weight	27-Oct-08	172	160	7.0
		GL-WALL-03	ng/g wet weight	27-Oct-08	528	524	0.8
		GL-WALL-04	ng/g wet weight	27-Oct-08	105	108	2.8
		GL-WALL-05	ng/g wet weight	27-Oct-08	502	492	2.0
		GL-WALL-12	ng/g wet weight	27-Oct-08	93.9	92.5	1.5
		GL-WALL-15	ng/g wet weight	27-Oct-08	416	410	1.4
		GL-WALL-25	ng/g wet weight	27-Oct-08	207	203	1.9
		GL-WALL-27	ng/g wet weight	27-Oct-08	55.4	59.8	7.4

Table B.2-14 Relative percent difference between duplicate mercury fish tissue samples collected from the Athabasca River, fall 2008.

Analyte	Waterbody	Sample ID	Unit	Sample Date	Sample	Duplicate	Relative Percent Difference (%)
Mercury	Athabasca River	LKWH-10B-11	ng/g wet weight	24-Sept-08	58.2	59.4	2.0
		WALL-01A-03	ng/g wet weight	29-Sept-08	235	251	6.4
		00B-115	ng/g wet weight	29-Sept-08	88.6	91.7	3.4

B.2.6 Acid-Sensitive Lakes Component

Field sampling under the Acid-Sensitive Lakes Component of RAMP is conducted entirely by personnel from Alberta Environment. Water samples collected at each lake are analyzed by the University of Alberta Limnology Laboratory. The lab uses a series of set procedures, outlined in detail below, for analytical quality control; the procedures used are identical to those used in previous RAMP studies (e.g., Golder 2003a).

B.2.6.1 Quality Control Activities – Field

Water sample collection in the field utilizes standard practices for quality control of samples to avoid contamination. Field instruments (e.g., water quality meters) are cared for so as to maximize data quality (i.e., proper calibration according to manufacturer specifications). Procedures used include 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 is thoroughly cleaned between sites;
- Sample containers are tripled-rinsed prior to filling (cap included);
- Sample containers are filled to the top (i.e., no head space);
- Samples are stored under cool (4°C) conditions and in the dark (i.e., in a refrigerator); and
- Samples are submitted to the appropriate analytical laboratory within established maximum holding period (typically 48 hours).

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. Programs used include 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 sample for each group of analyses from analytical grade chemicals or standard reference samples. Annually, 10 samples of known chemistry are submitted by Environment Canada's National Water Research Institute (NWRI) for blind analysis and comparison. Two times per 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 are run along with standard laboratory reference samples to create a standard results curve. QC solutions are then run in duplicate. If results for control are consistent for a series of analyses, no additional QC testing is required. If results from QC samples are divergent from standards, corrective action is initiated to determine the cause and results that may be affected. When new QC samples are prepared, each one is tested against the previous QC sample (for a given parameter) to assess comparability.

Appendix C

Climate and Hydrology Component

C.0 CLIMATE AND HYDROLOGY COMPONENT

C.1 CLIMATE DATA COLLECTED IN 2008

C.1.1 RAMP Climate Data

C.1.1.1 Aurora Climate Station (C1)

The Aurora Climate Station (C1) sensors monitored air temperature, wind speed and direction, precipitation, solar radiation, and relative humidity during 2008. Table C.1-1 lists the data elements monitored at the station. Monthly observations for 2008 are summarized in Table C.1-2, and daily observations are contained in the RAMP database.

The records in the station are incomplete due to the following data gaps:

- Global Solar Radiation: January 01 to January 15, generated incorrect values due to snow on sensor;
- January 11 to January 16, August 6 to August 9, September 10 to September 15 data not recorded due to program error; and
- Snow on the ground: January 10 to February 16, missing data due to faulty sensor.

Table C.1-1 Aurora Climate Station (C1) daily data elements.

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature 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 Tipping bucket rain gauge	Total	(mm)	Sum of 0.1 mm tips.
Depth of Snow on Ground Sonic level sensor	Total	(cm)	Average of 5 second readings made in the last minute of each hour.
Mean Relative Humidity Humidity sensor	Mean	(%)	Mean of readings every 5 sec.
Total Global Solar Radiation Pyranometer	Total	(kWh/m ²)	Sum of time integrated readings every 5 sec.
Wind Speed and Direction Wind Vane and Propeller	Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	5 sec. 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.

Table C.1-2 Summary of 2008 monthly climate data collected at C1 Aurora Climate Station.

Month	Temperature			Total Precip. (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Total Global Solar Radiation (kWh/m ²)	Maximum Sustained Wind Speeds		
	Min. (°C)	Mean (°C)	Max. (°C)					5 sec. (km/h)	2 min. (km/h)	10 min. (km/h)
2008										
January	-39.7 P	-18.9 P	-2.8 P	4.8 P	M	82.7 P	9.5 P	45.4 P	31.2 P	28.4 P
February	-39.8 P	-18.3 P	6.9 P	9.7	34.0	78.8	36.4	36.7	26.5	22.7
March	-35.5	-9.5	11.3	16.5	37.0	70.4	94.0	39.0	31.3	27.3
April	-19.4	-0.8	19.7	14.7	0	58.5	132.7	56.2	37.1	31.8
May	-4.5	11.1	26.7	5.6	0	48.3	181.1	46.2	36.7	30.3
June	0.2	16.7	30.9	42.1	0	59.7	176.8	41.4	29.5	25.5
July	5.5	17.8	32.0	81.5	0	67.0	161.9	52.6	31.2	28.2
August	1.8 P	15.8 P	32.7 P	95.9 P	0	75.2 P	107.0 P	49.7 P	33.5 P	27.7 P
September	-4.6 P	8.6 P	23.4 P	28.6 P	0	77.4 P	64.6 P	46.0 P	31.5 P	25.8 P
October	-9.4	4.9	27.6	36.6	0	70.2	50.0	59.1	36.9	33.2
November	-20.6	-4.6	4.4	15.3	5.0	92.8	9.8	29.4	20.7	17.7
December	-36.8	-22.7	3.2	15.1	15.7	78.7	5.2	50.5	37.9	33.3
2008 Annual	-39.8 P	0.0 P	32.7 P	366.6 P	15.7	71.7 P	1029.1 P	59.1 P	37.9 P	33.3 P

Note: M = Missing; P = Partial; See additional notes in section C.1.1.4

C.1.1.2 Horizon Climate Station (C2)

The Horizon Climate Station (C2) was established in October 2008. The sensors monitored air temperature, wind speed and direction, solar radiation, and relative humidity during 2008. Table C.1-1 lists the data elements monitored at the station. Monthly observations for 2008 are summarized in Table C.1-2, and daily observations are contained in the RAMP database.

Records at the station are incomplete due to the following data gaps:

- Wind data: November 5 to November 8, not recorded - reason unknown;
- All variables: December 14 to December 21 missing due to battery failure.

Table C.1-3 Horizon Climate Station (C2) daily data elements.

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature 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.
Depth of Snow on Ground Sonic level sensor	Total	(cm)	Average of 5 second readings made in the last minute of each hour.
Mean Relative Humidity Humidity sensor	Mean	(%)	Mean of readings every 5 sec.
Total Global Solar Radiation Pyranometer	Total	(kWh/m ²)	Sum of time integrated readings every 5 sec.
Barometric pressure	mean	KPa	Recorded for every minute and averaged per 1 hour
Wind Speed and Direction Wind Vane and Propeller	Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	5 sec. 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.

Table C.1-4 Summary of 2008 monthly climate data collected at C2 Horizon Climate Station.

Month	Temperature			Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Total Global Solar Radiation (kWh/m²)	Station Pressure (kPa)	Maximum Sustained Wind Speeds		
	Min. (°C)	Mean (°C)	Max. (°C)					5 sec. (km/h)	2 min. (km/h)	10 min. (km/h)
2008										
October	-8.4 P	2.0 P	11.5 P	M	61.1 P	17.3 P	96.3 P	78.5 P	60.8 P	50.5 P
November	-19.7	-4.6	4.0	14.4	90.1	10.3	96.4	67.0 P	43.6 P	37.2 P
December	-35.1 P	-21.1 P	3.8 P	31.4	78.3 P	3.7 P	96.5 P	58.4 P	44.3 P	32.7 P
2008 Annual	-35.1 P	-7.9 P	32.7 P	31.4	76.5 P	31.3 P	96.4 P	78.5 P	60.8 P	50.5 P

Note: M = Missing; P = Partial; See additional notes in section C.1.1.4

C.1.1.3 Other RAMP Climate Stations

Table C.1-5 summarizes the climate and water temperature parameters monitored at RAMP stations other than the Aurora and Horizon Climate Stations.

Sensors at Stations L1, L2, S2, S5A, S10, S14A, S19, S34 and S40 were operated throughout the year, while other sensors were operated during the open water season (May – October). Despite ongoing maintenance during regular site visits the station records are incomplete due to the following data gaps:

- L1 Air Temperature: October 22 to December 31; Water Temperature: January 1 to March 13 and September 14 to December 31; Relative Humidity: January 1 to January 13 and November 9 to December 31, missing data due to sensor malfunction and faulty battery.
- L2 Relative Humidity: missing data from September 17 to December 31 due to sensor malfunction.
- L2 Total Precipitation: data from June 12 to August 11 failed QA/QC checks and was discarded.
- S3 Total Precipitation: missing data from June 6 to September 13 because of a faulty cable and vandalism.
- S5A Water Temperature: missing data from January 1 to May 8, 2008 because of a faulty thermistor.
- S14A Water Temperature: the data from January 1 to May 11, 2008 was lost due to a combination of logger malfunction and thermistor destruction by ice.
- S19 Total Precipitation: data missing from June 10, 2008 to August 7, 2008 because of faulty equipment.
- S34 Water Temperature: data missing from October 16, 2008 to December 31 2008 due to battery failure.
- S40 Water Temperature: data missing from October 4, 2008 to October 15, 2008 due to vandalism.

Table C.1-6 and C.1.7 provide a monthly summary of the data collected at the other RAMP climate stations. Daily monitoring data are included in the RAMP database. Daily and cumulative precipitation depths at the various stations are compared to precipitation recorded at other regional stations in Figure C.1-1. Water temperatures are illustrated in Figure C.1-2.

Table C.1-5 Sensors at other RAMP climate stations.

Station	Parameter	Sensor
L1 McClelland Lake	Precipitation	Weighing Gauge
	Air Temperature	Thermistor
	Water Temperature ¹	Thermistor
	Relative Humidity	Humidity Sensor
L2 Kearl Lake	Precipitation	Tipping Bucket Rain/Snow Gauge Goenor Precipitation Gauge (after Sep 15)
	Water Temperature	Thermistor
	Air Temperature	Thermistor
	Relative Humidity	Humidity Sensor
S3 Iyininim Creek above Kearl Lake	Rainfall	Tipping Bucket Rain Gauge
S5A Muskeg River above Muskeg Creek	Barometric Pressure	Pressure Transducer
	Water Temperature	Thermistor
S10 Wapasu Creek at Canterra Road	Water Temperature ¹	Thermistor
S11 Poplar Creek at Highway 63	Water Temperature ¹	Thermistor
S14A Ells River at CNRL Bridge	Water Temperature	Thermistor
S15A Tar River near the mouth	Water Temperature	Thermistor
S19 Tar River Lowland Tributary near the mouth	Rainfall	Tipping Bucket Rain/Snow Gauge
	Snowfall	
S32 Surmont Creek at Highway 881	Water Temperature ¹	Thermistor
S34 Tar River above CNRL Bridge	Water Temperature ¹	Thermistor
S40 Mackay River at Petro-Canada Bridge	Water Temperature ¹	Thermistor

¹ Installed in 2008.

Table C.1-6 Summary of 2008 climate data collected at L1 – McClelland Lake and L2 – Kearn Lake.

Station	L1				L2			
	McClelland Lake				Kearl Lake			
Period of Operation	Jan 1 - Dec 31	Jan 1 - Dec 31	Jan 1 - Dec 31	Jan 1 - Dec 31	Jan 1 - Dec 31	Jan 1 - Dec 31	Jan 1 - Dec 31	Jan 1 - Dec 31
Month	Precipitation Depth (mm)	Water Temperature (°C)	Air Temperature (°C)	Relative Humidity (%)	Precipitation Depth (mm)	Water Temperature (°C)	Air Temperature (°C)	Relative Humidity (%)
Jan	7.9	M	-18.3	80.3 P	4.6	1.7	-17.3	84.2
Feb	16.7	M	-18.9	74.9 P	6.6	1.0	-17.8	78.3
Mar	17.1	-0.1 P	-10.4	65.1	3.3	0.6	-9.2	67.9
Apr	30.7	0.4	-1.3	55.5	11.2	0.7	-0.8	59.1
May	5.6	9.4	10.1	50.5	6.1	8.5	11.6	50.8
Jun	32.8	19.3	16.6	60.0	15.5 P	16.7	17.5	61.1
Jul	47.9	21.4	17.5	66.8	M	19.2	18.7	66.4
Aug	112.3	19.5	16.5	72.1	63.0 P	18.2	17.3	71.1
Sep	22.2	13.5 P	8.7	75.5	28.6	12.0	9.9	34.3 P
Oct	23.1	M	6.5 P	69.6	34.0	8.1	5.7	M
Nov	23.2	M	M	90.4 P	24.0	5.2	-3.8	M
Dec	14.2	M	M	72.7 P	17.9	3.3	-22.4	M
Annual ¹	353.7	11.9 P	2.7 P	69.5 P	214.8 P	7.9	0.8	63.7 P

Note: M = Missing; P = Partial

¹ See additional notes in section C.1.1.4.

Table C.1-7 Summary of 2008 climate data collected at other RAMP climate stations.

Station	S3 Iyininmin Creek above Kearn Lake	S5A Muskeg River above Muskeg Creek		S10 Wapasu Creek at Canterra Road	S11 Poplar Creek at Highway 63 (07DA007)	S14A Ells River at CNRL Bridge	S15A Tar River near the Mouth	S19 Tar River Lowland Tributary near the Mouth	S32 Surmont Creek at Highway 31	S34 Tar River above CNRL Lake	S40 Mackay River at Petro- Canada bridge
Period of Operation	May 13 - Oct 20	Jan 1- Dec 31		Jan 1- Dec 31	May 14 - Oct 14	Jan 1- Dec 31	May 11 - Oct 15	Jan 1 – Dec 31	June 24 - Oct 13	April 8 - Dec 31	Sep 19 - Dec 31
Month	Precipitation Depth	Barometric Pressure	Water Temperature	Water Temperature	Water Temperature	Water Temperature	Water Temperature	Precipitation Depth	Water Temperature	Water Temperature	Water Temperature
	(mm)	(kPa)	(°C)	(°C)	(°C)	(°C)	(°C)	(mm)	(°C)	(°C)	(°C)
Jan		97.8	M	0		0.2		1.2			
Feb		98.1	M	0		0.2		9.1			
Mar		98.1	M	0.1		0.2		35.7			
Apr		98.0	M	0.1		0.2		21.3		0	
May	4.6 P	98.1	12.1 P	10.0	12.9 P	10.8	10.5 P	4.1		5.8	
Jun	6.4 P	97.7	16.7	16.2	18.1	17.1	15.8	8.7 P	16.0 P	12.3	
Jul	M	97.6	18.2	16.2	20.0	19.7	16.8	M	16.1	14.9	
Aug	M	97.4	16.7	15.7	18.5	18.1	15.8	46.6 P	14.3	13.8	
Sep	14.0 P	98.0	9.4	8.8	12.1	10.7	10.3	12.0	8.8	7.4	8.2 P
Oct	24.8 P	97.8	4.5	4.6	9.0 P	5.0	7.9 P	9.2	7.1 P	5.1	3.0
Nov		97.6	0.3	0.4		0.8		0		M	0.3
Dec		98.2	0.1	0.2		0.5		0		M	0.3
Annual ¹	49.8 P	97.7	9.7 P	6.0	15.1 P	6.9	12.9 P	147.9 P	12.5 P	8.5 P	2.9 P

Note: M = Missing; P = Partial

¹ See additional notes in section C.1.1.4.

Figure C.1-1 Precipitation at Fort McMurray and RAMP Climate Stations, 2008.

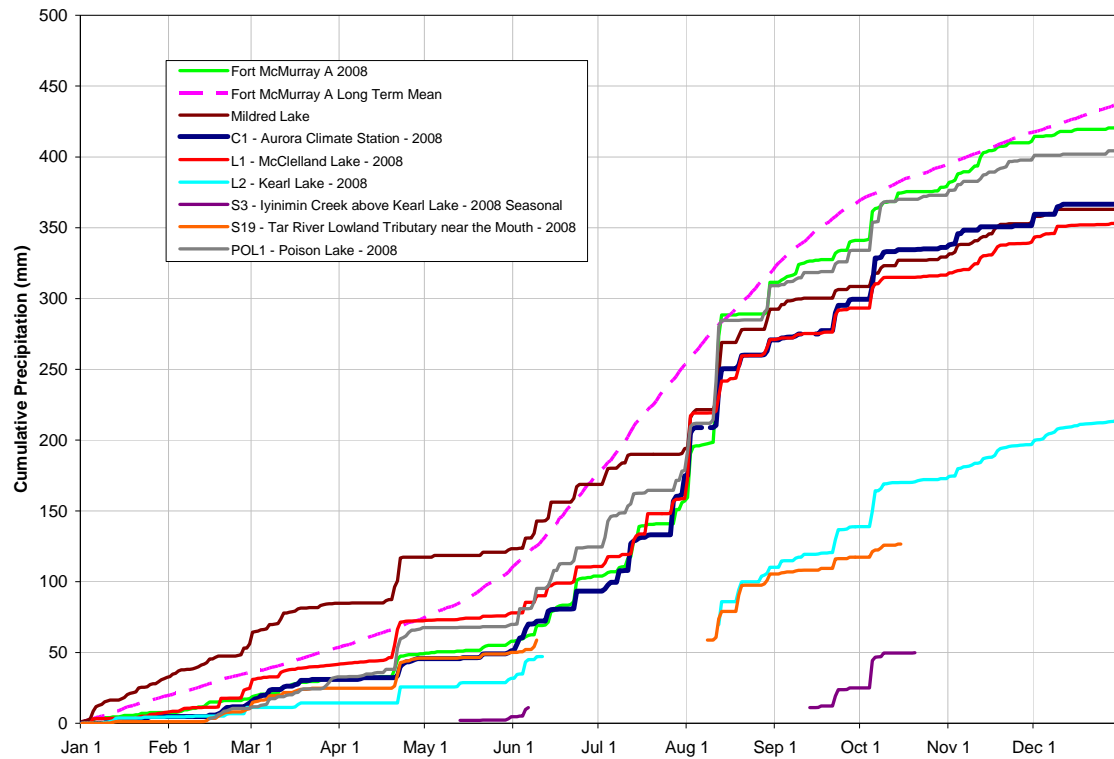
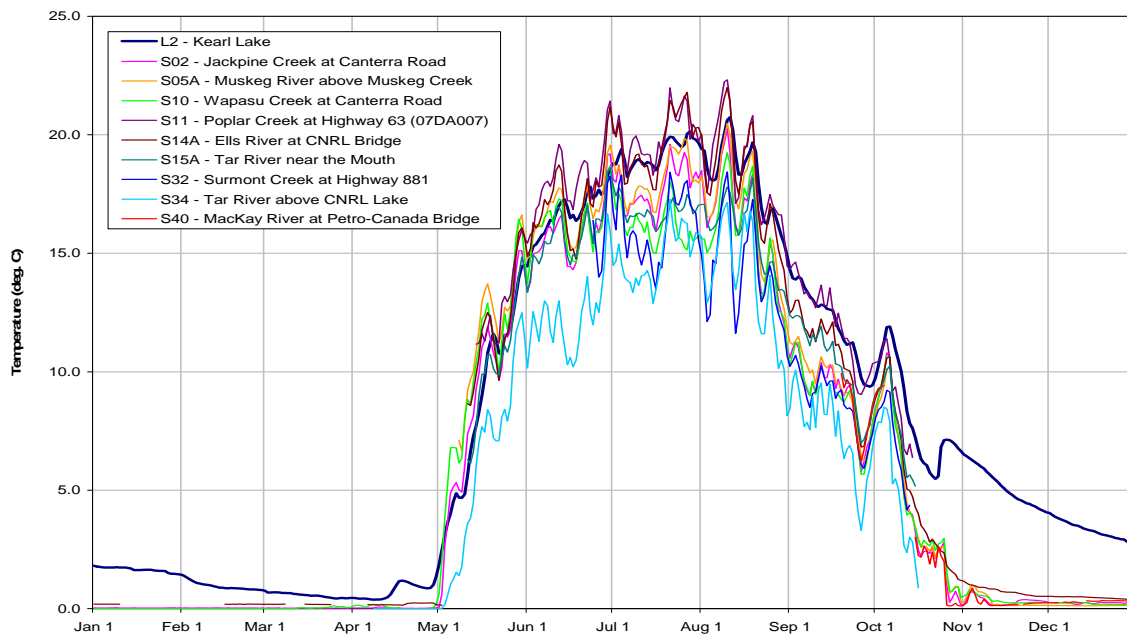


Figure C.1-2 2008 daily water temperatures.



C.1.1.4 Notes to Climate Data Tables

The following notes apply to the monthly climate data (Table C.1-2, C.1-4, C.1-6 and C.1-7) and to the daily data provided in the RAMP database (www.ramp-alberta.org):

- Time distribution of snowfall is sometimes not measured correctly. Snow can accumulate in the gauge for some time and is then recorded when it melts. Therefore daily total snowfall depths may not be accurate and the snowfall may have occurred on a date other than the date it was recorded;
- Precipitation gauges used in the RAMP network do not differentiate between rainfall and snowfall, therefore only total precipitation is reported;
- Monthly values consist of the following: extremes in the case of minimum and maximum temperature data; means in the case of mean temperature and relative humidity; totals in the case of precipitation and solar radiation;
- Annual values in the monthly table consist of the following: extremes in the case of minimum and maximum temperature data; means in the case of mean temperature and relative humidity; totals in the case of precipitation and solar radiation; and
- Wind direction is the direction from which the wind is blowing, measured in degrees clockwise from North.

C.1.1.5 2008 Snow Course Survey Results

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

- Flat Low Lying areas (FL);
- Open Land or Lake areas (OP);
- Mixed Deciduous (MD); and
- Jack Pine (JP).

Locations of the snow courses are shown on Figure 3.1-1 in the main report.

Snow course surveys were completed from February 11 to 19, March 7 to 15, and March 31 to April 9, 2008, with the results shown in Table C.1-8.

Table C.1-8 Summary of 2008 snow course surveys.

Terrain Type	Survey Plot No.	February 11 - 19		March 7 - 15		March 31 - April 9	
		Snow Depth (cm)	Snow Water Equivalent (mm)	Snow Depth (cm)	Snow Water Equivalent (mm)	Snow Depth (cm)	Snow Water Equivalent (mm)
Flat Low Lying	FL-04-1	37.3	60.3	62.4	120.7	43.4	127.9
	FL-00-1	22.7	43.1	60.7	115.3	44.9	96.7
	FL-04-4	62.4	94.5	65.6	96.7	57.2	107.0
	FL-06-1	62.3	90.9	61.6	106.0	52.8	116.4
	Mean	46.1	72.2	62.6	109.7	49.6	112.0
Open Land or Lake Area	OP-04-2 (Lake)	16.9	36.9	28.8	44.8	12.9	40.0
	OP-97-1 (Land)	58.5	101.2	58.8	110.5	51.9	139.3
	OP-99-2 (Land)	48.6	79.0	56.0	101.6	43.6	100.7
	OP-06-1 (Lake)	37.4	67.5	35.9	107.7	28.3	75.5
	Mean	40.3	71.1	44.9	91.1	34.2	88.9
Mixed Deciduous	MD-04-1	49.1	70.2	55.3	95.8	45.4	88.0
	MD-04-2	59.7	79.8	47.5	94.2	48.6	101.0
	MD-02-2	18.4	107.0	54.6	97.1	49.4	108.7
	MD-06-1	49.4	69.9	56.7	112.4	54.9	98.5
	Mean	44.1	81.7	53.5	99.9	49.5	99.0
Jack Pine	JP-00-1	20.6	53.3	61.0	112.7		
	JP-01-1	46.9	75.5	48.3	83.1	44.4	92.4
	JP-97-2	52.7	82.0	51.1	107.5	44.3	109.5
	JP-06-1	54.8	83.6	57.5	99.4	50.5	103.1
	Mean	43.7	73.6	54.4	100.7	46.4	101.6

C.1.2 Climate Data from Government Agencies

Daily climate data published by Environment Canada for climate stations in the study area have been incorporated into the RAMP database. An inventory of the data obtained for the stations is provided in Section C.5, below.

As of 2008, the only stations in the Fort McMurray area for which Environment Canada is reporting data are the Fort McMurray and Mildred Lake stations. Forestry lookout station data is no longer being processed by Environment Canada.

C.2 HYDROMETRIC DATA COLLECTED IN 2008

C.2.1 RAMP Hydrometric Data

C.2.1.1 Water Level and Discharge

Table C.2-1 summarizes the hydrometric monitoring carried out at various stations in 2008. Daily discharges and water levels are contained in the RAMP database. The quality assessment shown for each station record is based on an assessment matrix which considers the number and quality of discharge measurements made during the year, the quality and extent of the stage-discharge rating curve, and the record completeness.

The following data gaps occurred during 2008:

- S14A: January 11 to February 15, March 9 to March 14, and March 25 to April 5, missing data due to faulty data logger. May 2 to May 10, the spring ice run destroyed the depth sensor;
- Station S18A: The entire open water season was lost due to a combination of damage by wildlife and a logger programming error; and
- Station S35: No data was published for this station in 2008 pending additional manual measurements to define a discharge relationship for the combined velocity and depth sensor.

Table C.2-2 is a revised version of the table printed in the 2007 report. Revisions include accounting for Water Survey of Canada data that was finalized after the 2007 report was issued, and correction to transcription errors in the station data quality assessment.

Table C.2-1 Summary of 2008 hydrometric monitoring.

Station	Catchment Area	Monitored Period	Maximum Daily Discharge		Minimum Daily Discharge ¹		Runoff Volume ¹		Data Quality Assessment ²	
			2008	Mean	2008	Mean	2008	Mean	Winter	Open-Water
	(km ²)	2008	(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)	(dam ³)	(dam ³)		
Athabasca River										
S24 - Athabasca River below Eymundson Creek	146,000	Jan 1 - Dec 31	1820	2250	311	355	14,300,000	14,100,000	Fair	Fair
Athabasca River at McMurray (07DA001)	133,000	Jan 2 - Dec 31	1730	2500	286	430	13,100,000	15,700,000		
Muskeg River Watershed										
S2 - Jackpine Creek at Canterra Road	358	Jan 1 - Dec 31	10.1	8.41	0.182	0.309	33,600	29,600	Fair	Fair
S3 - Iyinin Creek above Kearl Lake	32.2	May 13 - Oct 20	1.20	1.27	0.007	0.049	3,650	4,918		Fair
S5 - Muskeg River above Stanley Creek	395	Jan 1 - Dec 31	9.8	8.38	0.104	0.222	33,200	27,600	Poor	Poor
S5A - Muskeg River above Muskeg Creek	552	Jan 1 - Dec 31	11.50	8.39	0.115	0.412	45,700	35,600	Fair	Fair
S7 - Muskeg River near Fort MacKay (07DA008)	1,460	Jan 1 - Dec 31	35.7	25.6	1.21	1.09	121,000	105,000	Good	Good
S9 - Kearl Lake Outlet	73.6	Jan 9 - Dec 9	0.720	0.704	0.005	0.061	2,310	4,080		Fair
S10 - Wapasu Creek at Canterra Road	90.7	Jan 1 - Dec 31	4.73	3.00	0.112	0.050	12,200	8,070	Fair	Fair
S20 - Muskeg River Upland	157	Jan 1 - Oct 23	4.86	4.73	0.000	0.068	12,300	9,330		Fair
S22 - Muskeg Creek near the Mouth	157	May 10 - Oct 23	8.27	6.10	0.221	0.191	20,500	22,900		Fair
S33 - Muskeg River at the Aurora/Albian Boundary	728	Jan 1 - Dec 31	18.4	15.0	0.188	0.473	66,100	54,800	Good	Good
S37 - East Jackpine Creek the 1300m Contour	33	May 13 - Oct 21	0.916		0.064		2,780			Fair
Athabasca River Tributaries Upstream of Fort McMurray										
S29 - Christina River near Chard (07CE002)	4,860	Jan 1 - Dec 31	99.5	80.6	5.55	6.52	528,000	369,000	Good	
S31 - Hangingstone Creek at North Star Road	160	May 6 - Oct 13	9.15	6.98	0.244	0.174	14,400	14,400		Fair
S32 - Sumont Creek at Highway 881	158	May 6 - Oct 13	7.85	6.35	0.152	0.181	15,200	19,500		Good
Athabasca River Tributaries Downstream of Fort McMurray										
S6 - Mills Creek at Highway 63	23.8	Jan 1 - Dec 31	0.206	0.173	0.009	0.017	1,000	765	Good	Good
S11 - Poplar Creek at Highway 63 (07DA007)	422	Jan 14 - Dec 11	5.54	8.62	0.175	0.142	20,800	24,000	Excellent	Fair
S12 - Fort Creek at Highway 63	31.9	May 8 - Oct 14	0.249	0.404	0.018	0.023	1,470	1,220		Fair
S14A - Ells River at CNRL bridge	2,430	Jan 1 - Dec 31	29.5	38.2	2.60	2.69	177,000	169,000	Fair	Fair
S15A - Tar River near the Mouth	301	May 11 - Oct 15	2.85	10.5	0.076	0.085	4,940	13,400		Good
S18A - Calumet River Upland Tributary	53.4	none	missing	1.20	missing	0.001	missing	600		Poor
S19 - Tar River Lowland Tributary near the Mouth	11.5	May 11 - Oct 15	0.039	0.071	0.004	0.003	176	234		Poor
S25 - Susan Lake Outlet	13.6	Jun 27 - Oct 14	0.119	0.443	0.001	0.003	360	849		Fair
S26 - MacKay River near Fort MacKay (07DB001)	5,570	Jan 1 - Dec 31	106	122	6.99	3.65	519,000	371,000	Fair	
S27 - Firebag River near the Mouth (07DC001)	5,990	Jan 1 - Dec 31	171	113	14.3	15.3	752,000	597,000	Good	
S34 - Tar River above CNRL Lake	136	Apr 8 - Dec 14	9.1	8.84	0.132	0.225	15,800	12,900	Poor	Poor
S35 - McClelland Lake outlet below McClelland Lake	155	Jan 14 - Dec 14	0.575	0.138	0.003	0.002	1,590	495		Poor
S36 - McClelland lake outlet above Firebag River	330	May 14 - Oct 21	1.29		0.371		7,990			Poor
S39 - Beaver River above Syncrude (07DA018)	165	Jan 3 - Dec 31	5.03		0.271		15,600		Fair	
S40 - Mackay River at Petro-Canada Bridge	5,290	Jan 1 - Dec 31	85.8		5.31		413,000		Good	Good
Water Level Stations										
			Maximum Level		Minimum Level					
			2008	Mean	2008	Mean				
L1 - McClelland Lake	155	Jan 14 - Dec 14	294.690	294.612	294.510	294.392				
L2 - Kearl Lake	72.6	Jan 1 - Dec 31	332.014	332.120	331.663	331.718				
L3 - Isadore's Lake	191	Jan 1 - Dec 31	233.980	299.909	233.682	233.667				

¹Runoff volume and minimum daily discharge are for the period May 1 - Oct 31, or for the monitored period, whichever is shorter.

²Quality assessment refers to RAMP discharge data only.

Table C.2-2 Summary of 2007 hydrometric monitoring.

Station	Catchment Area	Monitored Period	Maximum Daily Discharge		Minimum Daily Discharge ¹		Runoff Volume ¹		Data Quality Assessment ²	
			2007	Mean	2007	Mean	2007	Mean	Winter	Open-Water
	(km ²)	2007	(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)	(dam ³)	(dam ³)		
Athabasca River										
S24 - Athabasca River below Eymundson Creek	146,000	Jan 1 - Dec 31	3400	2177	326	361	16,100,000	14,100,000	Fair	Fair
Athabasca River at McMurray (07DA001)	133,000	Jan 1 - Dec 31	3170	2517	312	434	15,000,000	15,700,000		
Muskeg River Watershed										
S2 - Jackpine Creek at Canterra Road	358	Jan 12 - Dec 31	7.45	8.28	0.021	0.319	16,600	30,700	Good	Good
S3 - Iyininim Creek above Kearn Lake	32.2	Apr 25 - Oct 24	0.74	1.28	0.000	0.052	3,390	4,950		Fair
S4A - Blackfly Creek near the Mouth ³	27	Apr 25 - Oct 25	0.64		0.001		1,370			Poor
S5 - Muskeg River above Stanley Creek	395	Jan 1 - Dec 31	6.35	8.09	0.075	0.245	21,800	26,400	Poor	Poor
S5A - Muskeg River above Muskeg Creek	552	Jan 1 - Dec 31	9.01	7.88	0.304	0.437	31,800	34,100	Good	Fair
S7 - Muskeg River near Fort MacKay (07DA008)	1460	Jan 1 - Dec 31	18.60	25.32	0.265	1.092	68,700	104,000	Excellent	
S9 - Kearn Lake Outlet	73.6	Jan 12 - Dec 8	0.81	0.70	0.002	0.066	2,790	3,980		Fair
S10 - Wapasu Creek at Canterra Road	90.7	Jan 12 - Dec 31	2.47	3.00	0.007	0.042	8,290	7,680	Fair	Fair
S20 - Muskeg River Upland ³	157	Apr 25 - Oct 20	2.24	4.70	0.064	0.086	8,040	9,320		Fair
S22 - Muskeg Creek near the Mouth	157	Apr 24 - Oct 20	4.72	5.80	0.010	0.187	14,300	24,200		Fair
S28 - Khahago Creek below Blackfly Creek ³	212	Apr 25 - Oct 25	2.20	3.27	0.083	0.169	4,510	14,500		Fair
S33 - Muskeg River at the Aurora/Albian Boundary	728	Jan 1 - Dec 31	13.70	14.33	0.224	0.530	45,600	52,400	Good	Good
Athabasca River Tributaries Upstream of Fort McMurray										
S29 - Christina River near Chard (07CE002)	4,860	Jan 1 - Dec 31	104.0	78.1	7.9	6.4	448,000	362,000	Good	
S31 - Hangingstone Creek at North Star Road ³	160	Apr 28 - Oct 19	4.90	6.54	0.148	0.160	8,930	13,900		Fair
S32 - Summit Creek at Highway 881 ³	158	Apr 28 - Oct 19	6.12	6.05	0.029	0.187	9,970	18,800		Fair
Athabasca River Tributaries Downstream of Fort McMurray										
S6 - Mills Creek at Highway 63	23.8	Jan 1 - Dec 31	0.033	0.170	0.013	0.018	278	732	Excellent	Excellent
S11 - Poplar Creek at Highway 63 (07DA007) ³	422	Jan 13 - Dec 13	8.96	8.74	0.021	0.141	2,010	24,100	Fair	Fair
S12 - Fort Creek at Highway 63	45.6	Apr 24 - Oct 20	0.245	0.435	0.024	0.024	1,120	1,250		Fair
S14 - Ellis River above Joslyn Creek	2,450	Jan 14 - Oct 24	52.5	33.7	2.55	3.39	146,000	156,000		Poor
S14A - Ellis River at CNRL bridge ³	2,430	Jan 1 - Dec 31	36.6	41.1	2.66	2.72	73,700	156,000	Poor	Poor
S15A - Tar River near the Mouth	301	May 1 - Oct 22	18.20		0.094		20,600			Poor
S18A - Calumet River Upland Tributary ³	53.4	Apr 27 - Oct 24	1.110	1.196	0.000	0.001	146	642		Poor
S19 - Tar River Lowland Tributary near the Mouth	11.5	Apr 24 - Oct 22	0.092	0.069	0.000	0.002	153	229		Poor
S25 - Susan Lake Outlet	13.6	May 1 - Oct 23	0.672	0.604	0.007	0.003	830			Good
S26 - MacKay River near Fort MacKay (07DB001)	5570	Jan 1 - Dec 31	114	123	3.19	3.65	350,000	367,000	Excellent	
S27 - Firebag River near the Mouth (07DC001)	5990	Jan 1 - Dec 31	115	111	11.4	15.3	540,000	592,000	Good	
S34 - Tar River above CNRL Lake ³	136	Jan 1 - Dec 11	6.34	6.79	0.095	0.342	3,590		Poor	Poor
Water Level Stations										
			Maximum Level		Minimum Level					
			2007	Mean	2007	Mean				
L1 - McClelland Lake	28	Jan 14 - Dec 10	294.621	294.605	294.461	294.381				
L2 - Kearn Lake	72.6	Jan 1 - Dec 31	331.947	332.151	331.537	331.780				
L3 - Isadore's Lake	191	Jan 1 - Dec 31	233.897	233.900	233.627	233.665				

¹Runoff volume and minimum daily discharge are for the period May 1 - Oct 31.

²Quality assessment refers to RAMP discharge data only.

³The runoff volume and minimum daily discharge is based on a shorter period than at the other stations.

C.2.1.2 Suspended Sediment

Suspended sediment samples were collected at 27 RAMP stream flow stations for a total of 126 measurements during 2008. The total suspended sediment (TSS) data are provided in Table C.2-3. Discharge (Q) shown in the table is the discharge measured at the time the sample was collected.

Table C.2-3 Suspended sediment data collected at RAMP hydrometric stations in 2008.

Station		May 6 - 16	June 22 - July 1	Aug 5 - 10	Sept 8 - 16	Oct 13 - 24
S02	TSS (mg/L)	9	<3	<3	<3	3
	Q (m ³ /s)	7.35	0.71	0.97	0.95	2.20
S03	TSS (mg/L)	91	5	22	3	<3
	Q (m ³ /s)	1.18	0.12	0.31	0.10	0.12
S5	TSS (mg/L)	11	4	<3	7	<3
	Q (m ³ /s)	7.32	1.06	1.35	1.05	1.33
S5A	TSS (mg/L)	6	4	<3	<3	<3
	Q (m ³ /s)	11.25	1.54	1.77	1.09	1.75
S6	TSS (mg/L)	6	<3	<3	<3	4
	Q (m ³ /s)	0.05	0.09	0.06	0.04	0.05
S7	TSS (mg/L)		<3	<3	<3	<3
	Q (m ³ /s)		3.82	4.20	3.07	4.83
S9	TSS (mg/L)	3	6	5	<3	3
	Q (m ³ /s)	0.48	0.20	0.02	0.03	0.08
S10	TSS (mg/L)	3	3	<3	<3	<3
	Q (m ³ /s)	3.84	0.25	0.15	0.35	0.40
S11	TSS (mg/L)	10	5	4	3	3
	Q (m ³ /s)	6.21	1.68	0.55	1.40	0.92
S12	TSS (mg/L)	<3	55	3	4	7
	Q (m ³ /s)	0.22	0.10	0.16	0.06	0.24
S14A	TSS (mg/L)	227	46	15	9	3
	Q (m ³ /s)	29.05	19.77	9.64	5.82	4.65
S15A	TSS (mg/L)	2930	58	297	18	7
	Q (m ³ /s)	3.12	0.41	0.21	0.12	0.08
S18A	TSS (mg/L)	4	4	53	6	5
	Q (m ³ /s)	0.59	0.01	0.01	0.01	0.00
S19	TSS (mg/L)	4	8	<3	<3	9
	Q (m ³ /s)	0.16	0.02	0.01	0.01	0.02
S20	TSS (mg/L)	6	<3	<3	<3	<3
	Q (m ³ /s)	3.38	0.36	1.36	0.27	0.34
S22	TSS (mg/L)	8	<3	<3	<3	<3
	Q (m ³ /s)	8	0.48	0.16	0.61	1.32
S24	TSS (mg/L)		54	24	18	13
	Q (m ³ /s)		993	664	515	486

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

	Station	May 6 - 16	June 22 - July 1	Aug 5 - 10	Sept 8 - 16	Oct 13 - 24
S25	TSS (mg/L)		<3	<3	4	<3
	Q (m ³ /s)		0.05	0.03	0.03	0.04
S28	TSS (mg/L)	6				
	Q (m ³ /s)	4.28				
S31	TSS (mg/L)	41	3	7	3	3
	Q (m ³ /s)	4.66	0.74	1.32	0.56	0.86
S32	TSS (mg/L)	371	6	15	9	9
	Q (m ³ /s)	3.69	0.61	0.86	0.77	0.92
S33	TSS (mg/L)	5	4	<3	<3	<3
	Q (m ³ /s)	9	2	2.09	1.51	3.01
S34	TSS (mg/L)	66	15	21	<3	4
	Q (m ³ /s)	2.03	0.77	0.60	0.18	0.23
S35	TSS (mg/L)		3	19	9	19
	Q (m ³ /s)		--*	--*	--*	0.002
S36	TSS (mg/L)	7	11	<3	<3	3
	Q (m ³ /s)	0.96	0.51	0.51	0.41	0.55
S37	TSS (mg/L)	<3		<3	<3	5
	Q (m ³ /s)	1.11	0.15	0.25	0.15	0.33
S40	TSS (mg/L)	80	19	22	3	4
	Q (m ³ /s)	61.59	36.52	39.01	14.62	11.40

* - Not measured

C.2.2 Hydrometric Data from Oil Sands Operators

Several oil sands operators provided stream flow and operational water withdrawal and release information to RAMP, as summarized in Table C.2-4. Data provided at a daily time interval are contained in the RAMP database.

C.2.3 Hydrometric Data from Government Agencies

Daily data published by Environment Canada for hydrometric stations in the study area have been incorporated into the RAMP database. An inventory of the data obtained for the stations is provided in Section C.5.

Table C.2-4 Hydrometric information for 2008 received from oil sands operators.

Operator	Component	Location	Annual Volume (dam ³)	Daily Discharge Provided
CNRL - Horizon	Withdrawals from the Athabasca River	SW-14-97-11-W4	17,591	
	Releases to the Athabasca River			
	Release from Temporary Wastewater Treatment Plant	7-21-96-11-W4	413	
Husky Oil Operations Ltd.	Releases to Wapasu Creek		73	√
Imperial Oil Resources	Withdrawals from the Athabasca River		4	
	Releases to the Muskeg River		2,446	
Petro-Canada - Fort Hills	Withdrawals from the Athabasca River		0	
	Dewatering Releases			
	Release to Creek A (NNLL Pond)	468236 E; 6374880 N (NAD 83)	1,221*	√
	Release to Fort Creek (Pond 2)	463915 E; 6358770 N (NAD 83)	632*	√
	Release to Unnamed Creek (Pond 1)	461061 E; 6356525 N (NAD 83)	1,073*	√
Petro-Canada - MacKay River	Releases from storm water pond	SW-5-93-12-W4	12	
Shell Albion Sands - Muskeg River Mine	Withdrawals from the Athabasca River	SE-24-95-11-W4	13,505	√
	Releases		0	
Shell Albion Sands - Jackpine Mine	Dewatering Releases			
	Release to Shelley Creek (Pond 2)	476508 E; 6347999 N (NAD 83)	N/A	
	Release to Jackpine Creek (Pond 3)	480472 E; 6344400 N (NAD 83)	N/A	
	Release to Khahago Creek (Pond 4)	480472 E; 6347044 N (NAD 83)	N/A	
	Release to Jackpine Creek (Pond 6)	474067 E; 6345217 N (NAD 83)	N/A	
Suncor	Withdrawals from the Athabasca River	471871 E; 6317855 N (NAD 83)	45,900	
	Releases to the Athabasca River			
	Release from East Tank Farm Holding Pond		79	
	Release from East Temporary Settling Pond		296	
	Releases to Ruth Channel		401	
Syncrude	Withdrawals from the Athabasca River	NW35-96-09-W4	41,233	
	Release (treated wastewater) to the Athabasca River	2-93-10-W4	233	
	Diversions			
	Clean water diversion to Stanley Creek	SW-21-96-9-W4	2,527	
	Poplar Creek Spillway releases ¹		15,911	√

* Incomplete record; N/A – not available; ¹ The total Poplar Creek Spillway release includes releases to Ruth Channel by Suncor.

C.2.4 2008 Hydrographs in Historical Context

Discharge and water level hydrographs for 2008 for each RAMP station are presented in Figure C.2-1 through Figure C.2-33 below. Each hydrograph is presented with some historical context to assist in interpreting the hydrographs. The context shown on the graphs consists of the historical maximum, minimum, and median daily values for that station. For stations with more than 8 years of record, the upper and lower quartile lines are shown as well. In cases where the period of record is less than 3 years, the mean daily values are used instead of the median values. In all cases, the current year is excluded from the calculation of the historical context, so that the current year is compared to the previous years.

Figure C.2-1 2008 water level hydrograph and historical context for Station L1, McClelland Lake.

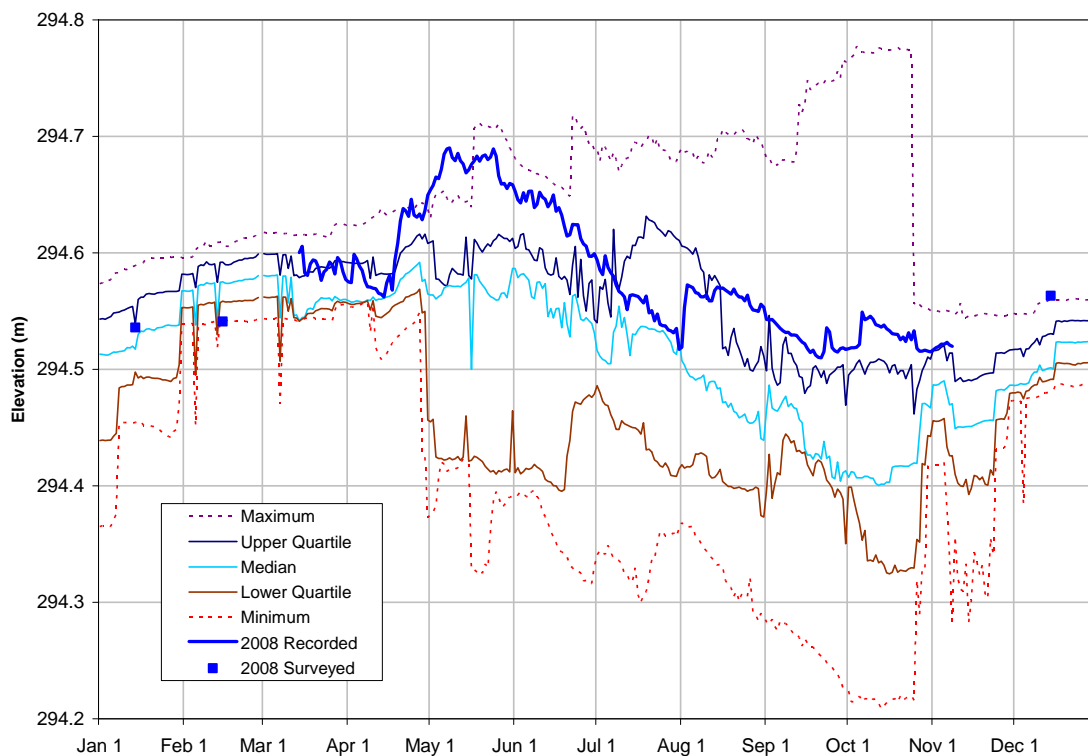


Figure C.2-2 2008 water level hydrograph and historical context for Station L2, Kearl Lake.

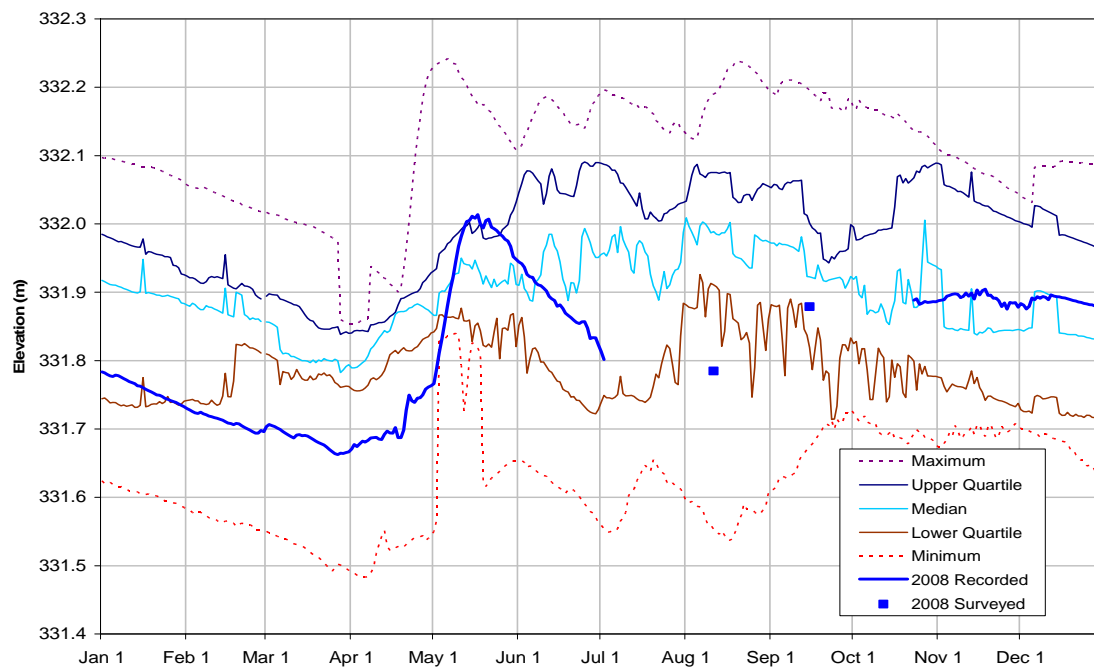


Figure C.2-3 2008 water level hydrograph and historical context for Station L3, Isadore's lake.

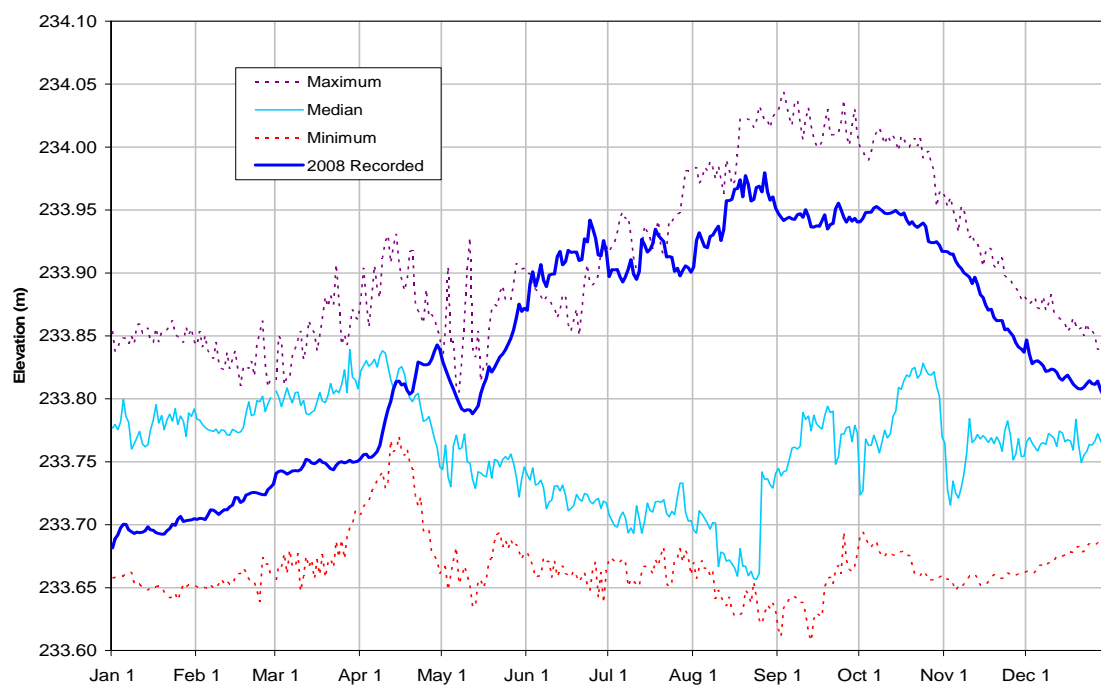


Figure C.2-4 2008 discharge hydrograph and historical context for Station S2, Jackpine Creek at Canterra Road.

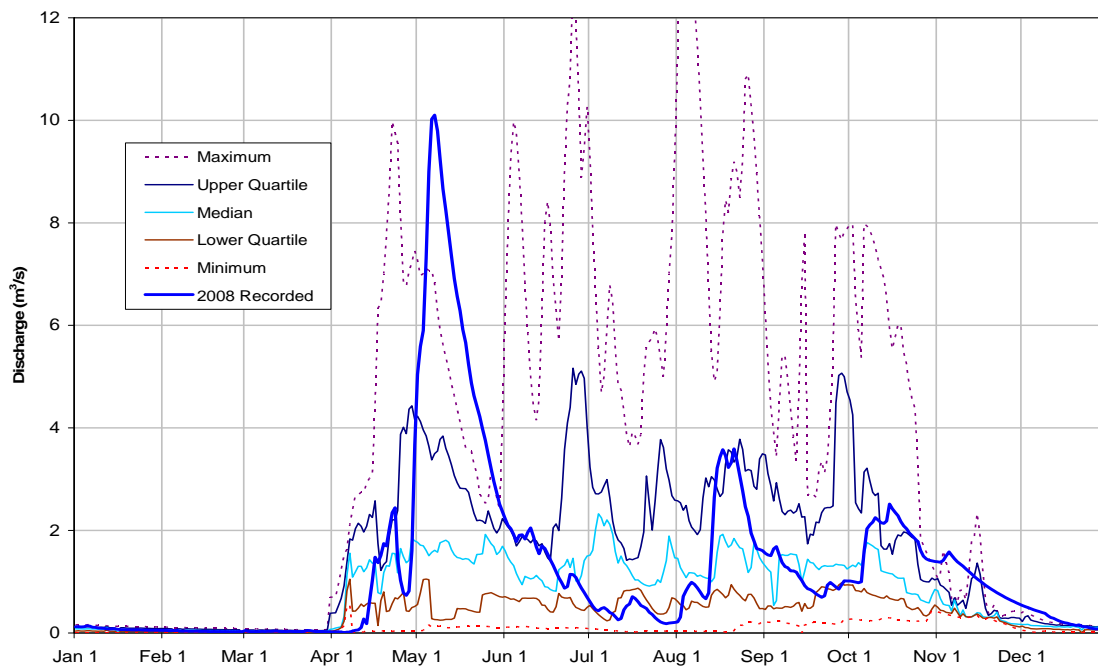


Figure C.2-5 2008 discharge hydrograph and historical context for Station S3, Iyininim Creek above Kears Lake.

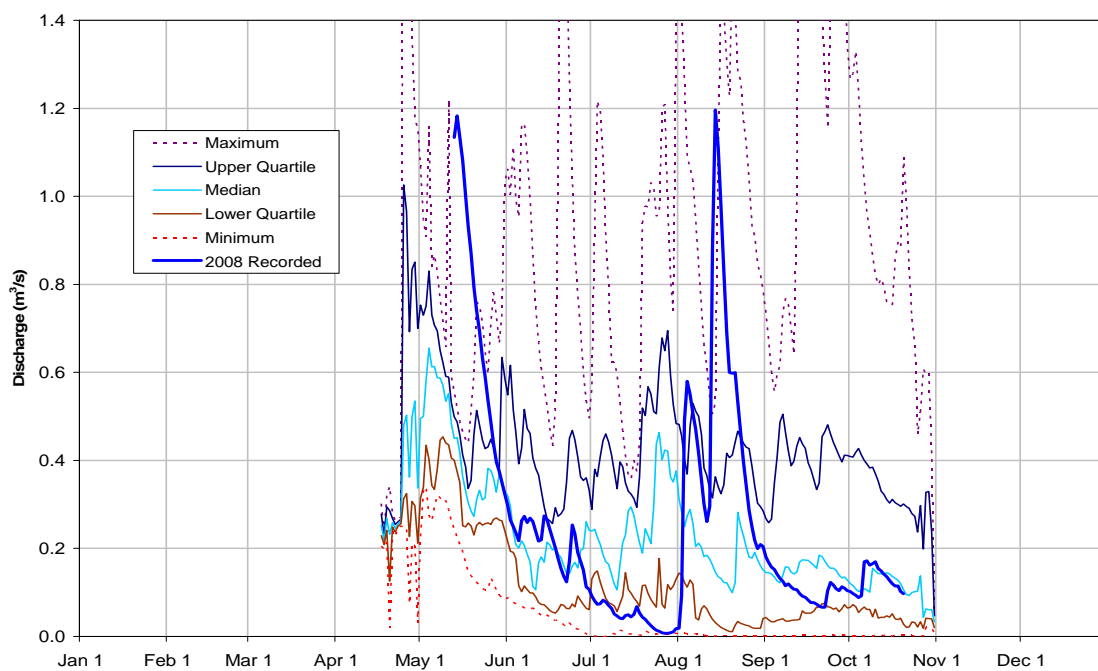


Figure C.2-6 2008 discharge hydrograph and historical context for Station S5, Muskeg River above Stanley Creek.

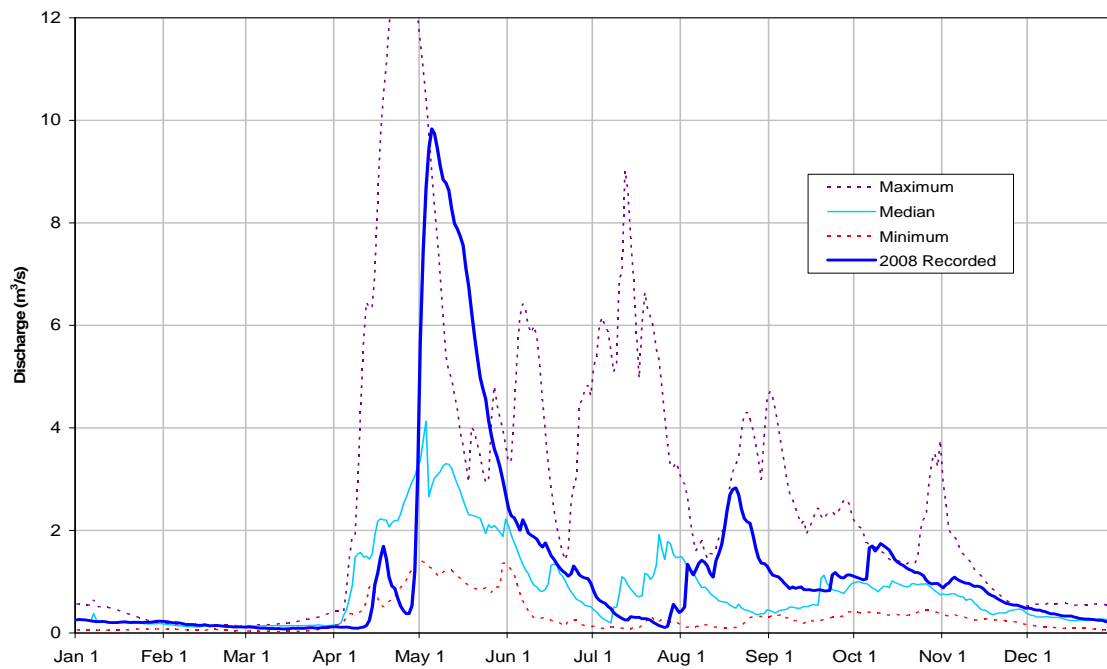


Figure C.2-7 2008 discharge hydrograph and historical context for Station S5A, Muskeg River above Muskeg Creek.

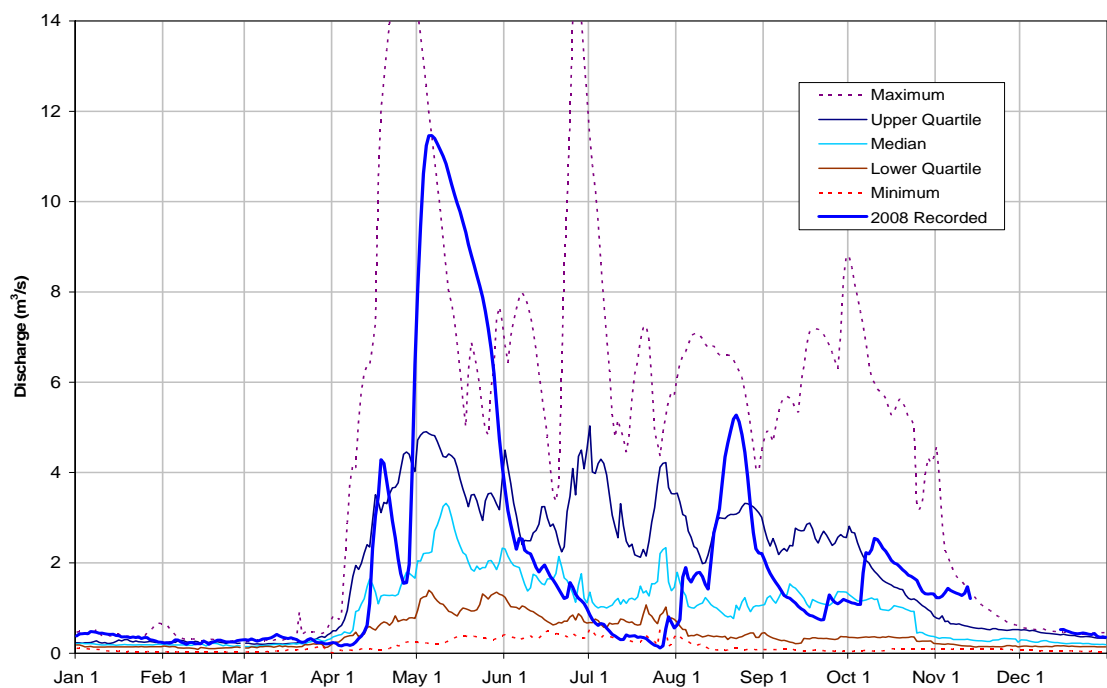


Figure C.2-8 2008 discharge hydrograph and historical context for Station S6, Mills Creek at Highway 63.

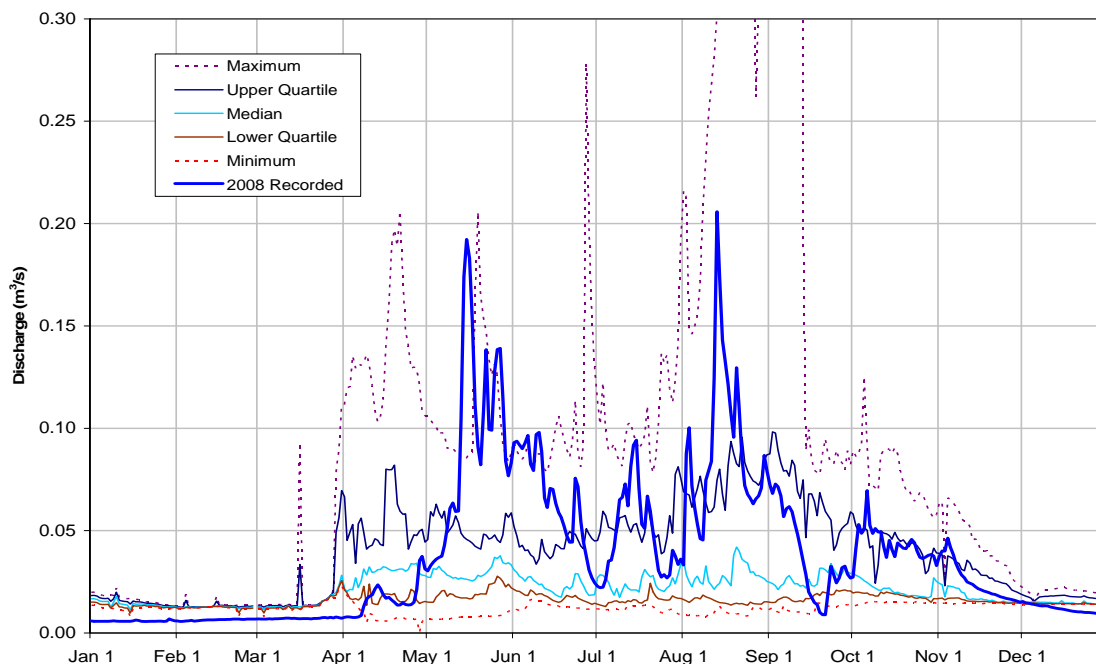


Figure C.2-9 2008 discharge hydrograph and historical context for Station S7, Muskeg River near Fort McKay (07DA008).

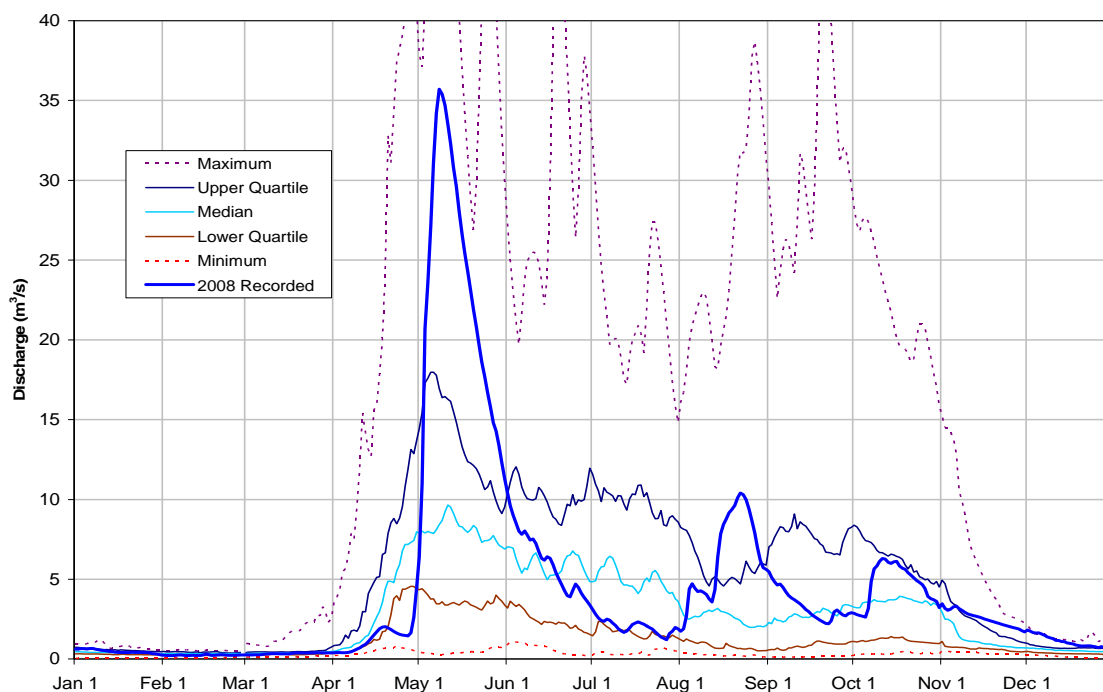


Figure C.2-10 2008 discharge hydrograph and historical context for Station S9, Kearl Lake Outlet.

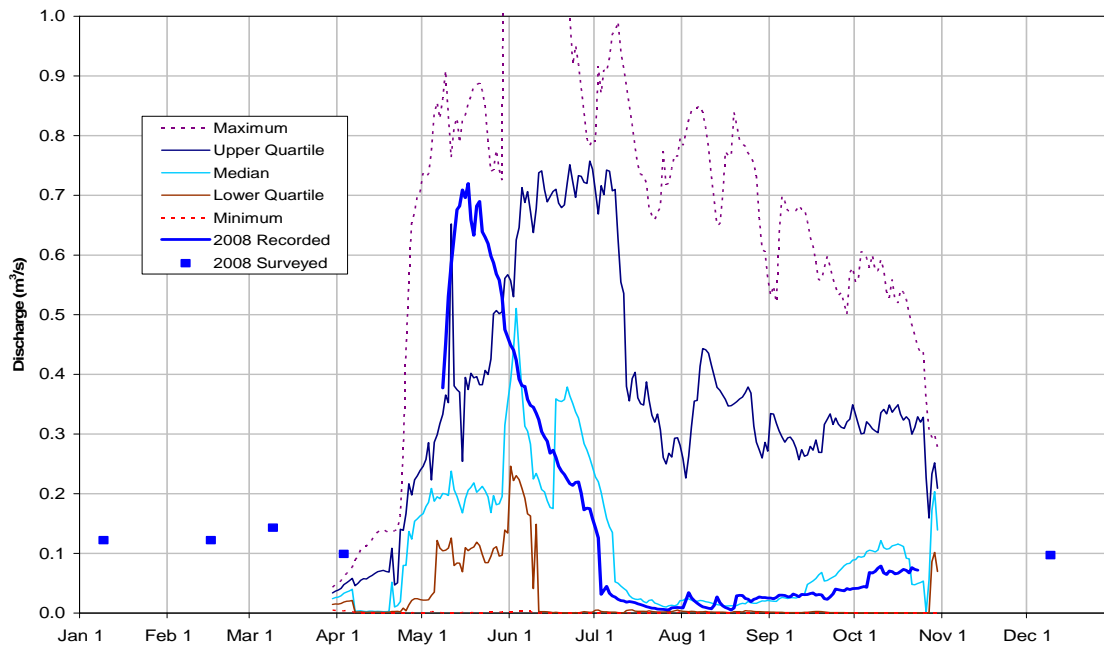


Figure C.2-11 2008 discharge hydrograph and historical context for Station S10, Wapasu Creek at Canterra Road.

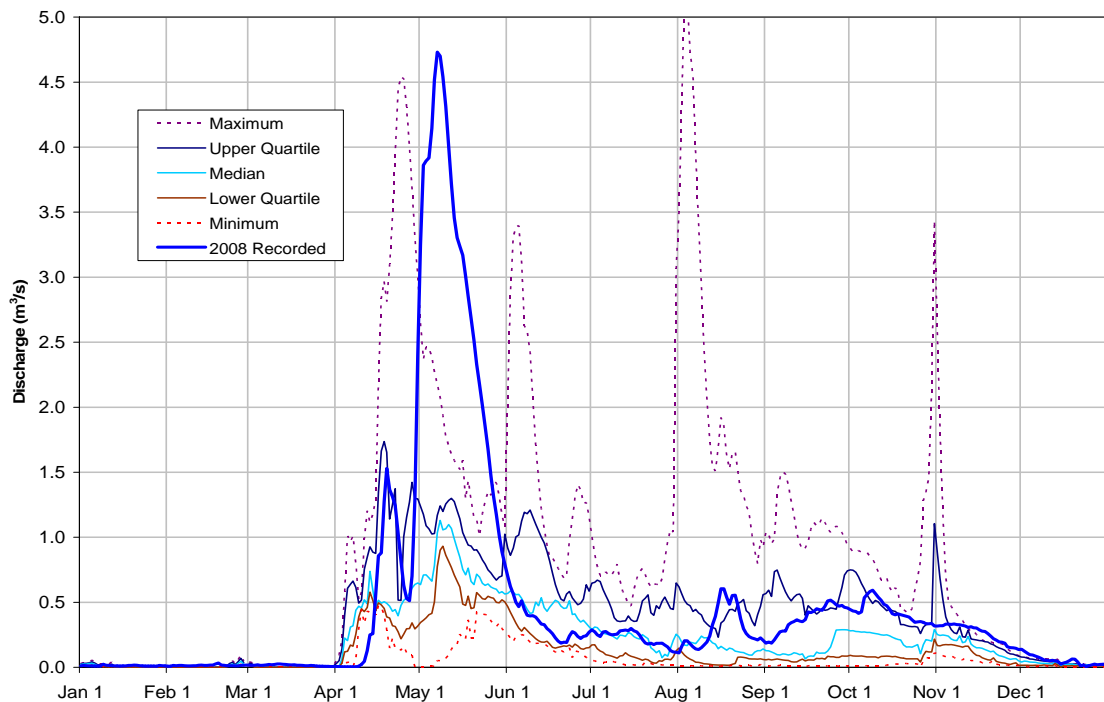


Figure C.2-12 2008 discharge hydrograph and historical context for Station S11, Poplar Creek at Highway 63 (07DA007).

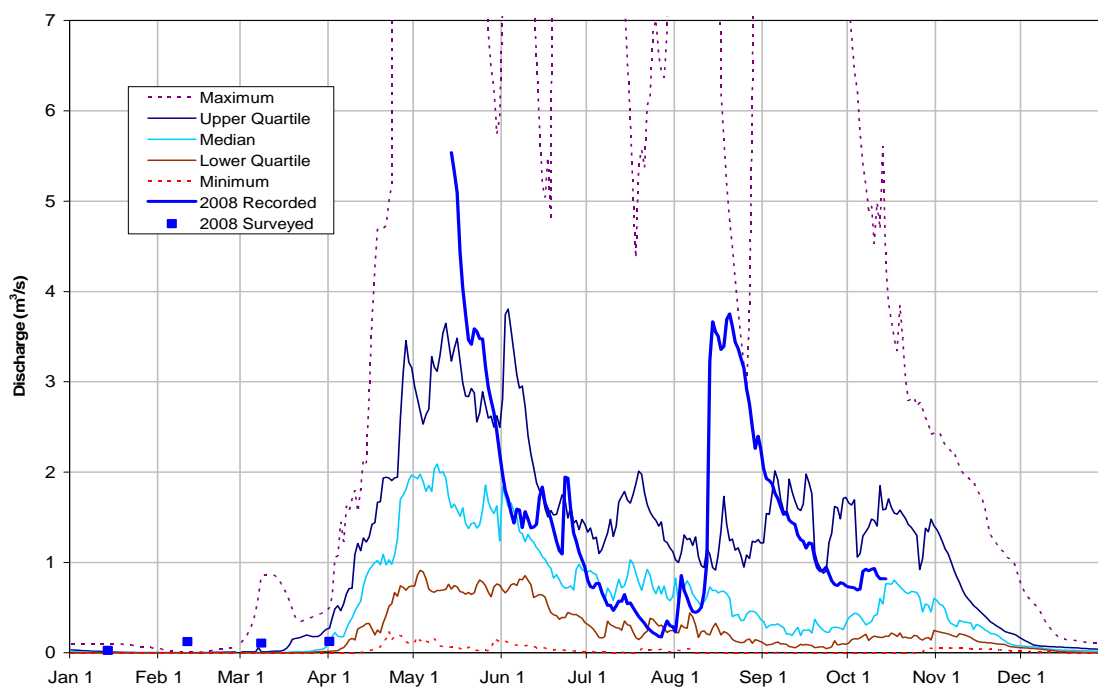


Figure C.2-13 2008 discharge hydrograph and historical context for Station S12, Fort Creek at Highway 63.

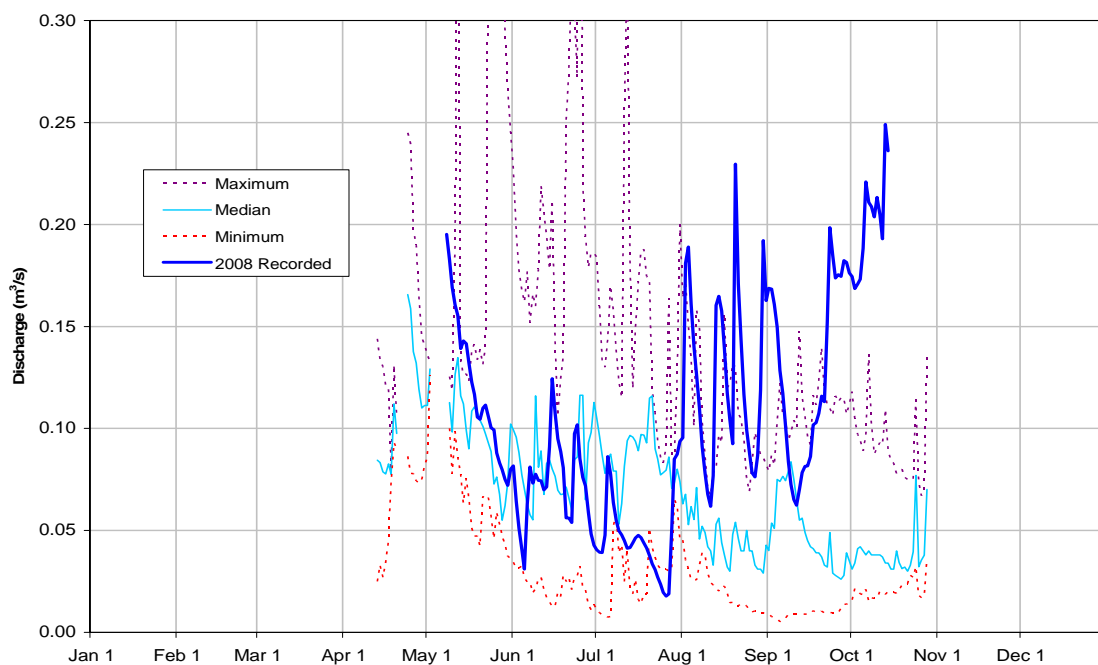


Figure C.2-14 2008 discharge hydrograph and historical context for Station S14A, Ells River at the CNRL Bridge.

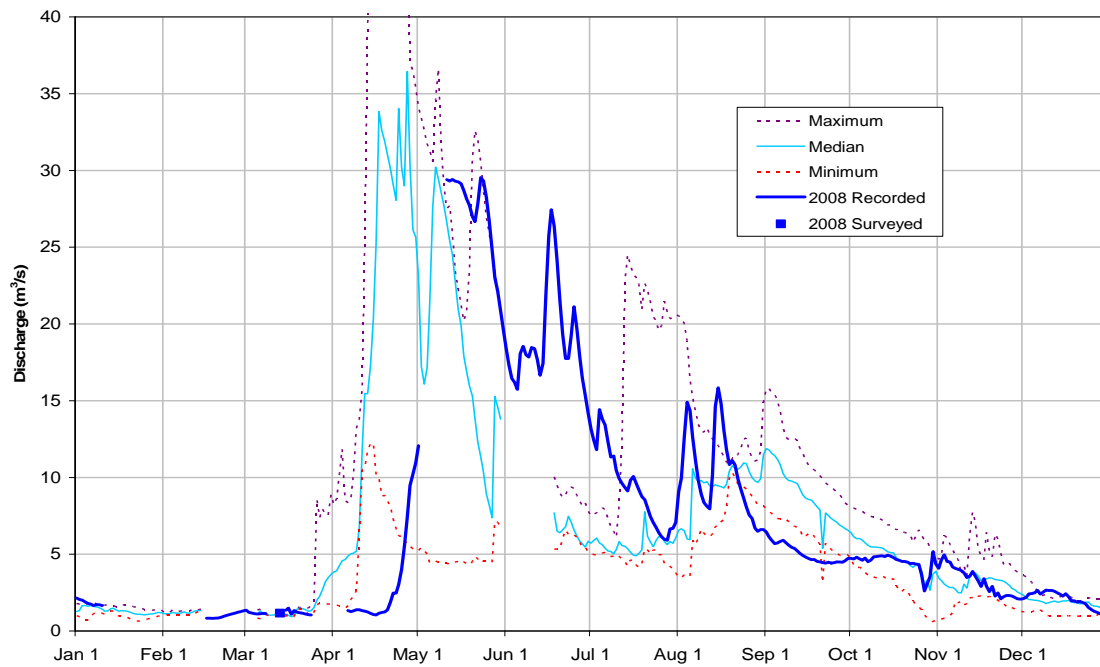


Figure C.2-15 2008 discharge hydrograph for Station S15A, Tar River near the Mouth.

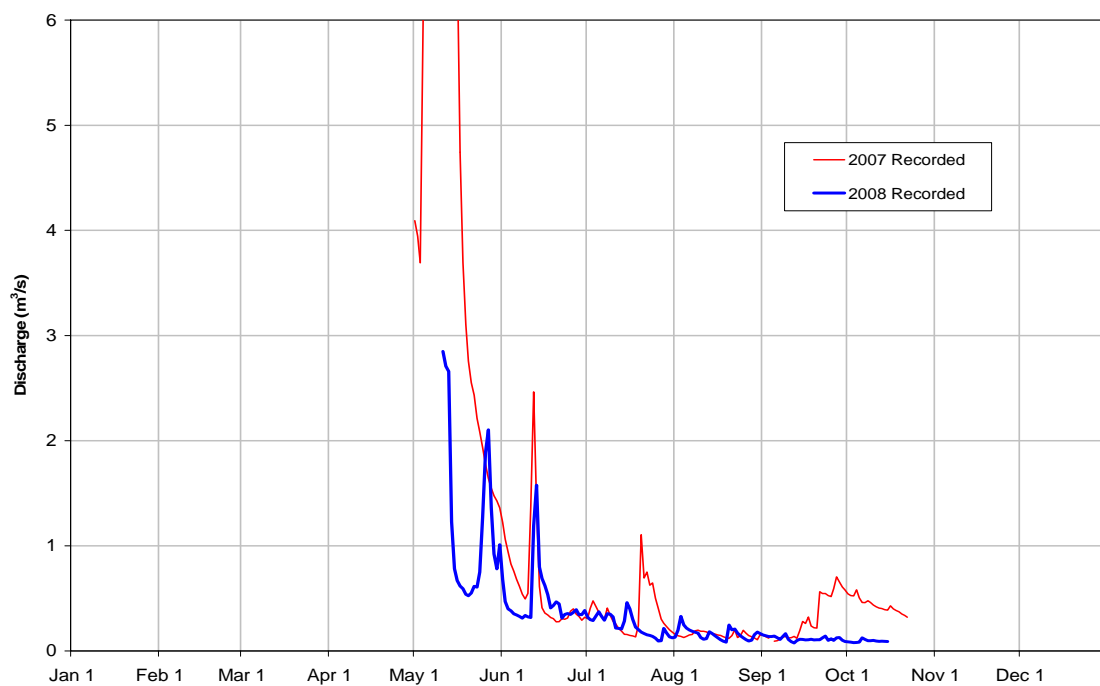


Figure C.2-16 2008 discharge hydrograph and historical context for Station S18A, Calumet River Upland Tributary.

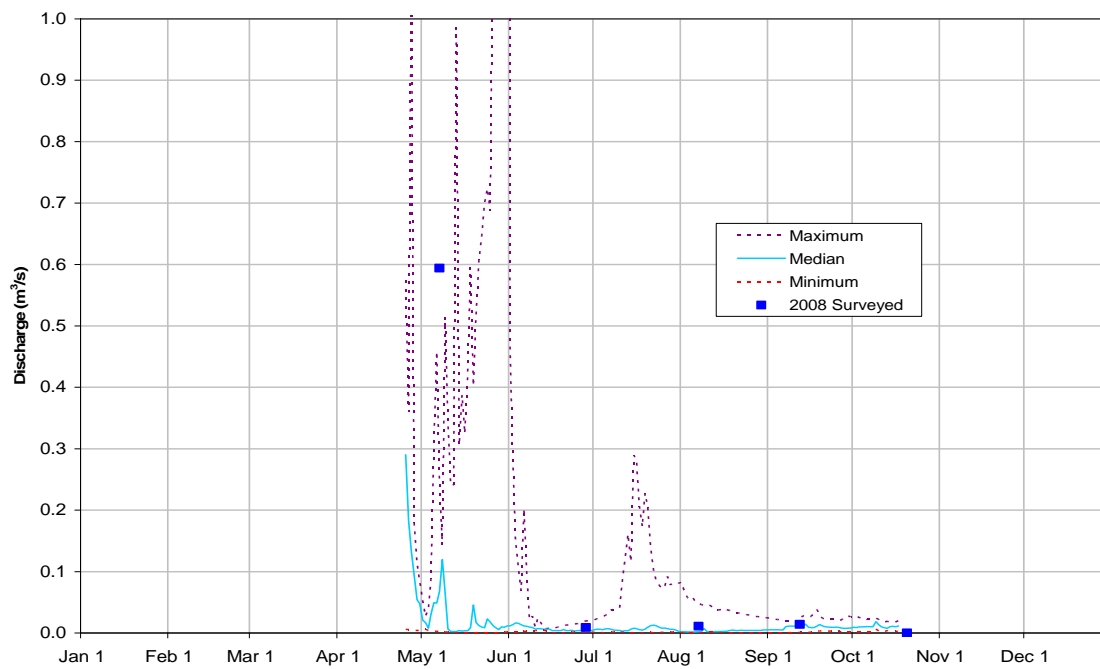


Figure C.2-17 2008 discharge hydrograph and historical context for Station S19, Tar River Lowland Tributary near the Mouth.

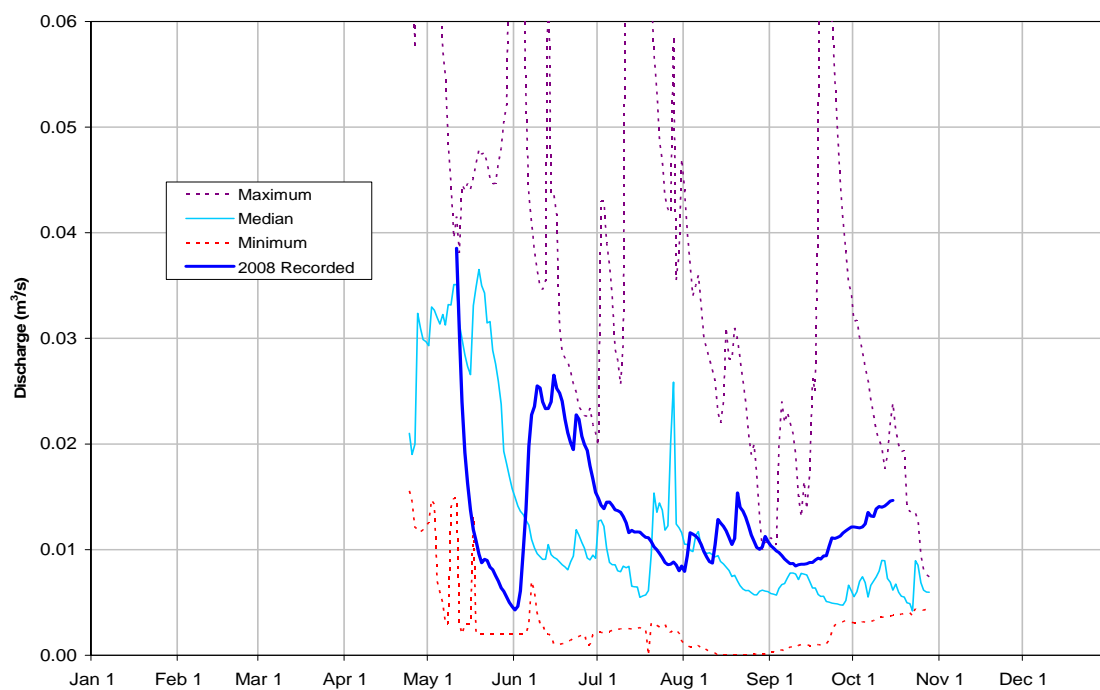


Figure C.2-18 2008 discharge hydrograph and historical context for Station S20, Muskeg River Upland.

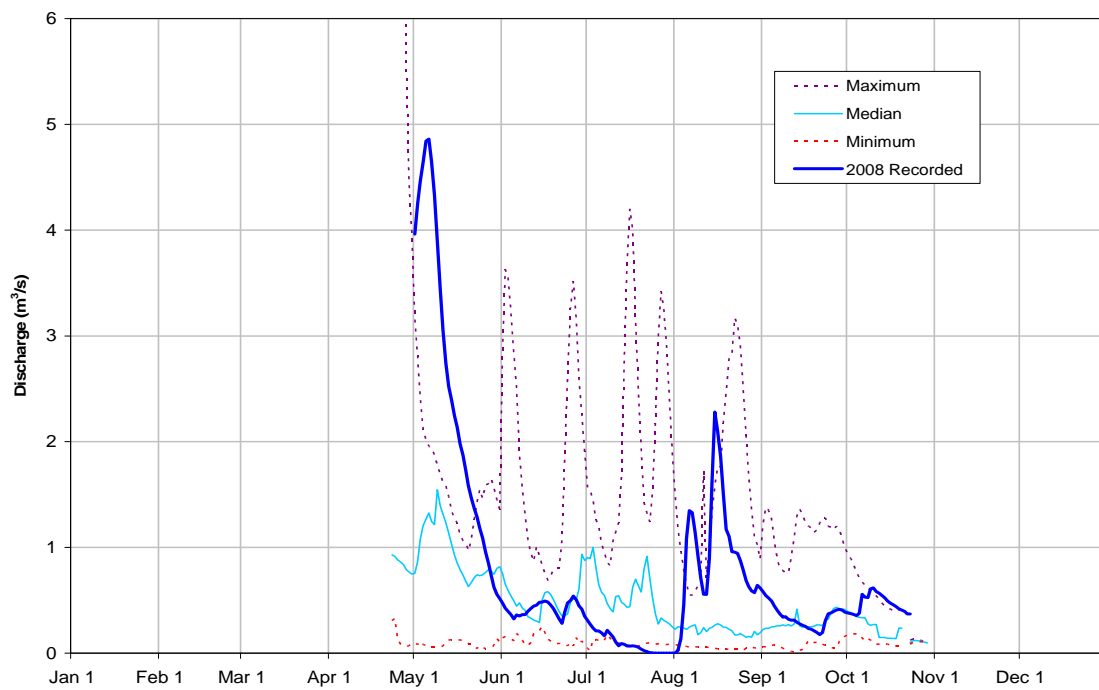


Figure C.2-19 2008 discharge hydrograph and historical context for Station S22, Muskeg Creek near the Mouth.

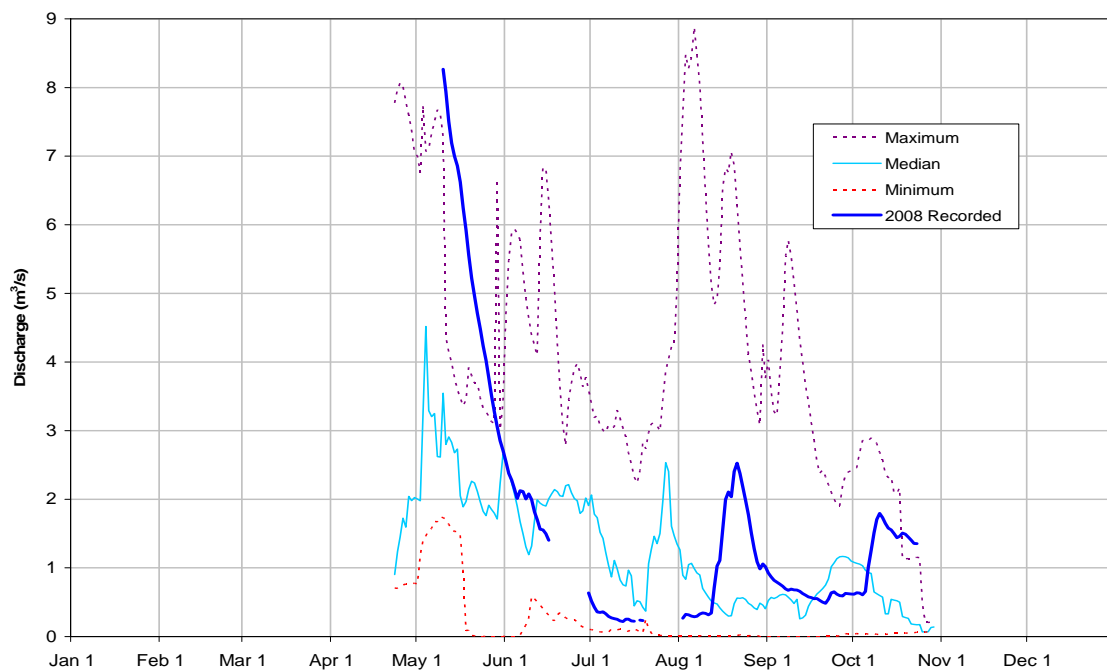


Figure C.2-20 2008 discharge hydrograph and historical context for Station S24, Athabasca River below Eymundson Creek.

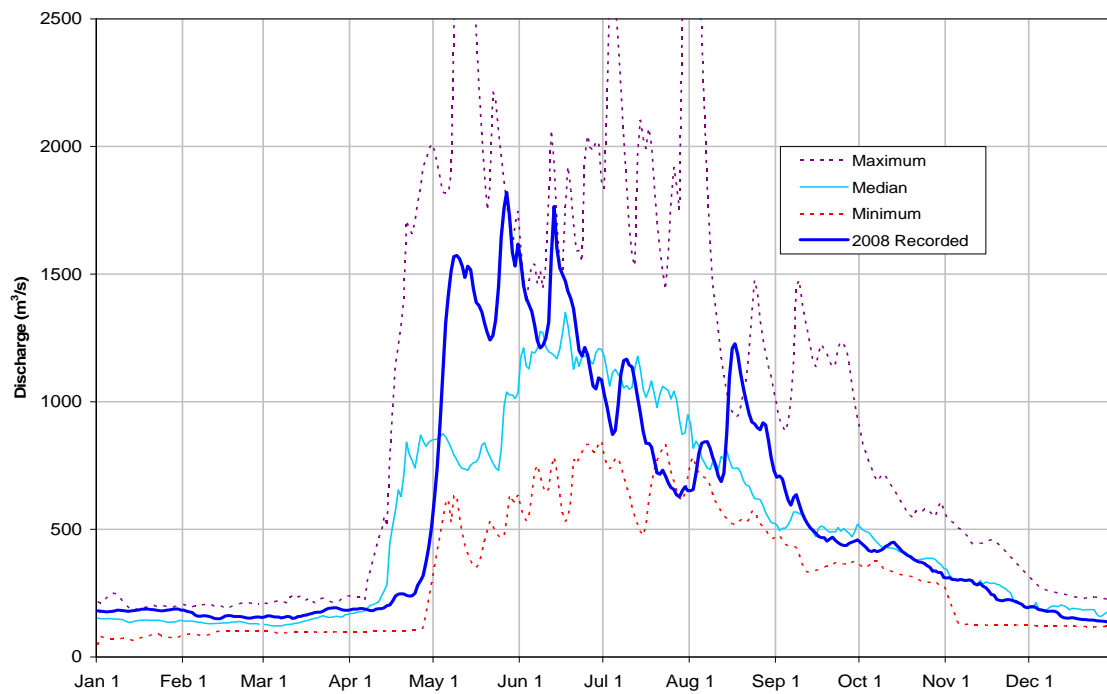


Figure C.2-21 2008 discharge hydrograph for Station S25, Susan Lake Outlet.

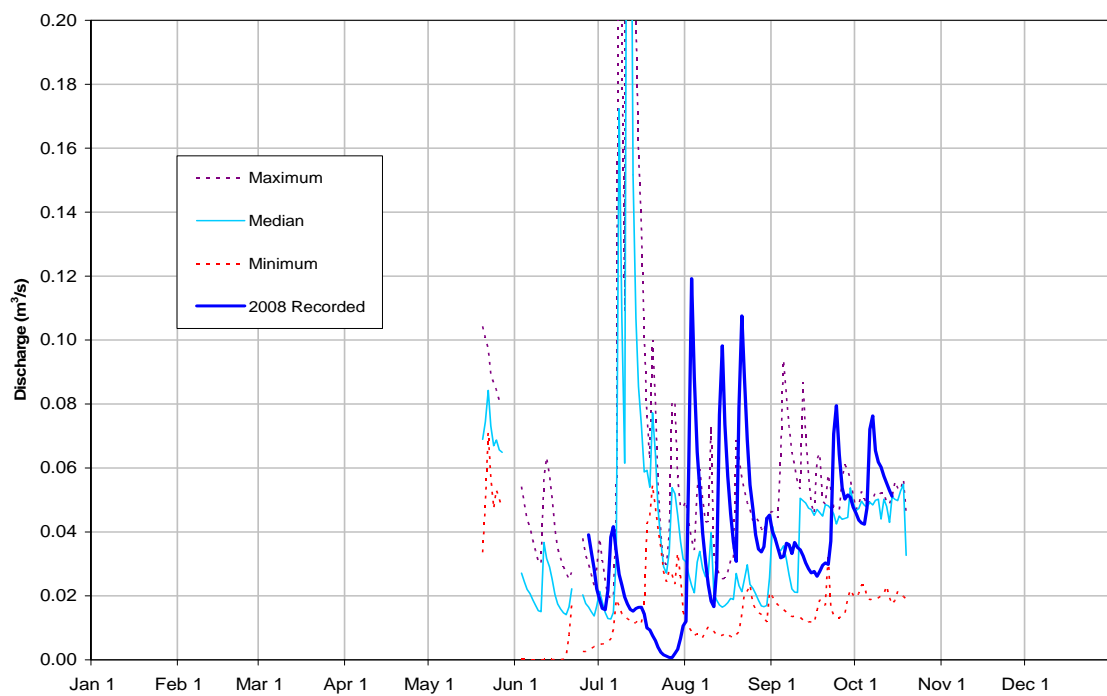


Figure C.2-22 2008 discharge hydrograph and historical context for Station S26, MacKay River near Fort McKay (07DB001).

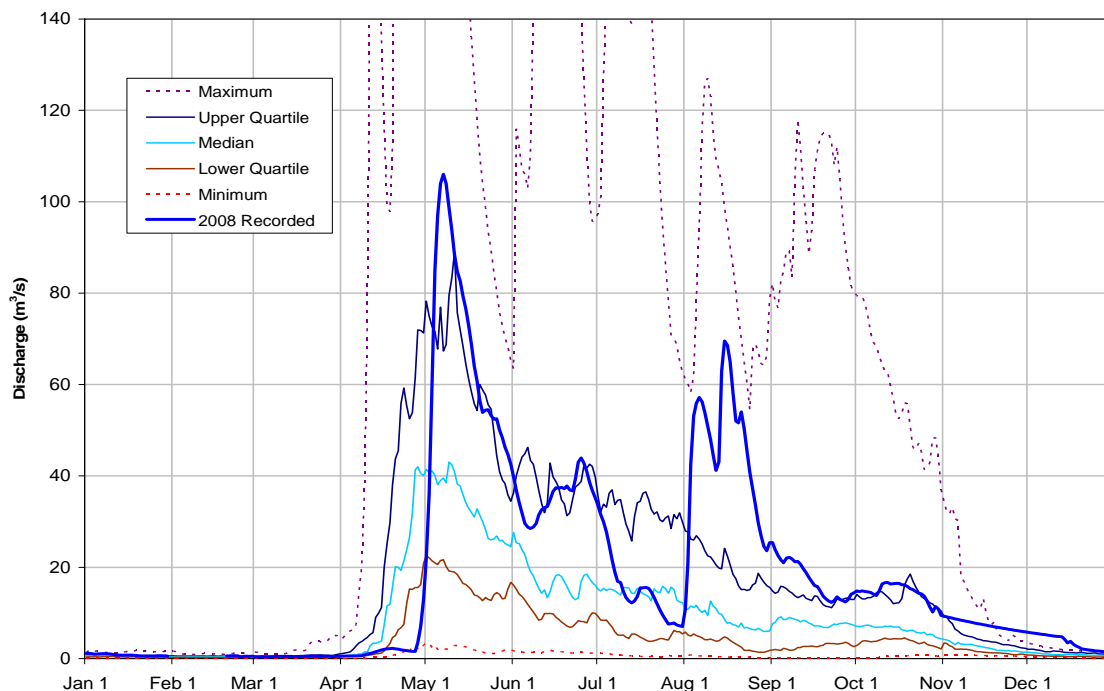


Figure C.2-23 2008 discharge hydrograph and historical context for Station S27, Firebag River near the Mouth (07DC001).

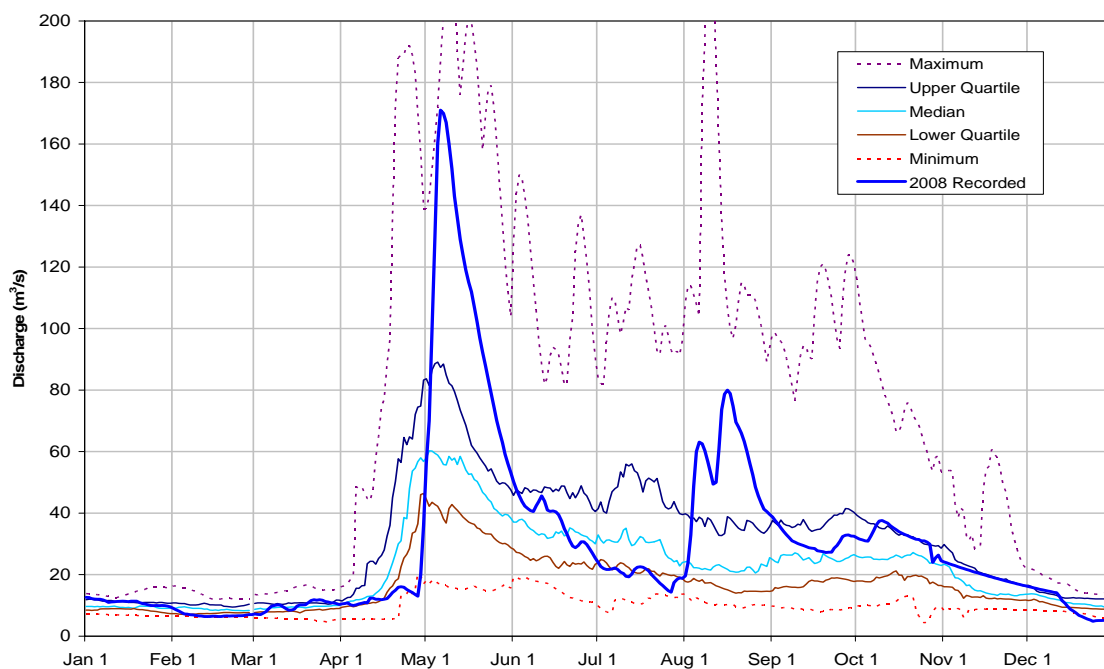


Figure C.2-24 2008 discharge hydrograph and historical context for Station S29, Christina River near Chard (07CE002).

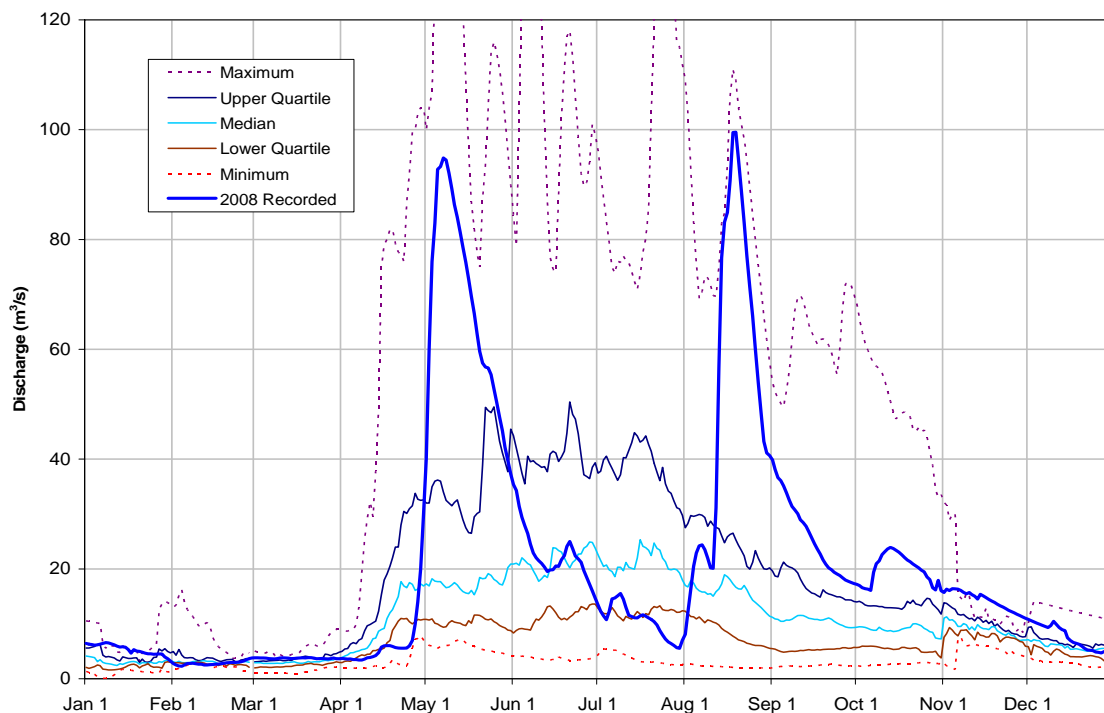


Figure C.2-25 2008 discharge hydrograph and historical context for Station S31, Hangingstone Creek near the Mouth.

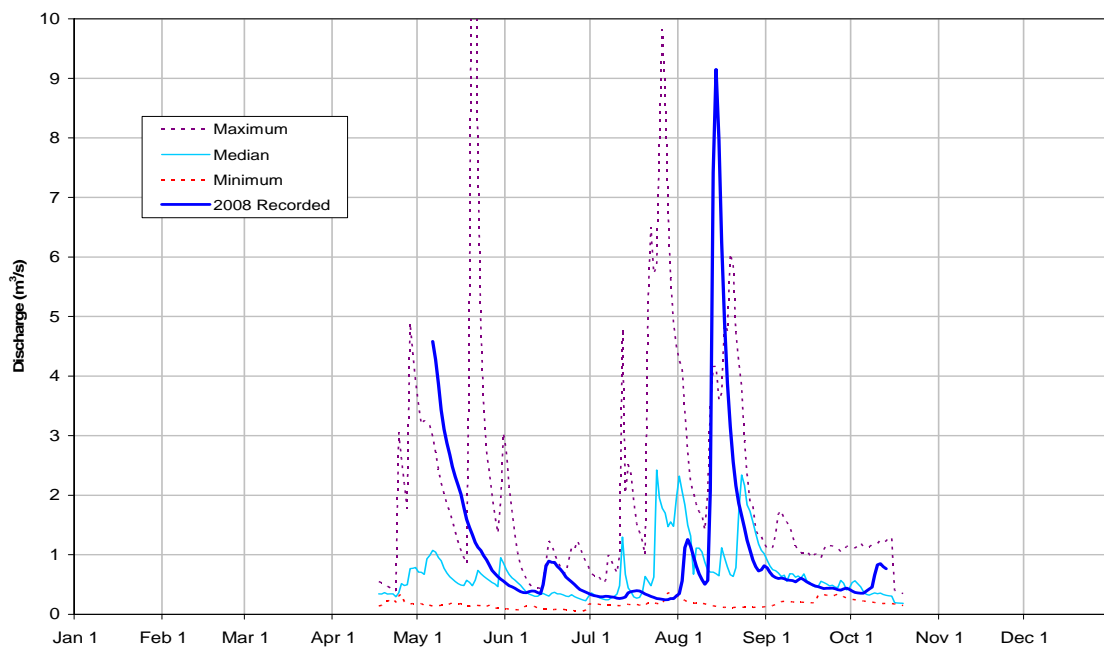


Figure C.2-26 2008 discharge hydrograph and historical context for Station S32, Surmont Creek at Highway 881.

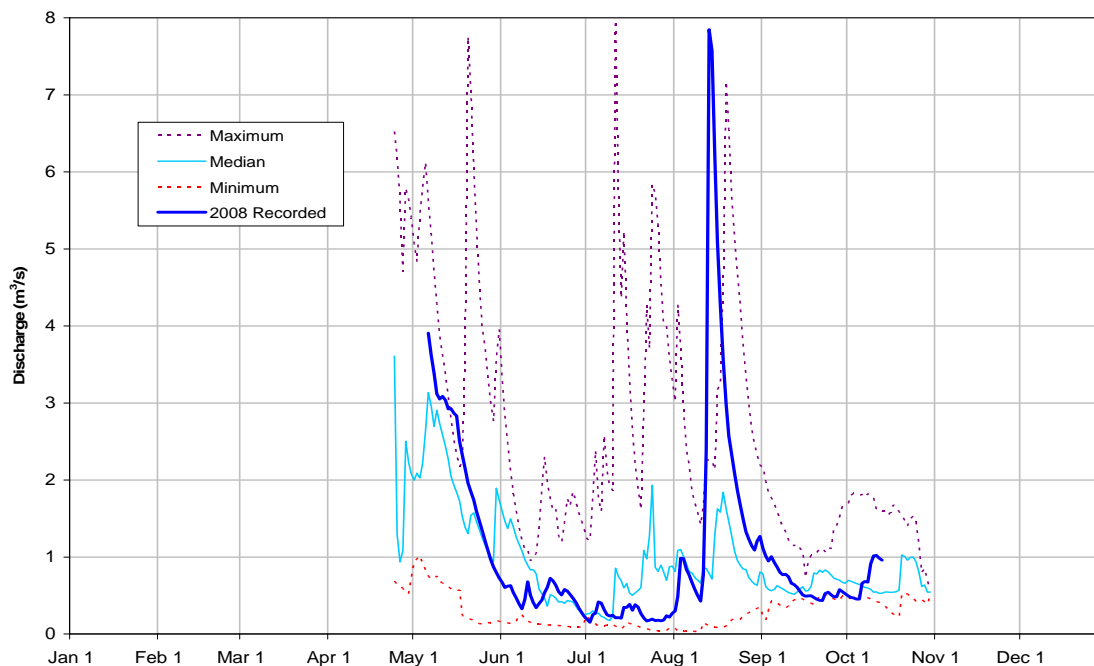


Figure C.2-27 2008 discharge hydrograph and historical context for Station S33, Muskeg River at the Aurora/Albian Boundary.

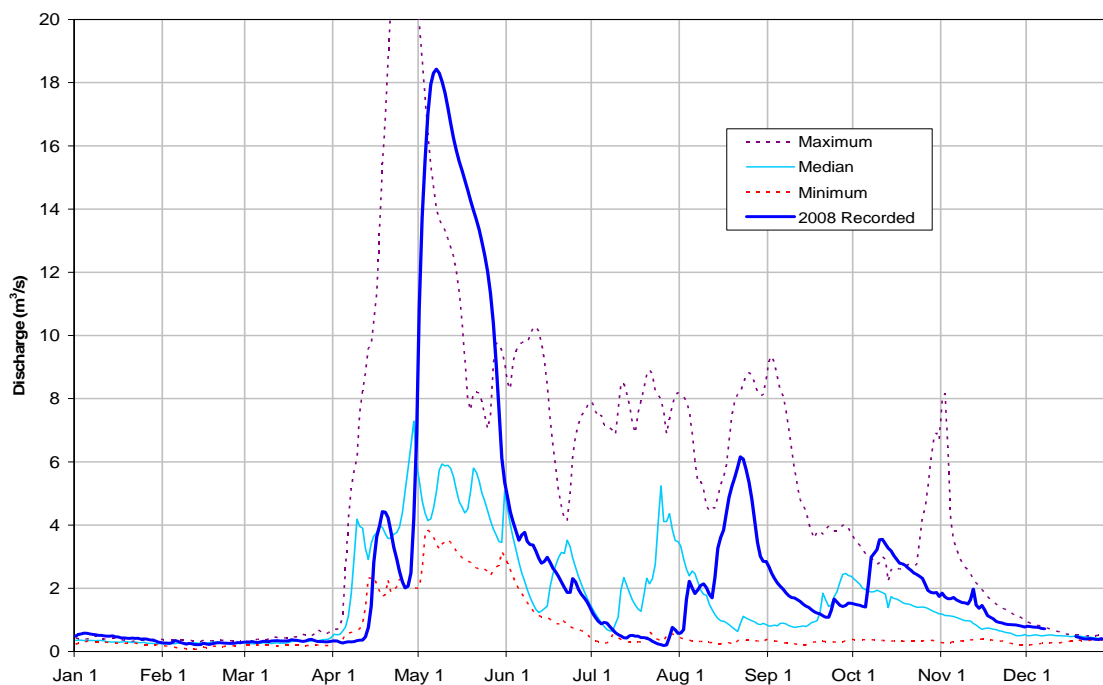


Figure C.2-28 2008 discharge hydrograph and historical context for Station S34, Tar River above CNRL Lake.

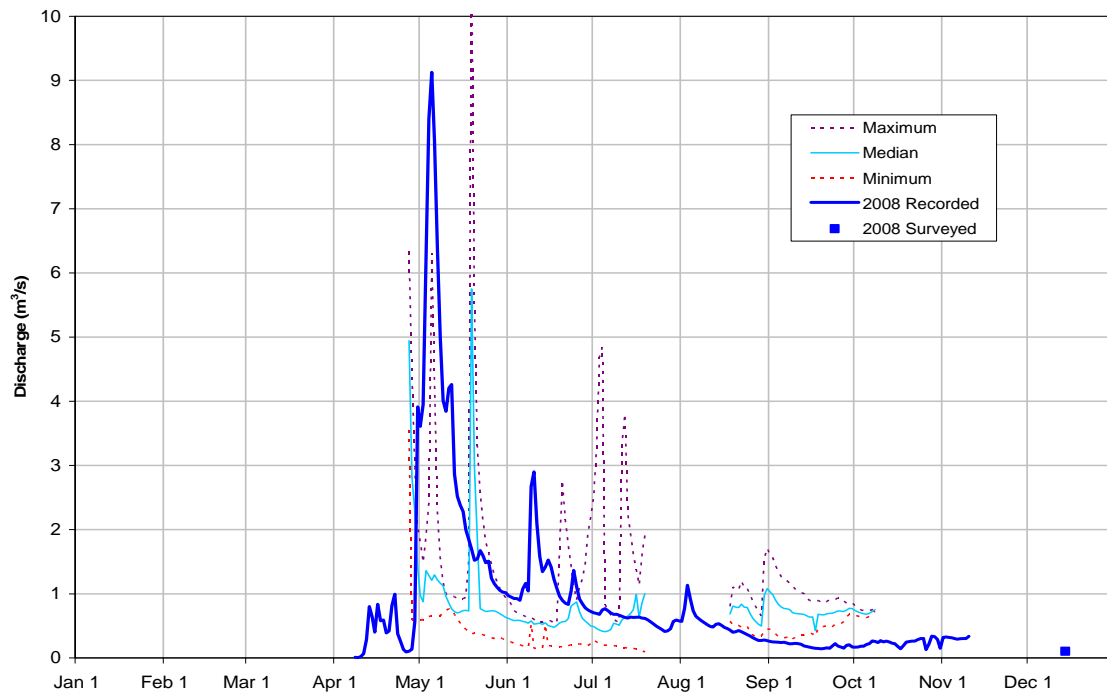


Figure C.2-29 2008 discharge hydrograph for Station S36, McClelland Lake Outlet above Firebag River.

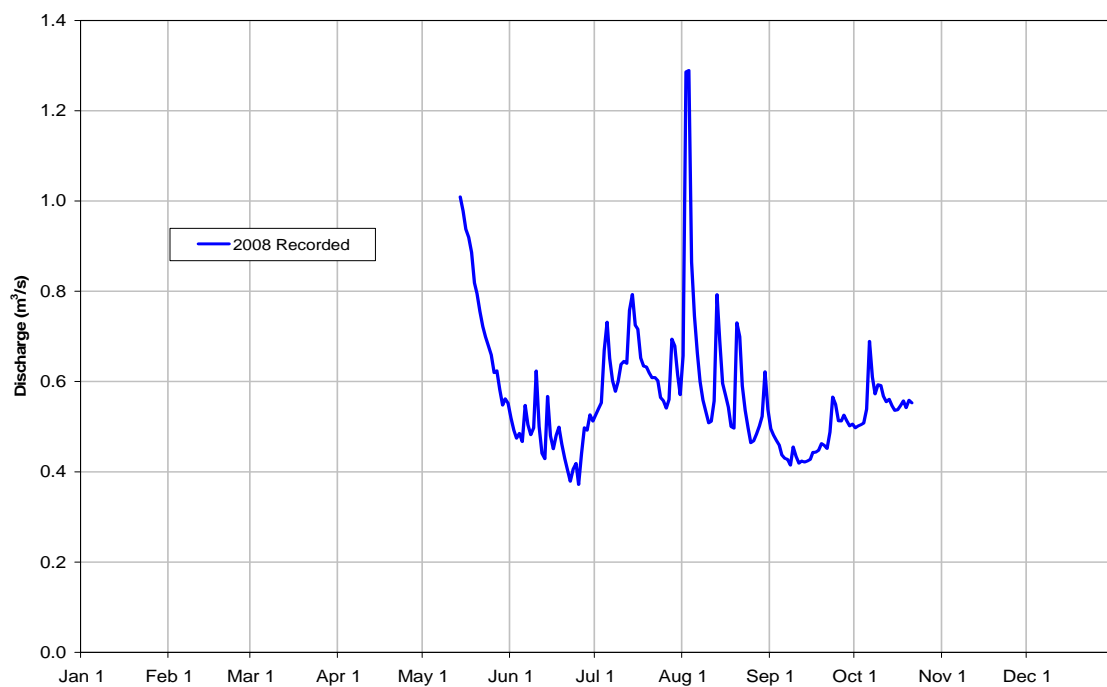


Figure C.2-30 2008 discharge hydrograph and historical context for Station S37, East Jackpine Creek near the 1300 m contour.

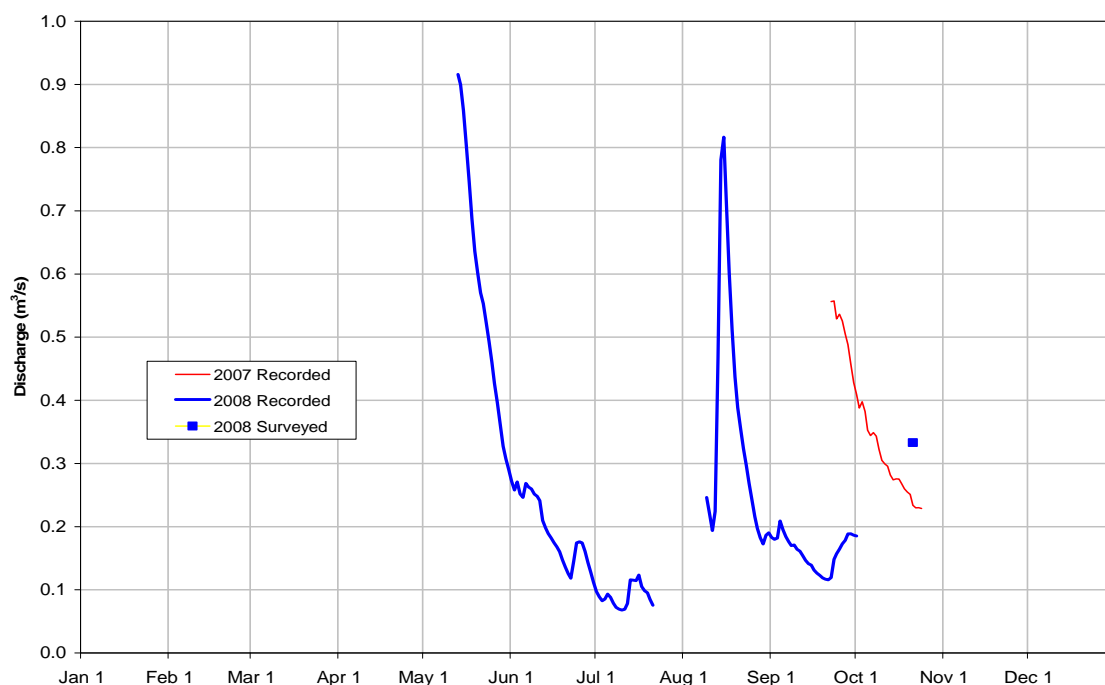


Figure C.2-31 2008 discharge hydrograph and historical context for Station S38, Steepbank River near Fort McMurray (07DA006).

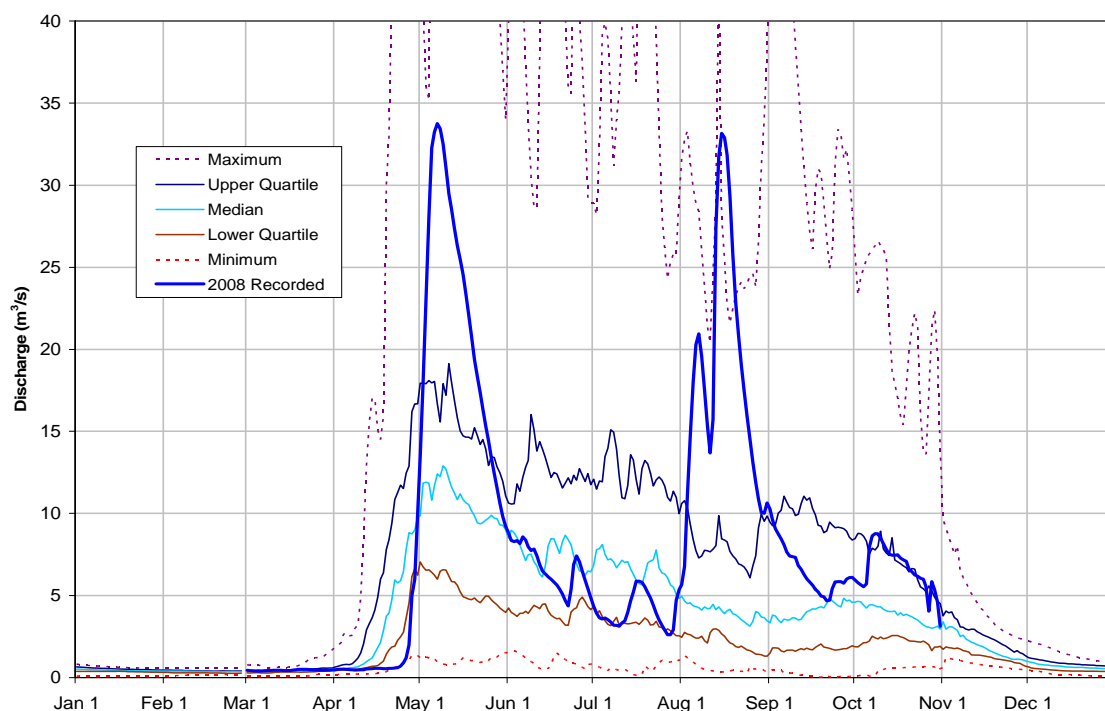


Figure C.2-32 2008 discharge hydrograph and historical context for Station S39, Beaver River above Syncrude (07DA018).

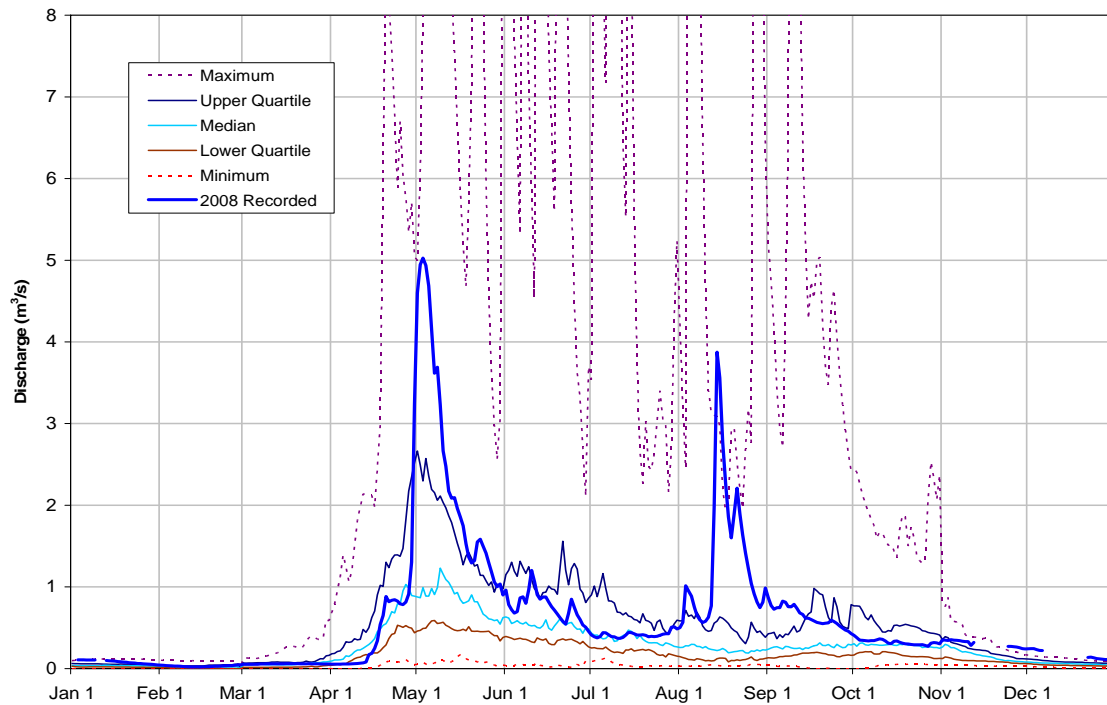
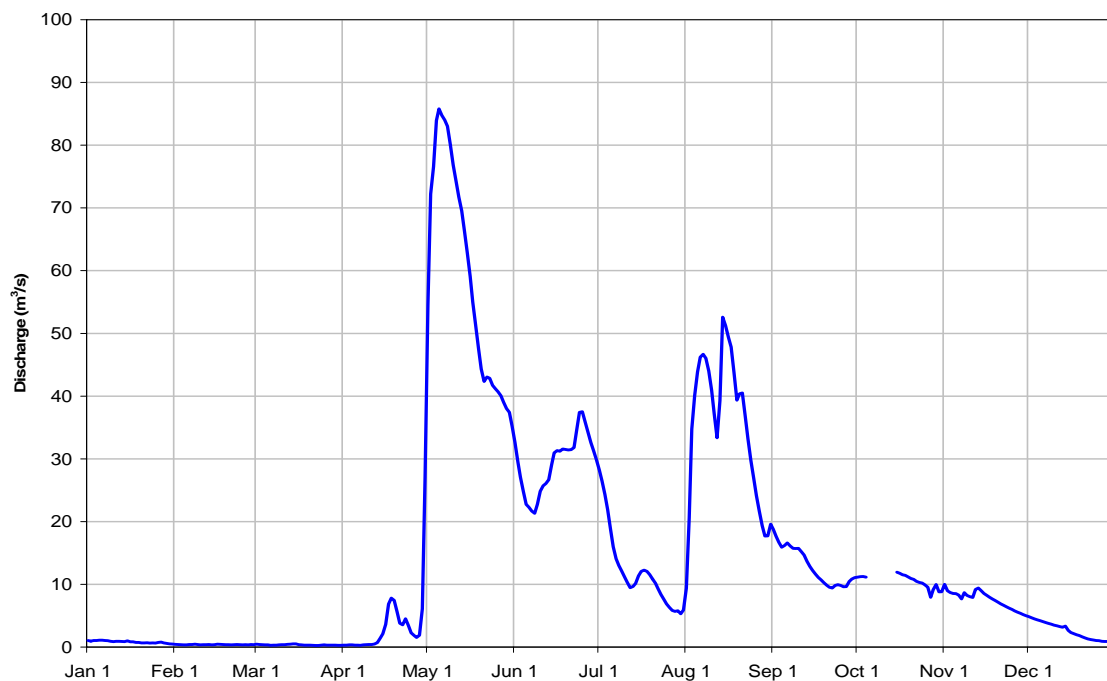


Figure C.2-33 2008 discharge hydrograph Station S40, Mackay River at Petro-Canada Bridge.



C.2.5 Stage-Discharge Rating Curves

Water level and discharge measurements were used to derive or update stage-discharge rating curves. The derived rating curves are shown graphically for each station in Figure C.2-34 through Figure C.2-62 below. Curve numbers (e.g. Curve 4) are used to identify the various curves applied during the history of a station.

Figure C.2-34 Stage-discharge rating curve for Station S02, Jackpine Creek at Canterra Road.

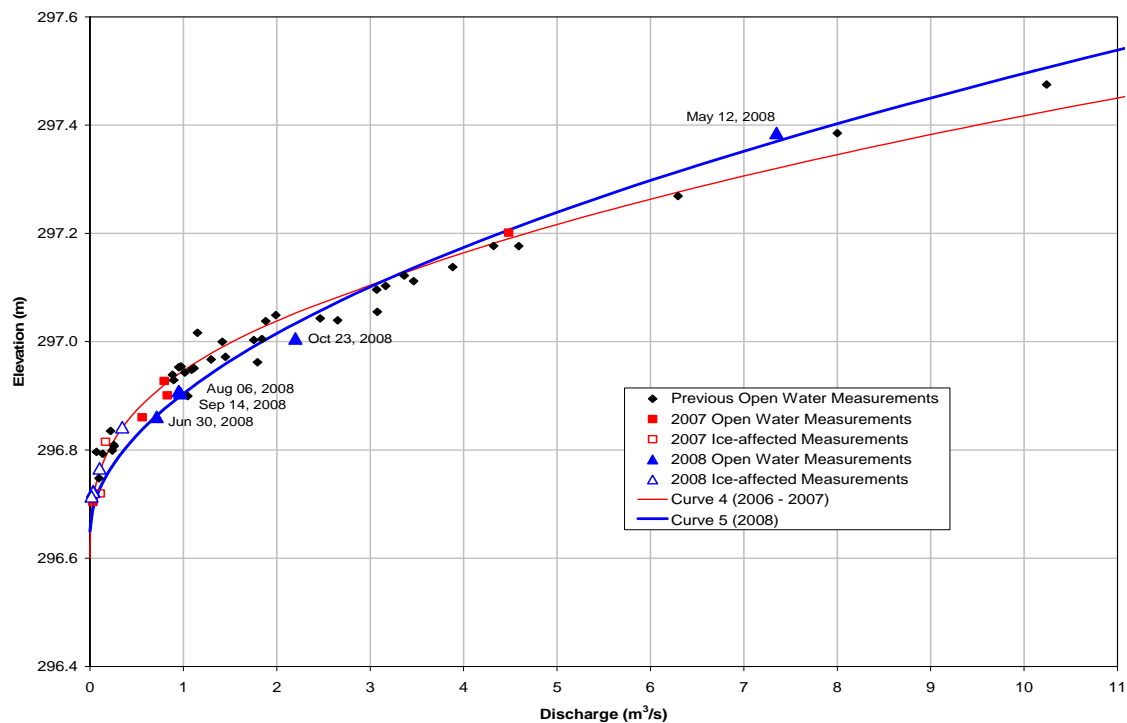


Figure C.2-35 Stage-discharge rating curve for Station S03, Iyininim Creek above Kears Lake.

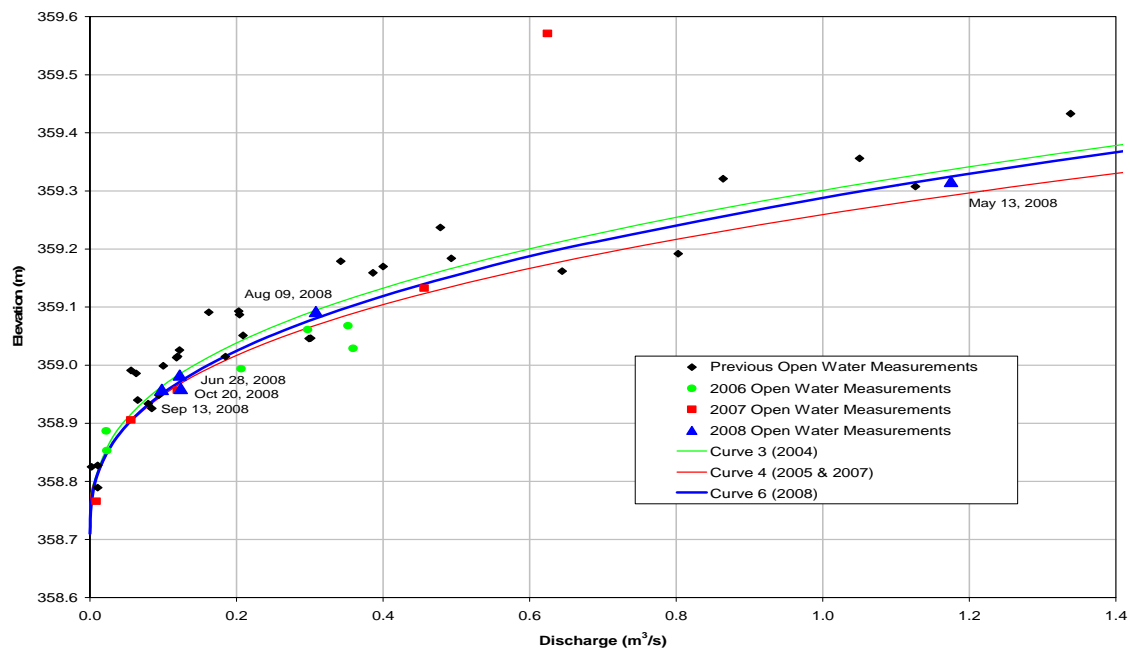


Figure C.2-36 Stage-discharge rating curve for Station S05, Muskeg River above Stanley Creek.

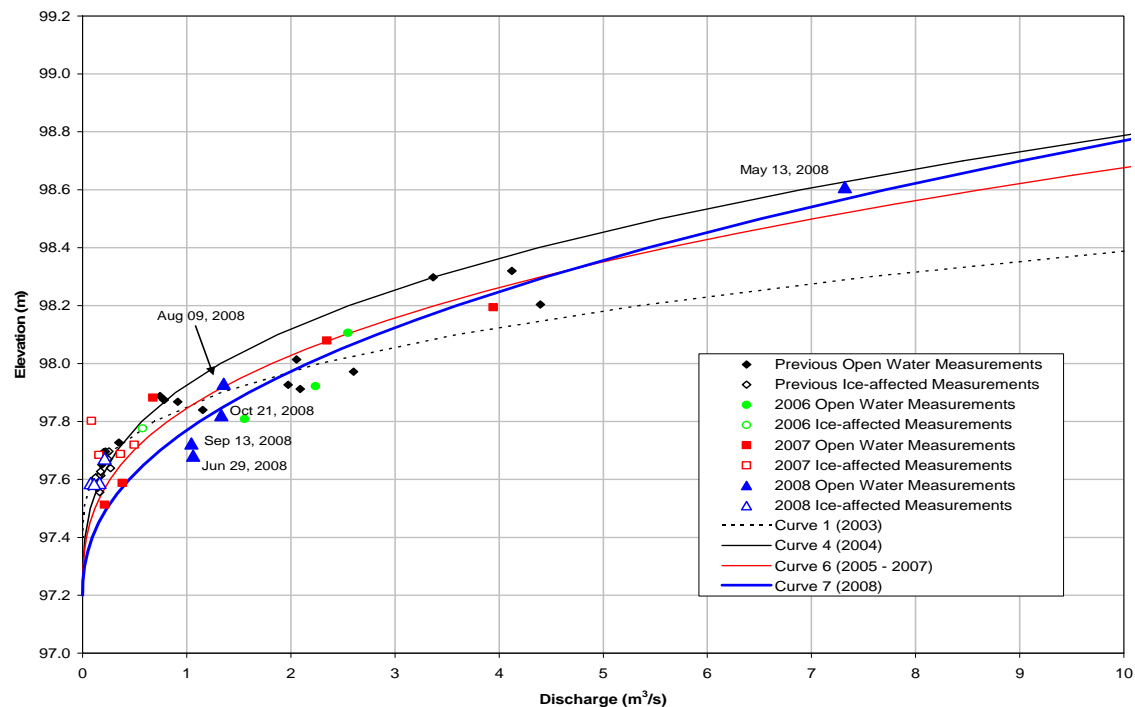


Figure C.2-37 Stage-discharge rating curve for Station S05A, Muskeg River above Muskeg Creek.

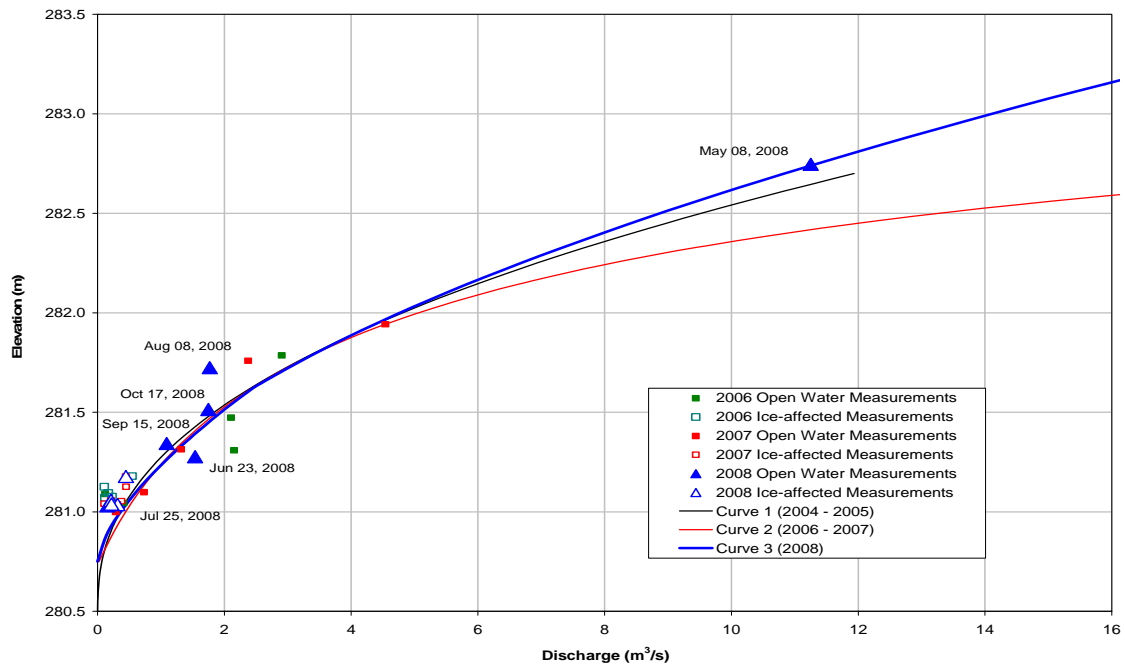


Figure C.2-38 Stage-discharge rating curve for Station S06, Mills Creek at Highway 63.

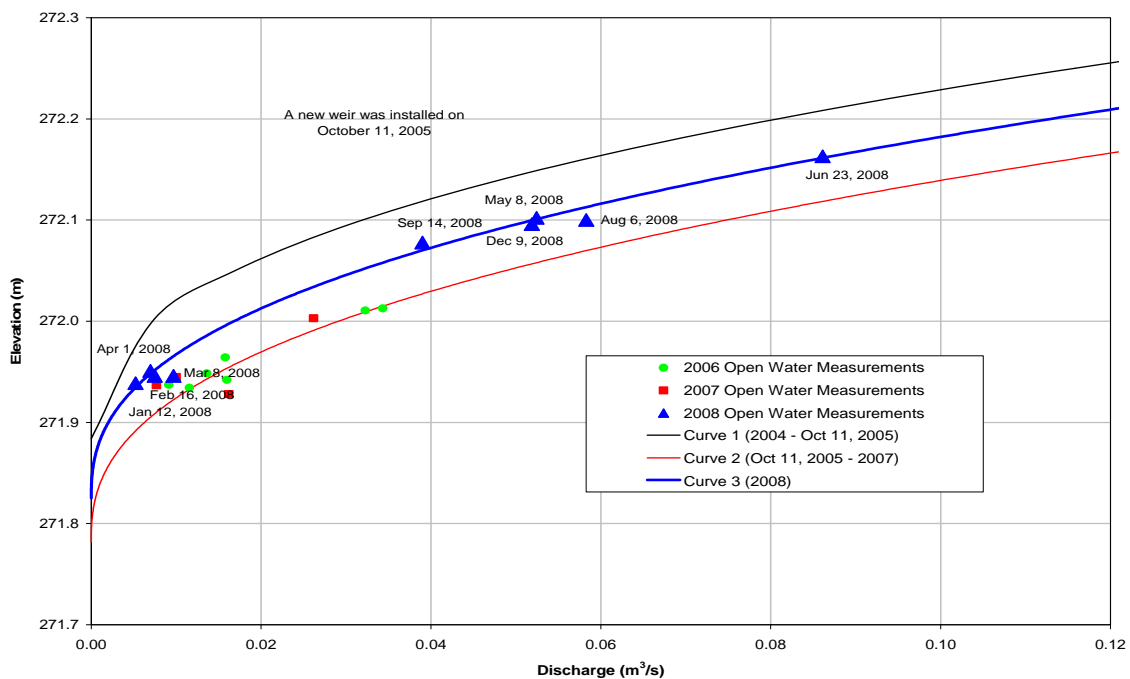


Figure C.2-39 Stage-discharge rating curve for Station S07, Muskeg River near Fort McKay (07DA008).

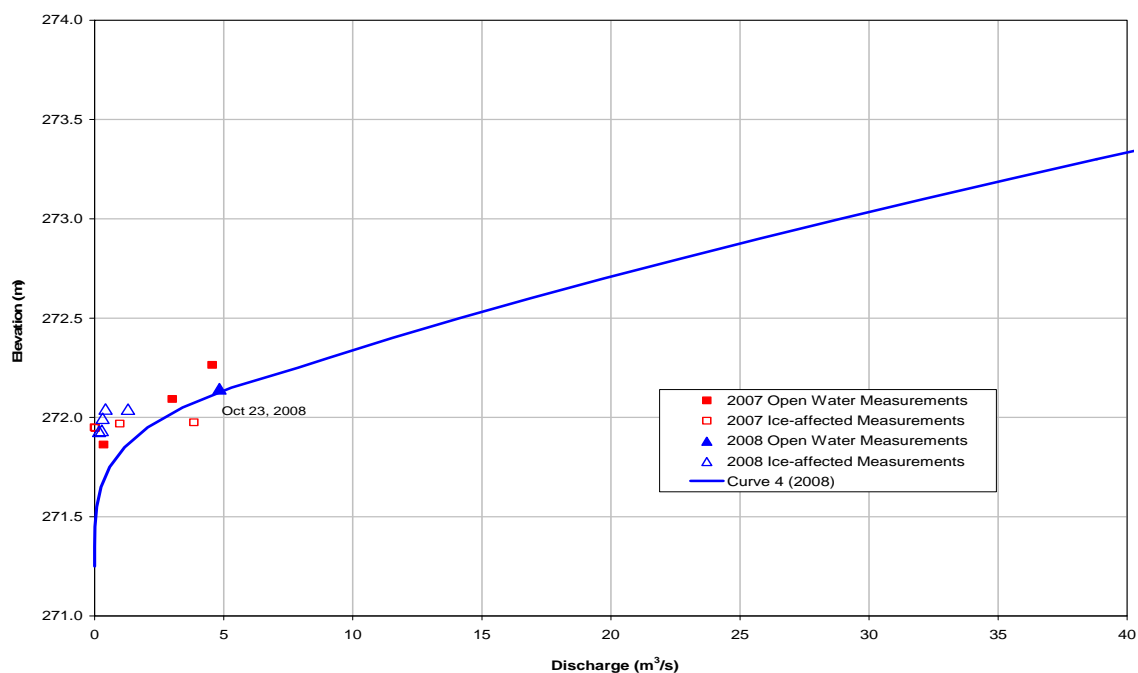


Figure C.2-40 Stage-discharge rating curve for Station S09, Kearl Lake Outlet.

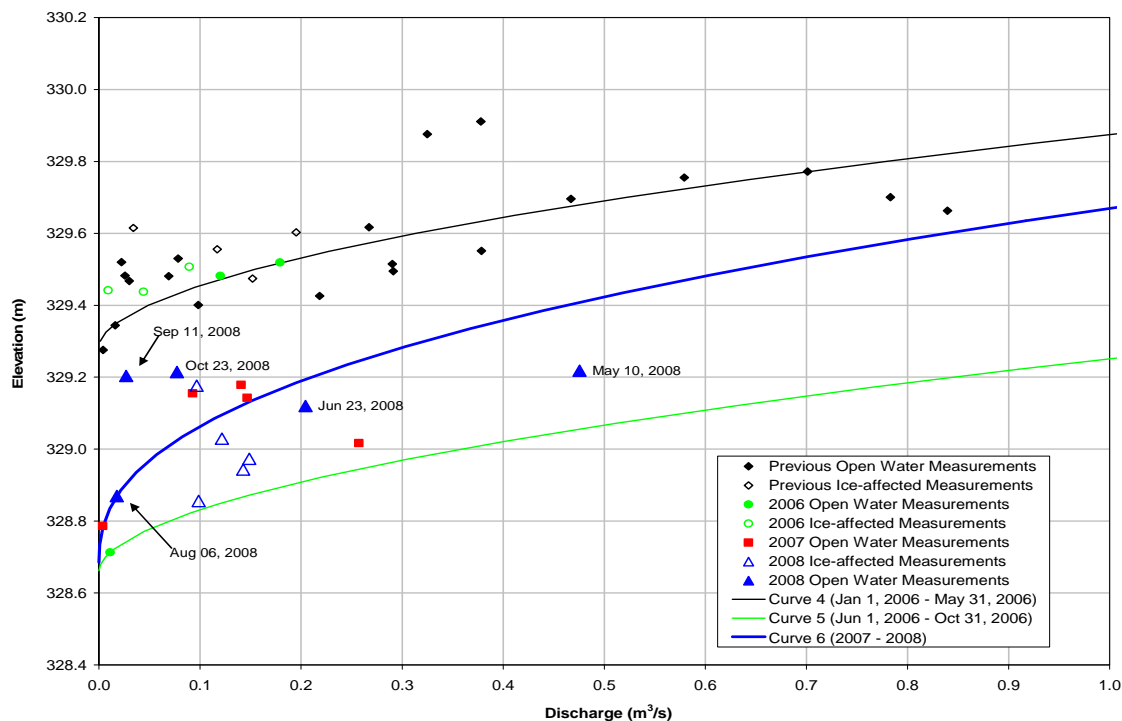


Figure C.2-41 Stage-discharge rating curve for Station S10, Wapasu Creek at Canterra Road.

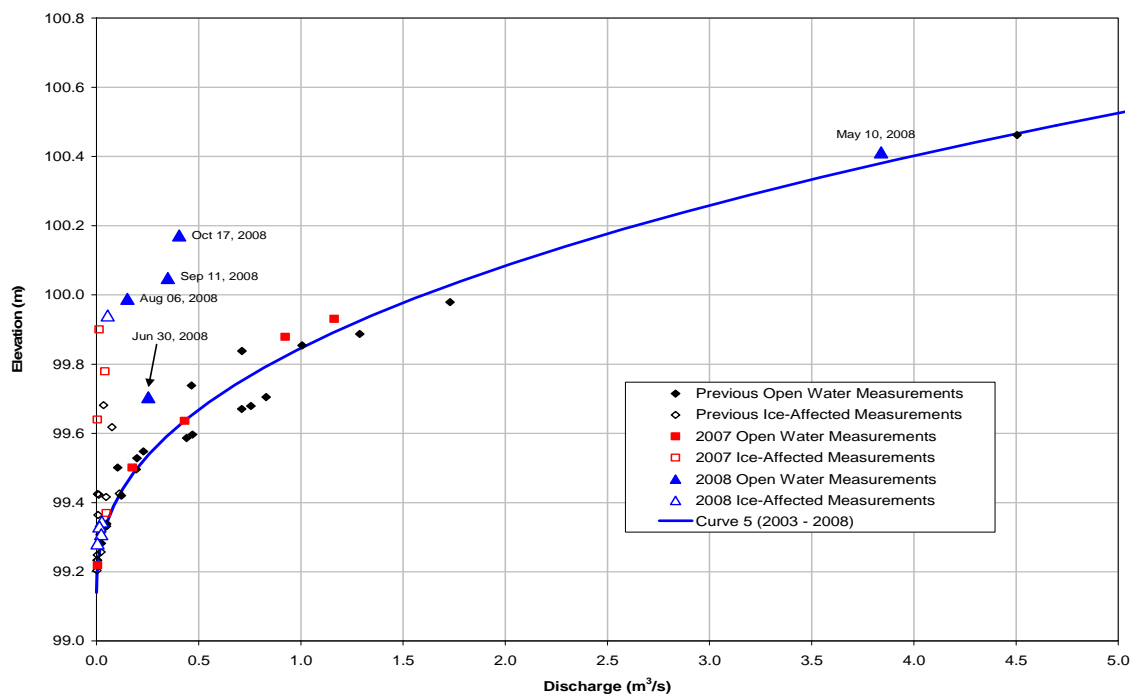


Figure C.2-42 Stage-discharge rating curve for Station S11, Poplar Creek at Highway 63 (07DA007).

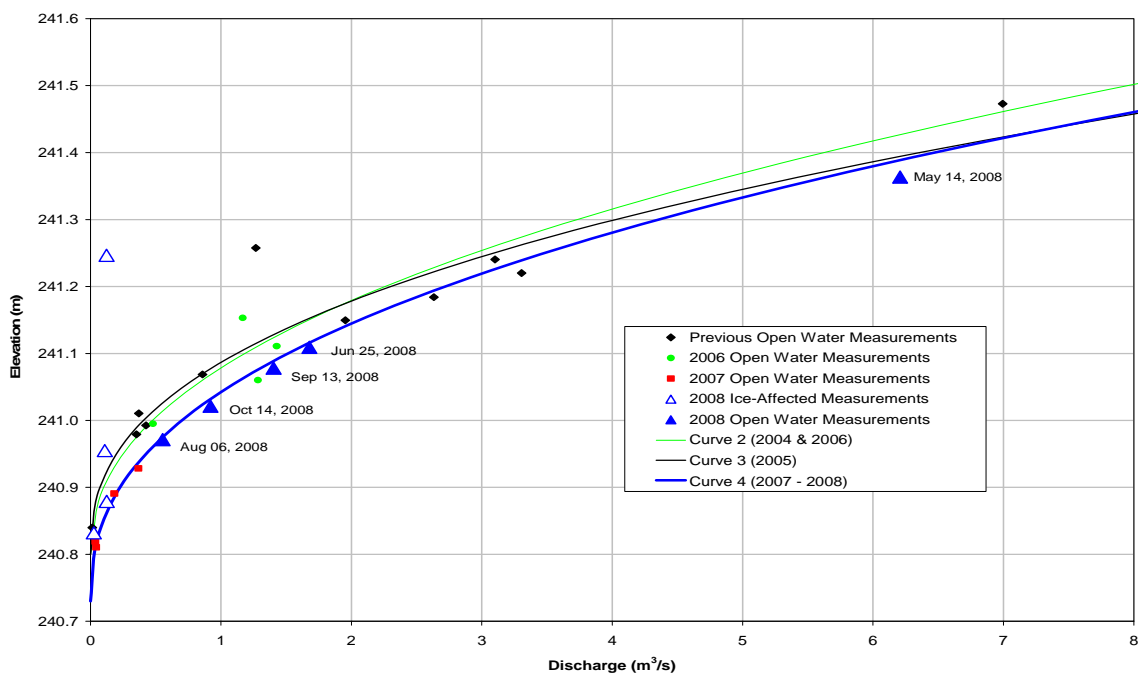


Figure C.2-43 Stage-discharge rating curve for Station S12, Fort Creek at Highway 63.

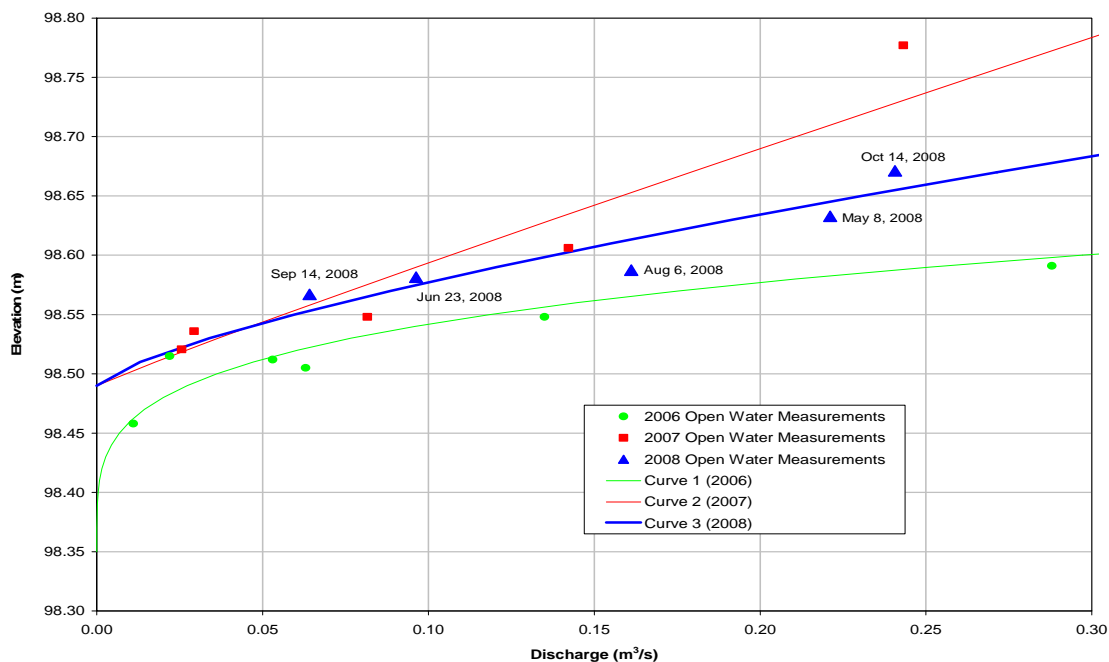


Figure C.2-44 Stage-discharge rating curve for Station S14A, Ells River at the CNRL Bridge.

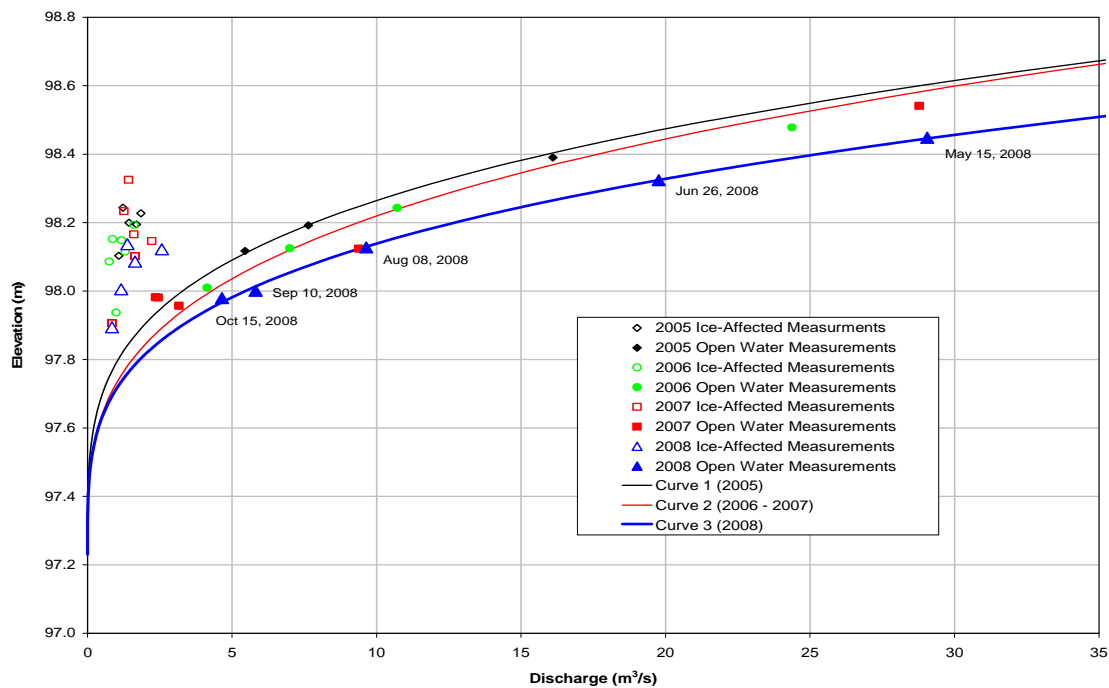


Figure C.2-45 Stage-discharge rating curve for Station S15A, Tar River near the Mouth.

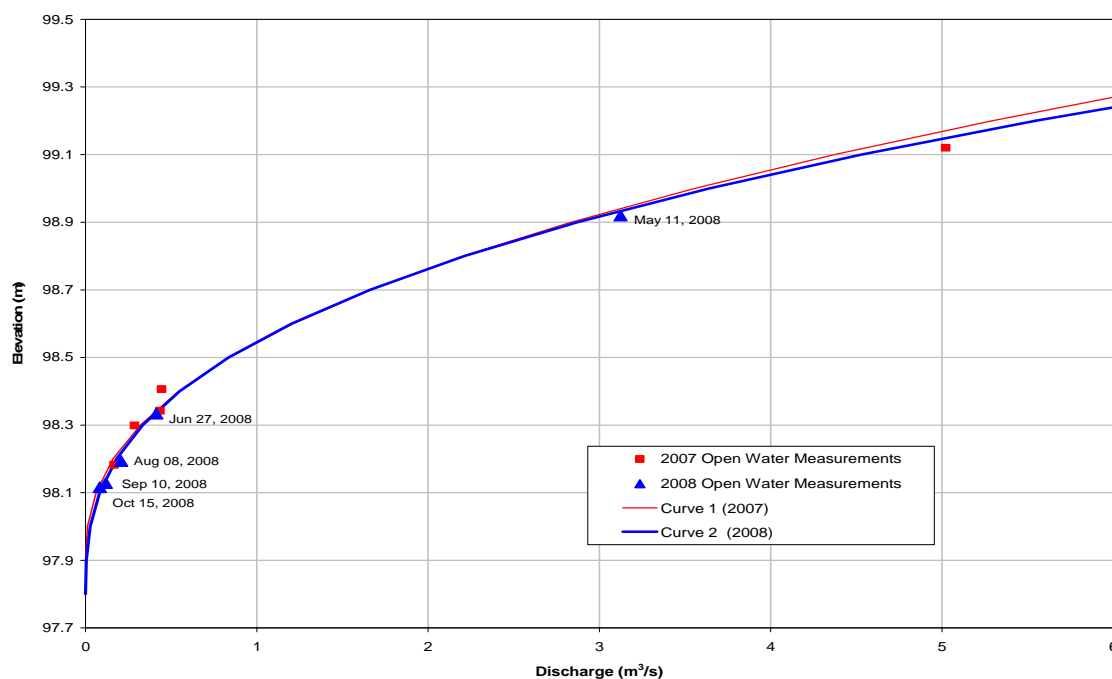


Figure C.2-46 Stage-discharge rating curve for Station S18A, Calumet River Upland Tributary.

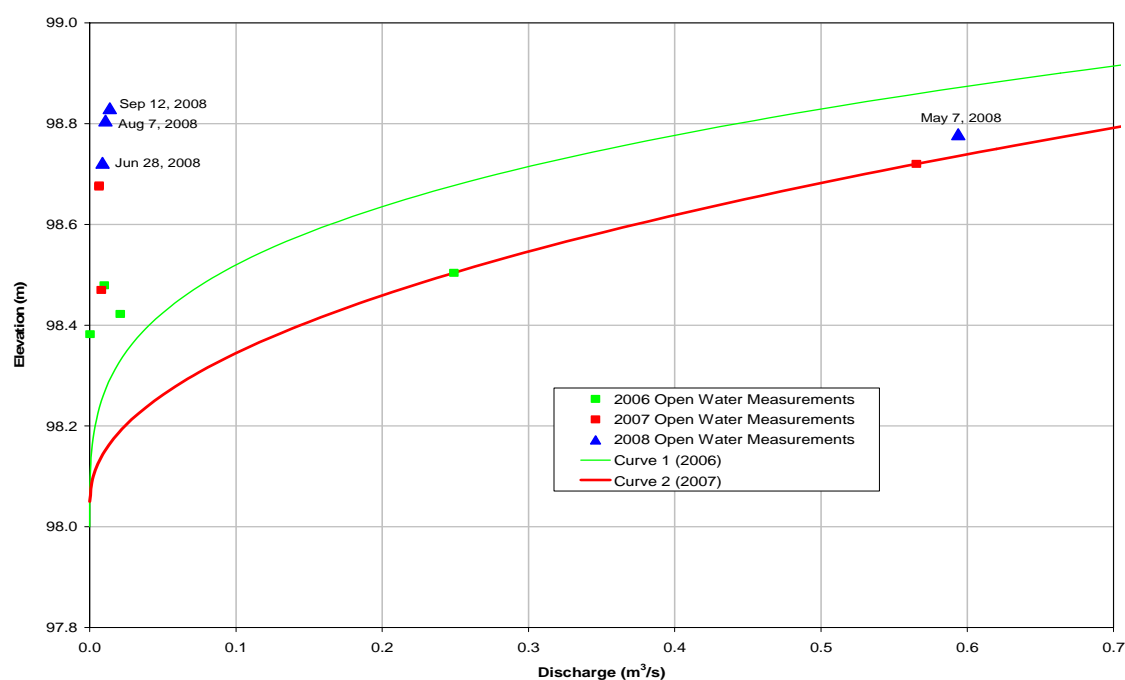


Figure C.2-47 Stage-discharge rating curve for Station S19, Tar River Lowland Tributary near the Mouth.

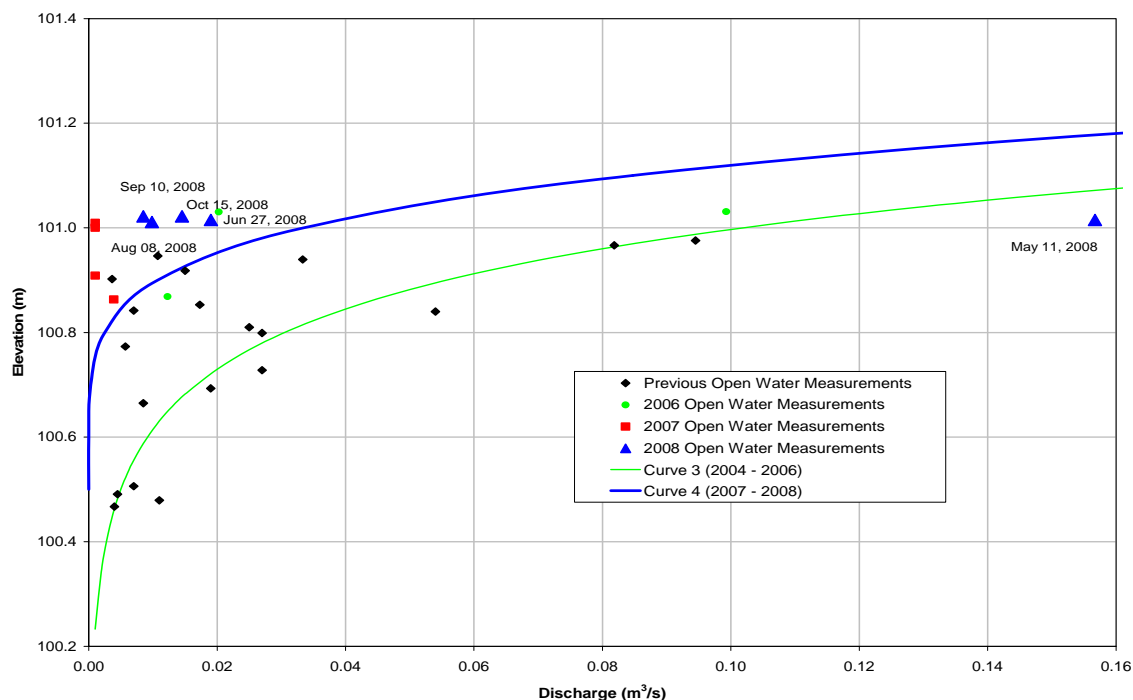


Figure C.2-48 Stage-discharge rating curve for Station S20, Muskeg River Upland.

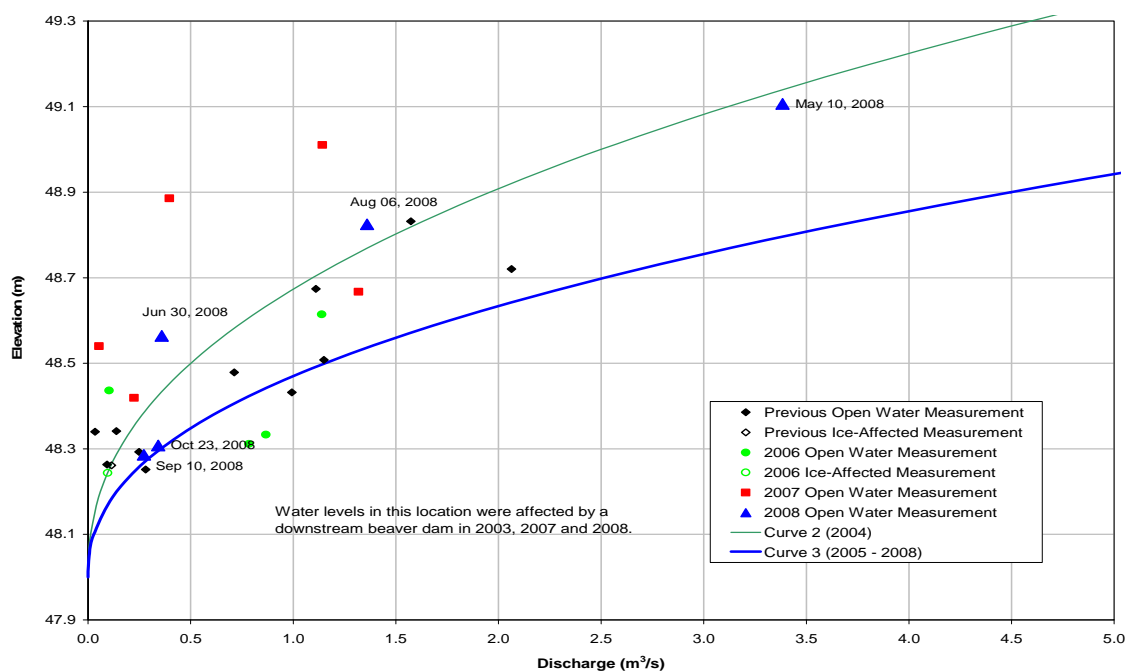


Figure C.2-49 Stage-discharge rating curve for Station S22, Muskeg Creek near the Mouth.

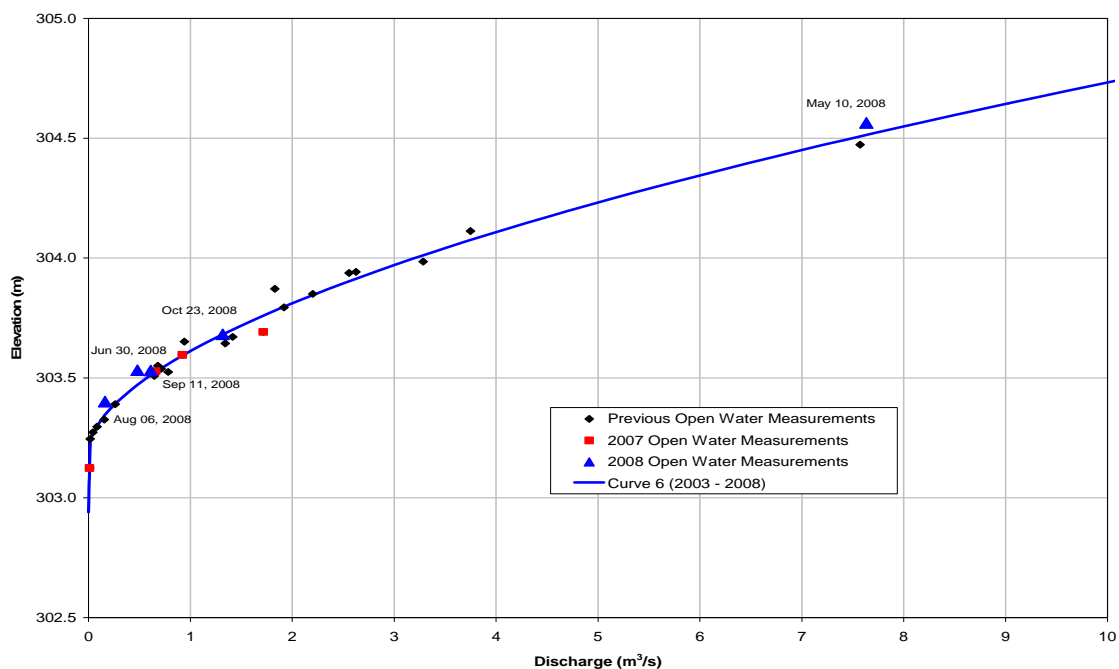


Figure C.2-50 Stage-discharge rating curve for Station S24, Athabasca River below Eymundson Creek.

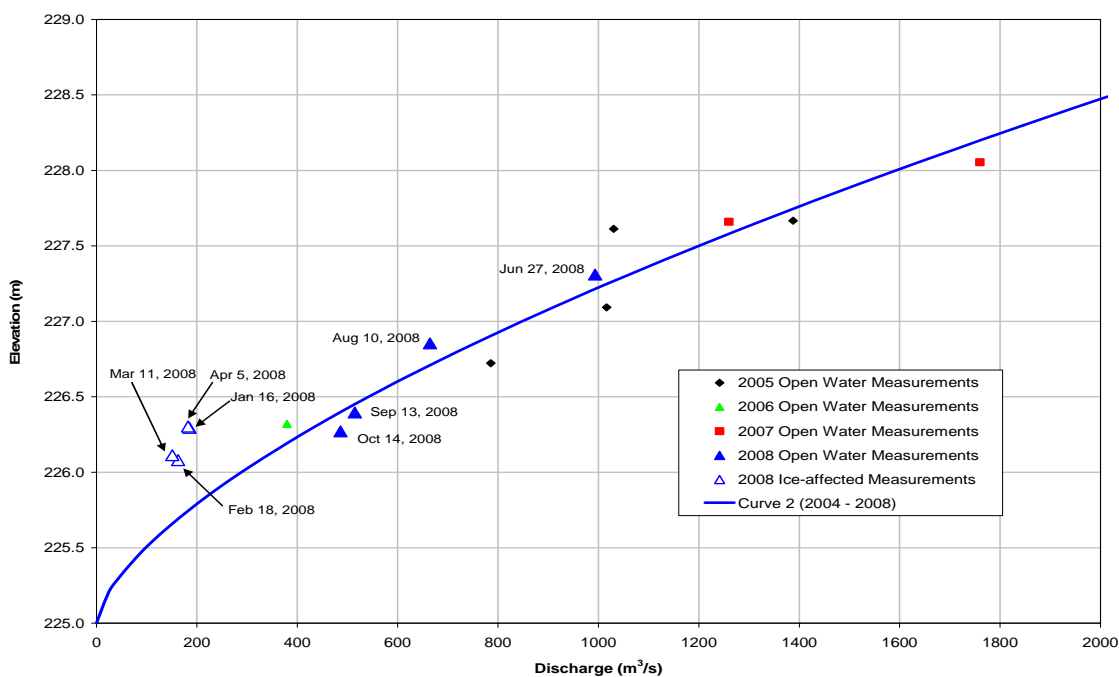


Figure C.2-51 Stage-discharge rating curve for Station S25, Susan Lake Outlet.

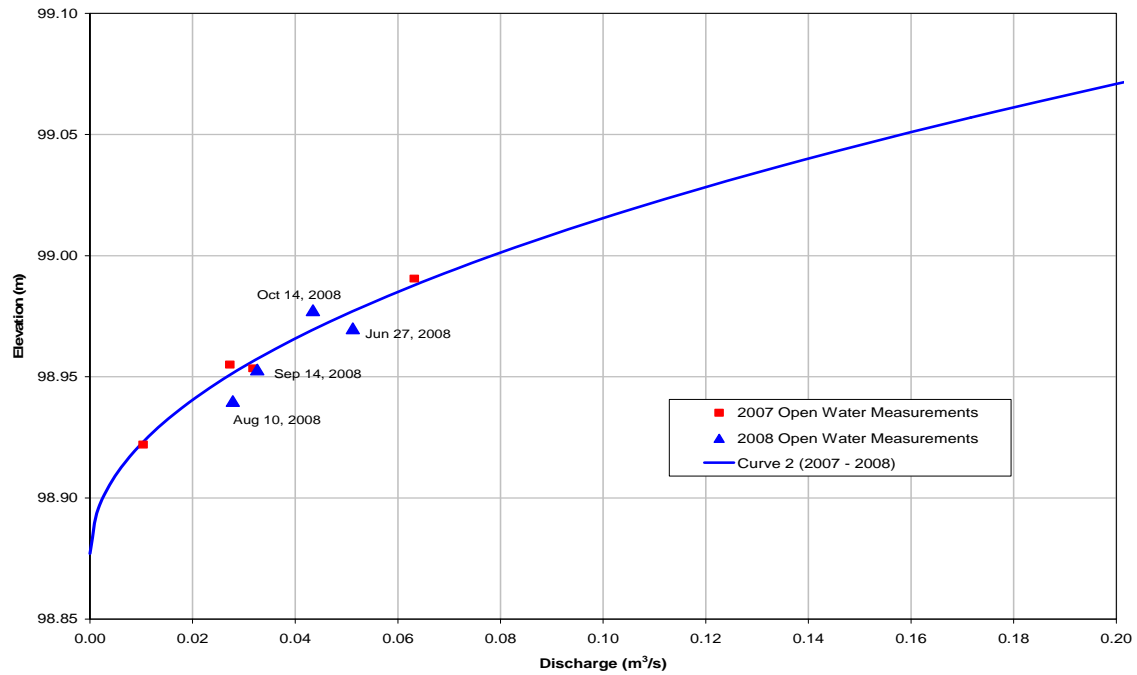


Figure C.2-52 Stage-discharge rating curve for Station S26, MacKay River near Fort McKay (07DB001).

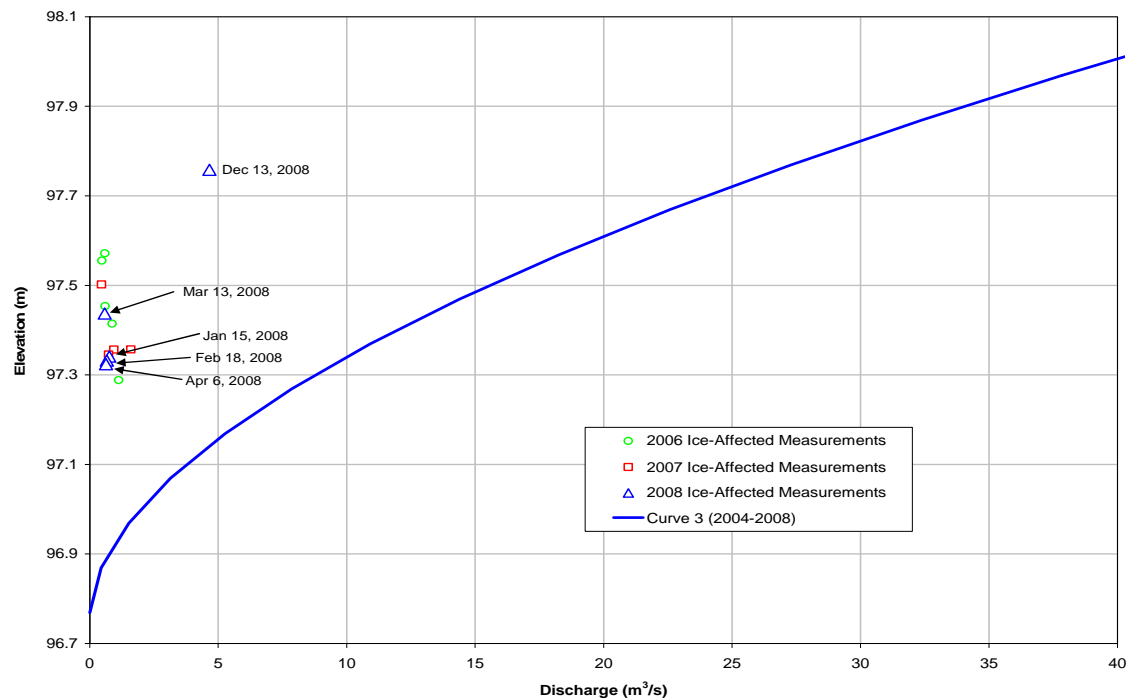


Figure C.2-53 Stage-discharge rating curve for Station S27, Firebag River near the Mouth.

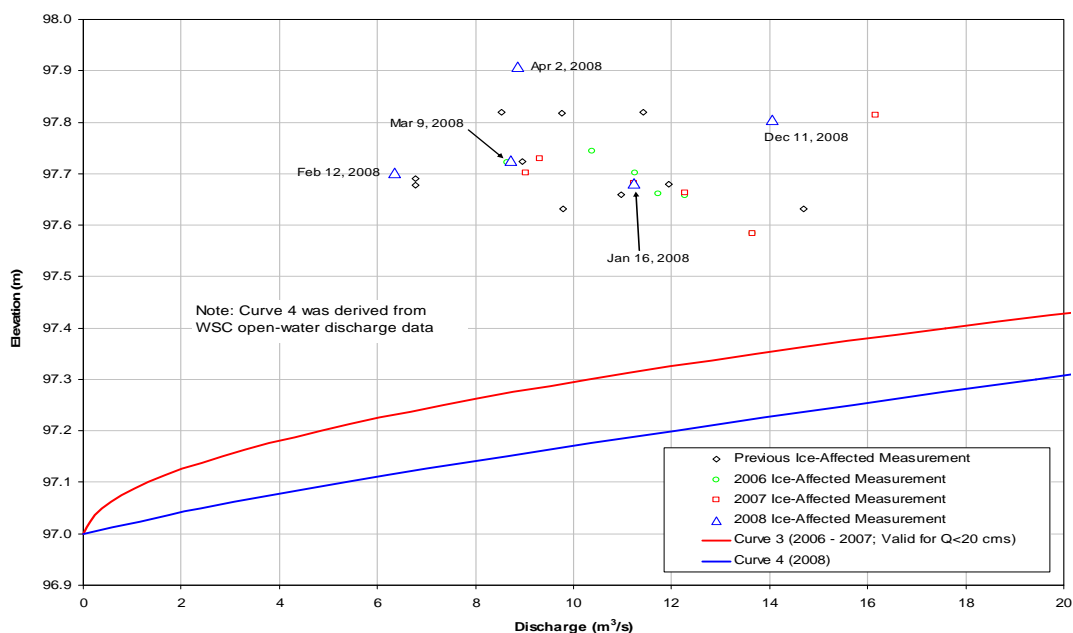


Figure C.2-54 Stage-discharge rating curve for Station S29, Christina River near Chard (07CE002).

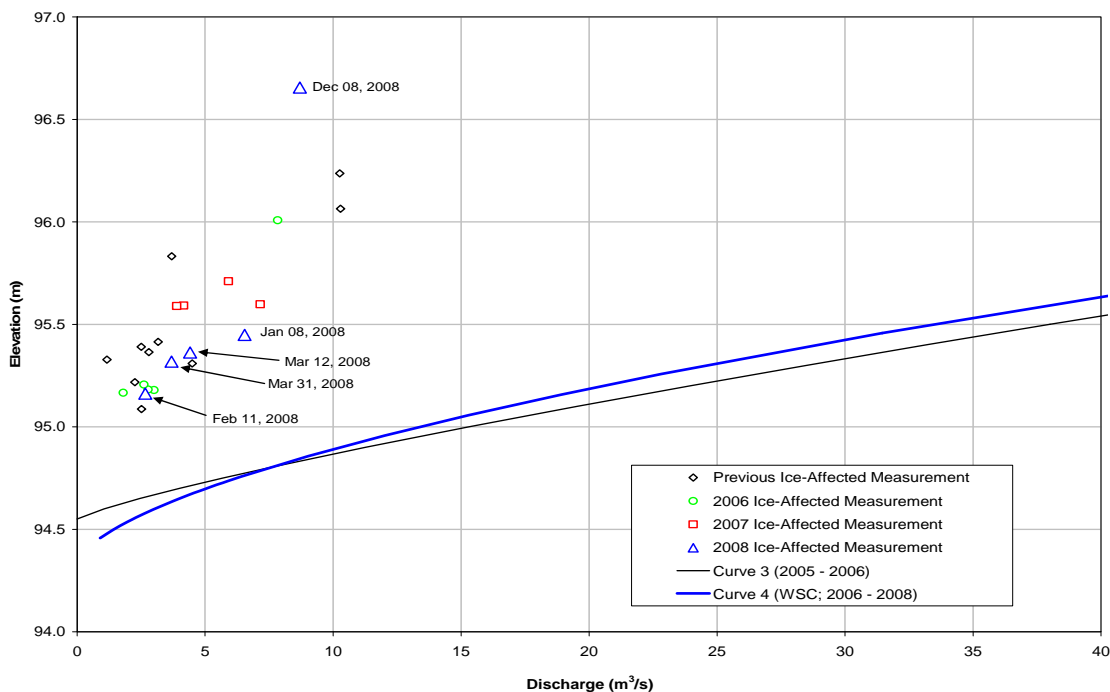


Figure C.2-55 Stage-discharge rating curve for Station S31, Hangingstone Creek near the Mouth.

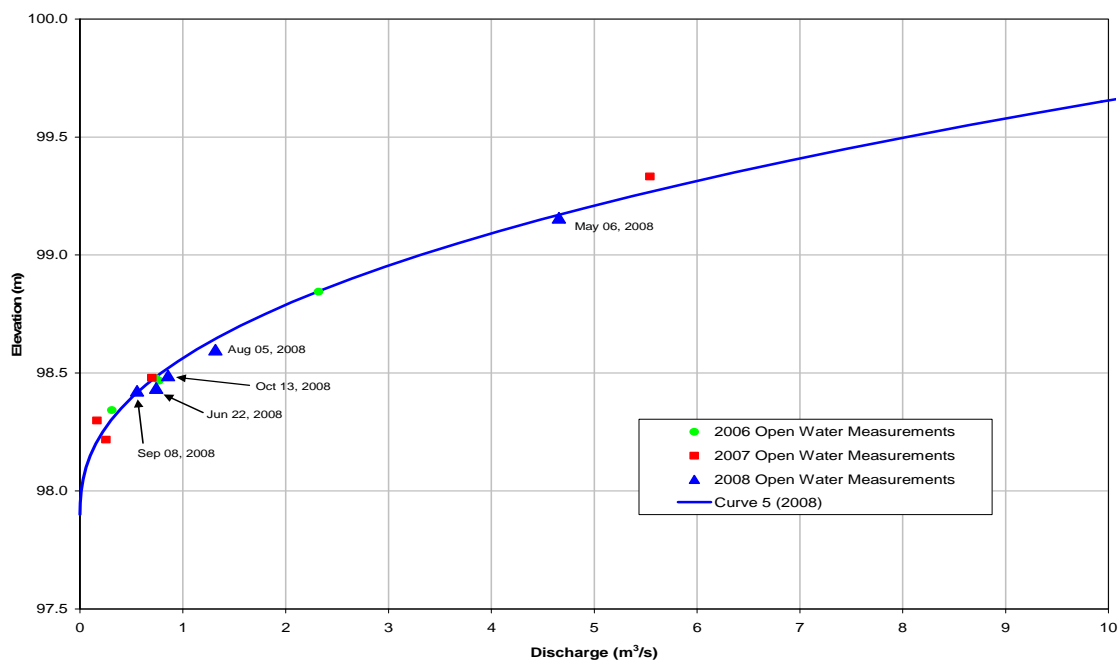


Figure C.2-56 Stage-discharge rating curve for Station S32, Surmont Creek at Highway 881.

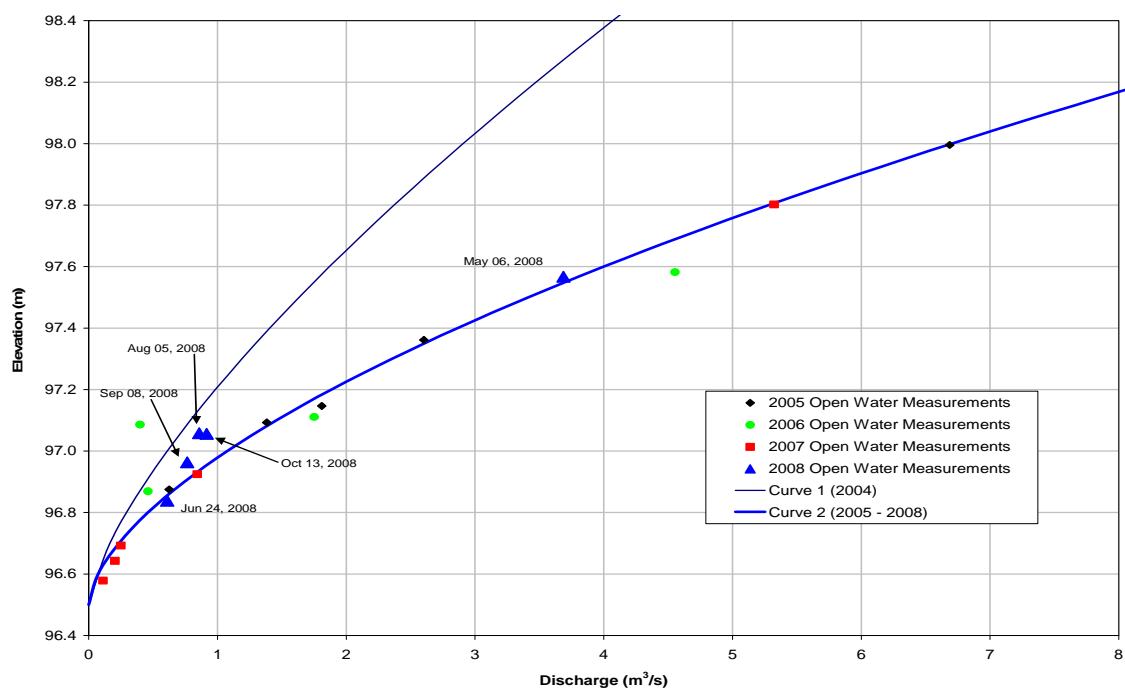


Figure C.2-57 Stage-discharge rating curve for Station S33, Muskeg River at the Aurora/Albian Boundary.

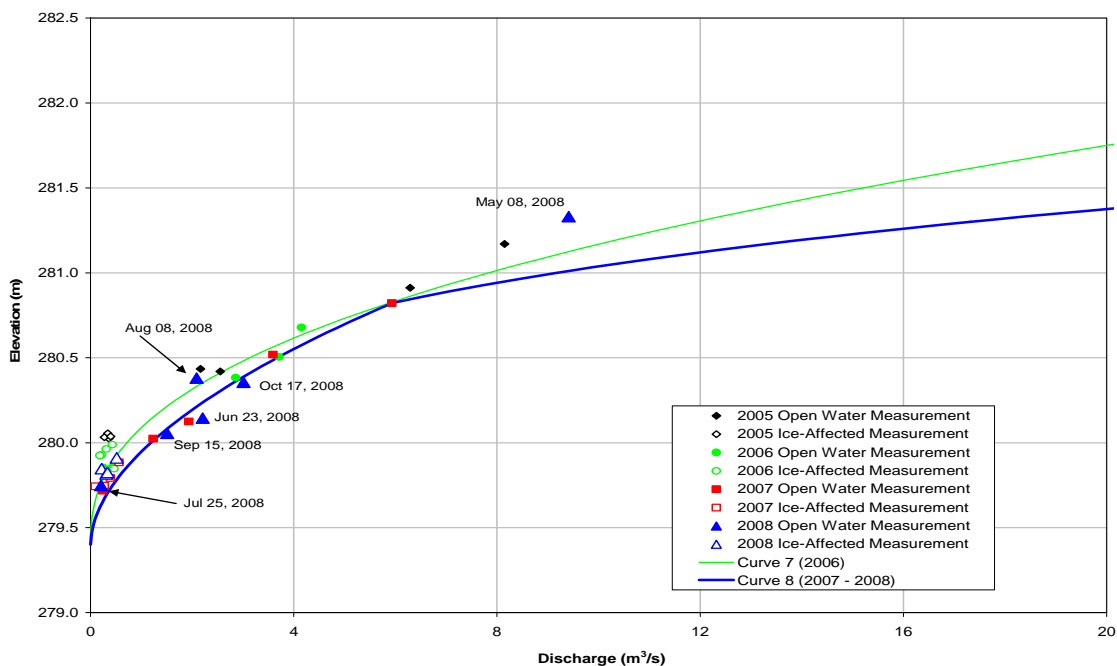


Figure C.2-58 Stage-discharge rating curve for Station S34, Tar River above CNRL Lake.

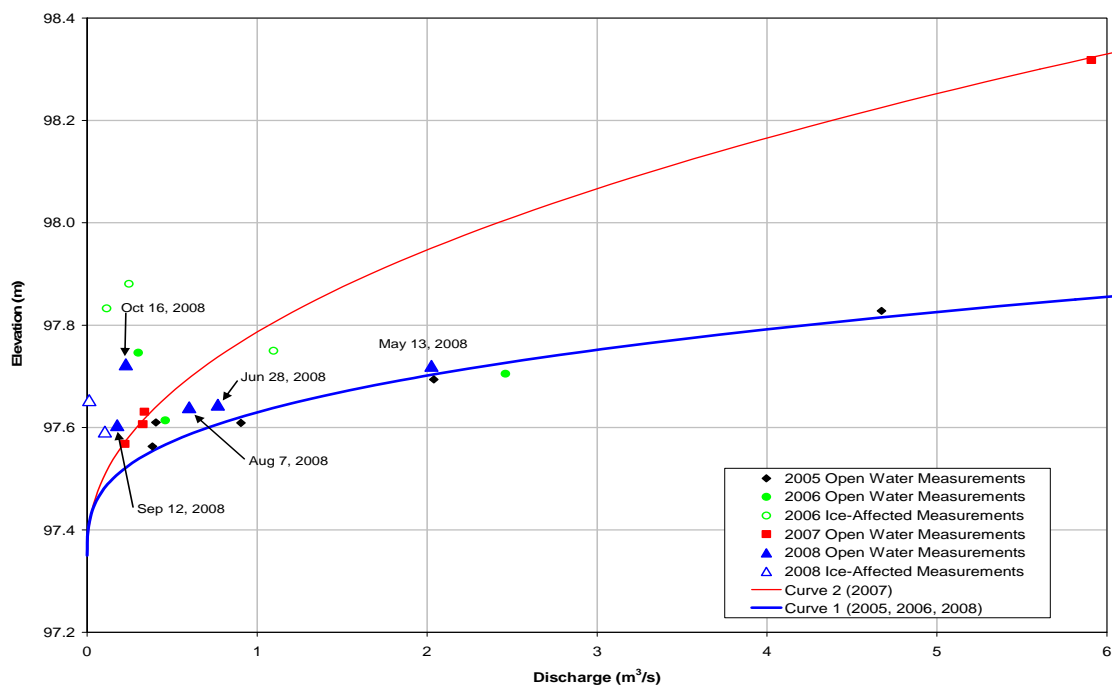


Figure C.2-59 Stage-discharge rating curve for Station S36, McClelland Lake Outlet above Firebag River.

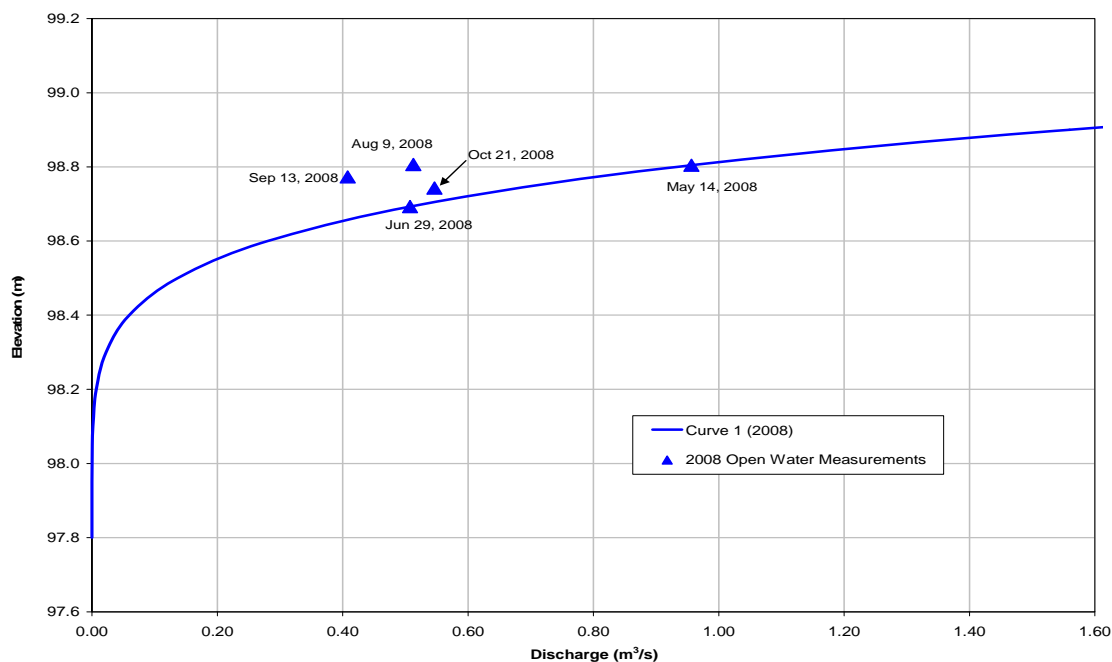


Figure C.2-60 Stage-discharge rating curve for Station S37, East Jackpine Creek near the 1300 m contour.

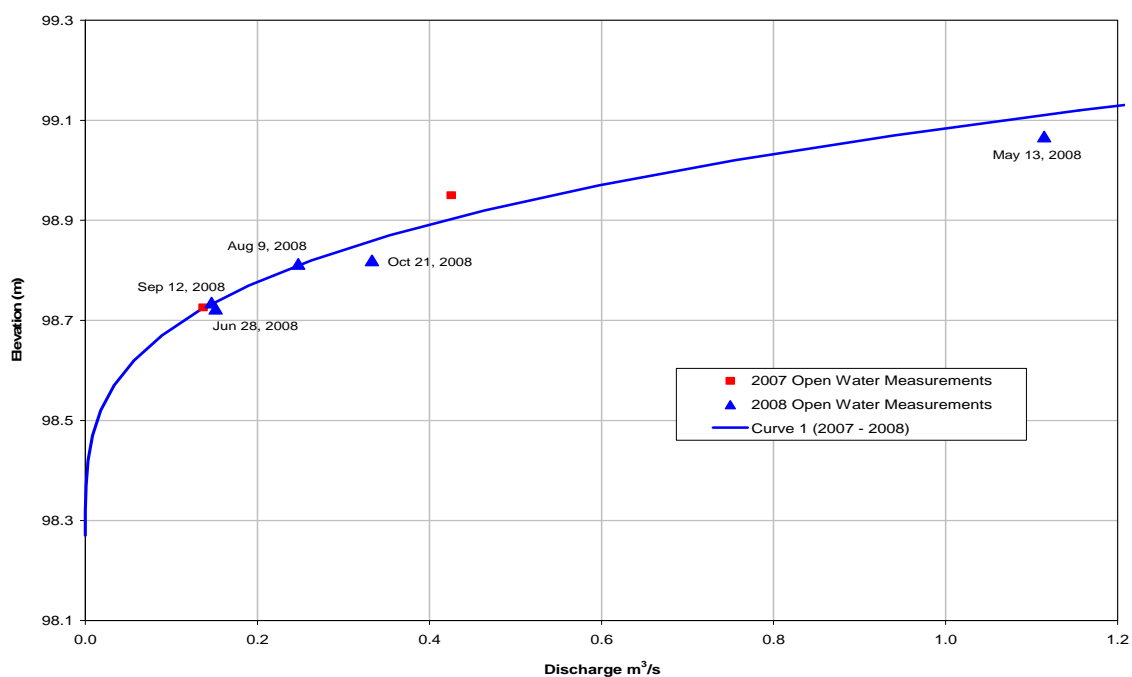


Figure C.2-61 Stage-discharge rating curve for Station S39, Beaver River above Syncrude (07DA018).

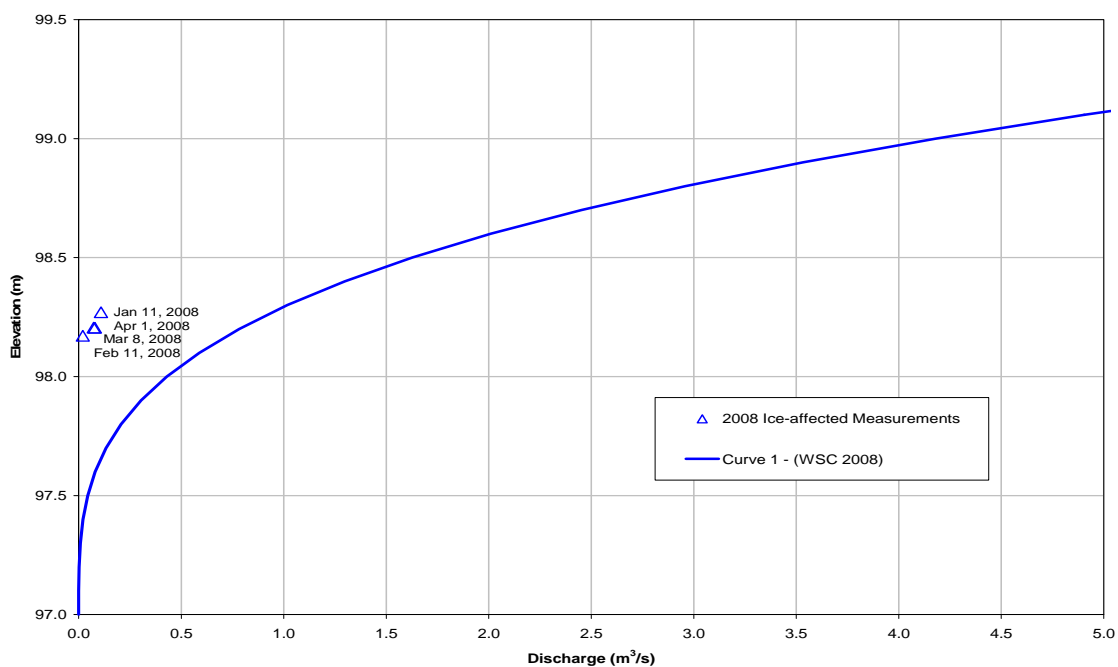
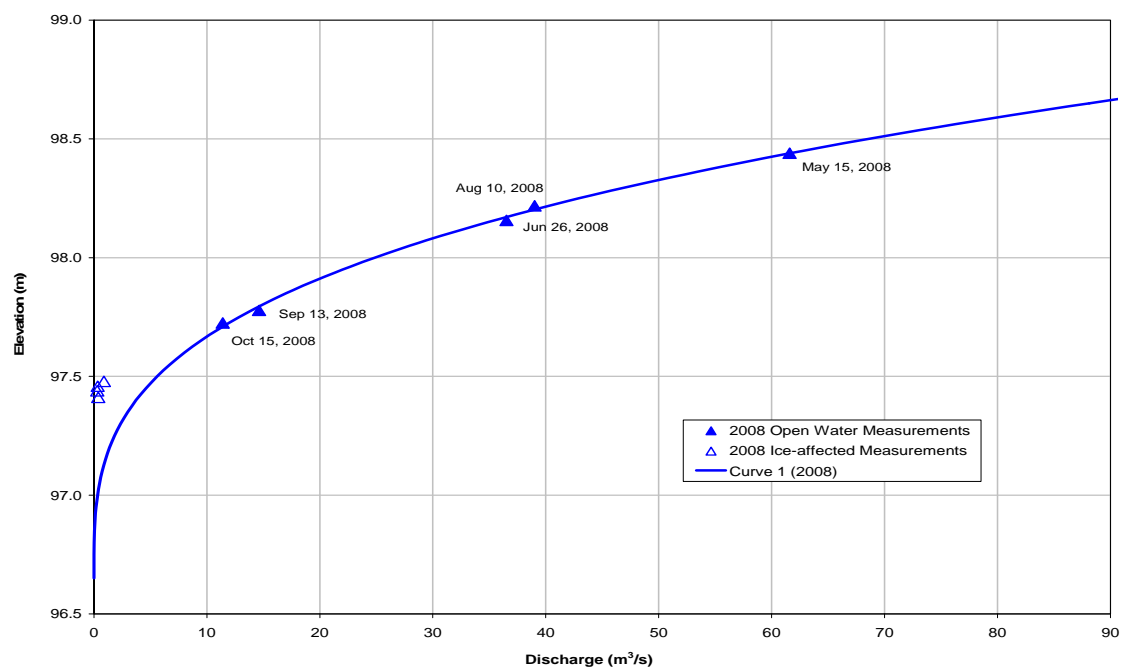


Figure C.2-62 Stage-discharge rating curve for Station S40, MacKay River at Petro-Canada Bridge.



C.3 NATURALIZED FLOW CALCULATION

C.3.1 Introduction

A water balance approach was used to assess hydrologic impacts on the flow regime experienced at the mouth of major tributaries of 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 involves the calculation of a naturalized hydrograph by accounting for flow inputs and outputs that have affected the observed hydrograph at a particular location. By adding back into the observed hydrograph flows that would have occurred under natural conditions, and by subtracting flows would not have occurred naturally, but have been added to the system through human intervention (flows added as a result of industrial activity such as industrial flow releases and land-use changes), a naturalized hydrograph for the location is calculated. The observed hydrograph and the naturalized hydrograph are compared to assess the impacts to the flow regime at the specified location.

Details of the procedure are provided below.

C.3.2 Rationale

C.3.2.1 Water Balance

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

$$Q_{obs} = Q_{nat} - Q_{HI} + Q_C - Q_O + Q_I \quad (1)$$

where:

- Q_{obs} is the observed discharge at the catchment outlet;
- Q_{nat} is the natural discharge that would have occurred at the catchment outlet in the absence of development;
- Q_{HI} is the runoff that would have occurred from hydrologically isolated (closed-circuit) areas; areas that no longer contribute runoff to the catchment;
- Q_C is the incremental runoff that occurs due to land clearing;
- Q_O is outflow; water removed from the stream; and
- Q_I is inflow; water released to the stream from sources that would not have contributed to the stream in the absence of development.

For catchments monitored as part of the RAMP program, the observed discharge is the discharge measured at streamflow stations near the catchment outlet. Most such streamflow stations are operated by RAMP, but some are operated by government, by a combination of government and RAMP, or by industry.

Water withdrawals and releases are obtained from industry reports. In some cases, daily discharges are reported. In other cases the withdrawal or release is reported as a monthly or annual volume, and the corresponding daily discharges are estimated by RAMP.

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

The natural flow, Q_{nat} is initially unknown and is estimated by solving Equation 1 using information on the other components of the water balance. Because some of the other components are 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} is hereinafter referred to as “naturalized”, rather than “natural”.

C.3.2.2 Effect of Clearing

The effect of clearing is estimated by assuming a 20% increase in average runoff depth in cleared areas. This assumption provides 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 average runoff depth is 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 catchment area.

C.3.2.3 Closed-Circuit Areas

Closed-circuit (or hydrologically isolated) areas were delineated based on satellite imagery and review by oil sands operators. It is assumed that zero runoff is released to the environment from closed-circuit areas.

The definition of “effective area” used in the water balance analyses is the area of the catchment remaining after removal of the closed-circuit areas. The effective area includes both cleared and natural areas that are not closed-circuited by development activities. All non-closed circuited areas of the watershed are included in the effective area for the purposes of the water balance analyses. The effective area as defined for this analysis may include areas that are 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.3-1 Closed-Circuit and Cleared Catchment Areas (2008).

Catchment	Total Area ¹ (km ²)	Closed-Circuit Area (km ²)	Cleared Area (km ²)
Athabasca River	146,000	300	109
Muskeg River	1,457	99.0	43.6
Steepbank River	1,320	9.61	25.2
Tar River	326	64.0	8.26
MacKay River	5,570	2.78	11.0
Calumet River	175	1.75	0.40
Firebag River	5,990	4.36	9.67
Ells River	2,430	1.61	2.95
Christina River ²	4,863	6.47	34.0
Hangingstone River	962	0.47	0.17
Poplar Creek	151	2.99	1.27
Fort Creek	31.9	0.300	19.5

¹ Area is reported for the monitoring location.

² The monitoring location for the Christina River is significantly upstream of the mouth.

C.3.3 Water Balance Procedure

In order to calculate the naturalized hydrograph, the observed discharge is first adjusted to remove the effects of industrial water withdrawals and releases. The resulting discharge represents the observed runoff (R) from the contributing portion of the catchment. The observed runoff is then converted to a naturalized runoff depth (d), accounting for the effects of clearing. The naturalized runoff depth is used to calculate the naturalized discharge for the catchment (Q_{nat}). The natural flow that would have occurred from industrially closed-circuited areas (Q_{HI}), and the incremental flow from cleared areas (Q_C) are also calculated. This process is shown in equation form below:

$$R = Q_{obs} + Q_O - Q_I \quad (2)$$

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

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

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

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

where:

- A is the total catchment area (km²)
- A_C is the cleared area in the catchment (km²)
- A_E is the effective area (i.e. A - A_{HI}) (km²)
- A_{HI} is the closed-circuit area (km²)
- C is the conversion factor from m³/s/km² to mm/yr
- d is the naturalized runoff depth (mm)
- F is the adjustment factor to account for clearing (0.20)
- R is the observed runoff from the effective area adjusted for reported industrial withdrawals and releases (m³/s); and

other symbols are as defined previously. The water balance calculation is done at a daily time step.

C.3.4 Revisions to Previously Published Estimates

Naturalized flows provided in the RAMP reports in 2005 – 2007 were estimated using methods similar to, but slightly different than, the procedure described above. Estimates for 2005 – 2007 have been revised to be consistent with the method used in 2008 which reflects more accurately a naturalized water balance. The assumption of differences in runoff response between upland and lowland terrain, previously applied to closed-circuited areas, is no longer applied due to the lack of a reliable and consistent approach for all watersheds. Revised estimates are provided in Section C.7 of this appendix.

C.4 UPDATED STATION DESCRIPTION SHEETS

Updated station description sheets are provided below for all of the stations that were active in 2008.

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.

Variables Measured: Temperature, Wind Speed, Snow Depth, Humidity, Precipitation

Period of Record: March 2006 to Present

Access: 2WD Truck Via Canterra Road

Coordinates: 475230 E, 6344049 N (NAD 83)

ATS: SW-16-95-9-W4

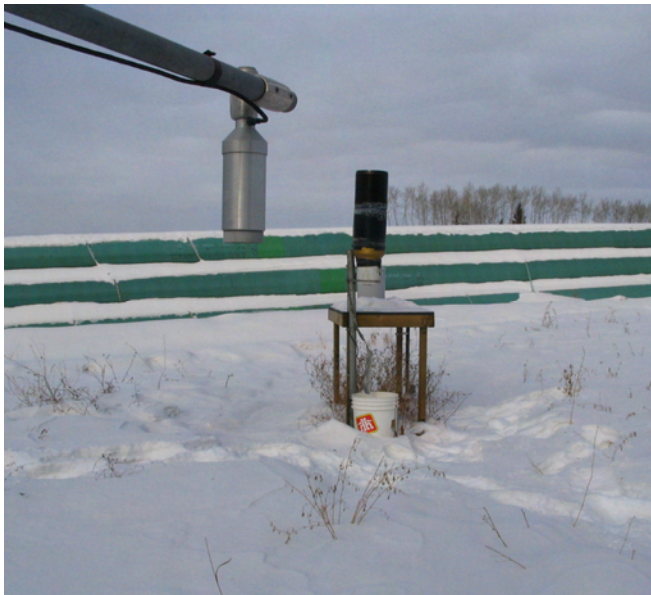
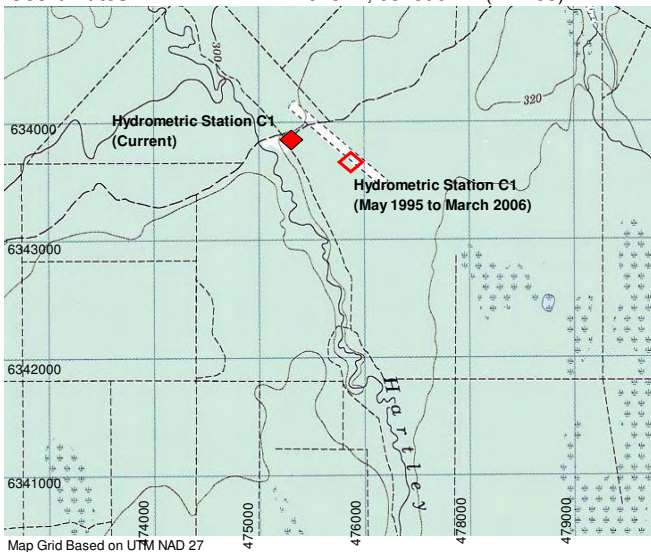
Lat/Long: 57°14'20" N, 111°24'37" W

NTS Map: 74E03

Previous Locations

Period: May 1995 to March 2006

Coordinates: 475734E, 6343967 N (NAD83)



Location and Purpose:

Established to monitor Climate parameters on the CNRL lease.

Variables Measured: Solar radiation, Station pressure, Wind Speed and Direction, Air Temperature, Snow Depth, Relative Humidity

Period of Record: October 17, 2008 to Present

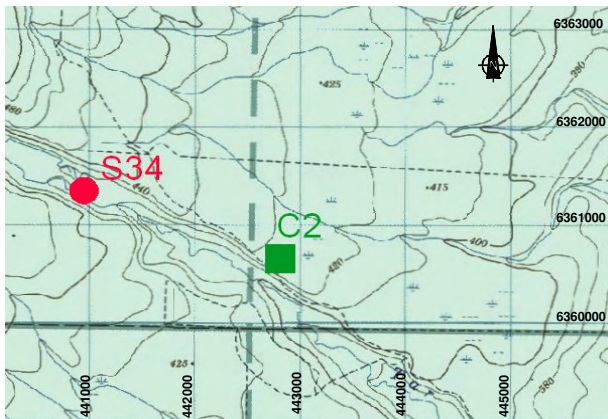
Access: via CNRL Horizon Mine

Coordinates: 442889E, 6360695N (UTM NAD 83)

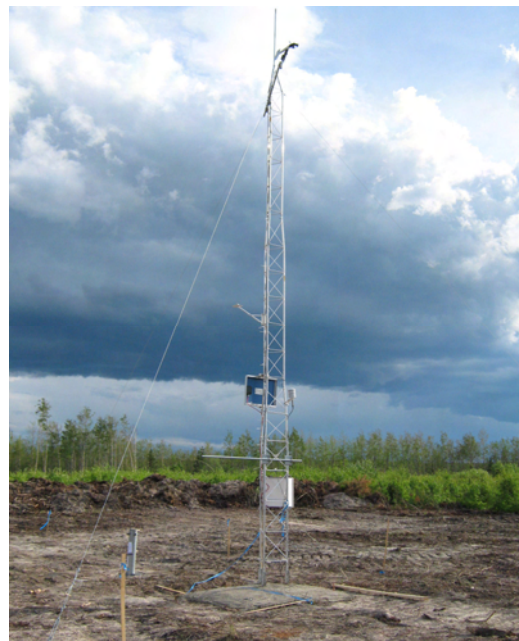
LSD:

Lat/Long: 57°23.128'N, 111°56.999' W

NTS Map: 74E 05



Map Grid Based on UTM NAD 83



Location and Purpose:

Established on the East side of McClelland Lake to monitor water levels. Climate data is also collected at this station including: temperature, precipitation, and relative humidity.

Variables Measured: Level (1997 -), precipitation (2004 -), temperature (2007 -), relative humidity (2007 -)

Period of Record: July 1997 to Present

Access: Helicopter

Drainage Area: 191 km²

Coordinates: 483430 E, 6371950 N

ATS: NW-12-98-9-W4

Lat/Long: 57°29'30" N, 111°16'37" W

NTS Map: 74E06



Map Grid Based on UTM NAD 27



Benchmarks:

BM: 1
Elevation: 294.865 m (geodetic)
Established: 2003 May 27
Basis: Level survey from BM 2

Location: Next to fence towards lake
Description: Iron rod, 0.4 m out of ground

BM: 2
Elevation: 296.814 m (geodetic)
Established: 2003 May 27
Basis: Level survey from previous BM from 2002 Station Fact Sheet, rebar in PVC case
Location: On hill 40 m East of data logger
Description: Steel pipe, 0.2 m out of ground



Location and Purpose

Established to monitor water levels in Kearl Lake.

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

Period of Record: May 1999 to Present - Water level, September 2007 to Present - Water Temp. Air temp. and Rel humidity, 2008-01-01 to present- precipitation **ATS:** 4-16-96-11-W4

Access: 4WD road access

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

Drainage Area: 72.6 km²

NTS Map: 74E06

Coordinates: 484856 E, 6351061 N (UTM NAD 83)

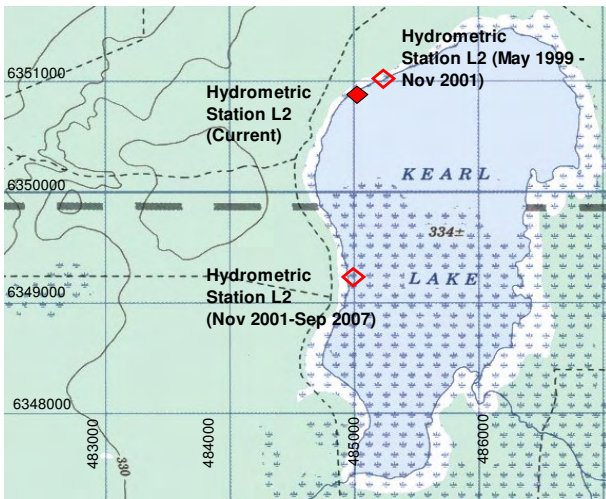
Previous Locations:

Period: May 1999 to November 2001

Coordinates: 485184 E, 6351267 N (UTM NAD 83)

Period: November 2001 to September 2007

Coordinates: 484856 E, 6349200 N (UTM NAD 83)



Benchmarks

BM: 1
Elevation: 333.348 m (geodetic)
Established: 2007 September 25
Basis: Level survey from BM 2 performed by HAS Focus Survey
Location: South side of pathway from parking to lake, at tree line
Description: rebar in ground by flagged tree

BM: 2
Elevation: 332.424 (geodetic)
Established: 2007 September 25
Basis: GPS Survey ± 13 mm referenced to Kearl Project
Location: 40 m West of logger at edge of tree line
Description: Iron rod in PVC cover

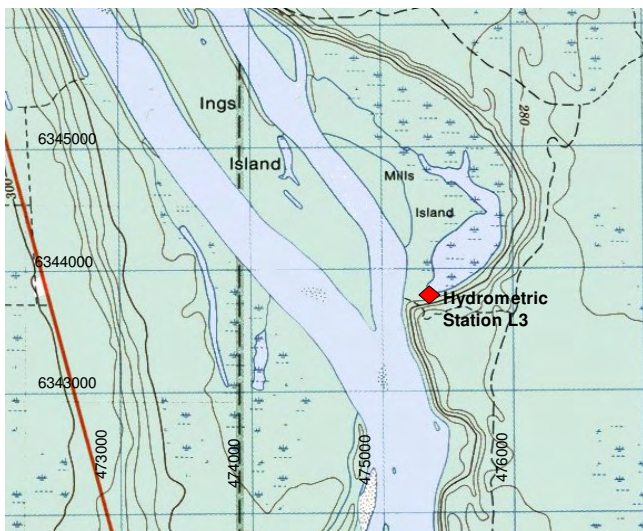


Location and Purpose:

Established to monitor water levels on Isadore's Lake.

Variable Measured: Water Level
Period of Record: February 2000 to Present
Access: 4WD road access off Highway 63
Drainage Area: 28.0 km²
Coordinates: 463400 E, 6342987 N (UTM NAD 83)

LSD: 16-7-95-10-W4
Lat/Long: 57°13'58" N, 111°36'24" W
NTS Map: 74E04



Map Grid Based on UTM NAD 27



Benchmarks

BM: 1
Elevation: 235.903 m (geodetic)
Established: Before 2003
Basis: Level survey from BM 2
Location: 35 m south of data logger box
Description: Nail in root of spruce tree upslope of lake, nail is flagged with orange tape

BM: 2
Elevation: 234.506 m (geodetic)
Established: Before 2003
Basis: 2002 Station Fact Sheet
Location: 30 m south of data logger box
Description: T-bar near ground elevation in PVC pipe between BM #1 and data logger box

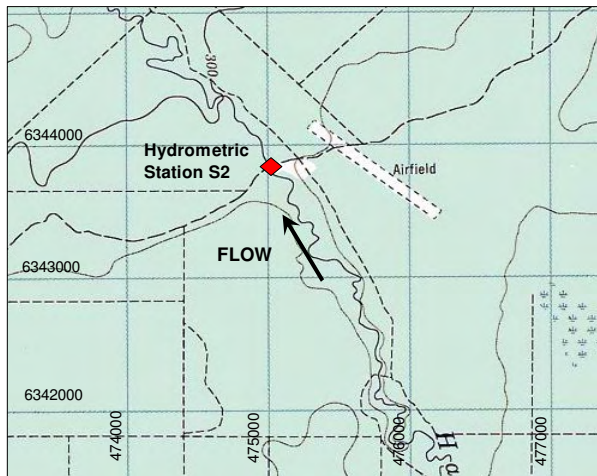


Location and Purpose:

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 dams.

Variable Measured: Depth, Discharge and Temperature
Period of Record: May 1995 to Present
Access: 2WD Access on Canterra Rd.
Drainage Area: 358 km²
Coordinates: 475132 E, 6343680 N (UTM NAD 83)

LSD: SE-17-95-9-W4
Lat/Long: 57°14'21" N, 111°24'53" W
NTS Map: 74E / 3



Map Grid Based on UTM NAD 27



Benchmarks

BM: 1
Elevation: 297.990 m (geodetic)
Established: Before 2003
Basis: 2002 Factsheet
Location: 6 m SE of data logger
Description: Rebar in white PVC pipe on right bank just upstream of the logger box

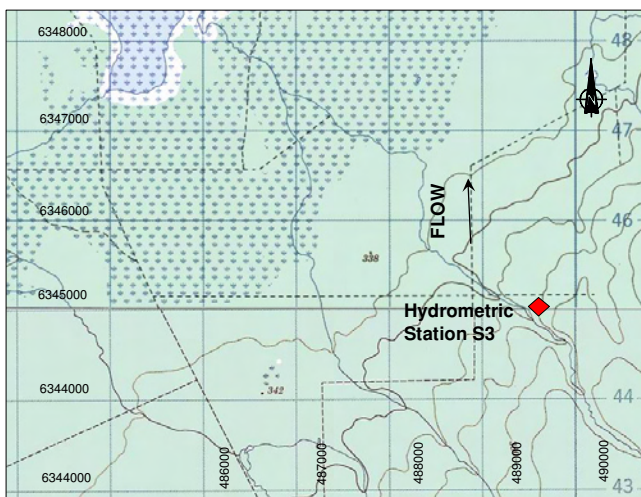


Location and Purpose:

Established to monitor discharge on Iyininin Creek upstream of Kearl Lake. This station is intended to characterize runoff from the North / West slopes of Muskeg Mountain and provide input to Kearl Lake water balance calculations. A rain gauge was added to the station in 1998.

Variables Measured: Water Level, Discharge, Rainfall (since 1998)
Period of Record: May 1995 to October 1999; May 2001 to Present
Access: Helicopter
Drainage Area: 32.2 km²
Coordinates: 489491 E, 6345029 N (UTM NAD 83)

LSD: NE-14-95-8-W4
Lat/Long: 57° 15' 00 " N, 111° 10'
NTS Map: 74E06



Map Grid Based on UTM NAD 27



Benchmarks:

BM: 1
Elevation: 360.610 m (geodetic)
Established: Before 2003
Basis: 2002 fact sheet
Location: 5 m west of data logger, 1 m away from rain gauge
Description: T-bar in PVC pipe, sunk underground,



Location and Purpose:

Established originally in 1995 to monitor discharge on the Muskeg River above disturbed watersheds. Decommissioned in 1996, station was re-activated in 2003 in accordance with regulatory monitoring.

Variable Measured: Water Level, Discharge

Period of Record: Aug 1995 to Dec 1996; Feb 2003 to Present

Access: Helicopter

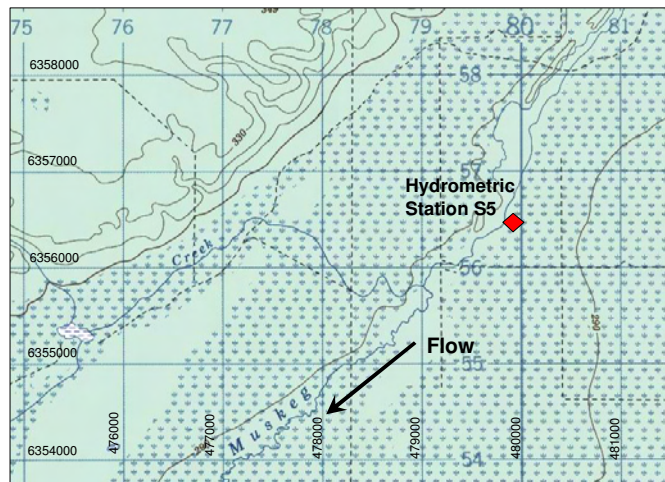
Drainage Area: 395 km²

Coordinates: 479800 E, 6356550 N (UTM NAD 83)

LSD: SE-26-96-9-W4

Lat/Long: 57°21'11" N, 111°20'03" W

NTS Map: 74E06



Map Grid Based on UTM NAD 27



Benchmarks

BM: 1
Elevation: 99.895 m
Established: Before 2003
Basis: Level survey from previous Bench Mark
Location: Box on top of corrugated steel tube
Description: Bottom of box at SE corner

BM: 2
Elevation: 97.195 m
Established: Before 2003
Basis: Level survey from Bench Mark 1
Location: Rebar in PVC
Description:



BM: 3
Elevation: 98.250 m
Established: 2008-Aug-09
Basis: Level survey from Bench Mark 1
Location: next to logger box
Description: T-post marked with orange flagging

Location and Purpose:

Established to monitor discharge on the Muskeg River upstream of disturbed watersheds. The station was relocated in 1998 to take advantage of road access.

Variables Measured: Water Level and Discharge (since August 1995)

Barometric Pressure and Water Temperature (since September 2004)

Period of Record: Aug 1995 to Present

Access: 2WD road via the Syncrude Aurora North mine site

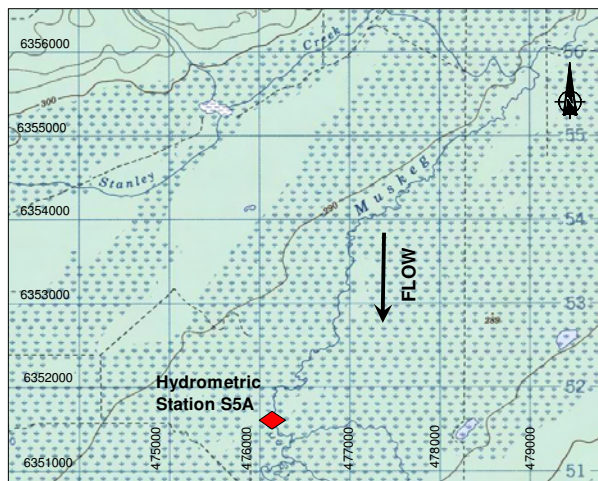
Drainage Area: 552 km² (was 390 km² until 1998)

Coordinates: 476100 E, 6351600 N (UTM NAD 83)

LSD: SE-9-96-9-W4

Lat/Long: 57°18'30" N, 111°23'43" W

NTS Map: 74E06



Map Grid Based on UTM NAD 27



Benchmarks:

BM: 1

Elevation: 282.380 m (geodetic)

Established: Before 2003

Basis: 2002 Fact Sheet

Location: 6 m east of data logger

Description: Rebar in white PVC pipe on right bank ~ 80 cm out of ground in willows, just off of path to river

BM: 2

Elevation: 282.665 m (geodetic)

Established: Before 2003

Basis: Level survey from Benchmark 1

Location:

Description: T Post in ground near data logger



Location and Purpose:

Established to monitor discharge on Mills Creek, downstream of the Mills Creek fen and upstream of Isadore's Lake. The original plywood and timber pile V-notch weir was replaced with steel piles and sheet steel weir in October 2005.

Variables Measured: Water Level and Discharge

Period of Record: May 1997 to Present

Access: 2WD road access along Highway 63 (paved)

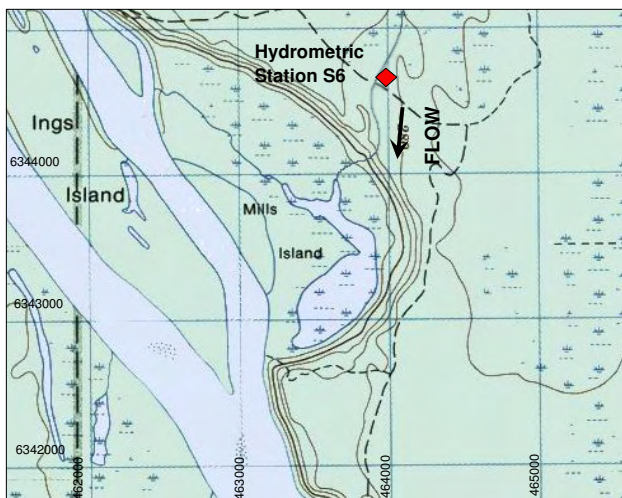
Drainage Area: 23.8 km²

Coordinates: 463829 E, 6344743 N (UTM NAD 83)

LSD: NW-17-95-10-W4

Lat/Long: 57°14'44" N, 111°35'57" W

NTS Map: 74E04



Map Grid Based on UTM NAD 27



Benchmarks: BM1

BM 1:

Elevation: 273.600 m

Established: Before 2003

Basis: 2002 Station fact sheet

Location: 7 m north west of data logger

Description: Rebar in white PVC pipe just uphill (in gully) from the data logger

BM 2:

Elevation: 274.073 m

Established: 2006-Apr-13

Basis: Level survey from BM 1

Location: At the equipment mast itself

Description: top of equipment mast or steel pipe on which the logger box is mounted, beside the stilling well



Location and Purpose:

Established to monitor winter discharge on the Muskeg River at the Environment Canada hydrometric station 07DA008. The Environment Canada hydrometric station has operated since 1975 but discharges are only published for the March-October period.

Variables Measured: Water Level and Discharge

Period of Record: October 1999 to Present

Access: 2WD access off of Canterra Road (gravel)

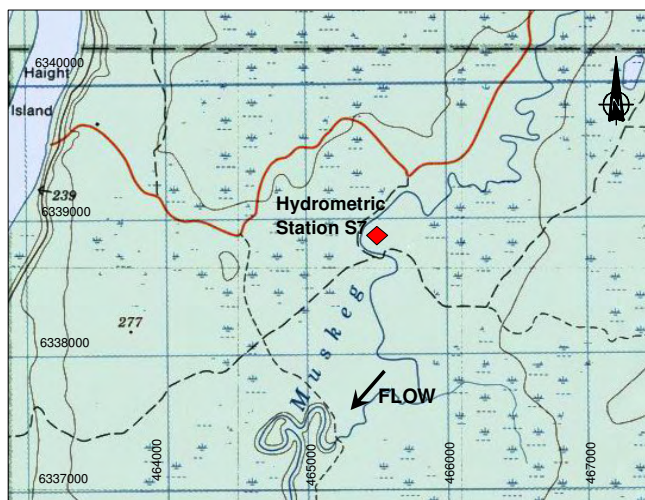
Drainage Area: 1457 km²

Coordinates: 465408 E, 6338944 N (UTM NAD 83)

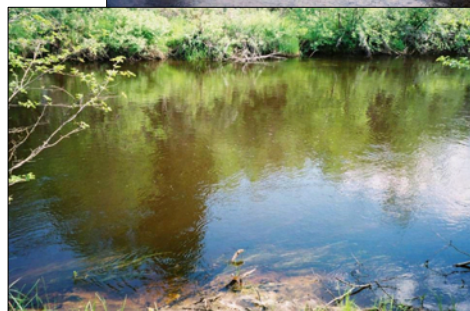
LSD: SE-32-94-10-W4

Lat/Long: 57°11'32" N, 111°34'21" W

NTS Map: 74E04



Map Grid Based on UTM NAD 27



Benchmarks:

Elevation: 275.565 m (geodetic)

Established: Before 2003

Basis: 2002 Station Fact Sheet

Location: 25 m west of data logger

Description: Nail in tree ~ 3 m north of road and ~ 25 m west of data logger box

Elevation: 275.406 m

Established: April 14, 2006

Basis: Level survey from BM 1

Location: ~2 m SW of data logger box

Description: Rebar in black PVC with orange cap



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 50 m downstream in November 2005 to avoid the influence of beaver dams. The station was located just upstream of a road culvert crossing before the move and is currently downstream of the crossing.

Variables Measured: Water Level and Discharge

Period of Record: March 1998 to October 1999; May 2001 to Present

Access: 2WD road (gravel)

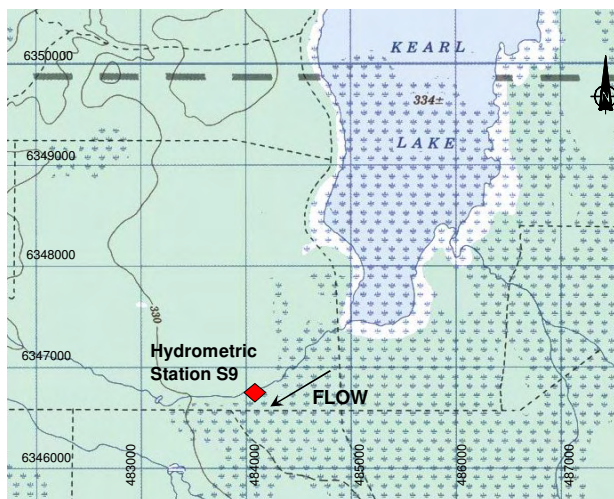
Drainage Area: 73.6 km²

Coordinates: 483962 E, 6346990 N (UTM NAD 83)

LSD: SE-29-95-8-W4

Lat/Long: 57°15'56.38" N, 111°15'57.27"

NTS Map: 74E06



Map Grid Based on UTM NAD 27



Benchmarks:

BM 1:

Elevation: 330.979 m (geodetic)

Established: 2005 November 4

Basis: Level Survey from previous Bench
Mark on circular bar on white PVC

Location: 20 m west of data logger beside road and north culvert

Description: flagged t-post

BM 2:

Elevation: 329.774 m

Established: 2006 April 14

Basis: Level survey from BM 1

Location: 5 m N of data logger box

Description: Nail in tree, orange flagging on nail and tree



Location and Purpose:

Established to monitor discharge on Wapasu Creek upstream of the Muskeg River.

Variable Measured: Water Level, Discharge (Since April 2003) Water Temperature (Since October 2007)

Period of Record: March 1998 to October 1999; May 2001 to Present

LSD: NW-24-96-8-W4

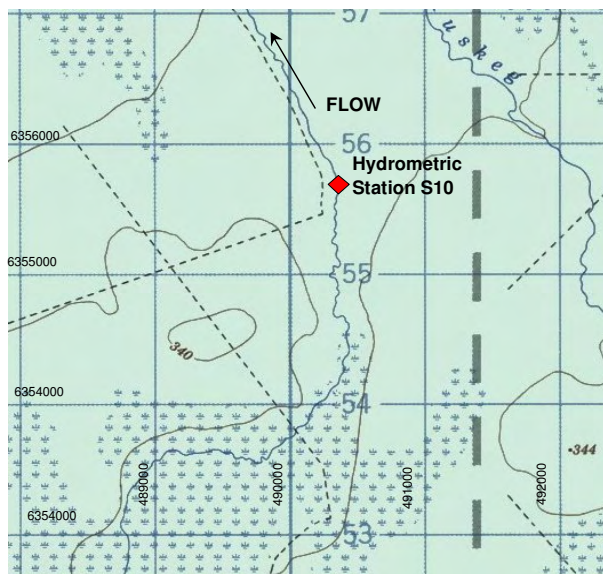
Access: 2WD road access on Canterra Road

Lat/Long: 57°20'35" N, 111°09'40" W

Drainage Area: 90.7 km²

NTS Map: 74E / 6

Coordinates: 490350 E, 6355500 N (UTM NAD 83)



Map Grid Based on UTM NAD 27



Benchmarks:

BM 1

Elevation: 100.721m (Assumed)

Established: June 14, 2007

Basis: Level survey from previous assumed Bench Mark

Location: 3 m downstream of data logger

Description: Nail in flagged tree, top of tree removed



BM2

Elevation: 100.657 m (Assumed)

Established: September 11, 2008

Basis: Level survey from Benchmark 1

Location: 4 m upstream of data logger

Description: rebar in white PVC tube in RB



Location and Purpose:

Established to monitor discharge on Poplar Creek upstream of the Athabasca River. The station is at the site of Environment Canada hydrometric station (07DA007) that operated from 1973 to 1986.

Variables Measured: Water Level and Discharge

Period of Record: May 1997 to Present

Access: 2WD access on Hwy 63 (paved)

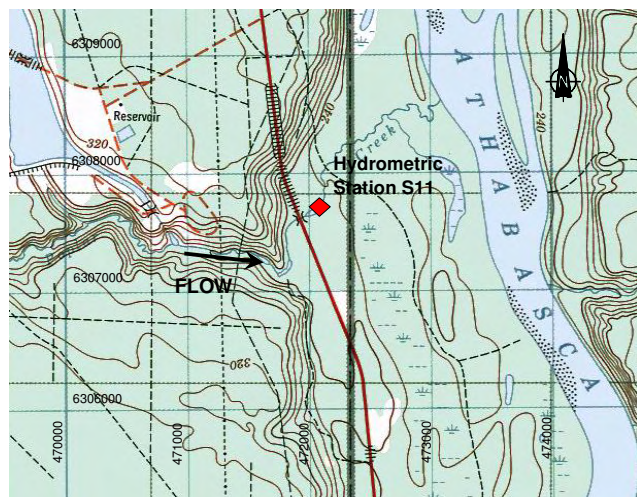
Drainage Area: 151 km²

Coordinates: 472000 E, 6307650 N (UTM NAD 83)

LSD: NE-24-91-19-W4

Lat/Long: 56°54'46" N, 111°27'44" W

NTS Map: 74D14



Map Grid Based UTM NAD 27



Benchmarks:

BM 1:

Elevation: 242.081 m (Geodetic)

Established: Before 2003

Basis: ASCM

Location: On river right, 15 m upstream from the logger

Description: ASCM marker, square pin next to orange stake

BM 2:

Elevation: 242.371 m

Established: Sep 3, 2006

Basis: Level survey from BM 1

Location: right bank, 15 m downstream of ASCM BM 1

Description: flagged rebar near flagged bush



Location and Purpose:

Established in May 2000 to monitor discharge on Fort Creek upstream of the Athabasca River and was discontinued in 2002. The station was reactivated in 2006 to monitor streamflow downstream of the Fort Hills development.

Variable Measured: Discharge

Period of Record: May 2000 - Oct. 2002; April 2006 - Present

Access: 4WD road access

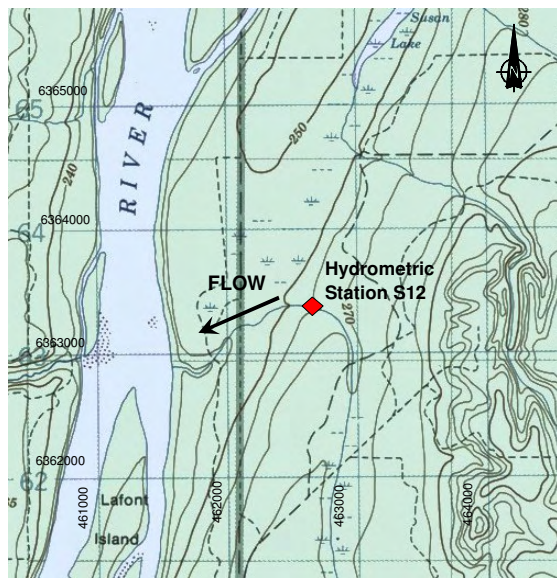
Drainage Area: 31.9 km²

Coordinates: 462600 E, 6363400 N (UTM NAD 83)

LSD: SW-18-97-10-W4

Lat/Long: 57°24'48" N, 111°37'18" W

NTS Map: 74E05



Map Grid Based on UTM NAD 27



Benchmarks:

BM : 1

Elevation: 100.000 m

Basis: assumed

Established: 2006-04-01 when the site was re activated

Location: 3 m northwest of data logger on left bank

Description: A 2 m long 15 mm dia rebar, which is about 400 mm above the ground

BM : 2

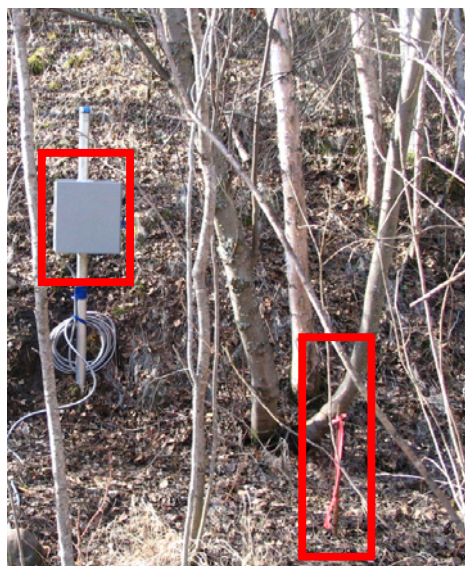
Elevation: 100.981 m

Basis: Level survey from BM1

Established: 2006-04-01 when the site was re activated

Location: Data Logger box

Description: Top of data logger box



Location and Purpose

Established in October 2004 to monitor discharge on the Ells River. This station replaced station S14.

Variable Measured: Water level, Discharge and Water Temperature

Period of Record: October 2004 to present

Access: Truck

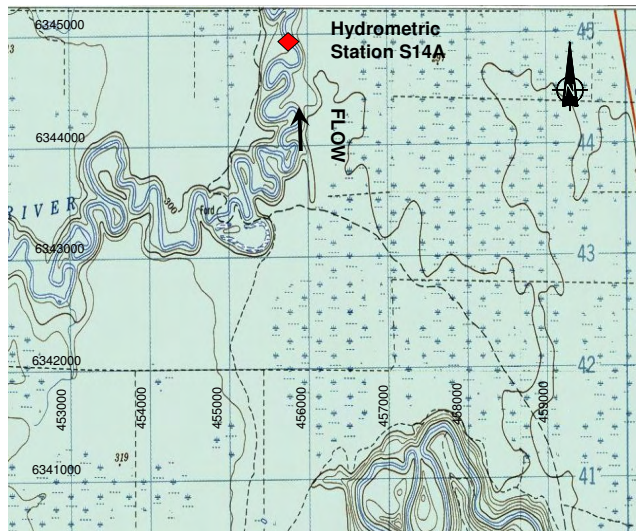
Drainage Area: 2430 km²

Coordinates: 455748 E, 6344947 N (UTM NAD 83)

ATS: NW-16-95-11-W4

Lat/Long: 57°14'27" N, 111°44'18" W

NTS Map: 74E04



Benchmarks

BM: 1
Elevation: 100.000 m
Established: 2004-Oct-30
Basis: Assumed
Location: 3 m to the right of data logger
Description: Rebar in ground marked with orange flagging tape

BM: 2
Elevation: 101.920 m
Established: 2006-Apr-13
Basis: Level survey from BM 1
Location: 8 m north east of data logger box
Description: Top of pipe closer to left bank that supports the bubbler system enclosure.



Location and Purpose

Established in May 2003 to monitor discharge in the Tar River below development. Replaced by S15A in April 2007.

Variable Measured: Discharge

Period of Record: May 2003 to April 2007

Access: Truck

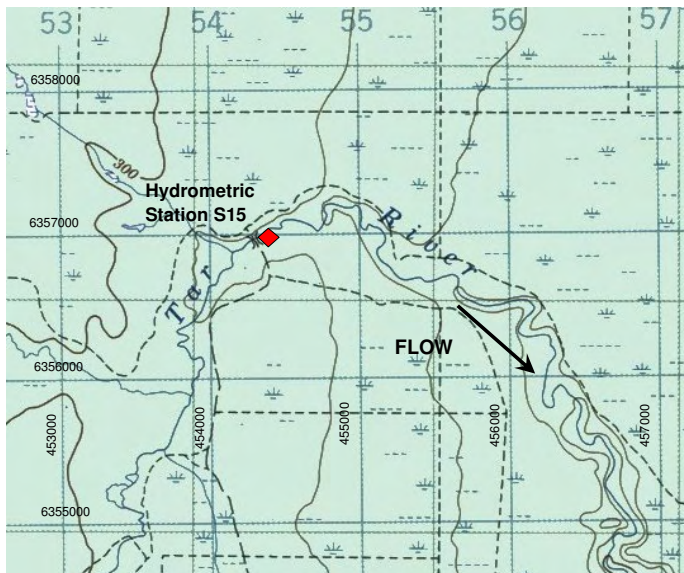
Drainage Area: 301 km²

Coordinates: 454453 E, 6356983 N (UTM NAD 83)

ATS: SE-29-11-96-W4

Lat/Long: 57°21'12.4" N, 111°45'25.1" W

NTS Map: 74E05



Map Grid Based on UTM NAD 27



Benchmarks

BM: 1
Elevation: 285.908 m (geodetic)
Basis: Unknown
Location: 2 m north of data logger
Description: T-bar protruding 0.4 m from ground

BM: 2
Elevation: 286.544 m (geodetic)
Basis: Level survey from BM 1
Location: 10 m to the north east of data logger
Description: Nail in base of tree marked with orange flagging



Location and Purpose

Established on May 1, 2007 to replace station S15. The purpose of the station is to monitor the discharge on the Tar River below development.

Variable Measured: Water Level, Discharge and Water temperature

Period of Record: May 1st 2007 to present

Access: Truck

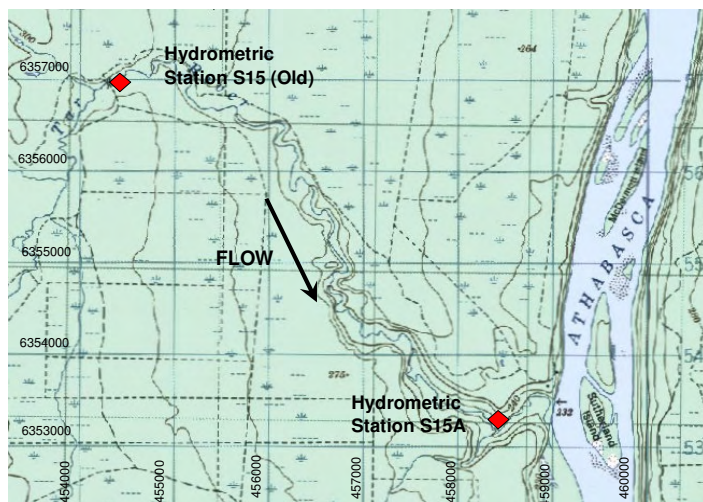
Drainage Area: 326 km²

Coordinates: 458395 E, 6353391 N (UTM NAD 83)

ATS: 16-10-96-11-W4

Lat/Long: 57°19'17.57" N, 111°41'27.08" W

NTS Map: 74E05



Map Grid Based on UTM NAD 27



Benchmarks

BM: 1
Elevation: 100.000 m (assumed)
Established: 2007-May-01
Basis: Assumed
Location: At base of large log spanning river on RB side
Description: Nail in stump with purple flagging.

BM: 2
Elevation: 100.912 m (assumed)
Established: 2007-May-01
Basis: Level survey from BM 1
Location: 1 meter DS from logger box on tree root
Description: Nail in tree root with purple flagging.



Location and Purpose:

Established to monitor discharge on a typical Calumet River upland tributary to characterize runoff from the east slopes of the Birch Mountains. Moved approximately 1 km downstream on installation in April 2006 to avoid beaver dam effects at the old location.

Variable Measured: Water Level and Discharge

Period of Record: June 2002 to Present

Access: Helicopter

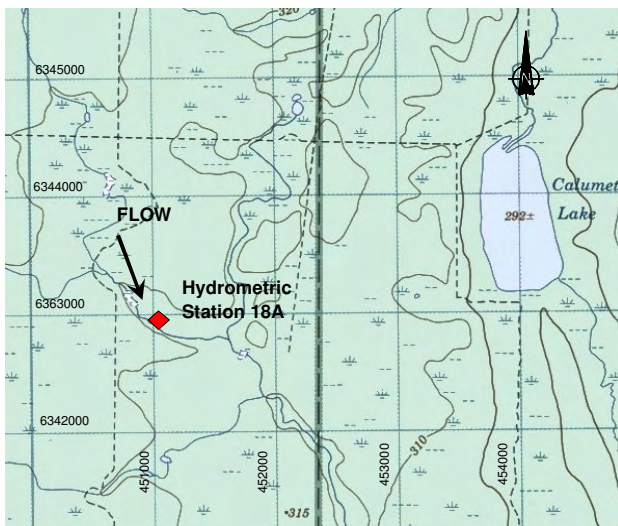
Drainage Area: 53.4 km²

Coordinates: 451129 E, 6363087 N (UTM NAD 83)

LSD: SE-4-97-12-14 SE/C 1114.2 6

Lat/Long: 57°24'28.50" N, 111°48'48.32"

NTS Map: 74E05



Map Grid Based on UTM NAD 27



Benchmarks:

BM 1

Elevation: 100.000 m

Basis: Assumed

Established: 2006 April 17

Location: 5 m NW of logger box

Description: Nail in a base of tree in pine forest to the north west of data logger marked with orange flagging Nail and tree are on left (north) bank.

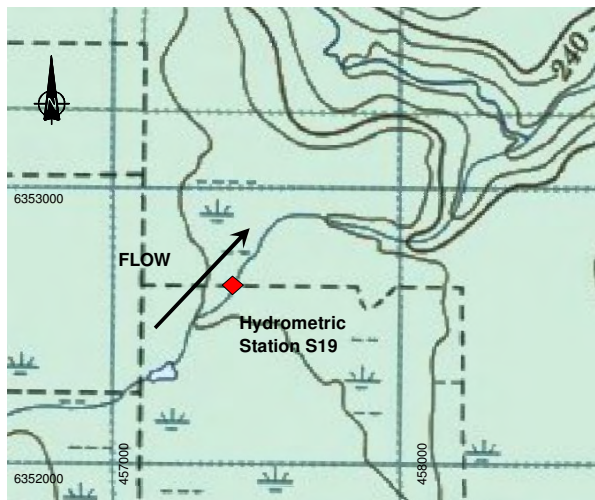


Location and Purpose:

Established adjacent to the CNRL Horizon Mine to monitor water level and discharge during the open water season, and total precipitation throughout the year.

Variables Measured: Water Level, Discharge, and Total Precipitation
Period of Record: June 2002 to Present
Access: Truck access via Fort McKay
Drainage Area: 11.5 km²
Coordinates: 457315 E, 6352863 N (UTM NAD 83)

LSD: SE-4-97-12-14 SE/C 1114.2 64
Lat/Long: N57 18 59.5 W111 42 30.5
NTS Map: 74E06



Map Grid Based on UTM NAD 27



Benchmarks:

BM 1:

Elevation: 101.630 m (Assumed)
Established: 2007 Aug 05
Basis: Level survey from previous BM
Location: 6 m West of road
Description: Nail in the base of a tree marked with pink and blue flagging



Location and Purpose: Established to monitor discharge on the upper reach of the Muskeg River.

Variable Measured: Water Level and Discharge

Period of Record: May 2001 to Present

Access: 2WD road access on Canterra Road

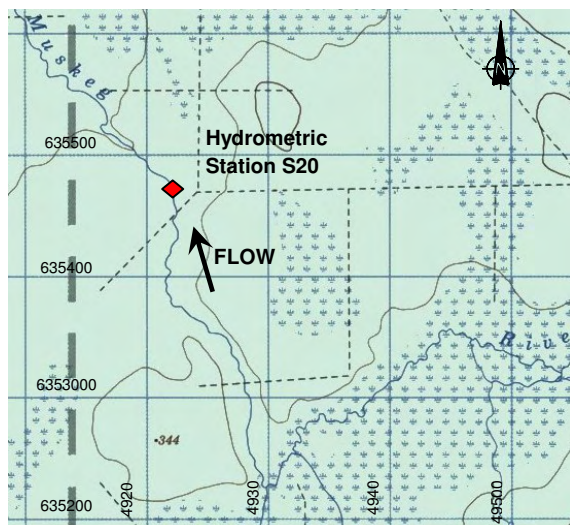
Drainage Area: 157 km²

Coordinates: 492178 E, 6354787 N (UTM NAD 83)

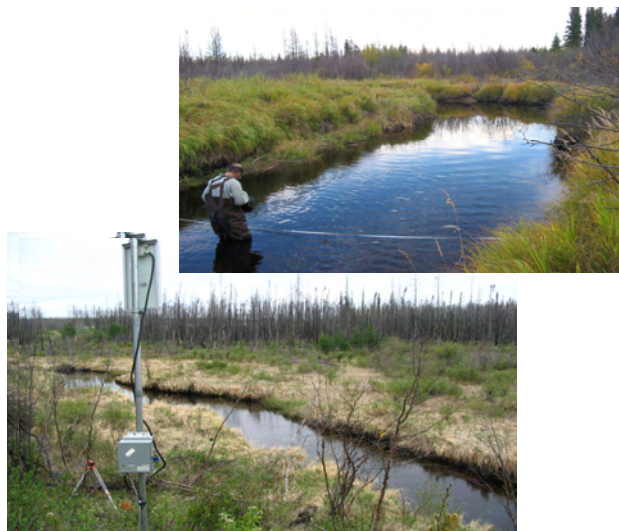
ATS: SE-19-96-7-W4

Lat/Long: 57°20'09" N, 111°07'48" W

NTS Map: 74E06



Map Grid Based on UTM NAD 27



Benchmarks

BM: 1
Elevation: 327.811 m (geodetic)
Established : Before 2003
Basis: GPS survey on April 22, 2008
Location: 20 m downstream of data logger
Description: rebar marked with orange flagging, 0.4 m above ground on left bank

BM: 2
Elevation: 328.976 m (geodetic)
Established : 2006 April 14
Basis: Level survey from BM 1
Location: 2 m east of equipment mast
Description: T-post on left bank marked with orange flagging

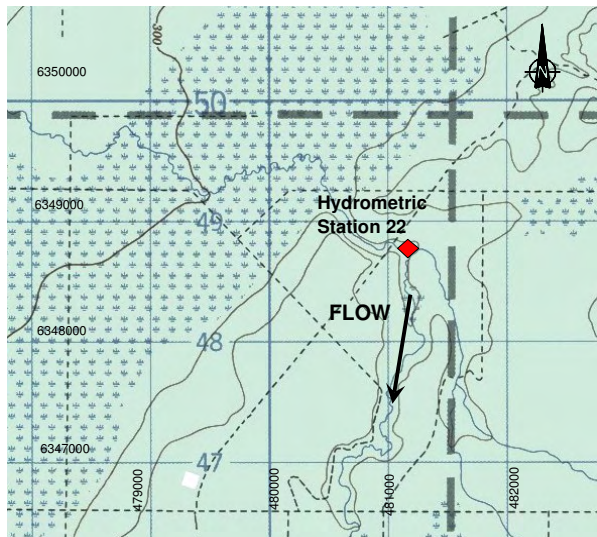


Location and Purpose:

Established to monitor discharge on Muskeg Creek upstream of the Muskeg River.

Variables Measured: Water Level and Discharge
Period of Record: May 2001 to Present
Access: 2WD road access on Canterra Road
Drainage Area: 157 km²
Coordinates: 481036 E, 6348856 N (UTM NAD 83)

LSD: SE-36-95-9-W4
Lat/Long: 57°16'56" N, 111°18'52" W
NTS Map: 74E06



Map Grid Based on UTM NAD 27



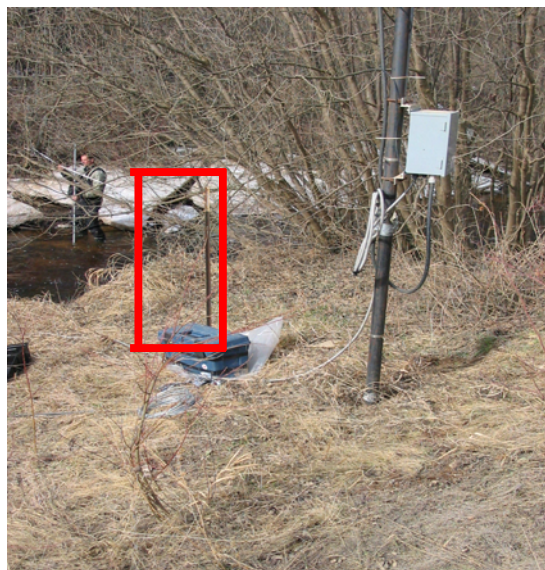
Benchmarks:

BM 1:

Elevation: 306.476 m (geodetic)
Established: Before 2003
Basis: 2002 fact sheet
Location: 1.5 m SW of data logger
Description: Metal T-bar on right bank near equipment mast

BM 2:

Elevation: 305.225 (geodetic)
Established: 2006 April 14
Basis: Level survey from BM 1
Location: ~2 m NW of the data logger box
Description: Nail in tree, on right bank, marked with orange flagging.

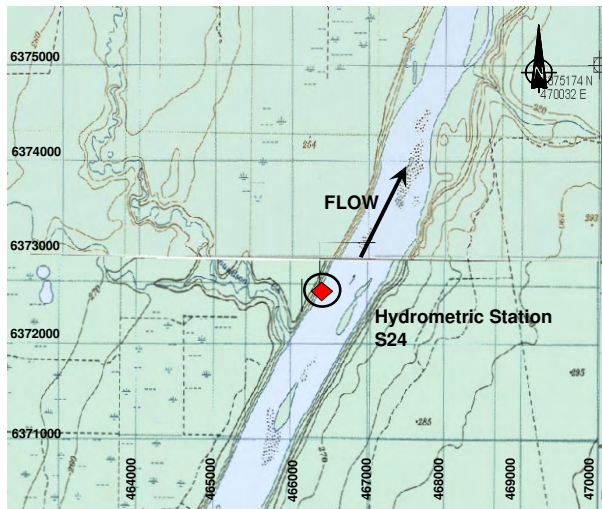


Location and Purpose:

Established to monitor water level and discharge on the Athabasca River downstream of existing and proposed mine developments.

Variables Measured: Water Level and Discharge
Period of Record: May 2001 to Present
Access: Boat (summer) or snowmobile (winter)
Drainage Area: 146000 km²
Coordinates: 466313 E, 6372760 N (UTM NAD 83)

LSD: NE-9-98-10-W4
Lat/Long: 57°29'46" N, 111°33'43" W
NTS Map: 74E05



Map Grid Based on UTM NAD 27



Benchmarks:

BM 1:

Elevation: 231.347 m (geodetic)
Established: Before 2003
Basis: 2002 Station Fact Sheet
Location: 2 m North of data logger box
Description: T-bar, rusty, about 1 m tall

BM 2:

Elevation: 231.096 (geodetic)
Established: Before 2003
Basis: Level survey from BM 1
Location: 4 m North of the data logger box
Description: Nail in birch tree at base of tree, tree and nail marked with yellow flags.



Location and Purpose:

Established in May 2002 to monitor discharge on Susan Lake Outlet upstream of the Athabasca River. The station was discontinued after the 2002 season, and was reactivated in May 2006 to monitor flows downstream of the Fort Hills development.

Variable Measured: Water Level and Discharge

Period of Record: Aug. - Oct. 2002; May 2006 - present

Access: Boat (summer) or snowmobile (winter)

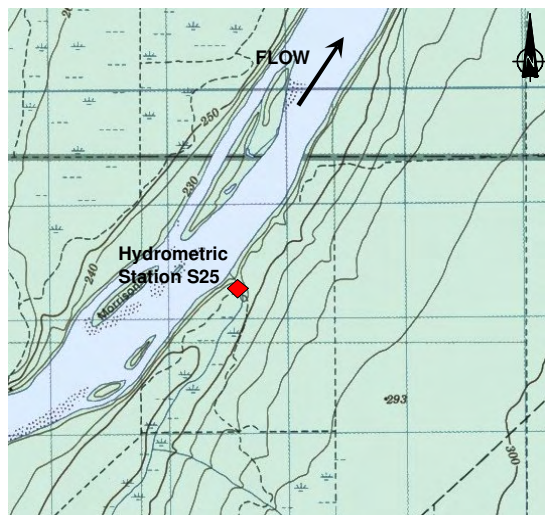
Drainage Area: 22.9 km² (including Susan Lake)

Coordinates: 464491 E, 6368503 N (UTM NAD 83)

LSD: SW-32-97-10-W4

Lat/Long: 57°27'28" N, 111°35'30" W

NTS Map: 74E05



Map Based on UTM NAD 27



Benchmarks:

BM :1

Elevation: 100.000 m

Established: 2007 May 1

Basis: Assumed

Location: 2 m north from the logger

Description: T-Bar sticking 0.8 m out of ground

BM :2

Elevation: 99.997 m

Established: 2007 May 1

Basis: Level Survey from BM1

Location: 3 m south of logger on Right Bank

Description: Nail in tree with orange flagging



Location and Purpose:

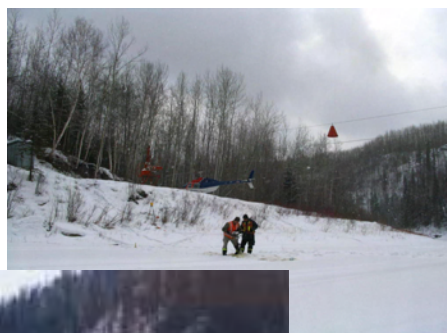
Established to monitor winter discharge on the Mackay River at the Water Survey of Canada gauging station 07DB001. The WSC station has operated since 1972 but discharges are currently only published for the March-October period.

Variables Measured: Water Level and Discharge
Period of Record: November 2001 to Present
Access: Truck or Helicopter
Drainage Area: 5570 km²
Coordinates: 458031 E, 6341078 N (UTM NAD 83)

LSD: SE-3-95-11-W4
Lat/Long: 57°12'39" N, 111°41'41" W
NTS Map: 74E04



Map Grid Based on UTM NAD 27



Benchmarks:

Elevation: 100.000 m
Basis: Assumed
Established: Before 2003
Location: 5 m upstream from WSC shack
Description: Rock with yellow paint in circular shape. Branch/bush above flagged with orange flagging.

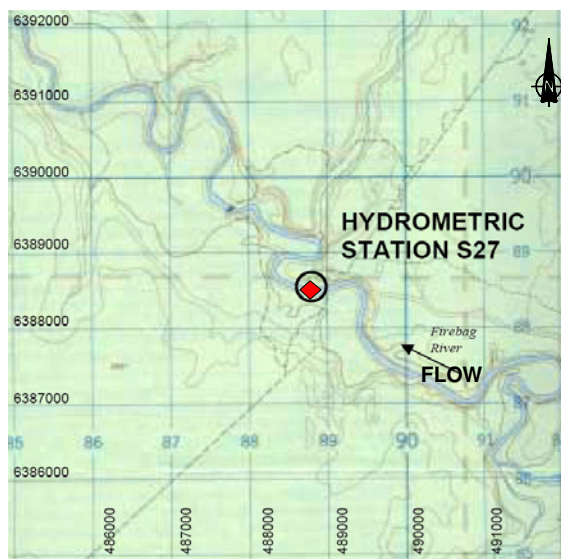


Location and Purpose:

Established to monitor winter discharge on the Firebag River just upstream of Environment Canada hydrometric station 07DC001. The Environment Canada hydrometric station has operated since 1971 but discharges are currently only published for the March-October period.

Variables Measured: Water Level and Discharge
Period of Record: November 2001 to Present
Access: Helicopter or Winter Road
Drainage Area: 5990 km²
Coordinates: 488685 E, 6388706 N (UTM NAD 83)

LSD: SE-35-99-8-W4
Lat/Long: 57°38'26" N, 111°11'22" W
NTS Map: 74E / 11



Map Grid Based on UTM NAD 27



Benchmarks:

BM: 1

Elevation: 99.773 m
Established: Before 2003
Basis: 2002 station fact sheet
Location: 1 m West of logger box
Description: Rebar in PVC Located on right bank immediately west of the logger housing.

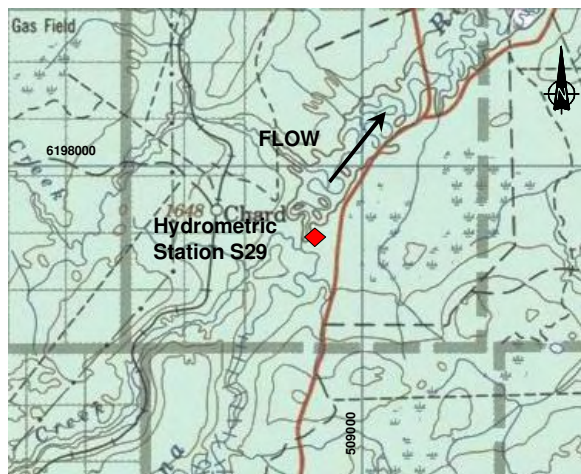


Location and Purpose:

Established at WSC station 07CE002 to measure winter water level and discharge on Christina River. WSC reports daily discharges from March 1 through October 31, and RAMP collects winter data.

Variables Measured: Water Level and Discharge
Period of Record: April 2004 to Present
Access: Truck
Drainage Area: 4863 Km²
Coordinates: 508183 E, 6187926 N (UTM NAD 83)

ATS: 16-9-79-6-W4
Lat/Long: 110° 52' 9.64" W 55° 50' 12.55" N
NTS Map: 73M10



Map Grid Based on UTM NAD 27



Benchmarks:

BM1

Elevation: 99.076 m
Established: Before 2003
Basis: 2002 station fact sheet
Location: ~2.5 m East of logger box
Description: T-bar in PVC pipe at ~ 20cm height above ground level

BM2

Elevation: 99.590 m
Established: Before 2003
Basis: Level survey from Bench mark 1
Location: ~3 m West of logger box
Description: Nail in birch tree at ground level, marked with yellow flagging

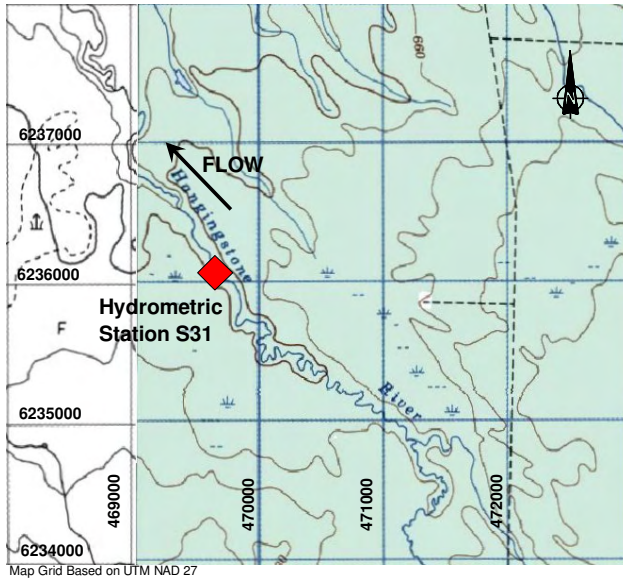


Location and Purpose:

Established to monitor discharge on Hangingstone Creek.

Variables Measured: Water Level and Discharge
Period of Record: April 2002 to Present (not operational 2003)
Access: Truck
Drainage Area: 160 km²
Coordinates: 469784 E, 6236095 N (UTM NAD 83)

ATS: 12-9-84-9-W4
Lat/Long: 111° 22' 18.72" W, 56° 16' 8.84" N
NTS Map: 74D06



Benchmarks:

BM 1:

Elevation: 100.000 m
Established: 2004-Apr-25
Basis: Assumed
Location: 20 m downstream from bridge, 15 m from left bank
Description: Nail in large pine tree root

BM 2:

Elevation: 100.134 m
Established: 2006-Apr-17
Basis: Level survey from BM 1
Location: 20 m downstream from bridge on right bank
Description: flagged t-post



Location and Purpose:

Established to monitor water level and discharge on Surmont Creek upstream of Gregoire Lake.

Variables Measured: Water Level and Discharge
Period of Record: April 2004 to Present
Access: Truck
Drainage Area: 150 km²
Coordinates: 490252 E, 6254511 N (UTM NAD 83)

LSD: 14-2-86-8-W4
Lat/Long: 111° 9' 29.08" W, 56° 26' 6.14" N
NTS Map: 74D06



Map Grid Based on UTM NAD 27



Benchmarks:

BM 1:

Elevation: 97.942 m (assumed)
Established : 2004-Apr-25
Basis: Level Survey from previous BM
Location: 15 m upstream of logger box
Description: Nail in wooden pile supporting abutment on downstream left side of bridge

BM 2:

Elevation: 98.981 (assumed)
Established : 2006-Apr-17
Basis: Level survey from BM 1
Location: 3 m upstream of logger box
Description: Iron rod roughly 1.5 feet out of the ground on LB.



Location and Purpose:

Established in April 2003 to monitor discharge on the Muskeg River at the Aurora - Albian lease boundary in compliance with monitoring requirements. LOC # 040365

Variables Measured: Water Level and Discharge

Period of Record: April 2003 to Present

Access: 2WD road via the Syncrude Aurora North mine site

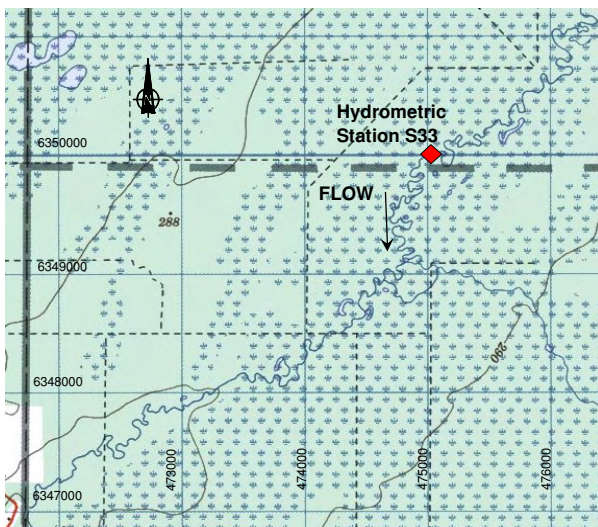
Drainage Area: 728 km²

Coordinates: 474876 E, 6350204 N (UTM NAD 83)

LSD: SE-5-96-9-W4

Lat/Long: 57°17'39" N, 111°25'1" W

NTS Map: 74E06



Benchmarks:

BM 1:

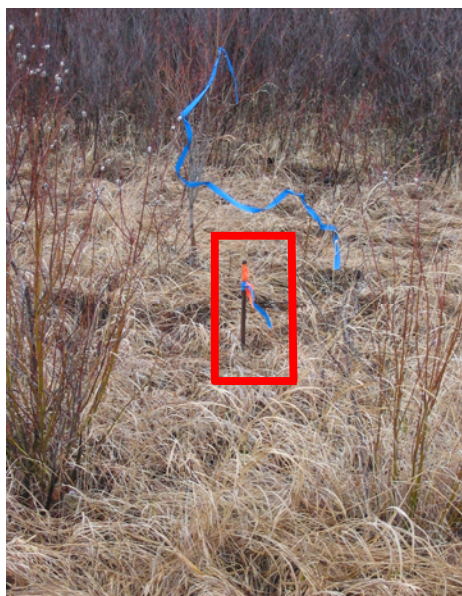
Elevation: 281.74 m

Established: December 14, 2003

Basis: Geodetic

Location: On the right bank in the upstream brush

Description: Rebar sticking up approximately 0.3 m from ground with PVC cover

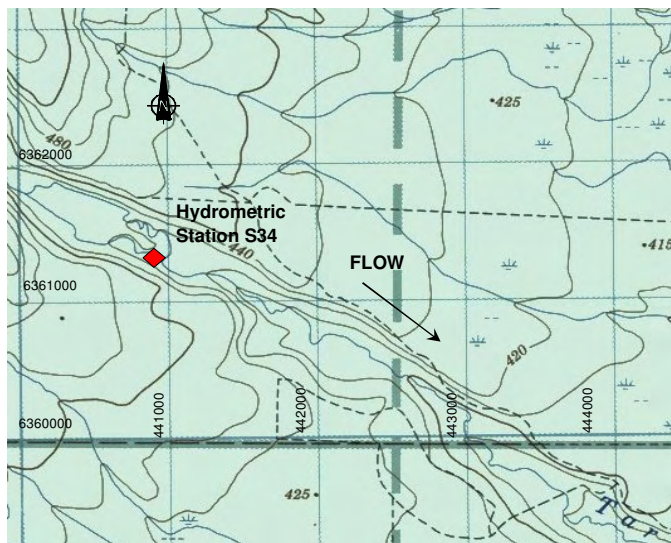


Location and Purpose:

Established in April 2005 to monitor discharge on the Tar River above development.

Variable Measured: Water Level, Discharge and Water Temperature
Period of Record: April 2005 to Present
Access: Helicopter
Drainage Area: 136 km²
Coordinates: 440712 E, 6361615 N (UTM NAD 83)

LSD: NW-2-97-13-W4
Lat/Long: 57°23'38.84" N, 111°59'10.17" W
NTS Map: 74E05



Map Grid Based on UTM NAD 27



Benchmarks:

BM1

Elevation: 100.00 m
Established 2005 April 26
Basis: Assumed
Location: On path 15 m north of station
Description: Rebar
Removed by persons unknown summer 2008

BM2

Elevation: 98.815 m
Established 2005 April 26
Basis: Level survey from Bench Mark 1
Location: Bottom of tree below the logger box, facing north
Description: Nail in base of logger tree



BM3

Elevation: 98.630 m (Assumed)
Established 2008 October 16
Basis: Level survey from Bench Mark 2
Location: 2 m Upstream from the logger box, in front of tree
Description: Rebar protruding 0.4 m

BM4

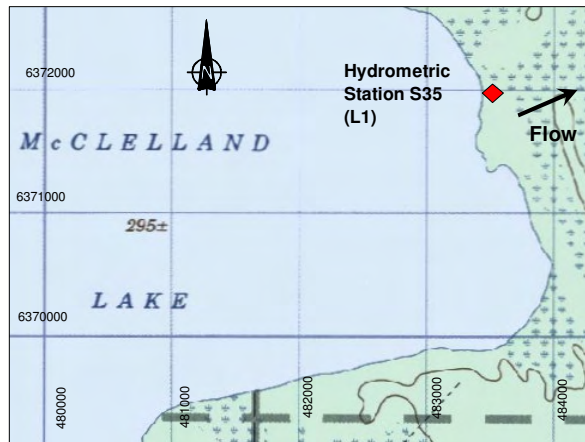
Elevation: 98.656 m (Assumed)
Established 2008 October 16
Basis: Level survey from Bench Mark 2
Location: Upstream side of logger tree

Location and Purpose:

Established on the east side of McClelland Lake just north of RAMP Station L1 to monitor lake outflow.

Variables Measured: Water level and discharge
Period of Record: June 1997 to Present
Access: Helicopter
Drainage Area: 191 km²
Coordinates: 483430 E, 6371950 N

ATS: NW-12-98-9-W4
Lat/Long: 57°29'30" N, 111°16'37" W
NTS Map: 74E06



Map Grid Based on UTM NAD 27



Benchmarks

BM: 1
Elevation: 294.865 m (geodetic)
Established: 2003 May 27
Basis: Level survey from BM 2

Location: Next to fence towards lake
Description: Iron rod, 0.4 m out of ground

BM: 2
Elevation: 296.814 m (geodetic)
Established: 2003 May 27
Basis: Level survey from previous BM from 2002 Station Fact Sheet, rebar in PVC case
Location: On hill 40 m East of data logger
Description: Steel pipe, 0.2 m out of ground

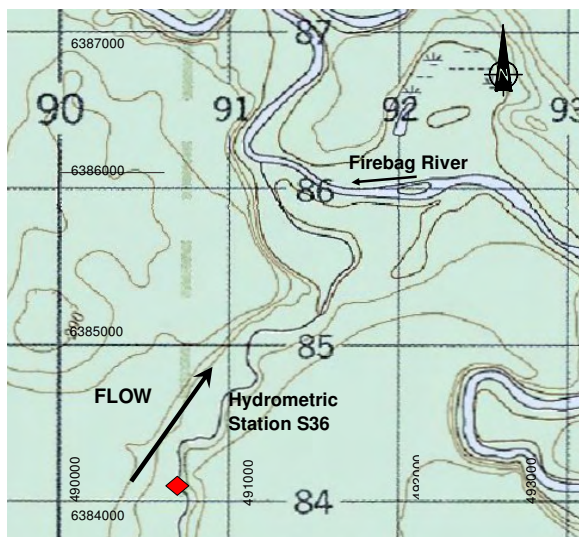


Location and Purpose:

Established in May 2008 to assist in monitoring runoff values for the entire catchment surrounding McClelland Lake. This is an open water station.

Variables Measured: Water Level and Discharge
Period of Record: May 2008 - present
Access: Helicopter
Drainage Area: 330 km²
Coordinates: 490626 E, 6384064 N (UTM NAD 83)

LSD: SE-13-99-8-W4
Lat/Long: 111 9 24.62 W , 57 35 55.95 N



Map Grid Based on UTM NAD 27

Benchmarks:

BM 1:

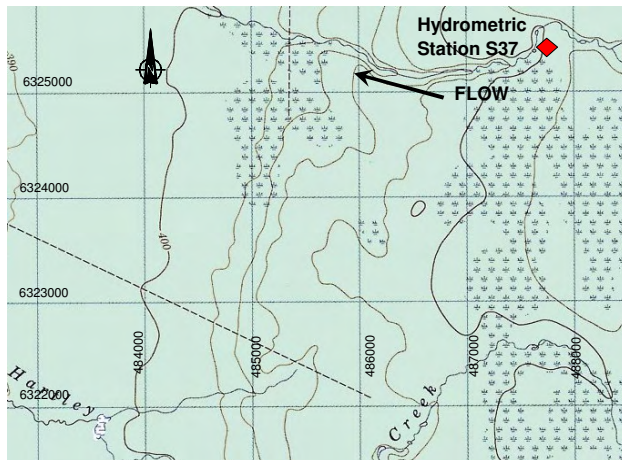
Elevation: 100.000 m
Established: 2008 May 14
Basis: Assumed
Location: Left bank immediately upstream of helicopter landing site
Description: rebar located approximately 1 meter above ground
3 meters away from the river

Location and Purpose

Established to monitor discharge on an upland reference location in the Muskeg River catchment.

Variables Measured: Water Level and Discharge
Period of Record: September 2007 to Present
Access: Helicopter
Drainage Area: 33.0 km²
Coordinates: 487840 E, 6325424 N (UTM NAD 83)

ATS: SE-15-8-93-W4
Lat/Long: 57°4'19.4' N, 111°12'2.0" W
NTS Map: 74E03



Map Grid Based on UTM NAD 27



Benchmarks

BM 1:

Elevation: 99.010 m
Established: 2008 August 9
Basis: Level Survey from previous BM
Location: 1 m down post on LB of stream
Description: Nail in flagged post

BM 2:

Elevation: 100.386 m
Established: 2008 August 9
Basis: Level Survey from previous BM
Location: left bank of creek, 20 m upstream of BM 1
Description: Nail in logger tree

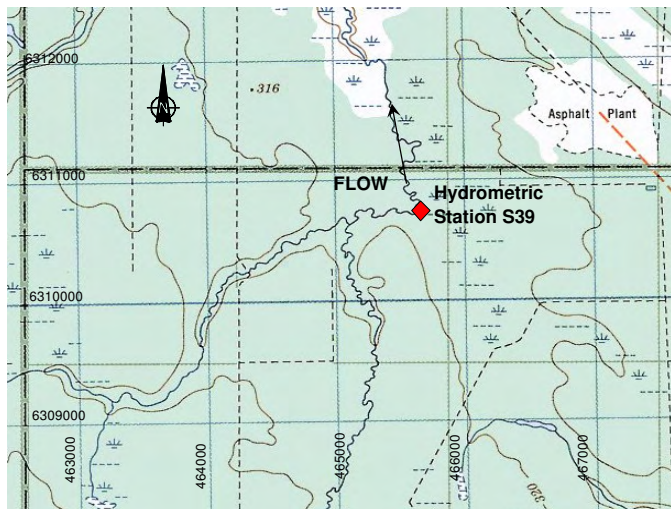


Location and Purpose:

Established to monitor winter discharge on Beaver River above Syncrude at Environment Canada hydrometric station 07DA018. The Environment Canada hydrometric station has operated since 1975, but discharges are currently only published for the March - October period.

Variables Measured: Water Level and Discharge
Period of Record: January 2008 to Present
Access: Truck
Drainage Area: 165 km²
Coordinates: 465475 E, 6310820 N (UTM NAD 83)

ATS: 9-32-91-10-W4
Lat/Long: 111° 34' 2.71" W, 56° 56' 23.02" N
NTS Map: 74D13



Benchmark:

BM: 1

Elevation: 100.000 m
Established: January 11, 2008
Basis: Assumed
Location: 6.9 m S of SW corner of gauge.
Description: WSC 94-2, Brass cap on top of redirod driven to refusal
(WSC Elevation 26.696 m assumed datum)

BM 2:

Elevation: 100.773 m
Established: January 11, 2008
Basis: Level survey from BM 1
Location: 4.4 m NW of SW corner of gauge
Description: WSC 94-1, brass cap on top of redirod driven to refusal
(WSC Elevation 30.469 m assumed datum)

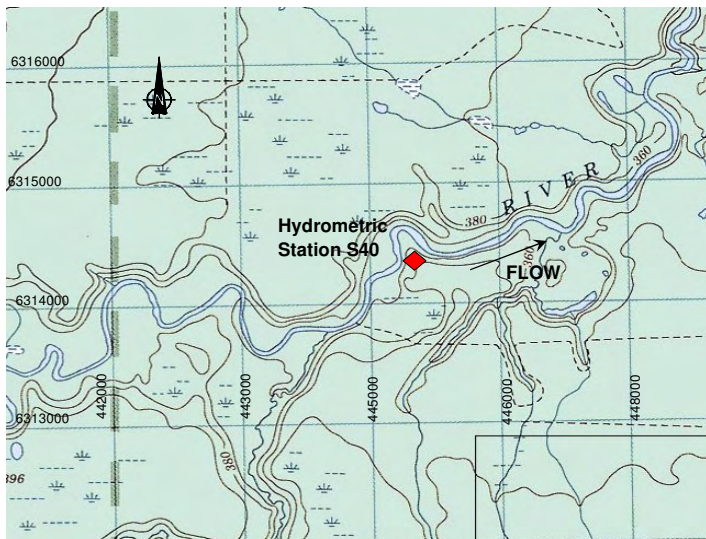


Location and Purpose:

Established to monitor water level and discharge on the Mackay River, upstream of development.

Variables Measured: Water Level, Discharge, and Water Temperature
Period of Record: January 2008 to Present
Access: Truck
Drainage Area: 5294 km²
Coordinates: 445023 E, 6314256 N (UTM NAD 83)

ATS: 12-8-92-12-W4
Lat/Long: 111° 54' 15.33" W, 56° 58' 7.01" N
NTS Map: 74D13



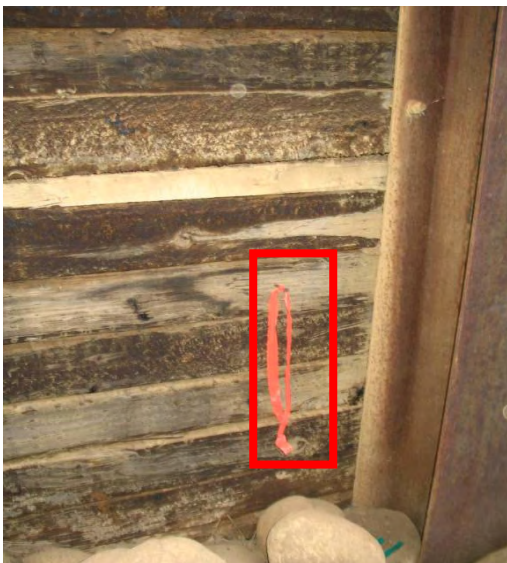
Benchmarks:

BM 1:

Elevation: 100.985 m
Established: January 11, 2008
Basis: Level survey from BM 2
Location: On left bank in the bridge retaining wall
Description: Nail in bridge retaining wall approximately 1 m from ground

BM 2:

Elevation: 100.000 m
Established: January 11, 2008
Basis: Assumed
Location: On the left bank, 8 m upstream of the bridge.
Description: Rebar sticking approximately 0.25 m out of the ground



C.5 INVENTORY OF HYDROLOGIC DATA IN THE RAMP DATABASE

A complete inventory of the daily hydrologic data contained in the RAMP database is provided on the following pages.

RAMP Hydrologic Data Inventory

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
07CC001	Horse River at Abasands Park	Daily	1 - Discharge	1930-12-12	1979-08-31
07CD001	Clearwater River at Draper	Daily	1 - Discharge	1930-12-15	2008-12-31
07CD004	Hangingstone River at Fort McMurray	Daily	1 - Discharge	1965-03-12	2008-10-15
07CD005	Clearwater River above Christina River	Daily	1 - Discharge	1966-06-16	2008-10-31
07CE001	Gregoire Lake near Fort McMurray	Daily	8 - Water Level	1969-08-01	2008-10-31
07CE002	Christina River near Chard	Daily	1 - Discharge	1982-05-20	2008-10-28
07DA001	Athabasca River below McMurray	Daily	1 - Discharge	1957-10-01	2008-12-31
07DA006	Steeptank River near Fort McMurray	Daily	1 - Discharge	1972-09-20	2008-10-31
07DA007	Poplar Creek near Fort McMurray	Daily	1 - Discharge	1972-03-16	1986-12-31
07DA008	Muskeg River near Fort McKay	Daily	1 - Discharge	1974-01-01	2008-10-31
07DA014	Calumet River near Fort MacKay	Daily	1 - Discharge	1975-07-21	1977-12-31
07DA015	Tar River near the Mouth	Daily	1 - Discharge	1975-08-24	1977-12-31
07DA016	Joslyn Creek near Fort McKay	Daily	1 - Discharge	1975-07-28	1993-10-31
07DA017	Ells River near the mouth	Daily	1 - Discharge	1975-07-28	1986-12-31
07DA018	Beaver River above Syncrude	Daily	1 - Discharge	1975-08-19	2008-10-31
07DB001	Mackay River near Fort McKay	Daily	1 - Discharge	1972-03-15	2008-10-31
07DC001	Firebag River near the Mouth	Daily	1 - Discharge	1971-05-06	2008-10-31
3060110	Algar LO	Daily	001 - Daily Maximum Temperature	1962-09-01	2007-09-13
		Daily	002 - Daily Minimum Temperature	1965-08-01	2007-09-14
		Daily	003 - Daily Mean Temperature	1965-08-01	2007-09-13
		Daily	010 - Total Rainfall	1959-04-17	2007-09-13

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	011 - Total Snowfall	2006-05-01	2007-09-13
		Daily	012 - Total Precipitation	2004-05-06	2007-09-13
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-14
3060700	Birch Mountain LO				
	Daily	001 - Daily Maximum Temperature		1966-05-01	2007-09-12
	Daily	002 - Daily Minimum Temperature		1966-05-01	2007-09-13
	Daily	003 - Daily Mean Temperature		1966-05-01	2007-09-12
	Daily	010 - Total Rainfall		1960-06-01	2007-09-12
	Daily	011 - Total Snowfall		2006-05-01	2007-09-12
	Daily	012 - Total Precipitation		2004-05-01	2007-09-12
	Daily	013 - Snow on the Ground		2006-06-01	2007-09-11
3060705	Bitumont LO				
	Daily	001 - Daily Maximum Temperature		1962-05-04	2007-09-13
	Daily	002 - Daily Minimum Temperature		1962-05-05	2007-09-14
	Daily	003 - Daily Mean Temperature		1962-05-05	2007-09-13
	Daily	010 - Total Rainfall		1962-05-04	2007-09-13
	Daily	011 - Total Snowfall		2006-05-01	2007-09-13
	Daily	012 - Total Precipitation		2004-04-21	2007-09-13
	Daily	013 - Snow on the Ground		2006-06-01	2007-09-14
3060922	Buckton LO				
	Daily	001 - Daily Maximum Temperature		1965-06-01	2007-08-30
	Daily	002 - Daily Minimum Temperature		1965-06-01	2007-08-31
	Daily	003 - Daily Mean Temperature		1965-06-01	2007-08-30
	Daily	010 - Total Rainfall		1965-06-01	2007-08-30
	Daily	011 - Total Snowfall		2006-05-10	2007-08-30
	Daily	012 - Total Precipitation		2004-05-14	2007-08-30
	Daily	013 - Snow on the Ground		2006-06-01	2007-08-31
3061580	Christina LO				
	Daily	001 - Daily Maximum Temperature		1967-06-01	2002-05-17
	Daily	002 - Daily Minimum Temperature		1967-06-01	2002-05-18
	Daily	003 - Daily Mean Temperature		1967-06-01	2002-05-17
	Daily	010 - Total Rainfall		1967-06-01	2002-05-17
3061800	Conklin LO				
	Daily	001 - Daily Maximum Temperature		1965-05-01	2007-09-24
	Daily	002 - Daily Minimum Temperature		1965-05-02	2007-09-25
	Daily	003 - Daily Mean Temperature		1965-05-02	2007-09-24
	Daily	010 - Total Rainfall		1954-05-21	2007-09-21
	Daily	011 - Total Snowfall		2006-05-01	2007-09-21
	Daily	012 - Total Precipitation		2004-04-22	2007-09-21
	Daily	013 - Snow on the Ground		2006-06-01	2007-09-22
3061930	Cowpar LO				
	Daily	001 - Daily Maximum Temperature		1965-05-02	2007-09-27
	Daily	002 - Daily Minimum Temperature		1965-05-01	2007-09-28
	Daily	003 - Daily Mean Temperature		1965-05-02	2007-09-27
	Daily	010 - Total Rainfall		1957-07-01	2007-09-26

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
3062300	Ells LO	Daily	011 - Total Snowfall	2006-05-01	2007-09-26
		Daily	012 - Total Precipitation	2004-05-01	2007-09-26
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-30
	Ells LO	Daily	001 - Daily Maximum Temperature	1964-05-01	2007-09-03
		Daily	002 - Daily Minimum Temperature	1964-05-01	2007-09-04
		Daily	003 - Daily Mean Temperature	1964-05-01	2007-09-03
		Daily	010 - Total Rainfall	1961-04-18	2007-09-03
		Daily	011 - Total Snowfall	2006-05-01	2007-09-03
		Daily	012 - Total Precipitation	2004-05-05	2007-09-03
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-04
3062693	Fort McMurray A	Daily	001 - Daily Maximum Temperature	1944-01-01	2008-07-24
		Daily	002 - Daily Minimum Temperature	1944-01-01	2008-07-24
		Daily	003 - Daily Mean Temperature	1944-01-01	2008-07-24
		Daily	004 - Daily Max Relative Humidity	2006-01-01	2008-09-25
		Daily	005 - Daily Min Relative Humidity	2006-01-01	2008-09-25
		Daily	010 - Total Rainfall	1944-01-01	2007-09-30
		Daily	011 - Total Snowfall	1944-01-01	2007-09-30
		Daily	012 - Total Precipitation	1944-01-01	2008-07-24
		Daily	013 - Snow on the Ground	2006-04-01	2007-09-30
		Daily	024 - Speed of Extreme Gust	2006-01-05	2008-07-24
3062696	Fort McMurray CS	Daily	001 - Daily Maximum Temperature	1996-05-01	2008-12-31
		Daily	002 - Daily Minimum Temperature	1996-05-01	2008-12-31
		Daily	003 - Daily Mean Temperature	2006-01-01	2008-12-31
		Daily	004 - Daily Max Relative Humidity	2006-01-01	2007-12-31
		Daily	005 - Daily Min Relative Humidity	2006-01-01	2007-12-31
		Daily	010 - Total Rainfall	1996-05-01	2007-09-30
		Daily	011 - Total Snowfall	1996-05-01	2007-12-31
		Daily	012 - Total Precipitation	1996-05-01	2008-12-31
		Daily	013 - Snow on the Ground	2006-01-01	2008-12-31
3062700	Fort McMurray AWOS A	Daily	001 - Daily Maximum Temperature	2008-07-25	2008-12-31
		Daily	002 - Daily Minimum Temperature	2008-07-25	2008-12-31
		Daily	003 - Daily Mean Temperature	2008-07-25	2008-12-31
		Daily	012 - Total Precipitation	2008-07-25	2008-12-31
3062889	Gordon Lake LO	Daily	001 - Daily Maximum Temperature	1964-05-01	2007-09-09
		Daily	002 - Daily Minimum Temperature	1964-06-01	2007-09-10
		Daily	003 - Daily Mean Temperature	1964-06-01	2007-09-09
		Daily	010 - Total Rainfall	1964-05-01	2007-09-09
		Daily	011 - Total Snowfall	2006-05-03	2007-09-09
		Daily	012 - Total Precipitation	2004-05-06	2007-09-09
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-10

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
3062905	Grande Lookout				
	Daily	001 - Daily Maximum Temperature		1965-08-05	2007-09-09
	Daily	002 - Daily Minimum Temperature		1965-08-05	2007-09-10
	Daily	003 - Daily Mean Temperature		2006-05-01	2007-09-09
	Daily	010 - Total Rainfall		1965-08-04	2007-09-09
	Daily	011 - Total Snowfall		1965-08-01	2007-09-09
	Daily	012 - Total Precipitation		1965-08-04	2007-09-09
	Daily	013 - Snow on the Ground		2006-06-01	2007-09-10
3063120	Heart Lake Lookout				
	Daily	001 - Daily Maximum Temperature		2005-04-14	2007-09-27
	Daily	002 - Daily Minimum Temperature		2005-04-15	2007-09-28
	Daily	003 - Daily Mean Temperature		2005-04-17	2007-09-27
	Daily	010 - Total Rainfall		2005-04-14	2007-09-26
	Daily	011 - Total Snowfall		2006-04-01	2007-09-26
	Daily	012 - Total Precipitation		2006-04-01	2007-09-26
	Daily	013 - Snow on the Ground		2006-06-01	2007-09-28
3063563	Johnson Lake LO				
	Daily	001 - Daily Maximum Temperature		1965-05-01	2007-08-29
	Daily	002 - Daily Minimum Temperature		1965-05-01	2007-08-30
	Daily	003 - Daily Mean Temperature		1965-05-01	2007-08-29
	Daily	010 - Total Rainfall		1965-05-01	2007-08-31
	Daily	011 - Total Snowfall		2006-05-08	2007-08-31
	Daily	012 - Total Precipitation		2004-05-14	2007-08-31
	Daily	013 - Snow on the Ground		2006-06-01	2007-08-31
3064528	Mildred Lake				
	Daily	001 - Daily Maximum Temperature		1994-01-01	2008-12-31
	Daily	002 - Daily Minimum Temperature		1994-01-01	2008-12-31
	Daily	003 - Daily Mean Temperature		1994-01-01	2008-12-31
	Daily	004 - Daily Max Relative Humidity		2006-01-01	2007-12-31
	Daily	005 - Daily Min Relative Humidity		2006-01-01	2007-12-31
	Daily	010 - Total Rainfall		1994-01-01	2007-12-27
	Daily	011 - Total Snowfall		1994-01-01	2007-12-27
	Daily	012 - Total Precipitation		1994-01-01	2008-12-31
	Daily	013 - Snow on the Ground		2006-01-01	2008-12-31
	Daily	024 - Speed of Extreme Gust		2006-11-08	2008-12-28
3064531	Mildred Lake				
	Daily	001 - Daily Maximum Temperature		1973-07-04	1996-07-31
	Daily	002 - Daily Minimum Temperature		1973-07-05	1996-07-31
	Daily	003 - Daily Mean Temperature		1973-07-05	1996-07-31
	Daily	010 - Total Rainfall		1973-07-01	1996-07-31
	Daily	011 - Total Snowfall		1973-07-01	1996-07-31
	Daily	012 - Total Precipitation		1973-07-01	1996-07-31
3064740	Muskeg LO				
	Daily	001 - Daily Maximum Temperature		1965-08-01	2007-09-06
	Daily	002 - Daily Minimum Temperature		1965-08-01	2007-09-07

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	003 - Daily Mean Temperature	1965-08-01	2007-09-06
		Daily	010 - Total Rainfall	1965-04-27	2007-09-06
		Daily	011 - Total Snowfall	2006-05-01	2007-09-06
		Daily	012 - Total Precipitation	2004-05-07	2007-09-06
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-06
3065492	Richardson LO				
		Daily	001 - Daily Maximum Temperature	1964-06-03	2007-09-20
		Daily	002 - Daily Minimum Temperature	1964-06-01	2007-09-21
		Daily	003 - Daily Mean Temperature	1964-06-03	2007-09-20
		Daily	010 - Total Rainfall	1960-04-25	2007-09-20
		Daily	011 - Total Snowfall	2006-05-13	2007-09-20
		Daily	012 - Total Precipitation	2004-05-07	2007-09-20
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-21
3065560	Round Hill LO				
		Daily	001 - Daily Maximum Temperature	1951-07-06	2007-08-29
		Daily	002 - Daily Minimum Temperature	1951-07-06	2007-08-30
		Daily	003 - Daily Mean Temperature	1951-07-06	2007-08-29
		Daily	010 - Total Rainfall	1952-04-28	2007-08-31
		Daily	011 - Total Snowfall	2006-05-01	2007-08-31
		Daily	012 - Total Precipitation	2004-05-01	2007-08-31
		Daily	013 - Snow on the Ground	2006-06-01	2007-08-31
3066160	Stoney Mountian LO				
		Daily	001 - Daily Maximum Temperature	1964-05-01	2007-09-20
		Daily	002 - Daily Minimum Temperature	1964-05-01	2007-09-21
		Daily	003 - Daily Mean Temperature	1964-05-01	2007-09-20
		Daily	010 - Total Rainfall	1954-05-01	2007-09-20
		Daily	011 - Total Snowfall	2006-05-01	2007-09-20
		Daily	012 - Total Precipitation	2004-04-19	2007-09-20
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-21
3066364	Tar Island				
		Daily	001 - Daily Maximum Temperature	1970-04-01	1984-06-29
		Daily	002 - Daily Minimum Temperature	1970-04-01	1984-06-30
		Daily	003 - Daily Mean Temperature	1970-04-01	1984-06-29
		Daily	010 - Total Rainfall	1970-06-01	1984-06-30
3066380	Thickwood LO				
		Daily	001 - Daily Maximum Temperature	1957-08-02	1992-08-27
		Daily	002 - Daily Minimum Temperature	1957-08-02	1992-08-28
		Daily	003 - Daily Mean Temperature	1957-08-02	1992-08-27
		Daily	010 - Total Rainfall	1957-04-08	1992-08-27
		Daily	011 - Total Snowfall	1957-04-08	1992-08-27
		Daily	012 - Total Precipitation	1957-04-08	1992-08-27
3067590	Winefred LO				
		Daily	001 - Daily Maximum Temperature	1965-05-01	2007-08-25
		Daily	002 - Daily Minimum Temperature	1965-05-01	2007-08-26
		Daily	003 - Daily Mean Temperature	1965-05-01	2007-08-25

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	010 - Total Rainfall	1957-05-01	2007-08-31
		Daily	011 - Total Snowfall	2006-05-03	2007-08-31
		Daily	012 - Total Precipitation	2004-05-03	2007-08-31
		Daily	013 - Snow on the Ground	2006-06-01	2007-08-31
3073792	Legend LO				
		Daily	001 - Daily Maximum Temperature	1962-05-06	2007-09-06
		Daily	002 - Daily Minimum Temperature	1962-05-06	2007-09-07
		Daily	003 - Daily Mean Temperature	1962-05-06	2007-09-06
		Daily	010 - Total Rainfall	1962-05-06	2007-09-06
		Daily	011 - Total Snowfall	2006-05-04	2007-09-06
		Daily	012 - Total Precipitation	2004-05-12	2007-09-06
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-07
ABMS	Albian Mine Site				
		Daily	003 - Daily Mean Temperature	2001-07-01	2008-12-31
ALBATH	Albian Athabasca River Withdrawal				
		Daily	1 - Discharge	2004-01-01	2008-12-31
ANZC	Anzac				
		Daily	003 - Daily Mean Temperature	2006-01-20	2008-12-31
ATHB	Fort McMurray Athabasca				
		Daily	003 - Daily Mean Temperature	1998-03-13	2008-12-31
AUCWD	Aurora Clean Water Diversion				
		Daily	1 - Discharge	2003-05-18	2004-12-31
BFVP	Buffalo Viewpoint				
		Daily	003 - Daily Mean Temperature	1999-01-31	2008-12-31
BGLD	Barge Landing				
		Daily	003 - Daily Mean Temperature	2001-07-01	2008-12-31
C1	Aurora Climate Station				
		Daily	001 - Daily Maximum Temperature	1995-05-10	2008-12-31
		Daily	002 - Daily Minimum Temperature	1995-05-10	2008-12-31
		Daily	003 - Daily Mean Temperature	1988-03-11	2008-12-31
		Daily	010 - Total Rainfall	1995-05-10	2008-12-31
		Daily	011 - Total Snowfall	1995-05-10	2008-12-31
		Daily	012 - Total Precipitation	1988-03-10	2008-12-31
		Daily	013 - Snow on the Ground	2003-01-01	2008-12-31
		Daily	024 - Speed of Extreme Gust	2006-01-01	2008-12-31
		Daily	061 - Global Solar Radiation (RF1)	1988-03-11	2008-12-31
		Daily	080 - Relative Humidity	2006-01-01	2008-12-31
		Daily	831 - Maximum 2-Minute Wind Speed	2006-01-01	2008-12-31
		Daily	832 - Maximum 10-Minute Wind Speed	2006-01-01	2008-12-31
C2	Horizon Climate Station				
		Daily	001 - Daily Maximum Temperature	2008-10-16	2008-12-31
		Daily	002 - Daily Minimum Temperature	2008-10-16	2008-12-31
		Daily	003 - Daily Mean Temperature	2008-10-16	2008-12-31
		Daily	013 - Snow on the Ground	2008-11-05	2008-12-31

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	024 - Speed of Extreme Gust	2008-10-16	2008-12-31
		Daily	061 - Global Solar Radiation (RF1)	2008-10-16	2008-12-31
		Daily	077 - Station pressure	2008-10-16	2008-12-31
		Daily	080 - Relative Humidity	2008-10-16	2008-12-31
		Daily	831 - Maximum 2-Minute Wind Speed	2008-10-16	2008-12-31
		Daily	832 - Maximum 10-Minute Wind Speed	2008-10-16	2008-12-31
CALUMET	Calumet River near the Mouth				
	Daily	1 - Discharge		2001-05-12	2007-10-24
CNRATHRL	CNRL Athabasca River Release				
	Daily	1 - Discharge		2006-01-07	2007-12-31
CNRATHW	CNRL Athabasca River Withdrawal				
	Daily	1 - Discharge		2006-07-18	2007-12-31
CNRLH	CNRL Horizon				
	Daily	003 - Daily Mean Temperature		2008-01-11	2008-12-31
CR1	Calumet River				
	Daily	1 - Discharge		2005-05-04	2008-09-20
	Daily	8 - Water Level		2005-05-04	2007-10-24
FCPW	Fort Chipewyan				
	Daily	003 - Daily Mean Temperature		1999-01-01	2008-12-31
	Daily	061 - Global Solar Radiation (RF1)		2001-05-01	2008-12-31
	Daily	080 - Relative Humidity		1999-01-31	2008-12-31
FMKY	Fort MacKay				
	Daily	003 - Daily Mean Temperature		1998-03-19	2008-12-31
	Daily	061 - Global Solar Radiation (RF1)		2001-05-01	2008-12-31
	Daily	080 - Relative Humidity		1998-05-01	2008-12-31
JC1	Joslyn Creek				
	Daily	1 - Discharge		2005-05-04	2005-10-21
L1	McClelland Lake				
	Daily	001 - Daily Maximum Temperature		2008-01-01	2008-10-21
	Daily	002 - Daily Minimum Temperature		2008-01-01	2008-10-21
	Daily	003 - Daily Mean Temperature		2008-01-01	2008-10-21
	Daily	010 - Total Rainfall		2003-05-27	2006-07-14
	Daily	012 - Total Precipitation		2006-04-15	2008-12-31
	Daily	080 - Relative Humidity		2006-09-06	2008-12-14
	Daily	1 - Discharge		1999-04-30	2008-12-14
	Daily	8 - Water Level		1997-06-22	2008-12-14
	Daily	998 - Water Temperature		2008-03-14	2008-09-13
L2	Kearl Lake				
	Daily	001 - Daily Maximum Temperature		2008-01-01	2008-12-31
	Daily	002 - Daily Minimum Temperature		2008-01-01	2008-12-31
	Daily	003 - Daily Mean Temperature		2008-01-01	2008-12-31
	Daily	012 - Total Precipitation		2008-01-01	2008-12-31
	Daily	080 - Relative Humidity		2008-01-01	2008-09-16
	Daily	8 - Water Level		1989-01-19	2008-12-31

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	998 - Water Temperature	2008-01-01	2008-12-31
L3	Isadore's Lake	Daily	8 - Water Level	2000-02-22	2008-12-31
LCMP	Lower Camp	Daily	003 - Daily Mean Temperature	2001-07-01	2008-12-31
LCMPB	Lower Camp B	Daily	003 - Daily Mean Temperature	1999-01-18	2003-12-31
MLDL	Mildred Lake	Daily	003 - Daily Mean Temperature	1999-03-04	2008-12-31
MLNM	Millennium	Daily	003 - Daily Mean Temperature	2001-09-01	2008-12-31
PMFM	Fort McMurray Patricia McInnes	Daily	003 - Daily Mean Temperature	1999-01-01	2008-12-31
POND2	Pond 2 to Shelley Creek	Daily	1 - Discharge	2007-01-01	2008-11-14
		Daily	8 - Water Level	2007-01-01	2007-10-31
POND3	Pond 3 to Jackpine Creek	Daily	1 - Discharge	2007-04-30	2007-10-22
		Daily	8 - Water Level	2007-04-30	2007-11-02
POND4	Pond 4 to Khahago Creek	Daily	1 - Discharge	2007-04-30	2008-11-14
		Daily	8 - Water Level	2007-04-30	2007-10-22
POND6	Pond 6 to Jackpine Creek	Daily	1 - Discharge	2007-01-18	2008-11-15
		Daily	8 - Water Level	2007-01-18	2007-10-22
POPCKSP	Poplar Creek Spillway Release	Daily	1 - Discharge	2004-03-23	2008-12-31
ppond1	Fort Hills Pond 1 release water from Dewater to Unnamed Cre	Daily	1 - Discharge	2007-04-06	2008-11-28
ppond2	Petro Canada Fort Hills Pond 2 Release to Fort Creek	Daily	1 - Discharge	2007-01-01	2008-12-31
RCHRISLK	Christina Lake near Winefred Lake	Daily	003 - Daily Mean Temperature	2003-01-01	2007-12-31
		Daily	010 - Total Rainfall	2001-09-28	2002-04-11
		Daily	012 - Total Precipitation	2003-01-01	2007-12-31
S01	Alsands Drain	Daily	1 - Discharge	1995-08-10	2002-12-31
		Daily	8 - Water Level	1997-04-16	2002-12-29
S02	Jackpine Creek at Canterra Road	Daily	1 - Discharge	1995-05-06	2008-12-31
		Daily	8 - Water Level	1997-04-17	2008-12-31
		Daily	998 - Water Temperature	2007-10-20	2008-12-31

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
S03	Iyininim Creek above Kearn Lake	Daily	010 - Total Rainfall	2004-05-16	2005-10-08
		Daily	012 - Total Precipitation	2008-05-13	2008-10-20
		Daily	1 - Discharge	1989-01-18	2008-10-20
		Daily	8 - Water Level	1989-04-20	2008-10-20
S04	Blackfly Creek near the Mouth	Daily	8 - Water Level	1989-02-15	1998-10-27
S04A	Blackfly Creek near the Mouth	Daily	1 - Discharge	2007-04-25	2007-10-25
		Daily	8 - Water Level	2007-04-25	2007-10-25
S05	Muskeg River above Stanley Creek	Daily	1 - Discharge	2003-05-04	2008-12-31
		Daily	8 - Water Level	2003-05-04	2008-12-31
S05A	Muskeg River above Muskeg Creek	Daily	077 - Station pressure	2008-01-01	2008-12-31
		Daily	1 - Discharge	1995-08-11	2008-12-31
		Daily	8 - Water Level	1997-04-17	2008-12-31
		Daily	998 - Water Temperature	2004-09-01	2008-12-31
S06	Mills Creek at Highway 63	Daily	1 - Discharge	1997-04-16	2008-12-31
		Daily	8 - Water Level	1997-04-16	2008-12-31
S07	Muskeg River near Fort MacKay (07DA008)	Daily	1 - Discharge	1974-01-01	2008-12-31
		Daily	8 - Water Level	2000-01-01	2008-12-31
S08	Stanley Creek near the Mouth	Daily	1 - Discharge	2003-05-03	2003-10-14
		Daily	8 - Water Level	1999-09-14	2003-10-14
S09	Kearn Lake Outlet	Daily	1 - Discharge	1989-01-18	2008-12-09
		Daily	8 - Water Level	1989-01-18	2008-12-09
S10	Wapasu Creek at Canterra Road	Daily	1 - Discharge	1997-05-08	2008-12-31
		Daily	8 - Water Level	1997-05-08	2008-12-31
		Daily	998 - Water Temperature	2008-01-01	2008-12-31
S11	Poplar Creek at Highway 63 (07DA007)	Daily	1 - Discharge	1972-03-16	2008-10-14
		Daily	8 - Water Level	1995-05-05	2008-12-11
		Daily	998 - Water Temperature	2008-05-14	2008-10-14
S12	Fort Creek at Highway 63	Daily	1 - Discharge	2000-04-02	2008-10-14
		Daily	8 - Water Level	2000-04-02	2008-10-14
S13	Albian Pond 3 Outlet	Daily	8 - Water Level	2000-03-02	2002-12-07

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
S14	Ells River above Joslyn Creek				
	Daily	1 - Discharge		2001-05-13	2007-10-24
	Daily	8 - Water Level		2001-05-13	2007-10-24
S14A	Ells River at CNRL Bridge				
	Daily	1 - Discharge		2004-10-30	2008-12-31
	Daily	8 - Water Level		2004-10-30	2008-12-31
	Daily	998 - Water Temperature		2005-07-14	2008-12-31
S15	Tar River near the Mouth (07DA015)				
	Daily	1 - Discharge		1975-08-24	2006-10-28
	Daily	8 - Water Level		2001-05-09	2006-10-28
S15A	Tar River near the mouth (new location start from 2007				
	Daily	1 - Discharge		2007-05-01	2008-10-15
	Daily	8 - Water Level		2007-05-01	2008-10-15
	Daily	998 - Water Temperature		2007-09-21	2008-10-15
S16	Calumet River near the Mouth				
	Daily	001 - Daily Maximum Temperature		2003-01-01	2005-10-11
	Daily	002 - Daily Minimum Temperature		2003-01-01	2005-10-11
	Daily	003 - Daily Mean Temperature		2003-01-01	2005-10-11
	Daily	010 - Total Rainfall		2003-01-01	2005-05-02
	Daily	011 - Total Snowfall		2003-01-01	2005-03-23
	Daily	012 - Total Precipitation		2003-01-01	2005-05-01
	Daily	1 - Discharge		2001-05-12	2004-10-31
	Daily	8 - Water Level		2001-05-12	2004-10-31
	Daily	998 - Water Temperature		2004-09-01	2004-10-31
S17	Tar River Upland Tributary				
	Daily	1 - Discharge		2001-05-12	2004-10-31
	Daily	8 - Water Level		2001-05-12	2004-10-31
S18A	Calumet River Upland Tributary				
	Daily	1 - Discharge		2002-06-10	2008-10-20
	Daily	8 - Water Level		2002-06-10	2008-10-20
S19	Tar River Lowland Tributary near the Mouth				
	Daily	010 - Total Rainfall		2004-04-27	2005-12-31
	Daily	012 - Total Precipitation		2006-01-01	2008-10-15
	Daily	1 - Discharge		2001-05-09	2008-10-15
	Daily	8 - Water Level		2001-05-09	2008-10-15
S20	Muskeg River Upland				
	Daily	1 - Discharge		2001-05-08	2008-10-23
	Daily	8 - Water Level		2001-05-08	2008-10-23
S21	Shelley Creek near the Mouth				
	Daily	1 - Discharge		2003-05-04	2003-10-14
	Daily	8 - Water Level		2001-05-14	2003-10-14
S22	Muskeg Creek near the Mouth				
	Daily	1 - Discharge		1989-01-17	2008-10-23
	Daily	8 - Water Level		1989-01-17	2008-10-23

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
S23	Aurora Boundary Weir				
	Daily	8 - Water Level		2001-01-01	2002-12-31
S24	Athabasca River below Eymundson Creek				
	Daily	1 - Discharge		2001-06-20	2008-12-31
	Daily	8 - Water Level		2001-06-21	2008-12-31
S25	Susan Lake Outlet				
	Daily	1 - Discharge		2002-06-11	2008-10-14
	Daily	8 - Water Level		2002-06-11	2008-10-14
S26	MacKay River near Fort McKay (07DB001)				
	Daily	1 - Discharge		1972-03-15	2008-12-31
	Daily	8 - Water Level		2001-10-31	2008-12-20
S27	Firebag River near the Mouth (07DC001)				
	Daily	1 - Discharge		1971-05-06	2008-12-31
	Daily	8 - Water Level		2002-01-01	2008-12-31
S28	Khahago Creek below Black Fly Creek				
	Daily	1 - Discharge		1989-01-19	2007-10-25
	Daily	8 - Water Level		1989-01-19	2007-10-25
S29	Christina River near Chard (07CE002)				
	Daily	1 - Discharge		1982-05-20	2008-12-31
	Daily	8 - Water Level		2002-01-13	2008-12-31
S31	Hangingstone Creek at North Star Road				
	Daily	1 - Discharge		2002-04-10	2008-10-13
	Daily	8 - Water Level		2002-04-10	2008-10-13
S32	Surmont Creek at Highway 881				
	Daily	1 - Discharge		2002-05-18	2008-10-13
	Daily	8 - Water Level		2002-05-18	2008-10-13
	Daily	998 - Water Temperature		2008-06-24	2008-10-13
S33	Muskeg River at the Aurora / Albion Boundary				
	Daily	1 - Discharge		2003-04-30	2008-12-31
	Daily	8 - Water Level		2003-04-30	2008-12-31
S34	Tar River above CNRL Lake				
	Daily	1 - Discharge		2005-04-26	2008-12-14
	Daily	8 - Water Level		2005-04-26	2008-12-14
	Daily	998 - Water Temperature		2008-04-08	2008-10-16
S35	McClelland Lake Outlet below McClelland Lake				
	Daily	1 - Discharge		2008-06-29	2008-10-08
	Daily	8 - Water Level		2008-06-29	2008-10-08
S36	McClelland lake Outlet above Firebag River				
	Daily	1 - Discharge		2008-05-14	2008-10-21
S37	East Jackpine Creek near the 1300 m contour				
	Daily	1 - Discharge		2007-09-22	2008-10-21
	Daily	8 - Water Level		2007-09-22	2008-10-21
S38	Steepbank River near Fort McMurray				

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
S39	Beaver River above Syncrude (07DA018)	Daily	1 - Discharge	1972-09-20	2008-10-31
		Daily	1 - Discharge	1975-08-19	2008-12-31
S40	MacKay River at Petro- Canada Bridge	Daily	1 - Discharge	2008-01-01	2008-12-31
SUEI	Syncrude UEI	Daily	003 - Daily Mean Temperature	2002-09-01	2008-12-31
SUNATH	Suncor Athabasca River Withdrawal	Daily	1 - Discharge	2002-01-01	2004-12-31
TR1	Tar River	Daily	1 - Discharge	2005-05-03	2005-10-21

C.6 MANUAL WATER LEVEL AND DISCHARGE MEASUREMENTS

Records of the manual measurements made during each site visit are provided on the following pages. The 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.

Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Lake
Location: McClelland Lake
Site Name: L1
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

Time of Measurement

Date of Measurement: January 14, 2008
Start Time: 10:25 AM MDT
End Time: MDT

Weather Conditions:

-2, sunny

River Conditions:

Notes: Battery changed, new reading 12.4V on Volt meter
Temp = -3.928
RH = 82.49
TD m=1.406399 b=0.0533069

Pluvio

Temp -5.890106 C
RG 1055.2 mm
memory used 27 %
DB# 1826
DL time 9:49 am
LT time 10:01 am

Personnel & Equipment

Measurement Made By: sm js
Data Entry By: sm Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Rod by fence	1.227	1.162
Water Level Reading:	1.560	1.488
ICE:	1.634	1.568
Transducer Reading & Calc'd El	0.894	0.894
Other:		

Data logger Notes:	Database
Data logger Internal Power:	3.88 V
Data logger External Power:	12.14 V
Data logger Memory Used:	57% Used
Data logger Clock:	Jan 14, 2008 10:25
Laptop Clock:	Jan 14, 2008 10:30 MST
Dessicant:	
Data logger:	Optimum DD128, # 110220411
PT:	Keller 730-130-5 psi #14538
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with Sun Saver Controller

Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Lake
Location: McClelland Lake
Site Name: L1
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

Time of Measurement

Date of Measurement: February 15, 2008
Start Time: 10:25 AM MDT
End Time: MDT

Weather Conditions:

-2, sunny

River Conditions:

Notes:

Temp = -10.928
RH = 81.88
TD m=1.406399 b=0.0533069

Pluvio

Temp -13.7 C
RG 1063 mm
memory used 52 %
DB# 1826
DL time 8:42 am
LT time 9:00 am

Personnel & Equipment

Measurement Made By: sm ss
Data Entry By: sm Checked: sm
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Rod by fence	1.162	1.067
Water Level Reading:	1.486	1.391
ICE:	1.481	1.383
Transducer Reading & Calc'd El	0.976	0.976
Other:		

Data logger Notes:	Database
Data logger Internal Power:	3.88 V
Data logger External Power:	12.19
Data logger Memory Used:	63% Used
Data logger Clock:	Feb 15, 2008 09:25
Laptop Clock:	Feb 15, 2008 09:32 MST
Dessicant:	good
Data logger:	Optimum DD128, # 110220411
PT:	Keller 730-130-5 psi #14538
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with Sun Saver Controller

Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Lake
Location: McClelland Lake
Site Name: L1
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

Time of Measurement

Date of Measurement: March 14, 2008
Start Time: 7:50 AM MDT
End Time:

Weather Conditions:

-24, Cold, Windy Cloudy

River Conditions:

Notes:

Temp = -24 °C
RH = 76.988143

Pluvio

Temp -24 °C
RG 1089.2 mm
memory used 73 %
DB# 1826
DL time 7:34 am
LT time 8:04 am

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: JS Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: Rod by fence	1.250	El: 294.865	1.215 El: 294.865
Water Level Reading:	1.532	El: 294.583	1.495 El: 294.585 294.584
ICE:	1.556	El: 294.559	1.522 El: 294.558
Transducer Reading & Calc'd El	0.748	El: 293.836	0.748 El: 293.838 293.837
Other:		El:	El:

Data logger Notes:	Database
Data logger Internal Power:	3.95 V
Data logger External Power:	11.98
Data logger Memory Used:	6% Used
Data logger Clock:	Mar 14, 2008 07:27 MST
Laptop Clock:	Mar 14, 2008 07:46 MST
Dessicant:	good
Data logger:	Optimum DD128, # 110220411
PT:	Keller 730-130-5 psi #14538
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with Sun Saver Controller

Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Lake
Location: McClelland Lake
Site Name: L1
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

Time of Measurement

Date of Measurement: April 4, 2008
Start Time: 8:05 AM MDT
End Time:

Weather Conditions: Overcast, Light Winds, -18 C

River Conditions:

Notes:

Temp = -18.83458 °C
RH = 48.255002
TBGR counts = 1752

Memory cleared on Pluvio

Pluvio

Temp -20.04 °C
RG 1093.9 mm
memory used 89 %
DB# 1826
DL time 7:01 am
LT time 7:33 am

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: JS Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Rod by fence	1.465	1.460
Water Level Reading:	1.748	1.741
ICE:	1.733	1.730
Transducer Reading & Calc'd El	0.752	0.752
Other:		

Data logger Notes:	Database
Data logger Internal Power:	4V
Data logger External Power:	12.22V
Data logger Memory Used:	9% Used
Data logger Clock:	Apr 04, 2008 07:05 MST
Laptop Clock:	Apr 04, 2008 07:25 MST
Dessicant:	good
Data logger:	Optimum DD128, # 110220411
PT:	Keller 730-130-5 psi #14538
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with Sun Saver Controller

Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Lake
Location: McClelland Lake
Site Name: L1
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

Time of Measurement

Date of Measurement: May 14, 2008
Start Time: 9:03 AM MDT
End Time:

Weather Conditions:

cloudy, light rain, 4 C

Lake Conditions:

75% ice covered

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: Rod by fence	1.037	El: 294.865	1.008 El: 294.865
Water Level Reading:	1.221	El: 294.681	1.187 El: 294.686 294.684
ICE:		El: 295.902	El: 295.873
Transducer Reading & Calc'd El	0.822	El: 293.859	0.822 El: 293.864 293.861
Other:		El:	El:

Notes:

Temp = 8.82 C
RH = 83.55

Transducer cord was pulled, and TD was not on the end of it.
Was taken back to the lockup and sent for repair.

Pluvio

Temp 5.13 °C
RG 1125.6 mm
memory used 31 %
DB# 1862
DL time 7:40 am
LT time 8:04 am

Data logger Notes:	Database
Data logger Internal Power:	4.73 V
Data logger External Power:	12.48 V
Data logger Memory Used:	16% Used
Data logger Clock:	8:30 AM MST
Laptop Clock:	8:41 AM MST
Dessicant:	good
Data logger:	Optimum DD128, # 110220411
PT:	Keller 730-130-5 psi #14538
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with Sun Saver Controller

Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Lake
Location: McClelland Lake
Site Name: L1
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

Time of Measurement

Date of Measurement: June 29, 2008
Start Time: 9:30 AM MDT
End Time:

Weather Conditions:

25C sunny

Lake Conditions:

Notes:

Temp = 19.37 C
RH = 56.08 %

Pluvio

Temp °C
RG mm
memory used %
DB#
DL time am
LT time am

Pluvio count = 1162.1

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: LM Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: IR by fence	1.137	El: 294.865	1.113 El: 294.865
Water Level Reading:	1.407	El: 294.595	1.380 El: 294.598 294.597
ICE:		El:	El:
Transducer Reading & Calc'd El	0.745	El: 293.850	0.745 El: 293.853 293.852
Other:		El:	El:

Data logger Notes:

Data logger Internal Power: 4.96 V
Data logger External Power: 13.62 V
Data logger Memory Used: 66% used
Data logger Clock: 9:26 AM MST
Laptop Clock: 9:36 AM MST
Dessicant:

Data logger:

PT:
Power:

PLUVIO

Data logger Notes:

Data logger Internal Power: 5.44 V
Data logger External Power: 13.8 V
Data logger Memory Used:
Data logger Clock: 8:24 AM MST
Laptop Clock: 7:58 AM MST
Dessicant:

Data logger:

PT:
Power:

Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Lake
Location: McClelland Lake
Site Name: L1
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

Time of Measurement

Date of Measurement: August 9, 2008
Start Time: 9:30 AM MDT
End Time:

Weather Conditions:

Lake Conditions:

Notes:

Temp = 22.5 C
RH = 63.39 %

Pluvio

Temp 16.19 °C
RG 1270.9 mm
memory used 32 %
DB# 1862
DL time am
LT time am

Pluvio count = 1270.9

Transducer re-installed

Personnel & Equipment

Measurement Made By: SM JSL
Data Entry By: SM JSL Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: IR by fence	1.169	El: 294.865	1.138 El: 294.865
Water Level Reading:	1.478	El: 294.556	1.440 El: 294.563 294.560
ICE:		El:	El:
Transducer Reading & Calc'd El	1.180	El: 293.376	1.180 El: 293.383 293.380
Other:		El:	El:

Data logger Notes:

Data logger Internal Power: 5
Data logger External Power: 12.70
Data logger Memory Used: 30% used
Data logger Clock: 7:56 AM MST
Laptop Clock: 8:07 AM MST
Dessicant: new

Data logger: SN# 220411
PT: SN# 25922
Power: solar panel

PLUVIO

Data logger Notes:
Data logger Internal Power: 5.44 V
Data logger External Power: 13.30
Data logger Memory Used: 32%
Data logger Clock: 6:40 AM MST
Laptop Clock: 7:07 AM MST
Dessicant:

Data logger:

Power:

Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Lake
Location: McClelland Lake
Site Name: L1
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

Time of Measurement

Date of Measurement: September 13, 2008
Start Time: 11:30 AM MDT
End Time:

Weather Conditions:

clear, 13 C

Lake Conditions:

open

Notes:

Air Temp = 13.33 C
Humidity = 59.44

Pluvio

Temp 9.01 °C
RG 1359.6 mm
DB# 1862

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: IR by fence	1.142	El: 294.865	1.103 El: 294.865
Water Level Reading:	1.490	El: 294.517	1.451 El: 294.517 294.517
ICE:		El:	El:
Transducer Reading & Calc'd El	1.148	El: 293.369	1.148 El: 293.369 293.369
Other:		El:	El:

Data logger Notes:

Data logger Internal Power: 4.8 V
Data logger External Power: 13.8 V
Data logger Memory Used: 36% used
Data logger Clock: 10:41 AM MST
Laptop Clock: 11:06 AM MST
Dessicant:

Data logger: 198.228.17.26

PT:

Power: solar panel

Data logger Notes:

Data logger Internal Power: 5.44 V
Data logger External Power: 14.68 V
Data logger Memory Used: 27%
Data logger Clock: 10:10 AM MST
Laptop Clock: 10:39 AM MST

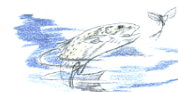
Dessicant:

Data logger:

Power:

Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Lake
Location: McClelland Lake
Site Name: L1
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

Time of Measurement

Date of Measurement: October 21, 2008
Start Time: 11:37 AM MDT
End Time: 11:42 AM MDT

Weather Conditions:

cloud light rain

River Conditions:

low

Personnel & Equipment

Measurement Made By: sm am
Data Entry By: sm Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rod by Pluvia 1.174
Water Level Reading: 1.514
Bench Mark Rod Near PVC
Transducer Reading & Calc'd El. 1.147
Other:

Setup No. 1

El: 294.865
El: 294.527
El: 293.378
El:

Setup No. 2

El: 294.865
El: 294.527
El: 293.380
El:

294.526

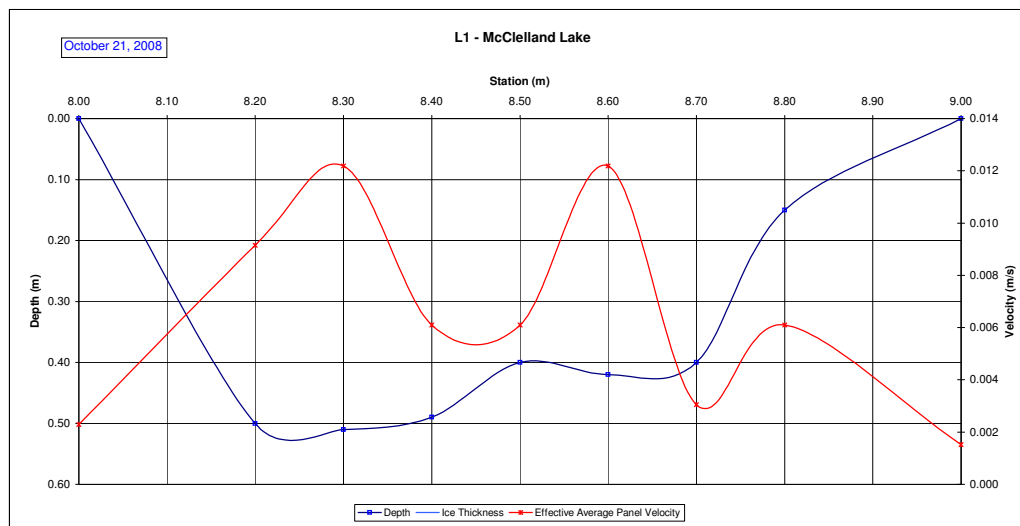
293.379

Measured Data						Measurement Data										Calculated Data				
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)						
RB	8.00	0.00			0.000	1.0	1	8.00	8.17	0.002	0.002	0.13	0.02	0.000	2%					
	8.20	0.50			0.009	1.0	2	8.17	8.25	0.009	0.009	0.50	0.04	0.000	0%					
	8.30	0.51			0.012	1.0	3	8.25	8.35	0.012	0.012	0.51	0.05	0.001	0%					
	8.40	0.49			0.006	1.0	4	8.35	8.45	0.006	0.006	0.49	0.05	0.000	13%					
	8.50	0.40			0.006	1.0	5	8.45	8.55	0.006	0.006	0.40	0.04	0.000	11%					
	8.60	0.42			0.012	1.0	6	8.55	8.65	0.012	0.012	0.42	0.04	0.001	22%					
	8.70	0.40			0.003	1.0	7	8.65	8.75	0.003	0.003	0.40	0.04	0.000	5%					
	8.80	0.15			0.006	1.0	8	8.75	8.80	0.006	0.006	0.15	0.01	0.000	2%					
LB	9.00	0.00			0.000	1.0	9	8.80	9.00	0.002	0.002	0.04	0.01	0.000	1%					
														Total Flow:	0.002					

Total Flow:	0.002	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	0.30	(m ²)
Top Width:	1.00	(m)
Hydraulic Depth:	0.300	(m)
Mean Velocity:	0.008	(m/s)
Froude Number	0.004	
Photographs taken looking at: lake		

Notes: pluvio 12.85v 29% memory
reset new count 0.8mm

Data logger Notes:	Database	607
Data logger Internal Power:	4.71v	
Data logger External Power:	12.18v	
Data logger Memory Used:	43%	Used
Data logger Clock:	Oct 21, 2008 10:17	MST
Laptop Clock:	Oct 21, 2008 10:26	MST
Dessicant:	good	
Data logger:	Optimum DD128, # 110220411	
PT:	Keller 730-130-5 psi #25922	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with Sun Saver Controller	



Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Lake
Location: McClelland Lake
Site Name: L1
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

Time of Measurement

Date of Measurement: December 14, 2008
Start Time: 11:35 AM MST
End Time:

Weather Conditions: cloudy, calm, -31 C

River Conditions: ice-cover

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rod by Pluvial 1.042
Water Level Reading: 1.342
Ice Level Reading: 1.314
Transducer Reading & Calc'd El 1.180
Other:

Setup No. 1

El: 294.865
El: 294.565
El: 294.593
El: 293.385
El:

Setup No. 2

El: 1.004 El: 294.865
El: 1.302 El: 294.567 294.566
El: 1.279 El: 294.590 294.592
El: 1.180 El: 293.387 293.386
El:

Data logger Notes:	Site 411
Data logger Internal Power:	
Data logger External Power:	
Data logger Memory Used:	47% Used
Data logger Clock:	MST
Laptop Clock:	MST
Dessicant:	
Data logger:	Optimum DD128, # 110220411
PT:	Keller 730-130-5 psi #25922
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with Sun Saver Controller

Notes: air temp -24 C PLUVIO: 37.80 mm internal battery 5.4 V
DL 11:32 external batt 13.51 V
LT 11:37
mem 42%

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: [Kearl Lake](#)
 Location: [Kearl Lake](#)
 Site Name: [L2](#)
 Coordinates & Legal: [484935 E, 6349023 N](#) [SE-32-95-8-4](#)

Time of Measurement

Date of Measurement: [January 9, 2008](#)
 Start Time: [10:44 AM](#) [MST](#)
 End Time:

Weather Conditions: [Clear, -27 C](#)

River Conditions: [Ice Cover](#)

Personnel & Equipment

Measurement Made By: [JS/JMS](#)
 Data Entry By: [SMS](#)
 Meter Type and No.:

Level Readings

Bench Mark Reading: rebar in PVC [1.053](#)
 Water Level Reading: [1.720](#)
 Top of Ice Level Reading: [1.682](#)
 Transducer Reading & Est. El.: [0.944](#)
 Other: pipe near logger [0.970](#)

Setup No. 1

El: [332.424](#)
 El: [331.757](#)
 El: [331.795](#)
 El: [330.813](#)
 El: [332.507](#)

Setup No. 2

El: [0.998](#)
 El: [332.424](#)
 El: [331.754](#)
 El: [1.668](#)
 El: [331.781](#)
 El: [1.641](#)
 El: [331.781](#)
 El: [0.944](#)
 El: [330.810](#)
 El: [332.510](#)
 El: [0.912](#)

Average

[331.756](#)
[331.788](#)
[330.812](#)
[332.509](#)

Data logger Notes:		
Data logger Internal Power:	6.78	
Data logger External Power:	76.52	
Data logger Memory Used:	23%	
Data logger Clock:	10:33	MST
Laptop Clock:	10:44	MST
Dessicant:	Good	
Data logger:	105010657	
PT:	303326	
Power:	Magnacharge 20V 10A DC Battery	

Notes: TD reading = 0.943616 RG tips = 133. very slushy ice on lake (see pics) snow gauge low on fluids (below top of tube) added liquids
 IGNORE TIPS FROM 1040 AM to 12 PM (tube may be frozen).
 air temp = -27.45 C, water temp = 0.171, Rel humid = 30.598

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: [Kearl Lake](#)
 Location: [Kearl Lake](#)
 Site Name: [L2](#)
 Coordinates & Legal: [484935 E, 6349023 N](#) [SE-32-95-8-4](#)

Time of Measurement

Date of Measurement: [January 15, 2008](#)
 Start Time: [10:16 AM](#) [MST](#)
 End Time:

Weather Conditions: [Overcast, -17 C](#)

River Conditions: [Ice Cover](#)

Personnel & Equipment

Measurement Made By: [JS/JMS](#)
 Data Entry By: [SMS](#) checked SM
 Meter Type and No.:

Level Readings

Bench Mark Reading: silver pipe by k [0.934](#)
 Water Level Reading: [1.699](#)
 Top of Ice Level Reading: [1.669](#)
 Transducer Reading & Est. El.: [0.936](#)
 Other: bar in white PVC

Setup No. 1

El: [332.509](#)
 El: [331.744](#)
 El: [331.774](#)
 El: [330.808](#)
 El:

Setup No. 2

El: [0.887](#)
 El: [331.739](#)
 El: [331.775](#)
 El: [330.803](#)
 El:

Average

[332.509](#)
[331.742](#)
[331.775](#)
[330.806](#)

Data logger Notes:

Data logger Internal Power: [4.90](#)
 Data logger External Power: [51.30](#)
 Data logger Memory Used: [29%](#)
 Data logger Clock: [10:16](#) [MST](#)
 Laptop Clock: [10:26](#) [MST](#)
 Dessicant: [50% used](#)

Data logger: [105010657](#)
 PT: [303326](#)
 Power: [Magnacharge 20V 10A DC Battery](#)

Notes: 2 Layers of Ice on Lake Air Temp -18.44 C
 Snow Gauge at 363 tips RH 27.6
 Change Dessicant next trip Water Temp -0.288 C

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: **Kearl Lake**
 Location: **Kearl Lake**
 Site Name: **L2**
 Coordinates & Legal: **484935 E, 6349023 N SE-32-95-8-4**

Time of Measurement

Date of Measurement: **February 15, 2008**
 Start Time: **1:38 PM MST**
 End Time: **2:34 PM**

Weather Conditions: **Overcast, -5 C**

River Conditions: **Ice Cover**

Personnel & Equipment

Measurement Made By: **js jvr**
 Data Entry By: **sm** checked SM
 Meter Type and No.:

Level Readings

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: rebar in PVC	0.957	El: 332.424	El: 332.424
Water Level Reading:	1.663	El: 331.718	1.482 El: 331.722
Top of Ice Level Reading:	1.657	El: 331.724	1.477 El: 331.727
Transducer Reading & Est. El.:	0.904	El: 330.814	0.904 El: 330.818
Other: pipe near logger	0.879	El: 332.502	0.702 El: 332.502

Data logger Notes:		
Data logger Internal Power:	6.29	
Data logger External Power:	72.37	
Data logger Memory Used:	31%	
Data logger Clock:	1:38 PM	MST
Laptop Clock:	2:34 PM	MST
Dessicant:	50% used	
Data logger:	105010657	
PT:	303326	
Power:	Magnacharge 20V 10A DC Battery	

OLD LOCATION

Level Readings

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading(tree)	1.950	El: 333.063	1.886 El: 333.063
Water Level Reading:	3.237	El: 331.776	3.168 El: 331.781
Top of Ice Level Reading:	3.245	El: 331.768	3.186 El: 331.763
Transducer Reading & Est. El.:		El: 331.776	El: 331.781
Other: bar in white PVC		El: 335.013	El: 334.949

Notes:

Snow Gauge at 368 tips Air Temp -2.13c
 RH 33.73%
 Water Ten -1.025
 anti freeze good
 only 5 tips since Jan5

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: [Kearl Lake](#)
 Location: [Kearl Lake](#)
 Site Name: [L2](#)
 Coordinates & Legal: [484935 E, 6349023 N](#) [SE-32-95-8-4](#)

Time of Measurement

Date of Measurement: [March 12, 2008](#)
 Start Time: [4:00 PM](#) [MDT](#)
 End Time: [4:30 PM](#)

Weather Conditions:

[-2 C, 0C, Windy](#)

River Conditions:

[Ice Cover](#)

Personnel & Equipment

Measurement Made By: [sm js](#)
 Data Entry By: [sm](#) checked SM
 Meter Type and No.:

Level Readings

Bench Mark Reading: rebar in PVC [0.930](#)
 Water Level Reading: [1.652](#)
 Top of Ice Level Reading: [1.652](#)
 Transducer Reading & Est. El.: [0.898](#)
 Other: pipe near logger [0.852](#)

Setup No. 1

El: [332.424](#)
 El: [331.702](#)
 El: [331.702](#)
 El: [330.804](#)
 El: [332.502](#)

Setup No. 2

El: [332.424](#)
 El: [331.701](#)
 El: [331.703](#)
 El: [330.803](#)
 El: [332.500](#)

Average

[331.702](#)
[331.703](#)
[330.803](#)
[332.501](#)

Data logger Notes:

Data logger Internal Power: [6.25](#)
 Data logger External Power: [73.13](#)
 Data logger Memory Used: [37%](#)
 Data logger Clock: [4:00 PM](#) [MDT](#)
 Laptop Clock: [4:22 PM](#) [MDT](#)
 Dessicant: [good](#)

Data logger: [105010657](#)
 PT: [303326](#)
 Power: [Magnacharge 20V 10A DC Battery](#)

Notes:

Air Temp [-4.989](#)
 RH [33.87%](#)
 Water Temp [-1.2945](#)

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: [Kearl Lake](#)
 Location: [Kearl Lake](#)
 Site Name: [L2](#)
 Coordinates & Legal: [484935 E, 6349023 N](#) [SE-32-95-8-4](#)

Time of Measurement

Date of Measurement: [April 3, 2008](#)
 Start Time: [1:30 PM](#) [MDT](#)
 End Time: [1:45 PM](#)

Weather Conditions: [Overcast, -6 C](#)

River Conditions: [Ice Cover](#)

Personnel & Equipment

Measurement Made By: [sm js](#)
 Data Entry By: [sm](#) checked SM
 Meter Type and No.:

Level Readings

Bench Mark Reading: rebar in PVC [0.931](#)
 Water Level Reading: [1.681](#)
 Top of Ice Level Reading: [1.592](#)
 Transducer Reading & Est. El.: [0.894](#)
 Other: pipe by logger [0.859](#)

Setup No. 1

El: [332.424](#)
 El: [331.674](#)
 El: [331.763](#)
 El: [330.780](#)
 El: [332.496](#)

Setup No. 2

El: [0.827](#)
 El: [1.578](#)
 El: [1.489](#)
 El: [0.894](#)
 El: [0.754](#)

Average

El: [332.424](#)
 El: [331.673](#)
 El: [331.762](#)
 El: [330.779](#)
 El: [332.497](#)

Data logger Notes:		
Data logger Internal Power:	4.94	
Data logger External Power:	12.30	manual check
Data logger Memory Used:	42%	
Data logger Clock:	12:05 PM	MDT
Laptop Clock:	12:29 PM	MDT
Dessicant:	good	
Data logger:	105010657	
PT:	303326	
Power:	Magnacharge 20V 10A DC Battery	

Notes:

Snow Gauge at 512 tips Air Temp [-8.04](#)
 RH [27.47%](#)
 Water Temp [-1.495](#)

 anti freeze good

 level in snow gauge is good

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: [Kearl Lake](#)
 Location: [Kearl Lake](#)
 Site Name: [L2](#)
 Coordinates & Legal: [484935 E, 6349023 N](#) [SE-32-95-8-4](#)

Time of Measurement

Date of Measurement: [May 12, 2008](#)
 Start Time: [6:46 PM](#) [MDT](#)
 End Time:

Weather Conditions:

[sunny, partly cloudy, 6 C](#)

Lake Conditions:

[open](#)

Personnel & Equipment

Measurement Made By: [SS/SM](#)
 Data Entry By: [SS](#) checked SM
 Meter Type and No.:

Level Readings

Bench Mark Reading: rebar in PVC [0.882](#)
 Water Level Reading: [1.325](#)
 Top of Ice Level Reading:
 Transducer Reading & Est. El.: [1.210](#)
 Other: pipe near logger [0.744](#)

Setup No. 1

El: [332.424](#)
 El: [331.981](#)
 El:
 El: [330.771](#)
 El: [332.562](#)

Setup No. 2

[0.865](#) El: [332.424](#)
[1.305](#) El: [331.984](#)
 El:
[1.210](#) El: [330.774](#)
[0.725](#) El: [332.564](#)

Average

[331.983](#)
[330.773](#)
[332.563](#)

Data logger Notes:		
Data logger Internal Power:	4.92 V	
Data logger External Power:	52.09 V	
Data logger Memory Used:	50%	
Data logger Clock:	5:19 PM	MST
Laptop Clock:	5:35 PM	MST
Dessicant:		
Data logger:	105010657	
PT:	303326	
Power:	Magnacharge 20V 10A DC Battery	

Notes:

[TBRG at 556 tips](#)
[Air temp 17 C](#)
[RH at 21.9%](#)
[Water temp @ 4.8 C](#)

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: [Kearl Lake](#)
 Location: [Kearl Lake](#)
 Site Name: [L2](#)
 Coordinates & Legal: [484935 E, 6349023 N](#) [SE-32-95-8-4](#)

Time of Measurement

Date of Measurement: [June 30, 2008](#)
 Start Time: [8:51 AM](#) [MDT](#)
 End Time:

Weather Conditions: [sunny, 24 C](#)

Lake Conditions:

Personnel & Equipment

Measurement Made By: [JMS/SM](#)
 Data Entry By: [LM](#) Checked: [SS](#)
 Meter Type and No.:

Level Readings

Bench Mark Reading: [rebar in PVC](#) [0.942](#)
 Water Level Reading: [1.538](#)
 Top of Ice Level Reading:
 Transducer Reading & Est. El.: [1.043](#)
 Other: [pipe by logger](#) [0.865](#)

Setup No. 1

El: [332.424](#)
 El: [331.828](#)
 El:
 El: [330.785](#)
 El: [332.501](#)

Setup No. 2

[0.926](#) El: [332.424](#)
[1.518](#) El: [331.832](#)
 El:
[1.043](#) El: [330.789](#)
[0.849](#) El: [332.501](#)

Average

[331.830](#)
[330.787](#)
[332.501](#)

Data logger Notes:			
Data logger Internal Power:	4.89 V		
Data logger External Power:	51.89 V	???	
Data logger Memory Used:	61%		
Data logger Clock:	7:38 AM	MST	
Laptop Clock:	7:54 AM	MST	
Dessicant:	good		
Data logger:	0209170657		
PT:	0303326		
Power:			

Notes: [RG at 667 tips](#)
[Air temp 24.589 C](#)
[RH at 29.305%](#)
[Water temp @ 16.617 C](#)

[Site # 657](#)
[memory erased](#)

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: [Kearl Lake](#)
 Location: [Kearl Lake](#)
 Site Name: [L2](#)
 Coordinates & Legal: [484935 E, 6349023 N](#) [SE-32-95-8-4](#)

Time of Measurement

Date of Measurement: [August 11, 2008](#)
 Start Time: [4:00 PM](#) [MDT](#)
 End Time:

Weather Conditions:

[Overcast, +20 C](#)

Lake Conditions:

Personnel & Equipment

Measurement Made By: [JS/SM](#)
 Data Entry By: [JS](#) Checked: [SM](#)
 Meter Type and No.:

Level Readings

Bench Mark Reading: [rebar in PVC](#) [1.325](#)
 Water Level Reading: [1.964](#)
 Top of Ice Level Reading:
 Transducer Reading & Est. El.: [0.465](#)
 Other: [pipe by logger](#) [1.261](#)

Setup No. 1

El: [332.424](#)
 El: [331.785](#)
 El:
 El:
 El: [332.488](#)

Setup No. 2

El: [1.315](#)
 El: [1.955](#)
 El:
 El:
 El: [1.258](#)

Average

[332.424](#)
[331.784](#)

[332.481](#)

[332.485](#)

Data logger Notes:			
Data logger Internal Power:	4.75 V		
Data logger External Power:	50.86 V	???	
Data logger Memory Used:	9%		
Data logger Clock:	3:59 PM	MST	
Laptop Clock:	4:12 PM	MST	
Dessicant:	good/changed		
Data logger:	0209170657		
PT:	0303326		
Power:			

Notes:

RG at 690 tips
 Air temp 20.623 C
 RH at 56.65%
 Water temp @ 18.769 C

Site # 657

fence moved
 geonor post installed

Hydrometric Measurement / Site Visit Record

L2 - Kears Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kears Lake
 Location: Kears Lake
 Site Name: L2
 Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

Time of Measurement

Date of Measurement: September 15, 2008
 Start Time: 3:55 PM MDT
 End Time:

Weather Conditions:

clear calm

Lake Conditions:

lower

Personnel & Equipment

Measurement Made By: JS/SM
 Data Entry By: JS
 Meter Type and No.: Checked: SM

Level Readings

Bench Mark Reading: rebar in PVC 1.300
 Water Level Reading: 1.845
 Top of Ice Level Reading:
 Transducer Reading & Est. El.: 0.447
 Other: pipe by logger 1.240

Setup No. 1

El: 332.424
 El: 331.879
 El:
 El:
 El: 332.484

Setup No. 2

El: 1.285
 El: 1.83
 El:
 El:
 El: 1.23

Average

332.424
 331.879
 331.879
 332.482

Data logger Notes:		
Data logger Internal Power:		
Data logger External Power:		???
Data logger Memory Used:	17%	
Data logger Clock:	1:40 PM	MST
Laptop Clock:	1:54 PM	MST
Dessicant:	good/changed	
Data logger:	0209170657	
PT:	0303326	
Power:		

Notes: count 976
 air temp 20.65
 RH
 water temp 10.6
 Site # 657
 geonor operational

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: **Kearl Lake**
 Location: **Kearl Lake**
 Site Name: **L2**
 Coordinates & Legal: **484935 E, 6349023 N SE-32-95-8-4**

Time of Measurement

Date of Measurement: **October 23, 2008**
 Start Time: **2:40 PM MDT**
 End Time:

Weather Conditions:

clear, sunny, windy

Lake Conditions:

lower

Personnel & Equipment

Measurement Made By: **SM/AM**
 Data Entry By: **LS** Checked: **sm**
 Meter Type and No.:

Level Readings

Bench Mark Reading: **Rebar in PVC 1.178**
 Water Level Reading: **1.740**
 Top of Ice Level Reading:
 Transducer Reading & Est. El.: **0.916**
 Other: **golder rebar 0.259**
 Other: **solnist depth 0.790**

Setup No. 1

El: **332.424**
 El: **331.862**
 El:
 El: **330.946**
 El: **333.343**
 El: **331.072**

Setup No. 2

El: **1.15**
 El: **1.7**
 El:
 El: **0.916**
 El: **0.232**
 El: **0.790**

Average

332.424
331.874

330.958
333.342
331.084
331.868
330.952
333.343
331.078

Data logger Notes:			
Data logger Internal Power:	4.15V		
Data logger External Power:	41.99V		
Data logger Memory Used:	26%		
Data logger Clock:	10:48 AM	MST	
Laptop Clock:	11:02 AM	MST	
Dessicant:	New		
Data logger:	0209170657		
PT:	0303326		
Power:			

must reconcile KCBL rebar in PVC bm to Golder rebar levels
 see October 26, 2007

Notes:

L2 Geonor

Added 6L

Frequency	1297.88	2042.51	Solnist
last min Depth	54.4	255.87	1021780
Hr	46.64	46.64	record rate one hour
New	46.62	255.66	elevation 350m
precip min	-7.77		battery 1005
Precip hr	-0.03		free memory 100%
batt	14.52		

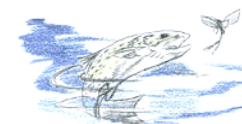
Transducer is not working properly

Water temperature **3.2 C**
 Air temperature **12.13 C**

New TD and new battery installed sn36676

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: [Kearl Lake](#)
 Location: [Kearl Lake](#)
 Site Name: [L2](#)
 Coordinates & Legal: [484935 E, 6349023 N](#) [SE-32-95-8-4](#)

Time of Measurement

Date of Measurement: [December 9, 2008](#)
 Start Time: [11:40 AM](#) [MST](#)
 End Time:

Weather Conditions: [light wind, overcast, -26 C](#)

Lake Conditions: [ice-cover](#)

Personnel & Equipment

Measurement Made By: [SM/SS](#)
 Data Entry By: [SS](#) Checked:
 Meter Type and No.:

Level Readings

Bench Mark Reading: [rebar in PVC](#) [1.422](#)
 Water Level Reading: [1.939](#)
 Top of Ice Level Reading: [1.901](#)
 Transducer Reading & Est. El.: [0.817](#)
 Other: [golder rebar](#) [0.516](#)

Setup No. 1

El: [332.424](#)
 El: [331.907](#)
 El: [331.945](#)
 El: [331.090](#)
 El: [333.330](#)

Setup No. 2

El: [1.394](#)
 El: [1.903](#)
 El: [1.87](#)
 El: [0.817](#)
 El: [0.487](#)

Average

[332.424](#)
[331.915](#)
[331.948](#)
[331.098](#)
[333.331](#)
[331.911](#)
[331.947](#)
[331.094](#)
[333.331](#)

Data logger Notes:			
Data logger Internal Power:	3.89 V		
Data logger External Power:	15.47 V		
Data logger Memory Used:			
Data logger Clock:	11:48 AM	MST	
Laptop Clock:	11:50 AM	MST	
Dessicant:	75 percent		
Data logger:			
PT:			
Power:			

Notes: TD not working for the past month. Solnist backup is still working
 solnist info downloaded and looks good

L2 Geonor: LT: 11:38
 DL: 12:38

Optimum DL Air temp -23.12 C
 RH 40.06 %
 1217 count
 water temp 1.62 C

Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: [Kearl Lake](#)
Location: [Kearl Lake](#)
Site Name: [L2](#)
Coordinates & Legal: [484935 E, 6349023 N](#) [SE-32-95-8-4](#)

Time of Measurement

Date of Measurement: [December 12, 2008](#)
Start Time: [11:53 AM](#) [MST](#)
End Time:

Weather Conditions: [cloudy, -22 C](#)

Lake Conditions: [ice-cover](#)

Personnel & Equipment

Measurement Made By: [SM/SS](#)
Data Entry By: [SS](#) Checked: [SM](#)
Meter Type and No.:

Level Readings

Bench Mark Reading: [1.493](#) rebar in PVC
Water Level Reading: [2.004](#)
Top of Ice Level Reading: [1.979](#)
Transducer Reading & Est. El.: [0.924](#)
Other: [0.581](#) golder rebar
Other: [0.815](#) solnist depth

Setup No. 1

El: [332.424](#)
El: [331.913](#)
El: [331.938](#)
El: [330.989](#)
El: [333.336](#)
El: [331.098](#)

Setup No. 2

El: [1.445](#)
El: [1.958](#)
El: [1.93](#)
El: [0.924](#)
El: [0.533](#)
El: [0.815](#)

Average

[332.424](#)
[331.911](#)
[331.939](#)
[330.987](#)
[333.336](#)
[331.096](#)
[331.912](#)
[331.939](#)
[330.988](#)
[333.336](#)
[331.097](#)

Notes:

battery changed
data downloaded
check depth above to make sure it is not supposed to be 0.942 m

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Isadore's Lake
 Location: Isadore's Lake
 Site Name: L3
 Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

Time of Measurement

Date of Measurement: January 12, 2008
 Start Time: 12:50 PM MST
 End Time: 1:00 PM MST

Weather Conditions:

overcast, ice cover, - 15

Personnel & Equipment

Measurement Made By: JMS, JS
 Data Entry By: JMS Checked: SM
 Meter Type and No.: Marsh McBirney FloMate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: bar in PVC 1.932
 Water Level Reading: 2.739
 Top of Ice Level Reading: 2.745
 Transducer Reading & Calc'd El 0.945
 Other: Nail in tree 0.533

Setup No. 1

El: 234.506
 El: 233.699
 El: 233.693
 El: 232.754
 El: 235.905

Setup No. 2

El: 234.506
 El: 233.695
 El: 233.689
 El: 232.750
 El: 236.318

Average

233.697
 232.752

Data logger Notes:

Data logger Internal Power: 100% 11.34V
 Data logger External Power: 77% 11.92V
 Data logger Memory Used: 13%
 Data logger Clock: Jan 12, 2008 12:58 MST
 Laptop Clock: Jan 13, 2008 13:04 MST
 Dessicant: 10% used
 Data logger: 94834-08
 PT: 509001-288
 Power: Battery

Photographs taken looking at:

Lake

Notes:

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Isadore's Lake
 Location: Isadore's Lake
 Site Name: L3
 Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

Time of Measurement

Date of Measurement: February 15, 2008
 Start Time: 12:25 PM MST
 End Time: MST

Weather Conditions:

overcast, ice cover, - 5

Personnel & Equipment

Measurement Made By: sm sms
 Data Entry By: sm Checked: sm
 Meter Type and No.: Marsh McBirney FloMate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: bar in PVC 2.017
 Water Level Reading: 2.805
 Top of Ice Level Reading: 2.807
 Transducer Reading & Calc'd El 0.972
 Other: Nail in tree 0.616

Setup No. 1

El: 234.506
 El: 233.718
 El: 233.716
 El: 232.746
 El: 235.907

Setup No. 2

El: 234.506
 El: 233.724
 El: 233.719
 El: 232.752
 El: 235.909

Average

233.721
 232.749
 235.908

Data logger Notes:

Data logger Internal Power: 100% 11.34V
 Data logger External Power: 11.8v
 Data logger Memory Used: 25%
 Data logger Clock: MST
 Laptop Clock: Feb 05, 2008 12:31 MST
 Dessicant: good
 Data logger: 94834-08
 PT: 509001-288
 Power: Battery

Photographs taken looking at:

Lake

Notes:

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Isadore's Lake
 Location: Isadore's Lake
 Site Name: L3
 Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

Time of Measurement

Date of Measurement: March 14, 2008
 Start Time: 11:35 AM MDT
 End Time:

Weather Conditions:

Ice Cover

Personnel & Equipment

Measurement Made By: JS/SM
 Data Entry By: JS Checked: SS
 Meter Type and No.: Marsh McBirney FloMate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: bar in PVC 1.601
 Water Level Reading: 2.346
 Top of Ice Level Reading: 2.395
 Transducer Reading & Calc'd El 0.999
 Other: Nail in tree 0.198

Setup No. 1

El: 234.506
 El: 233.761
 El: 233.712
 El: 232.762
 El: 235.909

Setup No. 2

El: 234.506
 El: 233.758
 El: 233.707
 El: 232.759
 El: 235.907

Average

233.760
 232.761
 235.908

Data logger Notes:

Data logger Internal Power: 100% 11.34V
 Data logger External Power: 75% 11.68V
 Data logger Memory Used: 15% used
 Data logger Clock: Mar 14, 2008 11:07 MST
 Laptop Clock: Mar 14, 2008 11:30 MST
 Dessicant: Bad, Changed
 Data logger: 94834-08
 PT: 509001-288
 Power: Battery

Photographs taken looking at:

Lake

Notes:

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Isadore's Lake
 Location: Isadore's Lake
 Site Name: L3
 Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

Time of Measurement

Date of Measurement: April 4, 2008
 Start Time: 11:45 AM MDT
 End Time:

Weather Conditions:

Ice Cover
 -10°C, Clear skies, Sunny, Moderate Winds

Personnel & Equipment

Measurement Made By: JS/SM
 Data Entry By: JS Checked: SS
 Meter Type and No.: Marsh McBirney FloMate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: bar in PVC 2.075
 Water Level Reading: 2.830
 Top of Ice Level Reading: 2.793
 Transducer Reading & Calc'd El 1.005
 Other: Nail in tree 0.675

Setup No. 1

El: 234.506
 El: 233.751
 El: 233.788
 El: 232.746
 El: 235.906

Setup No. 2

El: 234.506
 El: 233.755
 El: 233.787
 El: 232.750
 El: 235.907

Average

233.753
 232.748
 235.907

Data logger Notes:

Data logger Internal Power: 100% 11.34V
 Data logger External Power: 74% 11.56V
 Data logger Memory Used: 20% used
 Data logger Clock: Apr 04, 2008 11:36 MST
 Laptop Clock: Apr 04, 2008 12:01 MST
 Dessicant: Good
 Data logger: 94834-08
 PT: 509001-288
 Power: Battery

Photographs taken looking at:

Lake

Notes:

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Isadore's Lake
 Location: Isadore's Lake
 Site Name: L3
 Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

Time of Measurement

Date of Measurement: June 27, 2008
 Start Time: 2:30 PM MDT
 End Time:

Weather Conditions:

25°C, Sunny

Personnel & Equipment

Measurement Made By: JMS/SM
 Data Entry By: LM Checked: SS

Level Readings

Bench Mark Reading: iron rod 1.965
 Water Level Reading: 2.472
 Top of Ice Level Reading:
 Transducer Reading & Calc'd El 1.168
 Other: nail in tree 0.466

Setup No. 1

El: 234.506
 El: 233.901
 El:
 El: 232.733
 El: 235.907
 236.005

Setup No. 2

El: 234.506
 El: 233.894
 El:
 El: 232.726
 El: 235.907

Average

233.898
 232.730
 235.907

Data logger Notes:

Data logger Internal Power: 100% 11.34V
 Data logger External Power: 76% 11.68V
 Data logger Memory Used: 3% used
 Data logger Clock: 1:26 PM MST
 Laptop Clock: 1:42 PM MST
 Dessicant: Good
 Data logger: 94834-08
 PT: 509001-288
 Power: Battery

Photographs taken looking at:

Notes:

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Isadore's Lake
 Location: Isadore's Lake
 Site Name: L3
 Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

Time of Measurement

Date of Measurement: August 8, 2008
 Start Time: 2:30 PM MDT
 End Time:

Weather Conditions:

Sunny 30 C

Personnel & Equipment

Measurement Made By: SM/JS
 Data Entry By: SS Checked: sm

Level Readings

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: iron rod	1.811	1.782	
Water Level Reading:	2.434	2.400	233.886
Top of Ice Level Reading:			
Transducer Reading & Calc'd El	1.189	1.189	232.696
Other: nail in tree	0.415	0.386	235.902

Data logger Notes:

Data logger Internal Power: 100% 11.34V
 Data logger External Power: 80% 12.41 V
 Data logger Memory Used: 45% used
 Data logger Clock: 1:14 PM MST
 Laptop Clock: 1:30 PM MST
 Dessicant: New
 Data logger: 94834-08
 PT: 509001-288
 Power: Battery

Photographs taken looking at:

Notes:

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Isadore's Lake
 Location: Isadore's Lake
 Site Name: L3
 Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

Time of Measurement

Date of Measurement: September 14, 2008
 Start Time: 2:51 PM MDT
 End Time:

Weather Conditions:

overcast, 15 C

Personnel & Equipment

Measurement Made By: SM/SS
 Data Entry By: SS Checked: sm

Level Readings

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: iron rod	1.788	1.752	
Water Level Reading:	2.367	2.337	233.924
Top of Ice Level Reading:			
Transducer Reading & Calc'd El	1.190	1.190	232.734
Other: nail in tree	0.391	0.353	235.904

Notes:

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.04 V	77%
Data logger Memory Used:	10%	
Data logger Clock:	1:50 PM	MST
Laptop Clock:	1:51 PM	MST
Dessicant:	3/4 good	
Data logger:	94834-08	
PT:	509001-288	
Power:	Battery	

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Isadore's Lake
 Location: Isadore's Lake
 Site Name: L3
 Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

Time of Measurement

Date of Measurement: October 14, 2008
 Start Time:
 End Time:

Weather Conditions:

Partly cloudy

Personnel & Equipment

Measurement Made By: sm jsl
 Data Entry By: sm Checked: DW

Level Readings

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: iron rod	1.800	1.775	
Water Level Reading:	2.367	2.342	233.939
Top of Ice Level Reading:			
Transducer Reading & Calc'd El	1.207	1.207	232.732
Other: nail in tree	0.398	0.372	235.909

Notes: Lake open

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	11.92 V	78%
Data logger Memory Used:	10%	
Data logger Clock:	2:40 PM	MST
Laptop Clock:	2:42 PM	MST
Dessicant:	ok	
Data logger:	94834-08	
PT:	509001-288	
Power:	Battery	

Hydrometric Measurement / Site Visit Record

Jackpine Creek at Canterra Road - S2



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: S2
Site Name: Jackpine Creek at Canterra Road
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: January 9, 2008
Start Time: 1:40 PM MST
End Time: 2:10 PM MST

Weather Conditions:

Sunny, -20 C
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: JS/MS
Data Entry By: SMS checked SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

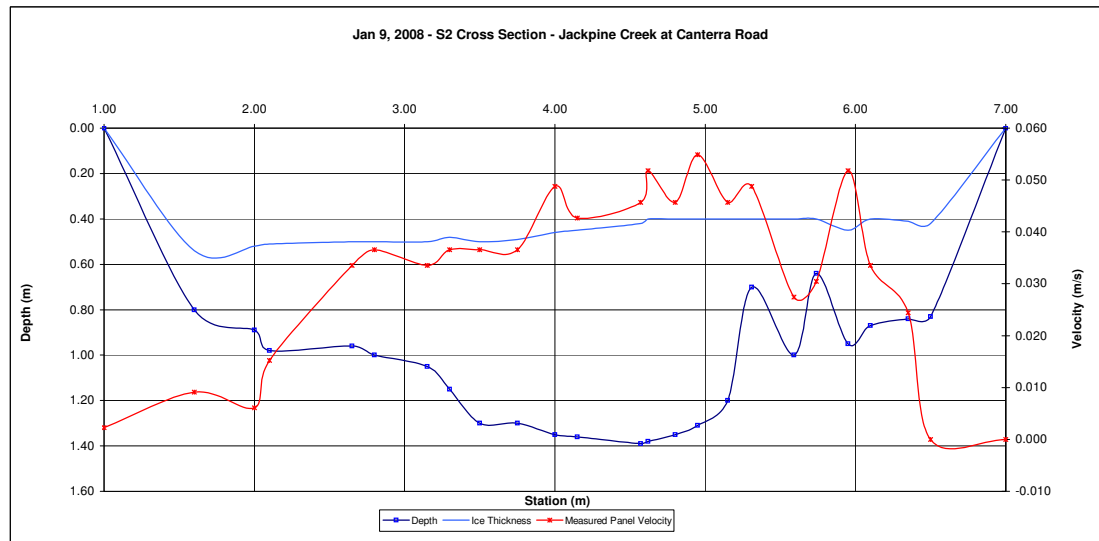
Bench Mark Reading: 0.698 El.: 297.990
Water Level Reading: 1.937 El.: 296.751
Top of Ice Level Reading: 1.798 El.: 296.890
Transducer Reading & Est. El.: 0.358 El.: 296.393
Other: El.: 296.748
Average: 296.750
Average: 296.891
Average: 296.392

		Measurement Data														
Measured Data							Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	1.00	0.00	0.00		0.000	0.90	1	1.00	1.30	0.002	0.002	0.07	0.02	0.000	0%	
	1.60	0.80	0.54		0.009	0.90	2	1.30	1.80	0.009	0.008	0.26	0.13	0.001	1%	
	2.00	0.89	0.52		0.006	0.90	3	1.80	2.05	0.006	0.005	0.37	0.09	0.001	0%	
	2.10	0.98	0.51		0.015	0.90	2	2.05	2.38	0.015	0.014	0.47	0.15	0.002	2%	
	2.65	0.96	0.50		0.034	0.90	3	2.38	2.73	0.034	0.030	0.46	0.16	0.005	5%	
	2.80	1.00	0.50		0.037	0.90	4	2.73	2.98	0.037	0.033	0.50	0.13	0.004	4%	
	3.15	1.05	0.50		0.034	0.90	3	2.98	3.23	0.034	0.030	0.55	0.14	0.004	4%	
	3.30	1.15	0.48		0.037	0.90	4	3.23	3.40	0.037	0.033	0.67	0.12	0.004	4%	
	3.50	1.30	0.50		0.037	0.90	5	3.40	3.63	0.037	0.033	0.80	0.18	0.006	6%	
	3.75	1.30	0.49		0.037	0.90	4	3.63	3.88	0.037	0.033	0.81	0.20	0.007	7%	
	4.00	1.35	0.46		0.049	0.90	5	3.88	4.08	0.049	0.044	0.89	0.18	0.008	8%	
	4.15	1.36	0.45		0.043	0.90	6	4.08	4.36	0.043	0.038	0.91	0.26	0.010	10%	
	4.57	1.39	0.42		0.046	0.90	5	4.36	4.60	0.046	0.041	0.97	0.23	0.009	9%	
	4.62	1.38	0.40		0.052	0.90	6	4.60	4.71	0.052	0.047	0.98	0.11	0.005	5%	
	4.80	1.35	0.40		0.046	0.90	7	4.71	4.88	0.046	0.041	0.95	0.16	0.006	6%	
	4.95	1.31	0.40		0.055	0.90	6	4.88	5.05	0.055	0.049	0.91	0.16	0.008	8%	
	5.15	1.20	0.40		0.046	0.90	7	5.05	5.23	0.046	0.041	0.80	0.14	0.006	6%	
	5.31	0.70	0.40		0.049	0.90	8	5.23	5.45	0.049	0.044	0.30	0.07	0.003	3%	
	5.59	1.00	0.40		0.027	0.90	7	5.45	5.67	0.027	0.025	0.60	0.13	0.003	3%	
	5.74	0.64	0.40		0.030	0.90	8	5.67	5.85	0.030	0.027	0.24	0.04	0.001	1%	
5.95	0.95	0.45		0.052	0.90	9	5.85	6.03	0.052	0.047	0.50	0.09	0.004	4%		
6.10	0.87	0.40		0.034	0.90	8	6.03	6.23	0.034	0.030	0.47	0.09	0.003	3%		
6.35	0.84	0.41		0.024	0.90	9	6.23	6.43	0.024	0.022	0.43	0.09	0.002	2%		
6.50	0.83	0.42		0.000	0.90	10	6.43	6.75	0.000	0.000	0.41	0.13	0.000	0%		
7.00	0.00	0.00			0.000	0.90	9	6.75	7.00	0.000	0.000	0.10	0.03	0.000	0%	
LB																
	Total Flow:													0.102	1.000	

Total Flow:	0.102	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	3.22	(m ²)
Top Width:	6.00	(m)
Hydraulic Depth:	0.537	(m)
Mean Velocity:	0.032	(m/s)
Froude Number	0.014	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:	
Data logger Internal Power:	Main: 100%
Data logger External Power:	Aux: 73%
Data logger Memory Used:	15%
Data logger Clock:	12:59
Laptop Clock:	13:04
Dessicant:	Good
Data logger:	206095
PT:	971024
Power:	Battery

Notes: TD reading = 0.3577
Ice thickness at transducer was only 5 centimeters thick.



Hydrometric Measurement / Site Visit Record

Jackpine Creek at Canterra Road - S2



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: S2
Site Name: Jackpine Creek at Canterra Road
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: February 16, 2008
Start Time: 10:30 AM MST
End Time: 11:00 AM MST

Weather Conditions:

Overcast, -13 C
Ice Cover

Personnel & Equipment

Measurement Made By: SMS/JS/JVR
Data Entry By: SMS checked SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.921
Water Level Reading: 2.173
Top of Ice Level Reading: 2.011
Transducer Reading & Est. El.: 0.319
Other:

Setup No. 1

El: 297.990 0.896
El: 296.738 2.154
El: 296.900 1.977
El: 296.419 0.319

Setup No. 2

El: 297.990
El: 296.732
El: 296.909
El: 296.413

Setup No. 3

El: 297.990
El: 296.733
El: 296.903
El: 296.414

Average

296.734
296.903
296.415

Measured Data						Measurement Data										Calculated Data					Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge							
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)							
21.10	0.00	0.00			0.90	1	21.10	20.58	0.001	0.001	0.02	0.01	0.000	0							
20.05	0.27	0.18			0.003	0.90	2	20.58	19.88	0.003	0.003	0.09	0.06	0.000	0						
19.70	0.48	0.18			0.018	0.90	3	19.88	19.63	0.018	0.016	0.30	0.08	0.001	4						
19.55	0.53	0.15			0.003	0.90	4	19.63	19.38	0.003	0.003	0.38	0.10	0.000	1						
19.20	0.74	0.19			0.009	0.90	5	19.38	19.13	0.009	0.008	0.55	0.14	0.001	3						
19.05	0.75	0.16			0.006	0.90	6	19.13	18.93	0.006	0.005	0.59	0.12	0.001	2						
18.80	0.92	0.20			0.015	0.90	7	18.93	18.73	0.015	0.014	0.72	0.14	0.002	6						
18.65	0.96	0.19			0.012	0.90	8	18.73	18.50	0.012	0.011	0.77	0.17	0.002	5						
18.35	1.09	0.20			0.015	0.90	9	18.50	18.28	0.015	0.014	0.89	0.20	0.003	8						
18.20	1.10	0.20			0.012	0.90	10	18.28	18.05	0.012	0.011	0.90	0.20	0.002	6						
17.90	1.20	0.23			0.015	0.90	11	18.05	17.83	0.015	0.014	0.97	0.22	0.003	9						
17.75	1.18	0.24			0.018	0.90	12	17.83	17.60	0.018	0.016	0.94	0.21	0.003	10						
17.45	1.14	0.25			0.015	0.90	13	17.60	17.38	0.015	0.014	0.89	0.20	0.003	8						
17.30	1.10	0.25			0.018	0.90	14	17.38	17.20	0.018	0.016	0.85	0.15	0.002	7						
17.10	1.05	0.25			0.015	0.90	15	17.20	17.03	0.015	0.014	0.80	0.14	0.002	6						
16.95	1.02	0.27			0.012	0.90	16	17.03	16.85	0.012	0.011	0.75	0.13	0.001	4						
16.75	1.08	0.27			0.006	0.90	17	16.85	16.68	0.006	0.005	0.81	0.14	0.001	2						
16.60	1.07	0.28			0.009	0.90	18	16.68	16.50	0.009	0.008	0.79	0.14	0.001	3						
16.40	0.98	0.27			0.009	0.90	19	16.50	16.33	0.009	0.008	0.71	0.12	0.001	3						
16.25	1.11	0.25			0.006	0.90	20	16.33	16.15	0.006	0.005	0.86	0.15	0.001	2						
16.05	1.05	0.25			0.003	0.90	21	16.15	15.98	0.003	0.003	0.80	0.14	0.000	1						
15.90	1.00	0.25			0.009	0.90	22	15.98	15.75	0.009	0.008	0.75	0.17	0.001	4						
15.60	1.13	0.24			0.003	0.90	23	15.75	15.53	0.003	0.003	0.89	0.20	0.001	2						
15.45	1.09	0.25			0.90	24	15.53	15.33	0.000	0.000	0.84	0.17	0.000	0							
15.20	1.10	0.26			0.003	0.90	25	15.33	15.13	0.003	0.003	0.84	0.17	0.000	1						
15.05	0.97	0.25			0.006	0.90	26	15.13	14.88	0.006	0.005	0.72	0.18	0.001	3						
14.70	0.70	0.21			0.90	27	14.88	14.25	0.000	0.000	0.49	0.31	0.000	0							
13.80	0.00	0.00			0.90	28	14.25	13.80	0.000	0.000	0.12	0.06	0.000	0							
Total Flow:														0.035	1.000						

Total Flow:	0.035	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	4.21	(m ²)
Top Width:	7.30	(m)
Hydraulic Depth:	0.577	(m)
Mean Velocity:	0.008	(m/s)
Froude Number:	0.003	
Photographs taken looking at:		
Photographs taken:		

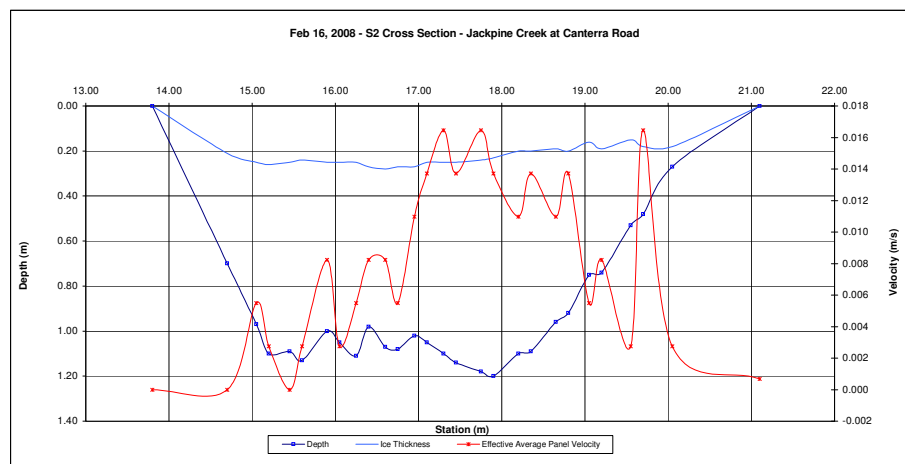
Data logger Notes:

Data logger Internal Power: Main: 100% 11.34
Data logger External Power: Aux 74% 11.6
Data logger Memory Used: 20%
Data logger Clock: 09:43 MST
Laptop Clock: 09:53 MST
Dessicant: Good

Data logger:

PT: 971024
Power: Battery

Notes: Thermistor = 0.0298 C



Hydrometric Measurement / Site Visit Record

Jackpine Creek at Canterra Road - S2



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: S2
Site Name: Jackpine Creek at Canterra Road
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: March 8, 2008
Start Time: 10:32 AM MST
End Time: 10:45 AM MST

Weather Conditions:

River Conditions: Ice Covered

Personnel & Equipment

Measurement Made By: SMS/JS
Data Entry By: LMM checked SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.023
Water Level Reading: 2.253
Top of Ice Level Reading: 2.097
Transducer Reading & Est. El.: 0.319
Other:

Setup No. 1

El: 297.990
El: 296.760
El: 296.916
El: 296.441
El:

Setup No. 2

El: 297.990
El: 296.759
El: 296.922
El: 296.440
El:

Average

296.760
296.922
296.440

Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	0.00	0.00	0.00		0.000	0.90	1	0.00	0.48	0.008	0.008	0.04	0.02	0.000	0%	
	0.95	0.20	0.04		0.034	0.90	2	0.48	1.13	0.034	0.030	0.16	0.10	0.003	10%	
	1.30	0.30	0.17		0.018	0.90	3	1.13	1.51	0.018	0.016	0.13	0.05	0.001	3%	
	1.72	0.40	0.21		0.030	0.90	4	1.51	1.88	0.030	0.027	0.19	0.07	0.002	6%	
	2.03	0.25	0.19		0.021	0.90	5	1.88	2.23	0.021	0.019	0.06	0.02	0.000	1%	
	2.42	0.47	0.22		0.055	0.90	6	2.23	2.66	0.055	0.049	0.25	0.11	0.005	16%	
	2.90	0.53	0.29		0.030	0.90	7	2.66	3.11	0.030	0.027	0.24	0.11	0.003	9%	
	3.31	0.45	0.30		0.027	0.90	8	3.11	3.51	0.027	0.025	0.15	0.06	0.001	5%	
	3.70	0.57	0.33		0.027	0.90	9	3.51	3.78	0.027	0.025	0.24	0.06	0.002	5%	
	3.85	0.60	0.35		0.027	0.90	10	3.78	3.98	0.027	0.025	0.25	0.05	0.001	4%	
	4.10	0.65	0.35		0.055	0.90	11	3.98	4.20	0.055	0.049	0.30	0.07	0.003	10%	
	4.30	0.64	0.35		0.055	0.90	12	4.20	4.47	0.055	0.049	0.29	0.08	0.004	12%	
	4.63	0.57	0.35		0.040	0.90	13	4.47	4.72	0.040	0.036	0.22	0.06	0.002	6%	
	4.80	0.55	0.34		0.034	0.90	14	4.72	4.93	0.034	0.030	0.21	0.04	0.001	4%	
	5.05	0.52	0.34		0.030	0.90	15	4.93	5.13	0.030	0.027	0.18	0.04	0.001	3%	
	5.20	0.54	0.32		0.027	0.90	16	5.13	5.36	0.027	0.025	0.22	0.05	0.001	4%	
	5.51	0.50	0.29		0.015	0.90	17	5.36	5.59	0.015	0.014	0.21	0.05	0.001	2%	
	5.66	0.44	0.25		0.009	0.90	18	5.59	5.88	0.009	0.008	0.19	0.06	0.000	1%	
	RB	6.10	0.31	0.25		0.009	0.90	19	5.88	6.10	0.002	0.002	0.05	0.01	0.000	0%
Total Flow:														0.033	1.000	

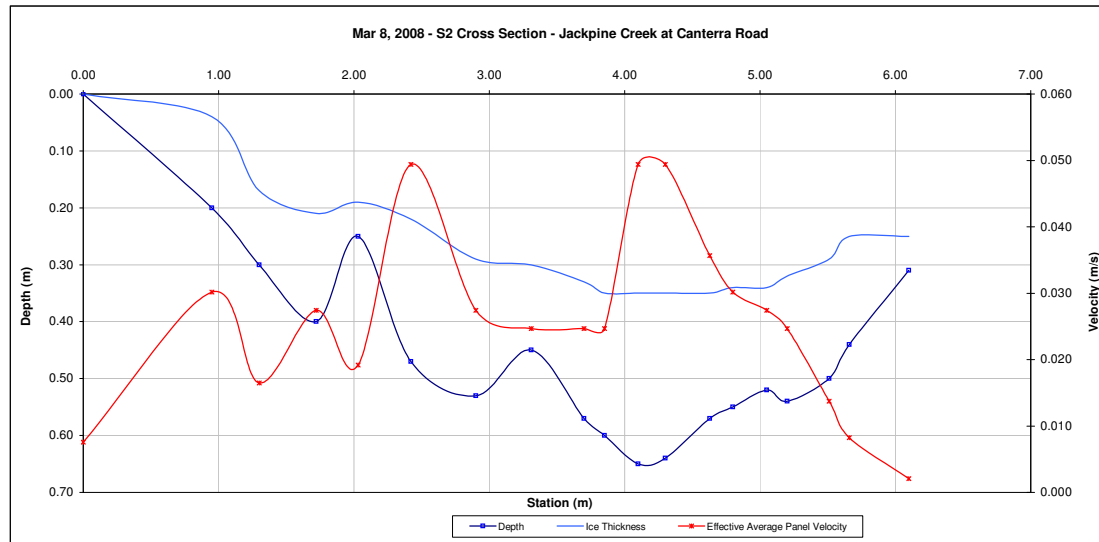
Total Flow:	0.033	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.10	(m ²)
Top Width:	6.10	(m)
Hydraulic Depth:	0.180	(m)
Mean Velocity:	0.030	(m/s)
Froude Number	0.022	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power: Main: 100% 11.34
Data logger External Power: Aux 74% 11.6
Data logger Memory Used: 25%
Data logger Clock: 09:42 MST
Laptop Clock: 10:04 MST
Dessicant: 70% used

Data logger: 105010269
PT: 101345
Power:

Notes: Data downloaded, changed dessicant.



Hydrometric Measurement / Site Visit Record

Jackpine Creek at Canterra Road - S2



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: S2
Site Name: Jackpine Creek at Canterra Road
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: April 1, 2008
Start Time: 9:49 AM MST
End Time: 10:11 AM MST

Weather Conditions:

River Conditions: Ice Covered

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: SM checked SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.799
Water Level Reading: 2.074
Top of Ice Level Reading: 1.855
Transducer Reading & Est. El.: 0.313
Other:

Setup No. 1

El: 297.990
El: 296.715
El: 296.934
El: 296.402
El:

Setup No. 2

El: 297.990
El: 296.715
El: 296.934
El: 296.402
El:

Average

296.715
296.934
296.402

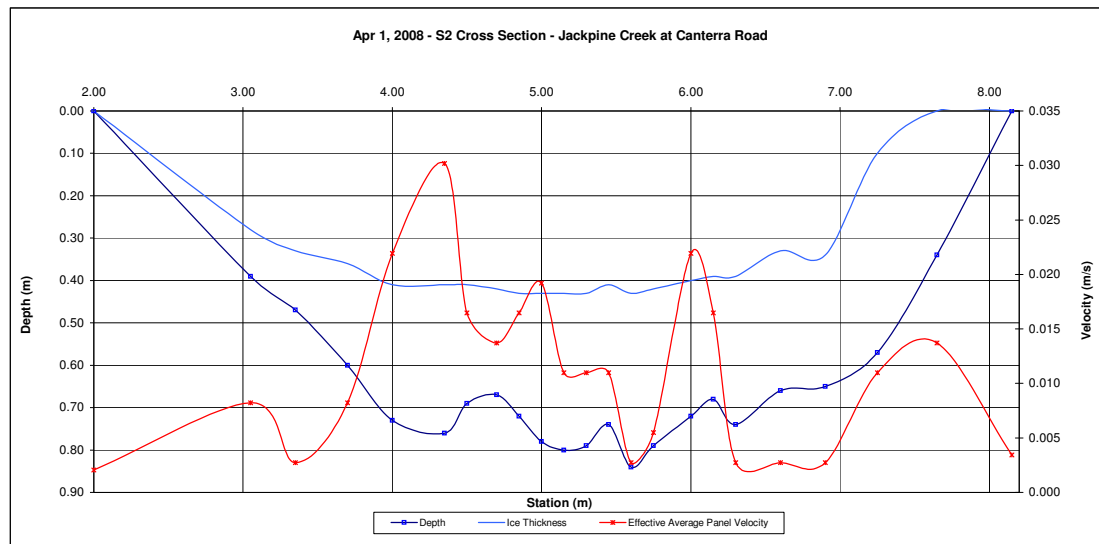
Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	2.00	0.00	0.00		0.000	0.90	1	2.00	2.53	0.002	0.002	0.03	0.01	0.000	0%	
	3.05	0.39	0.28		0.009	0.90	2	2.53	3.20	0.009	0.008	0.11	0.07	0.001	4%	
	3.35	0.47	0.33		0.003	0.90	3	3.20	3.53	0.003	0.003	0.14	0.05	0.000	1%	
	3.70	0.60	0.36		0.009	0.90	4	3.53	3.85	0.009	0.008	0.24	0.08	0.001	4%	
	4.00	0.73	0.41		0.024	0.90	5	3.85	4.18	0.024	0.022	0.32	0.10	0.002	13%	
	4.35	0.76	0.41		0.034	0.90	6	4.18	4.43	0.034	0.030	0.35	0.09	0.003	15%	
	4.50	0.69	0.41		0.018	0.90	7	4.43	4.60	0.018	0.016	0.28	0.05	0.001	5%	
	4.70	0.67	0.42		0.015	0.90	8	4.60	4.78	0.015	0.014	0.25	0.04	0.001	3%	
	4.85	0.72	0.43		0.018	0.90	9	4.78	4.93	0.018	0.016	0.29	0.04	0.001	4%	
	5.00	0.78	0.43		0.021	0.90	10	4.93	5.08	0.021	0.019	0.35	0.05	0.001	6%	
	5.15	0.80	0.43		0.012	0.90	11	5.08	5.23	0.012	0.011	0.37	0.06	0.001	4%	
	5.30	0.79	0.43		0.012	0.90	12	5.23	5.38	0.012	0.011	0.36	0.05	0.001	3%	
	5.45	0.74	0.41		0.012	0.90	13	5.38	5.53	0.012	0.011	0.33	0.05	0.001	3%	
	5.60	0.84	0.43		0.003	0.90	14	5.53	5.68	0.003	0.003	0.41	0.06	0.000	1%	
	5.75	0.79	0.42		0.006	0.90	15	5.68	5.88	0.006	0.005	0.37	0.07	0.000	2%	
	6.00	0.72	0.40		0.024	0.90	16	5.88	6.08	0.024	0.022	0.32	0.06	0.001	8%	
	6.15	0.68	0.39		0.018	0.90	17	6.08	6.23	0.018	0.016	0.29	0.04	0.001	4%	
	6.30	0.74	0.39		0.003	0.90	18	6.23	7.14	0.003	0.003	0.35	0.32	0.001	5%	
	6.60	0.66	0.33		0.003	0.90	19	7.14	7.31	0.003	0.003	0.33	0.06	0.000	1%	
	6.90	0.65	0.34		0.003	0.90	20	7.31	7.49	0.003	0.003	0.31	0.06	0.000	1%	
	7.25	0.57	0.10		0.012	0.90	21	7.49	7.68	0.012	0.011	0.47	0.09	0.001	6%	
	7.65	0.34	0.00		0.015	0.90	22	7.68	7.90	0.015	0.014	0.34	0.07	0.001	6%	
	RB	8.15	0.00	0.00		0.000	0.90	23	7.14	8.15	0.004	0.003	0.09	0.09	0.000	2%
Total Flow:														0.017	100%	

Total Flow:	0.017	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.68	(m ²)
Top Width:	6.15	(m)
Hydraulic Depth:	0.273	(m)
Mean Velocity:	0.010	(m/s)
Froude Number	0.006	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:		
Data logger Internal Power:	Main: 100%	11.34
Data logger External Power:	Aux 74%	11.6
Data logger Memory Used:	15%	
Data logger Clock:	09:49	MST
Laptop Clock:	10:11	MST
Dessicant:	good	
Data logger:		
PT:	101345	
Power:		

Notes: water temp 0.0475



Hydrometric Measurement / Site Visit Record

Jackpine Creek at Canterra Road - S2



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: S2
Site Name: Jackpine Creek at Canterra Road
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: May 12, 2008
Start Time: 5:20 PM MDT
End Time: 5:48 PM MDT

Weather Conditions:

clear, calm, 8 C
River Conditions: high, fast flow, open, turbulent

Personnel & Equipment

Measurement Made By: SS/SM checked SM
Data Entry By: SS Checked:
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.740
Water Level Reading: 1.343
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.988
Other:

Setup No. 1

El: 297.990
El: 297.387
El: 298.730
El: 296.399
El:

Setup No. 2

El: 297.990
El: 297.392
El: 298.689
El: 296.404
El:

Average

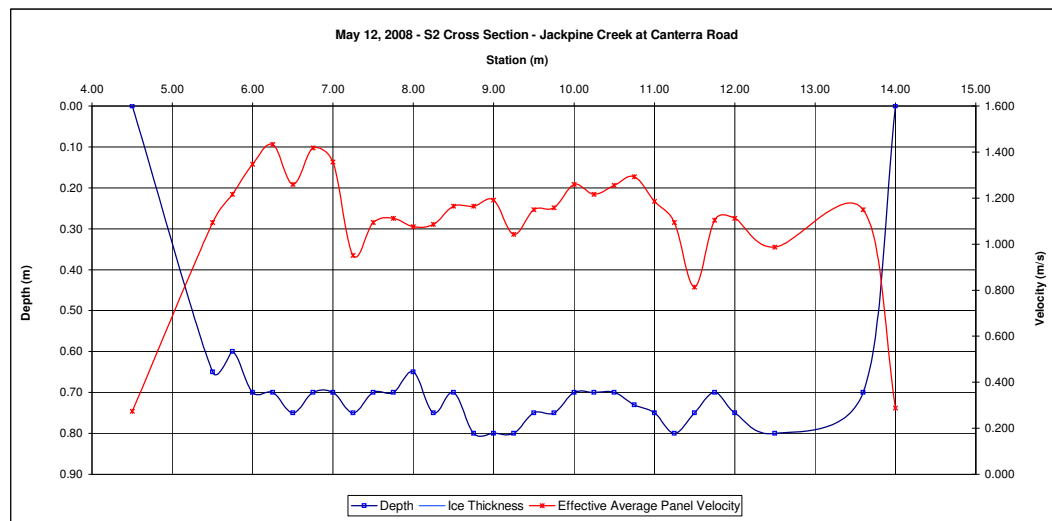
297.390
298.689
296.404

Measured Data							Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)						
4.50	0.00					1.00	1	4.50	5.00	0.274	0.274	0.16	0.08	0.022	0%					
5.50	0.65				1.094	1.00	2	5.00	5.63	1.094	1.094	0.65	0.41	0.445	6%					
5.75	0.60				1.216	1.00	3	5.63	5.88	1.216	1.216	0.60	0.15	0.182	2%					
6.00	0.70				1.347	1.00	4	5.88	6.13	1.347	1.347	0.70	0.18	0.236	3%					
6.25	0.70				1.433	1.00	5	6.13	6.38	1.433	1.433	0.70	0.18	0.251	3%					
6.50	0.75				1.259	1.00	6	6.38	6.63	1.259	1.259	0.75	0.19	0.236	3%					
6.75	0.70				1.417	1.00	7	6.63	6.88	1.417	1.417	0.70	0.18	0.248	3%					
7.00	0.70				1.356	1.00	8	6.88	7.13	1.356	1.356	0.70	0.18	0.237	3%					
7.25	0.75				0.951	1.00	9	7.13	7.38	0.951	0.951	0.75	0.19	0.178	2%					
7.50	0.70				1.094	1.00	10	7.38	7.63	1.094	1.094	0.70	0.18	0.191	3%					
7.75	0.70				1.113	1.00	11	7.63	7.88	1.113	1.113	0.70	0.18	0.195	3%					
8.00	0.65				1.076	1.00	12	7.88	8.13	1.076	1.076	0.65	0.16	0.175	2%					
8.25	0.75				1.085	1.00	13	8.13	8.38	1.085	1.085	0.75	0.19	0.203	3%					
8.50	0.70				1.164	1.00	14	8.38	8.63	1.164	1.164	0.70	0.18	0.204	3%					
8.75	0.80				1.164	1.00	15	8.63	8.88	1.164	1.164	0.80	0.20	0.233	3%					
9.00	0.80				1.192	1.00	16	8.88	9.13	1.192	1.192	0.80	0.20	0.238	3%					
9.25	0.80				1.042	1.00	17	9.13	9.38	1.042	1.042	0.80	0.20	0.208	3%					
9.50	0.75				1.149	1.00	18	9.38	9.63	1.149	1.149	0.75	0.19	0.215	3%					
9.75	0.75				1.158	1.00	19	9.63	9.88	1.158	1.158	0.75	0.19	0.217	3%					
10.00	0.70				1.259	1.00	20	9.88	10.13	1.259	1.259	0.70	0.18	0.220	3%					
10.25	0.70				1.216	1.00	21	10.13	10.38	1.216	1.216	0.70	0.18	0.213	3%					
10.50	0.70				1.256	1.00	22	10.38	10.63	1.256	1.256	0.70	0.18	0.220	3%					
10.75	0.73				1.292	1.00	23	10.63	10.88	1.292	1.292	0.73	0.18	0.236	3%					
11.00	0.75				1.186	1.00	24	10.88	11.13	1.186	1.186	0.75	0.19	0.222	3%					
11.25	0.80				1.094	1.00	25	11.13	11.38	1.094	1.094	0.80	0.20	0.219	3%					
11.50	0.75				0.814	1.00	26	11.38	11.63	0.814	0.814	0.75	0.19	0.153	2%					
11.75	0.70				1.103	1.00	27	11.63	11.88	1.103	1.103	0.70	0.18	0.193	3%					
12.00	0.75				1.113	1.00	28	11.88	12.25	1.113	1.113	0.75	0.28	0.313	4%					
12.50	0.80				0.988	1.00	29	12.25	13.05	0.988	0.988	0.80	0.64	0.632	9%					
13.60	0.70				1.149	1.00	30	13.05	13.80	1.149	1.149	0.70	0.53	0.603	8%					
14.00	0.00				1.00		31	13.80	14.00	0.287	0.287	0.18	0.03	0.010	0%					
Total Flow:														7.350		1.000				

Total Flow:	7.350	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	6.50	(m ²)
Top Width:	9.50	(m)
Hydraulic Depth:	0.684	(m)
Mean Velocity:	1.131	(m/s)
Froude Number	0.436	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	11.59 V	74%
Data logger Memory Used:	30%	
Data logger Clock:	15:33	MST
Laptop Clock:	15:47	MST
Dessicant:	good	
Data logger:	206095	
PT:	101345	
Power:		

Notes: Water Temp 7.98 C
manual water temp 8.3 C at top of water
very fast flow, difficult to get flow mmt



Hydrometric Measurement / Site Visit Record

Jackpine Creek at Canterra Road - S2



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: S2
Site Name: Jackpine Creek at Canterra Road
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: June 30, 2008
Start Time: 11:32 AM MDT
End Time: 11:50 AM MDT

Weather Conditions:

25 C, sunny

River Conditions:

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: LMM
Meter Type and No.: Checked: SS
March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.851
Water Level Reading: 1.968
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.468
Other:

Setup No. 1

El.: 297.990
El.: 296.873
El.:
El.: 296.405
El.:

Setup No. 2

El.: 297.990
El.: 296.874
El.:
El.: 296.406
El.:

Average

296.874
296.405

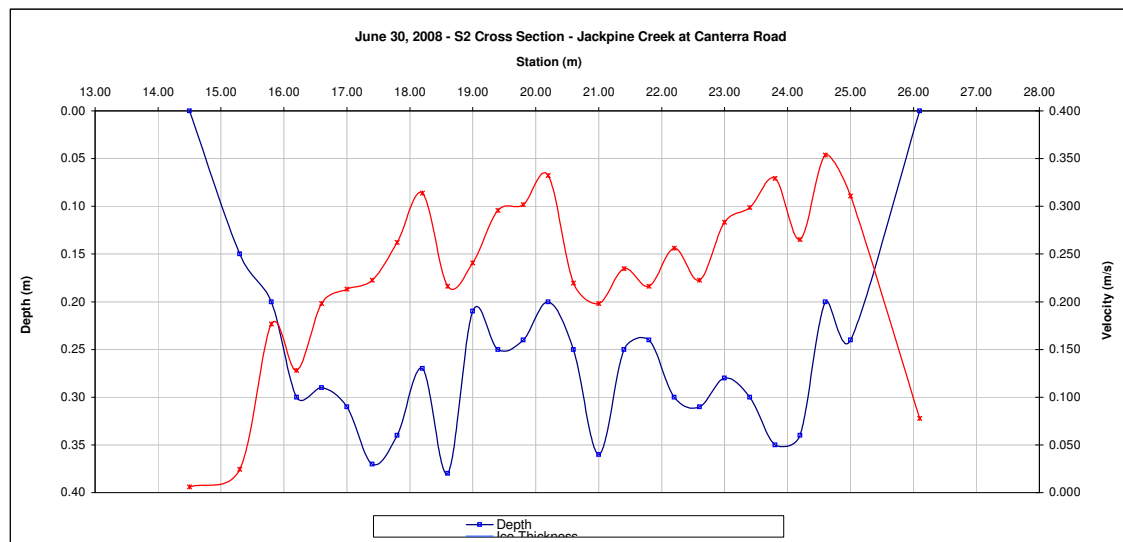
		Measurement Data															
		Measured Data						Calculated Data									
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	26.10	0.00					1.00	1	26.10	25.55	0.078	0.078	0.06	0.03	0.003	0%	
	25.00	0.24				0.311	1.00	2	25.55	24.80	0.311	0.311	0.24	0.18	0.056	8%	
	24.60	0.20				0.354	1.00	3	24.80	24.40	0.354	0.354	0.20	0.08	0.028	4%	
	24.20	0.34				0.265	1.00	4	24.40	24.00	0.265	0.265	0.34	0.14	0.036	5%	
	23.80	0.35				0.329	1.00	5	24.00	23.60	0.329	0.329	0.35	0.14	0.046	6%	
	23.40	0.30				0.299	1.00	6	23.60	23.20	0.299	0.299	0.30	0.12	0.036	5%	
	23.00	0.28				0.283	1.00	7	23.20	22.80	0.283	0.283	0.28	0.11	0.032	4%	
	22.60	0.31				0.223	1.00	8	22.80	22.40	0.223	0.223	0.31	0.12	0.028	4%	
	22.20	0.30				0.256	1.00	9	22.40	22.00	0.256	0.256	0.30	0.12	0.031	4%	
	21.80	0.24				0.216	1.00	10	22.00	21.60	0.216	0.216	0.24	0.10	0.021	3%	
	21.40	0.25				0.235	1.00	11	21.60	21.20	0.235	0.235	0.25	0.10	0.023	3%	
	21.00	0.36				0.198	1.00	12	21.20	20.80	0.198	0.198	0.36	0.14	0.029	4%	
	20.60	0.25				0.219	1.00	13	20.80	20.40	0.219	0.219	0.25	0.10	0.022	3%	
	20.20	0.20				0.332	1.00	14	20.40	20.00	0.332	0.332	0.20	0.08	0.027	4%	
	19.80	0.24				0.302	1.00	15	20.00	19.60	0.302	0.302	0.24	0.10	0.029	4%	
	19.40	0.25				0.296	1.00	16	19.60	19.20	0.296	0.296	0.25	0.10	0.030	4%	
	19.00	0.21				0.241	1.00	17	19.20	18.80	0.241	0.241	0.21	0.08	0.020	3%	
	18.60	0.38				0.216	1.00	18	18.80	18.40	0.216	0.216	0.38	0.15	0.033	5%	
	18.20	0.27				0.314	1.00	19	18.40	18.00	0.314	0.314	0.27	0.11	0.034	5%	
	17.80	0.34				0.262	1.00	20	18.00	17.60	0.262	0.262	0.34	0.14	0.036	5%	
	17.40	0.37				0.223	1.00	21	17.60	17.20	0.223	0.223	0.37	0.15	0.033	5%	
	17.00	0.31				0.213	1.00	22	17.20	16.80	0.213	0.213	0.31	0.12	0.026	4%	
	16.60	0.29				0.198	1.00	23	16.80	16.40	0.198	0.198	0.29	0.12	0.023	3%	
	16.20	0.30				0.128	1.00	24	16.40	16.00	0.128	0.128	0.30	0.12	0.015	2%	
	15.80	0.20				0.177	1.00	25	16.00	15.55	0.177	0.177	0.20	0.09	0.016	2%	
	15.30	0.15				0.024	1.00	26	15.55	14.90	0.024	0.024	0.15	0.10	0.002	0%	
	LB	14.50	0.00					1.00	27	14.90	14.50	0.006	0.006	0.04	0.02	0.000	0%
Total Flow:														0.713	1.000		

Total Flow:	0.713	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	2.95	(m ²)
Top Width:	11.60	(m)
Hydraulic Depth:	0.254	(m)
Mean Velocity:	0.242	(m/s)
Froude Number	0.153	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power: 10.80 V
Data logger External Power: 10.95 V 70%
Data logger Memory Used: 39712
Data logger Clock: 10:01 MST
Laptop Clock: 10:15 MST
Dessicant: changed
Data logger:
PT:
Power:

Notes: Water Temp 18.4342 C



Hydrometric Measurement / Site Visit Record

Jackpine Creek at Canterra Road - S2



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: S2
Site Name: Jackpine Creek at Canterra Road
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: August 6, 2008
Start Time: 11:32 AM MDT
End Time: 11:50 AM MDT

Weather Conditions:

25 C, sunny

River Conditions:

Personnel & Equipment

Measurement Made By: SM LM
Data Entry By: SM Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.774
Water Level Reading: 1.857
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.515
Other:

Setup No. 1

El: 297.990
El: 296.907
El: 296.392
El:

Setup No. 2

El: 297.990
El: 296.905
El: 296.390
El:

Average

296.906
296.391

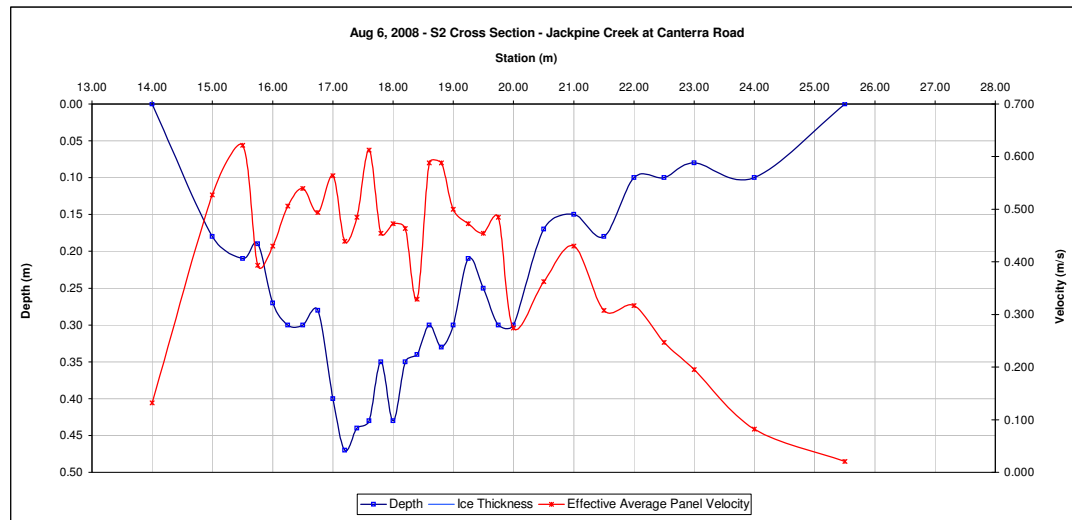
Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
14.00	0.00					1.00	1	14.00	14.50	0.132	0.132	0.05	0.02	0.003	0%	
15.00	0.18				0.527	1.00	2	14.50	15.25	0.527	0.527	0.18	0.14	0.071	7%	
15.50	0.21				0.622	1.00	3	15.25	15.63	0.622	0.622	0.21	0.08	0.049	5%	
15.75	0.19				0.393	1.00	4	15.63	15.88	0.393	0.393	0.19	0.05	0.019	2%	
16.00	0.27				0.430	1.00	5	15.88	16.13	0.430	0.430	0.27	0.07	0.029	3%	
16.25	0.30				0.506	1.00	6	16.13	16.38	0.506	0.506	0.30	0.08	0.038	4%	
16.50	0.30				0.539	1.00	7	16.38	16.63	0.539	0.539	0.30	0.08	0.040	4%	
16.75	0.28				0.494	1.00	8	16.63	16.88	0.494	0.494	0.28	0.07	0.035	4%	
17.00	0.40				0.564	1.00	9	16.88	17.10	0.564	0.564	0.40	0.09	0.051	5%	
17.20	0.47				0.439	1.00	10	17.10	17.30	0.439	0.439	0.47	0.09	0.041	4%	
17.40	0.44				0.485	1.00	11	17.30	17.50	0.485	0.485	0.44	0.09	0.043	4%	
17.60	0.43				0.613	1.00	12	17.50	17.70	0.613	0.613	0.43	0.09	0.053	5%	
17.80	0.35				0.454	1.00	13	17.70	17.90	0.454	0.454	0.35	0.07	0.032	3%	
18.00	0.43				0.472	1.00	14	17.90	18.10	0.472	0.472	0.43	0.09	0.041	4%	
18.20	0.35				0.463	1.00	15	18.10	18.30	0.463	0.463	0.35	0.07	0.032	3%	
18.40	0.34				0.329	1.00	16	18.30	18.50	0.329	0.329	0.34	0.07	0.022	2%	
18.60	0.30				0.588	1.00	17	18.50	18.70	0.588	0.588	0.30	0.06	0.035	4%	
18.80	0.33				0.588	1.00	18	18.70	18.90	0.588	0.588	0.33	0.07	0.039	4%	
19.00	0.30				0.500	1.00	19	18.90	19.13	0.500	0.500	0.30	0.07	0.034	3%	
19.25	0.21				0.472	1.00	20	19.13	19.38	0.472	0.472	0.21	0.05	0.025	3%	
19.50	0.25				0.454	1.00	21	19.38	19.63	0.454	0.454	0.25	0.06	0.028	3%	
19.75	0.30				0.485	1.00	22	19.63	19.88	0.485	0.485	0.30	0.08	0.036	4%	
20.00	0.30				0.274	1.00	23	19.88	20.25	0.274	0.274	0.30	0.11	0.031	3%	
20.50	0.17				0.363	1.00	24	20.25	20.75	0.363	0.363	0.17	0.09	0.031	3%	
21.00	0.15				0.430	1.00	25	20.75	21.25	0.430	0.430	0.15	0.08	0.032	3%	
21.50	0.18				0.308	1.00	26	21.25	21.75	0.308	0.308	0.18	0.09	0.028	3%	
22.00	0.10				0.317	1.00	27	21.75	22.25	0.317	0.317	0.10	0.05	0.016	2%	
22.50	0.10				0.247	1.00	28	22.25	22.75	0.247	0.247	0.10	0.05	0.012	1%	
23.00	0.08				0.195	1.00	29	22.75	23.50	0.195	0.195	0.08	0.06	0.012	1%	
24.00	0.10				0.082	1.00	30	23.50	24.75	0.082	0.082	0.10	0.13	0.010	1%	
25.00	0.00					1.00	31	24.75	25.50	0.021	0.021	0.03	0.02	0.000	0%	
Total Flow:														0.968	1.000	

Total Flow:	0.968	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	2.27	(m ²)
Top Width:	11.50	(m)
Hydraulic Depth:	0.198	(m)
Mean Velocity:	0.426	(m/s)
Froude Number	0.306	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power: 11.34
Data logger External Power: 13.02
Data logger Memory Used: 40%
Data logger Clock: 14:42 MST
Laptop Clock: 14:56 MST
Dessicant: good
Data logger:
PT:
Power:

Notes: Water Temp 18.32 C



Hydrometric Measurement / Site Visit Record

Jackpine Creek at Canterra Road - S2



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: S2
Site Name: Jackpine Creek at Canterra Road
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: September 14, 2008
Start Time: 6:05 PM MDT
End Time: 6:15 PM MDT

Weather Conditions:

cloudy, 15 C

River Conditions:

open

Personnel & Equipment

Measurement Made By:

Data Entry By:

Meter Type and No.:

SM/SS

SS Checked: SM

Marsh Mc Birney Flo-Mate 2000

s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC

Water Level Reading:

Top of Ice Level Reading:

Transducer Reading & Est. El.:

Other:

Setup No. 1

El.: 297.990

El.: 296.907

El.: 296.385

El.:

Setup No. 2

El.: 297.990

El.: 296.903

El.: 296.381

El.:

Average

296.905

296.383

296.383

296.383

Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
9.05	0.00					1.00	1	9.05	9.23	0.008	0.008	0.01	0.00	0.000	0%	
9.40	0.04				0.030	1.00	2	9.23	9.70	0.030	0.030	0.04	0.02	0.001	0%	
10.00	0.08				0.113	1.00	3	9.70	10.30	0.113	0.113	0.08	0.05	0.005	1%	
10.60	0.08				0.116	1.00	4	10.30	10.85	0.116	0.116	0.08	0.04	0.005	1%	
11.10	0.09				0.229	1.00	5	10.85	11.35	0.229	0.229	0.09	0.05	0.010	1%	
11.60	0.10				0.232	1.00	6	11.35	11.85	0.232	0.232	0.10	0.05	0.012	1%	
12.10	0.15				0.232	1.00	7	11.85	12.35	0.232	0.232	0.15	0.08	0.017	2%	
12.60	0.10				0.101	1.00	8	12.35	12.85	0.101	0.101	0.10	0.05	0.005	1%	
13.10	0.13				0.335	1.00	9	12.85	13.35	0.335	0.335	0.13	0.07	0.022	2%	
13.60	0.19				0.341	1.00	10	13.35	13.85	0.341	0.341	0.19	0.10	0.032	3%	
14.10	0.20				0.305	1.00	11	13.85	14.35	0.305	0.305	0.20	0.10	0.030	3%	
14.60	0.25				0.381	1.00	12	14.35	14.85	0.381	0.381	0.25	0.13	0.048	5%	
15.10	0.24				0.482	1.00	13	14.85	15.23	0.482	0.482	0.24	0.09	0.043	5%	
15.35	0.25				0.570	1.00	14	15.23	15.48	0.570	0.570	0.25	0.06	0.036	4%	
15.60	0.16				0.561	1.00	15	15.48	15.73	0.561	0.561	0.16	0.04	0.022	2%	
15.85	0.30				0.744	1.00	16	15.73	15.98	0.744	0.744	0.30	0.08	0.056	6%	
16.10	0.31				0.482	1.00	17	15.98	16.23	0.482	0.482	0.31	0.08	0.037	4%	
16.35	0.34				0.369	1.00	18	16.23	16.48	0.369	0.369	0.34	0.09	0.031	3%	
16.60	0.42				0.439	1.00	19	16.48	16.73	0.439	0.439	0.42	0.11	0.046	5%	
16.85	0.34				0.506	1.00	20	16.73	16.98	0.506	0.506	0.34	0.09	0.043	5%	
17.10	0.40				0.716	1.00	21	16.98	17.23	0.716	0.716	0.40	0.10	0.072	8%	
17.35	0.41				0.405	1.00	22	17.23	17.48	0.405	0.405	0.41	0.10	0.042	4%	
17.60	0.35				0.533	1.00	23	17.48	17.85	0.533	0.533	0.35	0.13	0.070	7%	
18.10	0.27				0.521	1.00	24	17.85	18.35	0.521	0.521	0.27	0.14	0.070	7%	
18.60	0.27				0.451	1.00	25	18.35	18.85	0.451	0.451	0.27	0.14	0.061	6%	
19.10	0.23				0.664	1.00	26	18.85	19.35	0.664	0.664	0.23	0.12	0.076	8%	
19.60	0.16				0.539	1.00	27	19.35	19.85	0.539	0.539	0.16	0.08	0.043	5%	
20.10	0.10				0.338	1.00	28	19.85	20.25	0.338	0.338	0.10	0.04	0.014	1%	
20.40	0.00					1.00	29	20.25	20.40	0.085	0.085	0.03	0.00	0.000	0%	
Total Flow:														0.951	1.000	

Total Flow:	0.951	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.18	(m ²)
Top Width:	11.35	(m)
Hydraulic Depth:	0.192	(m)
Mean Velocity:	0.436	(m/s)
Froude Number	0.318	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power: 11.34 V 100%

Data logger External Power: 12.65 V 81%

Data logger Memory Used: 50%

Data logger Clock: 4:19 PM MST

Laptop Clock: 4:33 PM MST

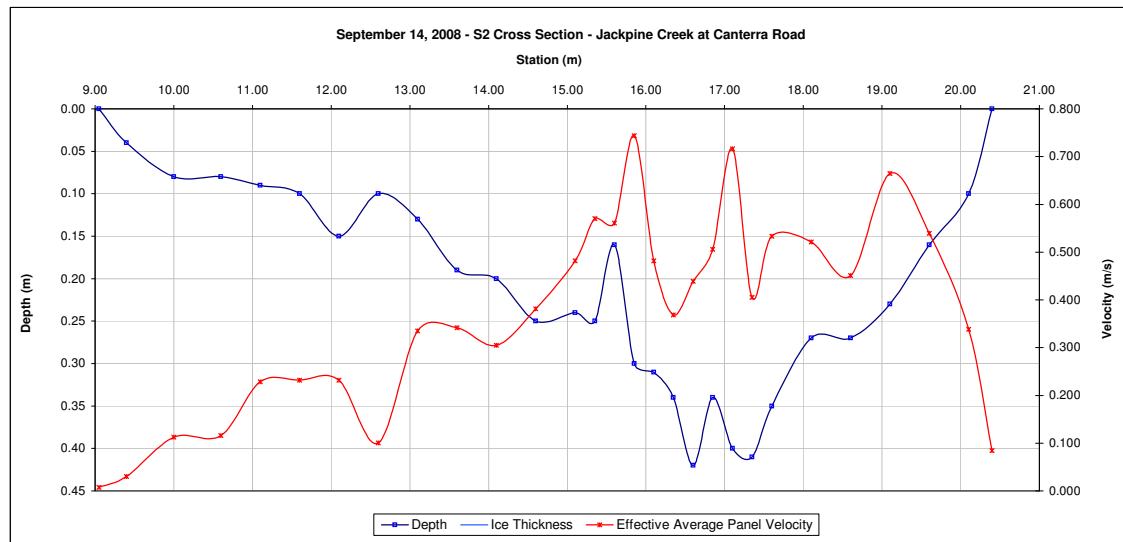
Dessicant:

Data logger: 206095

PT:

Power:

Notes: New enclosure box installed



Hydrometric Measurement / Site Visit Record

Jackpine Creek at Canterra Road - S2



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: S2
Site Name: Jackpine Creek at Canterra Road
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: October 23, 2008
Start Time: 4:36 PM MDT
End Time: 4:45 PM MDT

Weather Conditions:

partly cloudy, 6C
River Conditions: higher than September

Personnel & Equipment

Measurement Made By: SM/AM
Data Entry By: SS
Meter Type and No.: Marsh Mc Birney Flo-Mate 2000 s/n 2004521

SM/AM

Checked: SM

Marsh Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.805

Water Level Reading: 1.800

Top of Ice Level Reading:

Transducer Reading & Est. El.: 0.623

Other:

Setup No. 1

El.: 297.990

El.: 296.995

El.: 296.372

El.: 296.372

Setup No. 2

El.: 297.990

El.: 297.000

El.: 296.377

El.: 296.377

Average

296.998

296.375

296.375

296.375

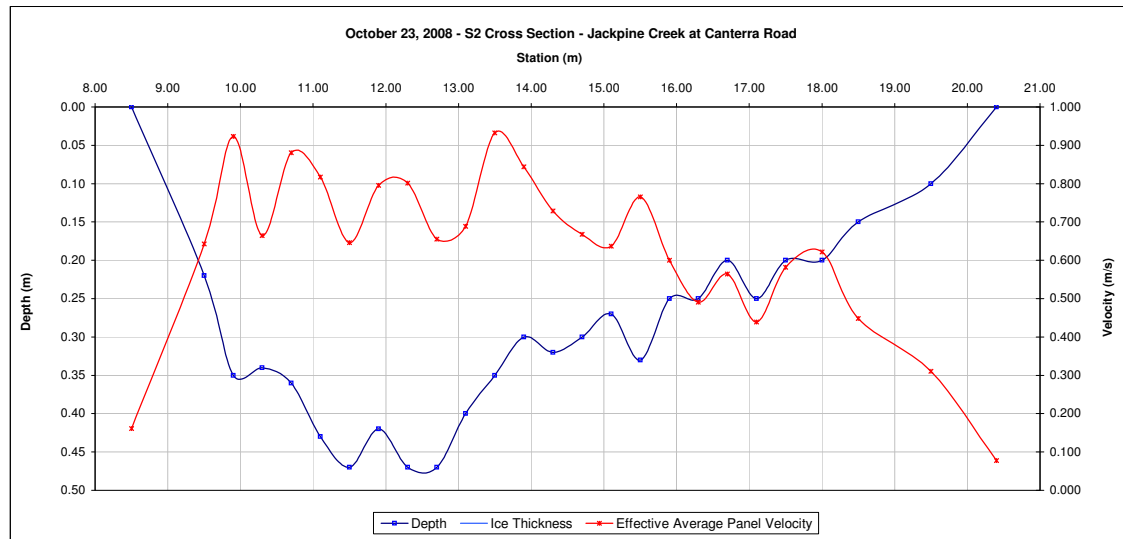
Measurement Data

	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	8.50	0.00					1.00	1	8.50	9.00	0.161	0.161	0.06	0.03	0.004	0%
	9.50	0.22				0.643	1.00	2	9.00	9.70	0.643	0.643	0.22	0.15	0.099	5%
	9.90	0.35				0.924	1.00	3	9.70	10.10	0.924	0.924	0.35	0.14	0.129	6%
	10.30	0.34				0.664	1.00	4	10.10	10.50	0.664	0.664	0.34	0.14	0.090	4%
	10.70	0.36				0.881	1.00	5	10.50	10.90	0.881	0.881	0.36	0.14	0.127	6%
	11.10	0.43				0.817	1.00	6	10.90	11.30	0.817	0.817	0.43	0.17	0.141	6%
	11.50	0.47				0.646	1.00	7	11.30	11.70	0.646	0.646	0.47	0.19	0.121	6%
	11.90	0.42				0.796	1.00	8	11.70	12.10	0.796	0.796	0.42	0.17	0.134	6%
	12.30	0.47				0.802	1.00	9	12.10	12.50	0.802	0.802	0.47	0.19	0.151	7%
	12.70	0.47				0.655	1.00	10	12.50	12.90	0.655	0.655	0.47	0.19	0.123	6%
	13.10	0.40				0.689	1.00	11	12.90	13.30	0.689	0.689	0.40	0.16	0.110	5%
	13.50	0.35				0.933	1.00	12	13.30	13.70	0.933	0.933	0.35	0.14	0.131	6%
	13.90	0.30				0.844	1.00	13	13.70	14.10	0.844	0.844	0.30	0.12	0.101	5%
	14.30	0.32				0.728	1.00	14	14.10	14.50	0.728	0.728	0.32	0.13	0.093	4%
	14.70	0.30				0.668	1.00	15	14.50	14.90	0.668	0.668	0.30	0.12	0.080	4%
	15.10	0.27				0.637	1.00	16	14.90	15.30	0.637	0.637	0.27	0.11	0.069	3%
	15.50	0.33				0.765	1.00	17	15.30	15.70	0.765	0.765	0.33	0.13	0.101	5%
	15.90	0.25				0.600	1.00	18	15.70	16.10	0.600	0.600	0.25	0.10	0.060	3%
	16.30	0.25				0.491	1.00	19	16.10	16.50	0.491	0.491	0.25	0.10	0.049	2%
	16.70	0.20				0.564	1.00	20	16.50	16.90	0.564	0.564	0.20	0.08	0.045	2%
LB	17.10	0.25				0.439	1.00	21	16.90	17.30	0.439	0.439	0.25	0.10	0.044	2%
	17.50	0.20				0.582	1.00	22	17.30	17.75	0.582	0.582	0.20	0.09	0.052	2%
	18.00	0.20				0.622	1.00	23	17.75	18.25	0.622	0.622	0.20	0.10	0.062	3%
	18.50	0.15				0.448	1.00	24	18.25	19.00	0.448	0.448	0.15	0.11	0.050	2%
	19.50	0.10				0.311	1.00	25	19.00	19.95	0.311	0.311	0.10	0.09	0.030	1%
	20.40	0.00					1.00	26	19.95	20.40	0.078	0.078	0.03	0.01	0.001	0%
Total Flow:															2.198	1.000

Total Flow:	2.198	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	3.20	(m²)
Top Width:	11.90	(m)
Hydraulic Depth:	0.269	(m)
Mean Velocity:	0.686	(m/s)
Froude Number	0.423	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.41 V	80%
Data logger Memory Used:	15%	
Data logger Clock:	3:08 PM	MST
Laptop Clock:	3:09 PM	MST
Dessicant:	NEW	
Data logger:	206095	
PT:	971024	
Power:		

Notes: New transducer installed Serial Number 000871
New depth reading 0.624 m
Water temp = 2.8217 C



Hydrometric Measurement / Site Visit Record

Jackpine Creek at Canterra Road - S2



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: S2
Site Name: Jackpine Creek at Canterra Road
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: December 9, 2008
Start Time: 1:15 PM MST
End Time: 1:35 PM MST

Weather Conditions: snow, cloudy, -21 C
River Conditions: ice-cover

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS
Meter Type and No.: Marsh Mc Birney Flo-Mate 2000 s/n 2004521

Checked: SM
Marsh Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.715
Water Level Reading: 1.859
Top of Ice Level Reading: 1.653
Transducer Reading & Est. El.: 0.397
Other:

Setup No. 1

El.: 297.990
El.: 296.846
El.: 297.052
El.: 296.449
El.:

Setup No. 2

El.: 297.990
El.: 296.839
El.: 297.039
El.: 296.442
El.:

Average

296.843
297.046
296.446

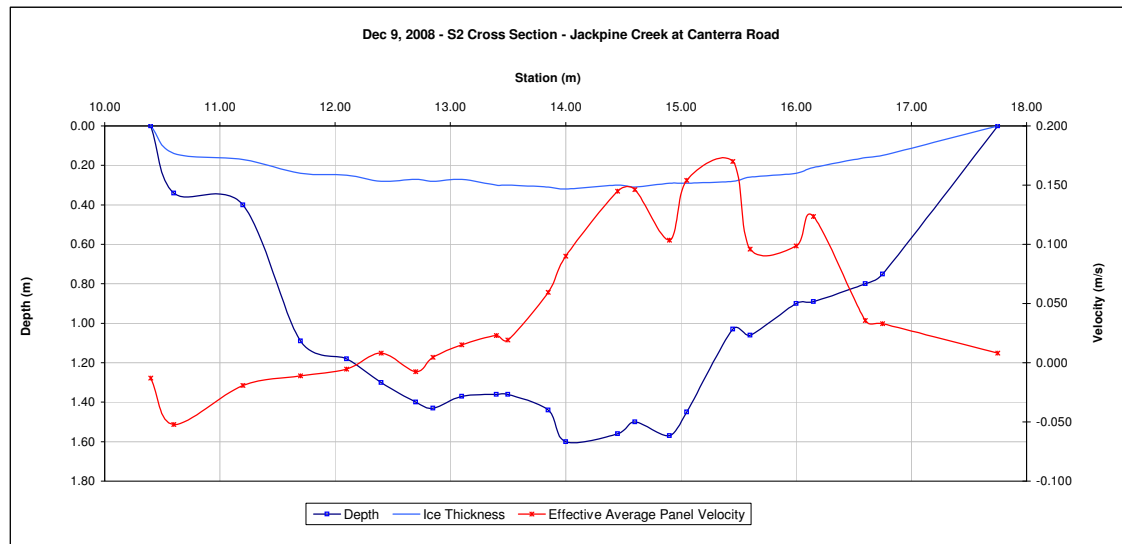
Measurement Data

	Measured Data						Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
RB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
	10.40	0.00	0.00				0.90	1	10.40	10.50	-0.014	-0.013	0.05	0.00	0.000	0%	
	10.60	0.34	0.14			-0.058	0.90	2	10.50	10.90	-0.058	-0.052	0.20	0.08	-0.004	-1%	
	11.20	0.40	0.17			-0.021	0.90	3	10.90	11.45	-0.021	-0.019	0.23	0.13	-0.002	-1%	
	11.70	1.09	0.24			-0.012	0.90	4	11.45	11.90	-0.012	-0.011	0.85	0.38	-0.004	-1%	
	12.10	1.18	0.25			-0.006	0.90	5	11.90	12.25	-0.006	-0.005	0.93	0.33	-0.002	-1%	
	12.40	1.30	0.28			0.009	0.90	6	12.25	12.55	0.009	0.008	1.02	0.31	0.003	1%	
	12.70	1.40	0.27	-0.009	-0.006		1.00	7	12.55	12.78	-0.008	-0.008	1.13	0.25	-0.002	-1%	
	12.85	1.43	0.28	-0.015	0.024		1.00	8	12.78	12.98	0.005	0.005	1.15	0.23	0.001	0%	
	13.10	1.37	0.27	0.003	0.027		1.00	9	12.98	13.25	0.015	0.015	1.10	0.30	0.005	1%	
	13.40	1.36	0.30	-0.006	0.052		1.00	10	13.25	13.45	0.023	0.023	1.06	0.21	0.005	1%	
	13.50	1.36	0.30			0.021	0.90	11	13.45	13.68	0.021	0.019	1.06	0.24	0.005	1%	
	13.85	1.44	0.31	0.049	0.070		1.00	12	13.68	13.93	0.059	0.059	1.13	0.28	0.017	5%	
	14.00	1.60	0.32	0.076	0.104		1.00	13	13.93	14.23	0.090	0.090	1.28	0.38	0.035	10%	
	14.45	1.56	0.30	0.125	0.165		1.00	14	14.23	14.53	0.145	0.145	1.26	0.38	0.055	16%	
	14.60	1.50	0.31	0.137	0.155		1.00	15	14.53	14.75	0.146	0.146	1.19	0.27	0.039	11%	
	14.90	1.57	0.29	0.134	0.073		1.00	16	14.75	14.98	0.104	0.104	1.28	0.29	0.030	9%	
	15.05	1.45	0.29	0.183	0.125		1.00	17	14.98	15.25	0.154	0.154	1.16	0.32	0.049	14%	
	15.45	1.03	0.28			0.189	0.90	18	15.25	15.53	0.189	0.170	0.75	0.21	0.035	10%	
	15.60	1.06	0.26			0.107	0.90	19	15.53	15.80	0.107	0.096	0.80	0.22	0.021	6%	
	16.00	0.90	0.24			0.110	0.90	20	15.80	16.08	0.110	0.099	0.66	0.18	0.018	5%	
	16.15	0.89	0.21			0.137	0.90	21	16.08	16.38	0.137	0.123	0.68	0.20	0.025	7%	
	16.60	0.80	0.16			0.040	0.90	22	16.38	16.68	0.040	0.036	0.64	0.19	0.007	2%	
	16.75	0.75	0.15			0.037	0.90	23	16.68	17.25	0.037	0.033	0.60	0.35	0.011	3%	
17.75	0.00	0.00				0.90	24	17.25	17.75	0.009	0.008	0.15	0.08	0.001	0%		
LB																	
Total Flow:															0.345	1.000	

Total Flow:	0.345	(m³/s)
Perceived Measurement Quality:	Fair	
Total Area:	5.81	(m²)
Top Width:	7.35	(m)
Hydraulic Depth:	0.790	(m)
Mean Velocity:	0.059	(m/s)
Froude Number	0.021	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	11.8 V	78%
Data logger Memory Used:	10%	
Data logger Clock:	12:38 PM	MST
Laptop Clock:	12:40 PM	MST
Dessicant:	60%	
Data logger:	206095	
PT:	871	
Power:		

Notes: water temp 0.176 C
MMT done under bridge



Hydrometric Measurement / Site Visit Record

S3 - Iyininim Creek above Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Iyininim Creek
Location: Iyininim Creek above Kearl Lake
Site Name: S3
Coordinates & Legal: 6345029 N, 489491 E NE-14-95-8-W4

Time of Measurement

Date of Measurement: May 13, 2008
Start Time: 1:00 PM MDT
End Time: 1:15 PM MDT

Weather Conditions:

overcast, light rain, 10 C

River Conditions:

high, turbulent

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Bar in PVC 1.808
Water Level Reading: 3.101
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.811
Other: 1 m mark on wide staff gauge

Setup No. 1

El: 360.610
El: 359.317
El: 358.506
El:

Setup No. 2

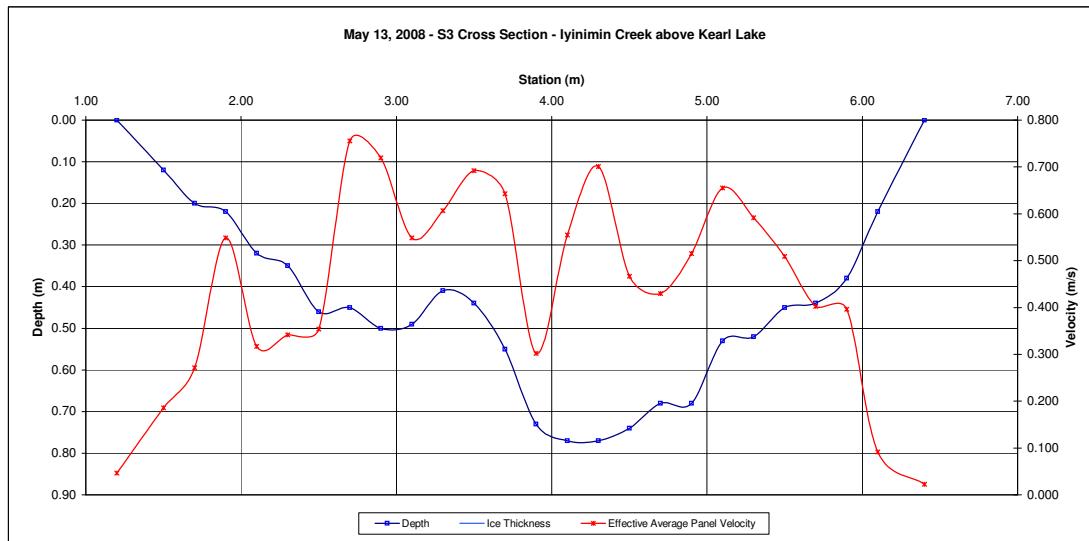
El: 360.610
El: 359.316
El: 358.505
El:

		Measurement Data															
Measured Data						Calculated Data											
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)			
LB	1.20	0.00				1.0	1	1.20	1.35	0.046	0.046	0.03	0.00	0.000	0%		
	1.50	0.12			0.186	1.0	2	1.35	1.60	0.186	0.186	0.12	0.03	0.006	0%		
	1.70	0.20			0.271	1.0	3	1.60	1.80	0.271	0.271	0.20	0.04	0.011	1%		
	1.90	0.22			0.549	1.0	4	1.80	2.00	0.549	0.549	0.22	0.04	0.024	2%		
	2.10	0.32			0.317	1.0	5	2.00	2.20	0.317	0.317	0.32	0.06	0.020	2%		
	2.30	0.35			0.341	1.0	6	2.20	2.40	0.341	0.341	0.35	0.07	0.024	2%		
	2.50	0.46			0.354	1.0	7	2.40	2.60	0.354	0.354	0.46	0.09	0.033	3%		
	2.70	0.45			0.756	1.0	8	2.60	2.80	0.756	0.756	0.45	0.09	0.068	6%		
	2.90	0.50			0.719	1.0	9	2.80	3.00	0.719	0.719	0.50	0.10	0.072	6%		
	3.10	0.49			0.549	1.0	10	3.00	3.20	0.549	0.549	0.49	0.10	0.054	5%		
	3.30	0.41			0.607	1.0	11	3.20	3.40	0.607	0.607	0.41	0.08	0.050	4%		
	3.50	0.44			0.692	1.0	12	3.40	3.60	0.692	0.692	0.44	0.09	0.061	5%		
	3.70	0.55			0.643	1.0	13	3.60	3.80	0.643	0.643	0.55	0.11	0.071	6%		
	3.90	0.73			0.302	1.0	14	3.80	4.00	0.302	0.302	0.73	0.15	0.044	4%		
	4.10	0.77			0.555	1.0	15	4.00	4.20	0.555	0.555	0.77	0.15	0.085	7%		
	4.30	0.77			0.701	1.0	16	4.20	4.40	0.701	0.701	0.77	0.15	0.108	9%		
	4.50	0.74			0.466	1.0	17	4.40	4.60	0.466	0.466	0.74	0.15	0.069	6%		
	4.70	0.68			0.430	1.0	18	4.60	4.80	0.430	0.430	0.68	0.14	0.058	5%		
	4.90	0.68			0.515	1.0	19	4.80	5.00	0.515	0.515	0.68	0.14	0.070	6%		
	5.10	0.53			0.655	1.0	20	5.00	5.20	0.655	0.655	0.53	0.11	0.069	6%		
	5.30	0.52			0.591	1.0	21	5.20	5.40	0.591	0.591	0.52	0.10	0.061	5%		
	5.50	0.45			0.509	1.0	22	5.40	5.60	0.509	0.509	0.45	0.09	0.046	4%		
	5.70	0.44			0.402	1.0	23	5.60	5.80	0.402	0.402	0.44	0.09	0.035	3%		
	5.90	0.38			0.396	1.0	24	5.80	6.00	0.396	0.396	0.38	0.08	0.030	3%		
	RB	6.10	0.22			0.091	1.0	25	6.00	6.25	0.091	0.091	0.22	0.06	0.005	0%	
		6.40	0.00				1.0	26	6.25	6.40	0.023	0.023	0.06	0.01	0.000	0%	
													Total Flow:	1.175	1.000		

Total Flow:	1.175	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.31	(m ²)
Top Width:	5.20	(m)
Hydraulic Depth:	0.445	(m)
Mean Velocity:	0.508	(m/s)
Froude Number	0.243	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.9 V	83%
Data logger Memory Used:	0%	
Data logger Clock:	12:22:00 PM	MST
Laptop Clock:	12:22:00 PM	MST
Dessicant:	New	
Data logger:	Lakewood Ultra Logger RX-2 #41174-08	
PT:	Keller Pressure Transducer LE8363K 5 psi #201747	
Power:	Lakewood battery	

Notes: TD and station installed
TBRG tips at 5516



Hydrometric Measurement / Site Visit Record

S3 - Iyininim Creek above Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Iyininim Creek
Location: Iyininim Creek above Kearl Lake
Site Name: S3
Coordinates & Legal: 6345029 N, 489491 E NE-14-95-8-W4

Time of Measurement

Date of Measurement: June 28, 2008
Start Time: 4:20 PM MDT
End Time: 4:40 PM MDT

Weather Conditions:

sunny, +26 C

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Bar in PVC 1.786
Water Level Reading: 3.416
Top of Ice Level Reading:
TD Reading & Calc'd El.: 0.497
Other: 1 m mark on wide staff gauge

Setup No. 1

El: 360.610 1.760
El: 358.980 3.384
El: 358.483 0.497
El:

Setup No. 2

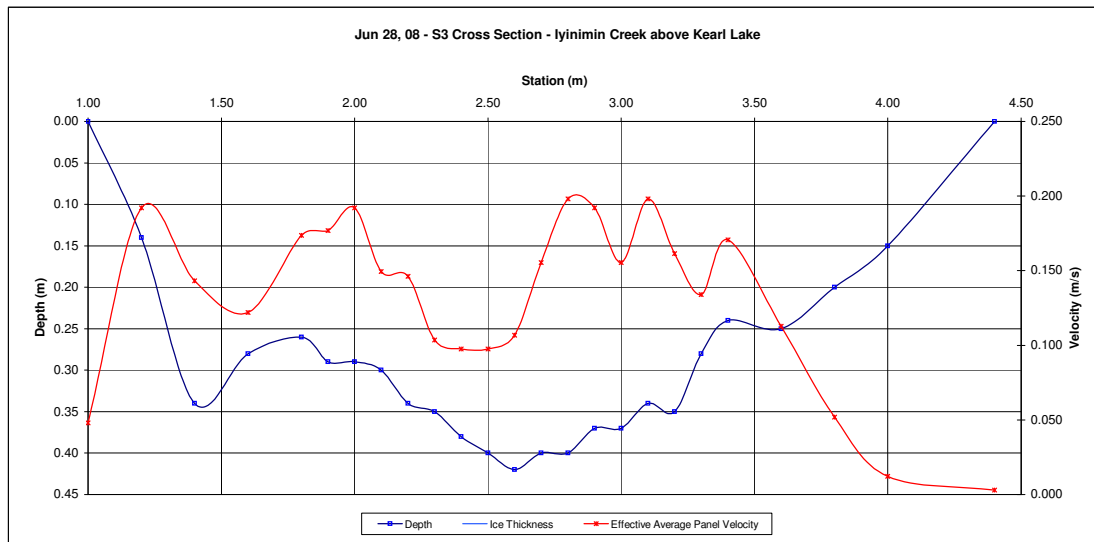
El: 360.610
El: 358.986 358.983
El:
El: 358.489 358.486
El:

Measured Data							Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)						
RB 1.00	0.00					1.0	1	1.00	1.10	0.048	0.048	0.04	0.00	0.000	0%					
1.20	0.14				0.192	1.0	2	1.10	1.30	0.192	0.192	0.14	0.03	0.005	4%					
1.40	0.34				0.143	1.0	3	1.30	1.50	0.143	0.143	0.34	0.07	0.010	8%					
1.60	0.28				0.122	1.0	4	1.50	1.70	0.122	0.122	0.28	0.06	0.007	6%					
1.80	0.26				0.174	1.0	5	1.70	1.85	0.174	0.174	0.26	0.04	0.007	6%					
1.90	0.29				0.177	1.0	6	1.85	1.95	0.177	0.177	0.29	0.03	0.005	4%					
2.00	0.29				0.192	1.0	7	1.95	2.05	0.192	0.192	0.29	0.03	0.006	5%					
2.10	0.30				0.149	1.0	8	2.05	2.15	0.149	0.149	0.30	0.03	0.004	4%					
2.20	0.34				0.146	1.0	9	2.15	2.25	0.146	0.146	0.34	0.03	0.005	4%					
2.30	0.35				0.104	1.0	10	2.25	2.35	0.104	0.104	0.35	0.03	0.004	3%					
2.40	0.38				0.098	1.0	11	2.35	2.45	0.098	0.098	0.38	0.04	0.004	3%					
2.50	0.40				0.098	1.0	12	2.45	2.55	0.098	0.098	0.40	0.04	0.004	3%					
2.60	0.42				0.107	1.0	13	2.55	2.65	0.107	0.107	0.42	0.04	0.004	4%					
2.70	0.40				0.155	1.0	14	2.65	2.75	0.155	0.155	0.40	0.04	0.006	5%					
2.80	0.40				0.198	1.0	15	2.75	2.85	0.198	0.198	0.40	0.04	0.008	6%					
2.90	0.37				0.192	1.0	16	2.85	2.95	0.192	0.192	0.37	0.04	0.007	6%					
3.00	0.37				0.155	1.0	17	2.95	3.05	0.155	0.155	0.37	0.04	0.006	5%					
3.10	0.34				0.198	1.0	18	3.05	3.15	0.198	0.198	0.34	0.03	0.007	6%					
3.20	0.35				0.162	1.0	19	3.15	3.25	0.162	0.162	0.35	0.03	0.006	5%					
3.30	0.28				0.134	1.0	20	3.25	3.35	0.134	0.134	0.28	0.03	0.004	3%					
3.40	0.24				0.171	1.0	21	3.35	3.50	0.171	0.171	0.24	0.04	0.006	5%					
3.60	0.25				0.113	1.0	22	3.50	3.70	0.113	0.113	0.25	0.05	0.006	5%					
3.80	0.20				0.052	1.0	23	3.70	3.90	0.052	0.052	0.20	0.04	0.002	2%					
4.00	0.15				0.012	1.0	24	3.90	4.20	0.012	0.012	0.15	0.05	0.001	0%					
RB 4.40	0.00					1.0	25	4.20	4.40	0.003	0.003	0.04	0.01	0.000	0%					
													Total Flow:	0.122		1.000				

Total Flow:	0.122	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	0.90	(m²)
Top Width:	3.40	(m)
Hydraulic Depth:	0.265	(m)
Mean Velocity:	0.136	(m/s)
Froude Number	0.084	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.9 V	83%
Data logger Memory Used:	33%	used
Data logger Clock:	3:02:00 PM	MST
Laptop Clock:	3:02:00 PM	MST
Dessicant:	good	
Data logger:	Lakewood Ultra Logger RX-2 #41174-08	
PT:	Keller Pressure Transducer LE8363K 5 psi #201747	
Power:	Lakewood battery	

Notes: memory cleared
TBRG was tipped over upon arrival to the site
TBRG = 5626 Tips



Hydrometric Measurement / Site Visit Record

S3 - Iyininim Creek above Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Iyininim Creek
Location: Iyininim Creek above Kearl Lake
Site Name: S3
Coordinates & Legal: 6345029 N, 489491 E NE-14-95-8-W4

Time of Measurement

Date of Measurement: August 28, 2008
Start Time: 12:30 PM MDT
End Time: 12:40 PM MDT

Weather Conditions:

sunny, +26 C

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: SM Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Bar in PVC
Water Level Reading: 3.183
Top of Ice Level Reading:
TD Reading & Calc'd El.: 0.611
Other: 1 m mark on wide staff gauge

Setup No. 1

El: 360.610
El: 359.097
El: 358.486
El:

Setup No. 2

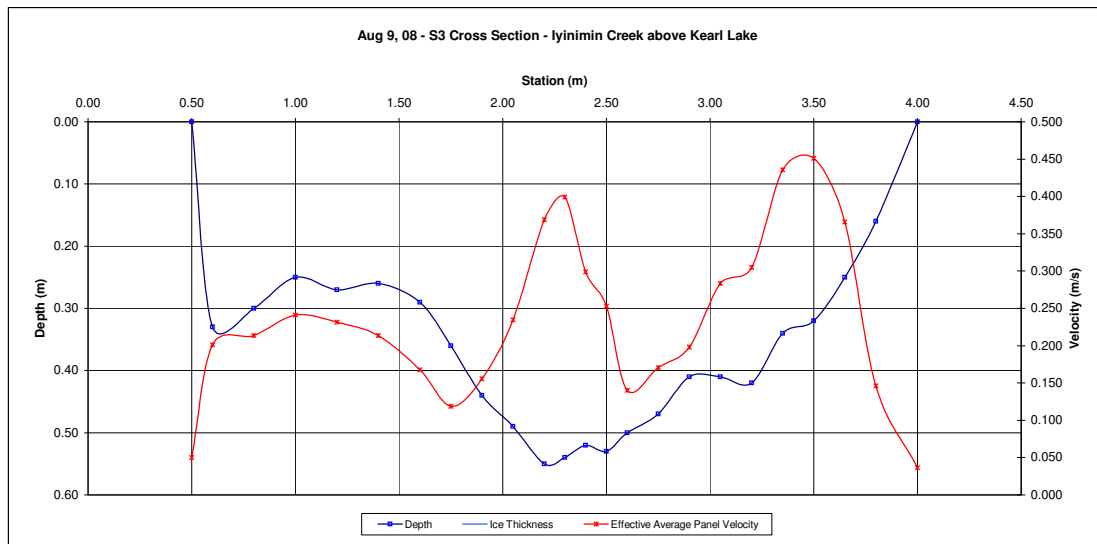
El: 360.610
El: 359.088
El: 358.477
El:

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	0.50	0.00				1.0	1	0.50	0.55	0.050	0.050	0.08	0.00	0.000	0%
	0.60	0.33			0.201	1.0	2	0.55	0.70	0.201	0.201	0.33	0.05	0.010	3%
	0.80	0.30			0.213	1.0	3	0.70	0.90	0.213	0.213	0.30	0.06	0.013	4%
	1.00	0.25			0.241	1.0	4	0.90	1.10	0.241	0.241	0.25	0.05	0.012	4%
	1.20	0.27			0.232	1.0	5	1.10	1.30	0.232	0.232	0.27	0.05	0.013	4%
	1.40	0.26			0.213	1.0	6	1.30	1.50	0.213	0.213	0.26	0.05	0.011	4%
	1.60	0.29			0.168	1.0	7	1.50	1.68	0.168	0.168	0.29	0.05	0.009	3%
	1.75	0.36			0.119	1.0	8	1.68	1.83	0.119	0.119	0.36	0.05	0.006	2%
	1.90	0.44			0.155	1.0	9	1.83	1.98	0.155	0.155	0.44	0.07	0.010	3%
	2.05	0.49			0.235	1.0	10	1.98	2.13	0.235	0.235	0.49	0.07	0.017	6%
	2.20	0.55			0.369	1.0	11	2.13	2.25	0.369	0.369	0.55	0.07	0.025	8%
	2.30	0.54			0.399	1.0	12	2.25	2.35	0.399	0.399	0.54	0.05	0.022	7%
	2.40	0.52			0.299	1.0	13	2.35	2.45	0.299	0.299	0.52	0.05	0.016	5%
	2.50	0.53			0.253	1.0	14	2.45	2.55	0.253	0.253	0.53	0.05	0.013	4%
	2.60	0.50			0.140	1.0	15	2.55	2.68	0.140	0.140	0.50	0.06	0.009	3%
	2.75	0.47			0.171	1.0	16	2.68	2.83	0.171	0.171	0.47	0.07	0.012	4%
	2.90	0.41			0.198	1.0	17	2.83	2.98	0.198	0.198	0.41	0.06	0.012	4%
	3.05	0.41			0.283	1.0	18	2.98	3.13	0.283	0.283	0.41	0.06	0.017	6%
	3.20	0.42			0.305	1.0	19	3.13	3.28	0.305	0.305	0.42	0.06	0.019	6%
	3.35	0.34			0.436	1.0	20	3.28	3.43	0.436	0.436	0.34	0.05	0.022	7%
	3.50	0.32			0.451	1.0	21	3.43	3.58	0.451	0.451	0.32	0.05	0.022	7%
	3.65	0.25			0.366	1.0	22	3.58	3.73	0.366	0.366	0.25	0.04	0.014	4%
	3.80	0.16			0.146	1.0	23	3.73	3.90	0.146	0.146	0.16	0.03	0.004	1%
	4.00	0.00				1.0	24	3.90	4.00	0.037	0.037	0.04	0.00	0.000	0%
													Total Flow:	0.308	1.000

Total Flow:	0.308	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	1.23	(m²)
Top Width:	3.50	(m)
Hydraulic Depth:	0.351	(m)
Mean Velocity:	0.251	(m/s)
Froude Number	0.135	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.9 V	83%
Data logger Memory Used:	0%	used
Data logger Clock:	3:02:00 PM	MST
Laptop Clock:	3:02:00 PM	MST
Dessicant:	good	
Data logger:	Lakewood Ultra Logger RX-2 #41174-08	
PT:	Keller Pressure Transducer LE8363K 5 psi #201747	
Power:	Lakewood battery	

Notes: memory cleared
TBRG was not connected inside terminal plug
TBRG = 5626 Tips



Hydrometric Measurement / Site Visit Record

S3 - Iyininim Creek above Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Iyininim Creek
Location: Iyininim Creek above Kearl Lake
Site Name: S3
Coordinates & Legal: 6345029 N, 489491 E NE-14-95-8-W4

Time of Measurement

Date of Measurement: September 13, 2008
Start Time: 2:45 PM MDT
End Time: 2:50 PM MDT

Weather Conditions:

clear, 18 C

River Conditions:

open, low

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Bar in PVC
Water Level Reading: 3.490
Top of Ice Level Reading:
TD Reading & Calc'd El.: 0.472
Other: 1 m mark on wide staff gauge

Setup No. 1

El: 360.610
El: 358.961
El: 358.490
El:

Setup No. 2

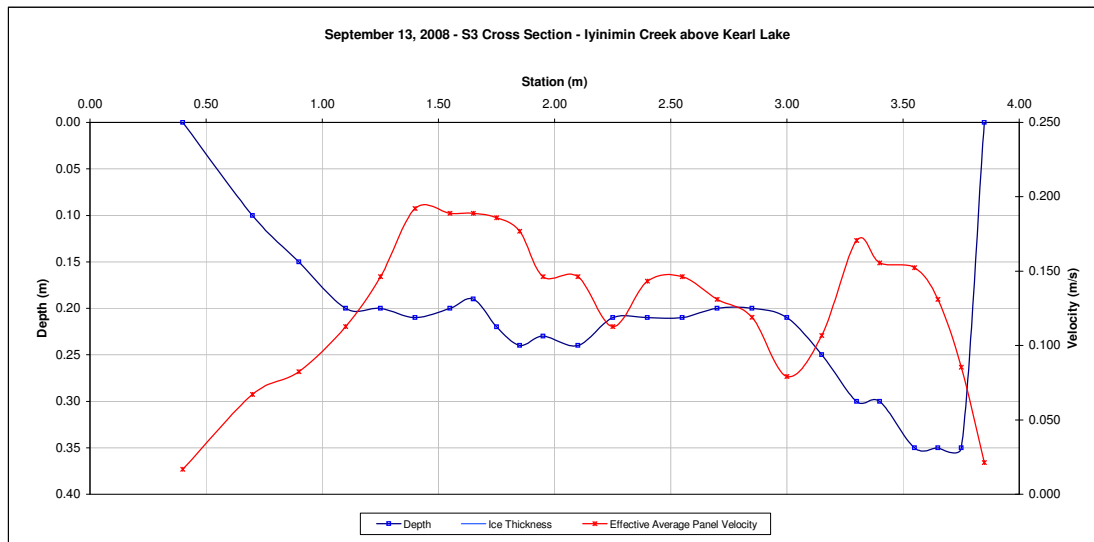
El: 360.610
El: 358.956
El: 358.485
El:

Measurement Data																
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
LB	0.40	0.00				1.0	1	0.40	0.55	0.017	0.017	0.03	0.00	0.000	0%	
	0.70	0.10			0.067	1.0	2	0.55	0.80	0.067	0.067	0.10	0.03	0.002	2%	
	0.90	0.15			0.082	1.0	3	0.80	1.00	0.082	0.082	0.15	0.03	0.002	3%	
	1.10	0.20			0.113	1.0	4	1.00	1.18	0.113	0.113	0.20	0.04	0.004	4%	
	1.25	0.20			0.146	1.0	5	1.18	1.33	0.146	0.146	0.20	0.03	0.004	4%	
	1.40	0.21			0.192	1.0	6	1.33	1.48	0.192	0.192	0.21	0.03	0.006	6%	
	1.55	0.20			0.189	1.0	7	1.48	1.60	0.189	0.189	0.20	0.03	0.005	5%	
	1.65	0.19			0.189	1.0	8	1.60	1.70	0.189	0.189	0.19	0.02	0.004	4%	
	1.75	0.22			0.186	1.0	9	1.70	1.80	0.186	0.186	0.22	0.02	0.004	4%	
	1.85	0.24			0.177	1.0	10	1.80	1.90	0.177	0.177	0.24	0.02	0.004	4%	
	1.95	0.23			0.146	1.0	11	1.90	2.03	0.146	0.146	0.23	0.03	0.004	4%	
	2.10	0.24			0.146	1.0	12	2.03	2.18	0.146	0.146	0.24	0.04	0.005	5%	
	2.25	0.21			0.113	1.0	13	2.18	2.33	0.113	0.113	0.21	0.03	0.004	4%	
	2.40	0.21			0.143	1.0	14	2.33	2.48	0.143	0.143	0.21	0.03	0.005	5%	
	2.55	0.21			0.146	1.0	15	2.48	2.63	0.146	0.146	0.21	0.03	0.005	5%	
	2.70	0.20			0.131	1.0	16	2.63	2.78	0.131	0.131	0.20	0.03	0.004	4%	
	2.85	0.20			0.119	1.0	17	2.78	2.93	0.119	0.119	0.20	0.03	0.004	4%	
	3.00	0.21			0.079	1.0	18	2.93	3.08	0.079	0.079	0.21	0.03	0.002	3%	
	3.15	0.25			0.107	1.0	19	3.08	3.23	0.107	0.107	0.25	0.04	0.004	4%	
	3.30	0.30			0.171	1.0	20	3.23	3.35	0.171	0.171	0.30	0.04	0.006	7%	
	3.40	0.30			0.155	1.0	21	3.35	3.48	0.155	0.155	0.30	0.04	0.006	6%	
	3.55	0.35			0.152	1.0	22	3.48	3.60	0.152	0.152	0.35	0.04	0.007	7%	
	3.65	0.35			0.131	1.0	23	3.60	3.70	0.131	0.131	0.35	0.04	0.005	5%	
	3.75	0.35			0.085	1.0	24	3.70	3.80	0.085	0.085	0.35	0.03	0.003	3%	
	RB	3.85	0.00				1.0	25	3.80	3.85	0.021	0.021	0.09	0.00	0.000	0%
													Total Flow:	0.098	1.000	

Total Flow:	0.098	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.73	(m ²)
Top Width:	3.45	(m)
Hydraulic Depth:	0.211	(m)
Mean Velocity:	0.135	(m/s)
Froude Number	0.094	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.41 V	80%
Data logger Memory Used:	65%	used
Data logger Clock:	1:35 PM	MST
Laptop Clock:	1:36 PM	MST
Dessicant:	NEW	
Data logger:	Lakewood Ultra Logger RX-2 #41174-08	
PT:	Keller Pressure Transducer LE8363K 5 psi #201747	
Power:	Lakewood battery	

Notes: TBRG Count 5661
TBRG upside down upon arrival. Ignore tips from today
start count after 5644



Hydrometric Measurement / Site Visit Record

S3 - Iyininim Creek above Kearl Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Iyininim Creek
Location: Iyininim Creek above Kearl Lake
Site Name: S3
Coordinates & Legal: 6345029 N, 489491 E NE-14-95-8-W4

Time of Measurement

Date of Measurement: October 20, 2008
Start Time: 4:40 PM MDT
End Time: 4:49 PM MDT

Weather Conditions:

Overcast, +3 C

River Conditions:

open, low

Personnel & Equipment

Measurement Made By: SM/AM
Data Entry By: LS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Bar in PVC 1.700
Water Level Reading: 3.350
Top of Ice Level Reading:
TD Reading & Calc'd El.: 0.470
Other: 1 m mark on wide staff gauge

Setup No. 1

El: 360.610 1.675
El: 358.960 3.325
El: 358.490 0.470

Setup No. 2

El: 360.610
El: 358.960
El: 358.490

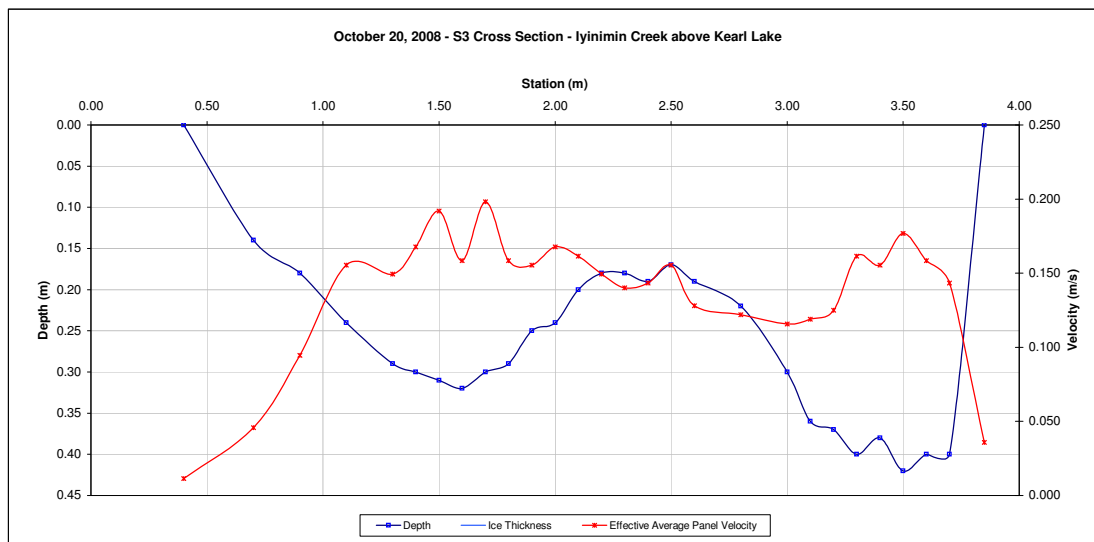
	Measured Data						Measurement Data									Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	0.40	0.00					1.0	1	0.40	0.55	0.011	0.011	0.04	0.01	0.000	0%
	0.70	0.14				0.046	1.0	2	0.55	0.80	0.046	0.046	0.14	0.04	0.002	1%
	0.90	0.18				0.094	1.0	3	0.80	1.00	0.094	0.094	0.18	0.04	0.003	3%
	1.10	0.24				0.155	1.0	4	1.00	1.20	0.155	0.155	0.24	0.05	0.007	6%
	1.30	0.29				0.149	1.0	5	1.20	1.35	0.149	0.149	0.29	0.04	0.006	5%
	1.40	0.30				0.168	1.0	6	1.35	1.45	0.168	0.168	0.30	0.03	0.005	4%
	1.50	0.31				0.192	1.0	7	1.45	1.55	0.192	0.192	0.31	0.03	0.006	5%
	1.60	0.32				0.158	1.0	8	1.55	1.65	0.158	0.158	0.32	0.03	0.005	4%
	1.70	0.30				0.198	1.0	9	1.65	1.75	0.198	0.198	0.30	0.03	0.006	5%
	1.80	0.29				0.158	1.0	10	1.75	1.85	0.158	0.158	0.29	0.03	0.005	4%
	1.90	0.25				0.155	1.0	11	1.85	1.95	0.155	0.155	0.25	0.03	0.004	3%
	2.00	0.24				0.168	1.0	12	1.95	2.05	0.168	0.168	0.24	0.02	0.004	3%
	2.10	0.20				0.162	1.0	13	2.05	2.15	0.162	0.162	0.20	0.02	0.003	3%
	2.20	0.18				0.149	1.0	14	2.15	2.25	0.149	0.149	0.18	0.02	0.003	2%
	2.30	0.18				0.140	1.0	15	2.25	2.35	0.140	0.140	0.18	0.02	0.003	2%
	2.40	0.19				0.143	1.0	16	2.35	2.45	0.143	0.143	0.19	0.02	0.003	2%
	2.50	0.17				0.155	1.0	17	2.45	2.55	0.155	0.155	0.17	0.02	0.003	2%
	2.60	0.19				0.128	1.0	18	2.55	2.70	0.128	0.128	0.19	0.03	0.004	3%
	2.80	0.22				0.122	1.0	19	2.70	2.90	0.122	0.122	0.22	0.04	0.005	4%
	3.00	0.30				0.116	1.0	20	2.90	3.05	0.116	0.116	0.30	0.05	0.005	4%
	3.10	0.36				0.119	1.0	21	3.05	3.15	0.119	0.119	0.36	0.04	0.004	3%
	3.20	0.37				0.125	1.0	22	3.15	3.25	0.125	0.125	0.37	0.04	0.005	4%
	3.30	0.40				0.162	1.0	23	3.25	3.35	0.162	0.162	0.40	0.04	0.006	5%
	3.40	0.38				0.155	1.0	24	3.35	3.45	0.155	0.155	0.38	0.04	0.006	5%
	3.50	0.42				0.177	1.0	25	3.45	3.55	0.177	0.177	0.42	0.04	0.007	6%
	3.60	0.40				0.158	1.0	26	3.55	3.65	0.158	0.158	0.40	0.04	0.006	5%
	3.70	0.40				0.143	1.0	27	3.65	3.78	0.143	0.143	0.40	0.05	0.007	6%
	3.85	0.00					1.0	28	3.78	3.85	0.036	0.036	0.10	0.01	0.000	0%
RB																
Total Flow:														0.124	1.000	

Total Flow:	0.124	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	0.87	(m²)
Top Width:	3.45	(m)
Hydraulic Depth:	0.252	(m)
Mean Velocity:	0.143	(m/s)
Froude Number	0.091	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.17 V	78%
Data logger Memory Used:	100%	used
Data logger Clock:	3:00 PM	MST
Laptop Clock:		MST
Dessicant:	NEW	
Data logger:	Lakewood Ultra Logger RX-2 #41174-08	
PT:	Keller Pressure Transducer LE8363K 5 psi #201747	
Power:	Lakewood battery	

Notes:

Station Removed



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

Time of Measurement

Date of Measurement: January 14, 2008
Start Time: 10:59 AM MST
End Time: 11:27 AM MST

Weather Conditions:

overcast, sunny, -2 C
River Conditions: ice cover with open spots u/s of logger

Personnel & Equipment

Measurement Made By: JS/JMS
Data Entry By: SMS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: 0.853
Water Level Reading: 2.085
Top of Ice Level Reading: 2.087
Transducer Reading & Est. El.: 1.249
Other:

1.0 m placed on bottom of DL box

Setup No. 1

El: 99.895
El: 97.663
El: 98.661
El: 96.414

Setup No. 2

El: 99.895
El: 97.665
El: 98.662
El: 96.416

Average

97.664
98.662
96.415

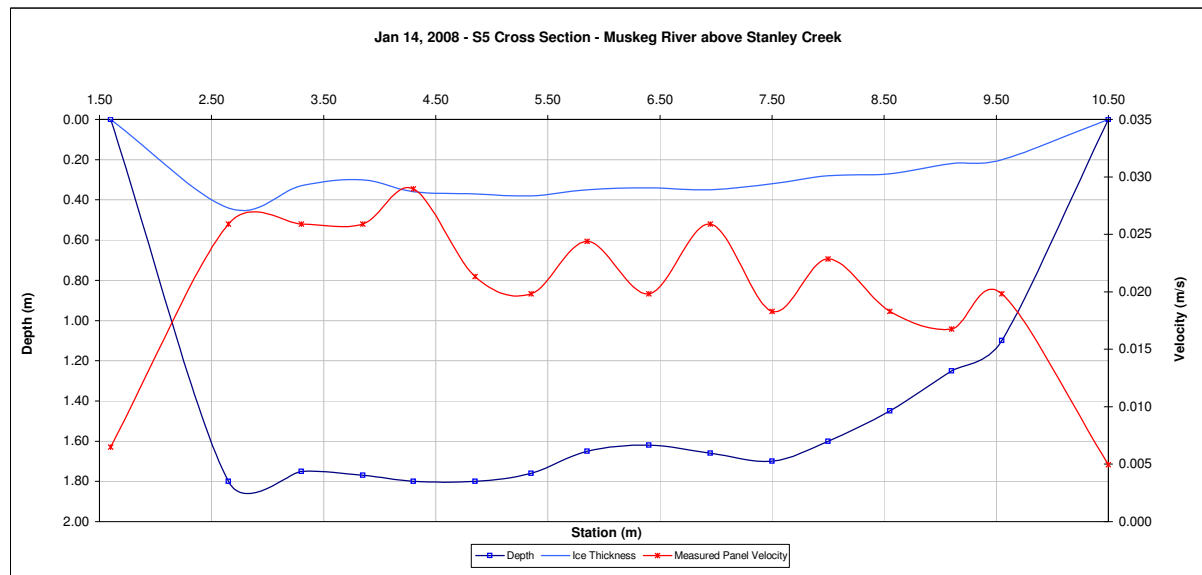
		Measured Data					Measurement Data										Calculated Data				
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)						
LB	1.60	0.00	0.00			0	0.90	1	1.60	2.13	0.006	0.006	0.34	0.18	0.001	0%					
	2.65	1.80	0.44	0.018	0.034		0.90	2	2.13	2.98	0.026	0.023	1.36	1.16	0.027	13%					
	3.30	1.75	0.33	0.018	0.034		0.90	3	2.98	3.58	0.026	0.023	1.42	0.85	0.020	9%					
	3.85	1.77	0.30	0.024	0.027		0.90	4	3.58	4.08	0.026	0.023	1.47	0.74	0.017	8%					
	4.30	1.80	0.36	0.034	0.024		0.90	5	4.08	4.58	0.029	0.026	1.44	0.72	0.019	9%					
	4.85	1.80	0.37	0.018	0.024		0.90	6	4.58	5.10	0.021	0.019	1.43	0.75	0.014	7%					
	5.35	1.76	0.38	0.018	0.021		0.90	7	5.10	5.60	0.020	0.018	1.38	0.69	0.012	6%					
	5.85	1.65	0.35	0.024	0.024		0.90	8	5.60	6.13	0.024	0.022	1.30	0.68	0.015	7%					
	6.40	1.62	0.34	0.015	0.024		0.90	9	6.13	6.68	0.020	0.018	1.28	0.70	0.013	6%					
	6.95	1.66	0.35	0.027	0.024		0.90	10	6.68	7.23	0.026	0.023	1.31	0.72	0.017	8%					
	7.50	1.70	0.32	0.015	0.021		0.90	11	7.23	7.75	0.018	0.016	1.38	0.72	0.012	6%					
	8.00	1.60	0.28	0.024	0.021		0.90	12	7.75	8.28	0.023	0.021	1.32	0.69	0.014	7%					
	8.55	1.45	0.27	0.015	0.021		0.90	13	8.28	8.83	0.018	0.016	1.18	0.65	0.011	5%					
	9.10	1.25	0.22	0.015	0.018		0.90	14	8.83	9.33	0.017	0.015	1.03	0.52	0.008	4%					
	9.55	1.10	0.20	0.024	0.015		0.90	15	9.33	10.03	0.020	0.018	0.90	0.63	0.011	5%					
RB	10.50	0.00	0.00			0	0.90	16	10.03	10.50	0.005	0.004	0.23	0.11	0.000	0%					
Total Flow:															0.211	100%					

Total Flow:	0.211	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	10.51	(m ²)
Top Width:	8.90	(m)
Hydraulic Depth:	1.181	(m)
Mean Velocity:	0.020	(m/s)
Froude Number	0.006	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power: 4.25 V
Data logger External Power: 13.37 V
Data logger Memory Used: 52%
Data logger Clock: 10:49 MST
Laptop Clock: 10:54 MST
Dessicant: Good
Data logger: 308190845
PT: 104640
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: TD Reading = 1.244244



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

Time of Measurement

Date of Measurement: March 14, 2008
Start Time: 11:21 AM MDT
End Time: 11:40 AM MDT

Weather Conditions:

overcast, light snow, -20 C

River Conditions:

Ice cover

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: JS Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: 1.0 m placed on top of DL box
Water Level Reading: 2.107
Top of Ice Level Reading: 2.097
Transducer Reading & Est. El.: 1.164
Other: bottom of logger box

Setup No. 1

El: 99.895
El: 97.594
El: 98.604
El: 96.430
El: 99.893

Setup No. 2

El: 99.895
El: 97.597
El: 98.613
El: 96.433
El: 99.905

Average

97.596
96.431
99.899

LB

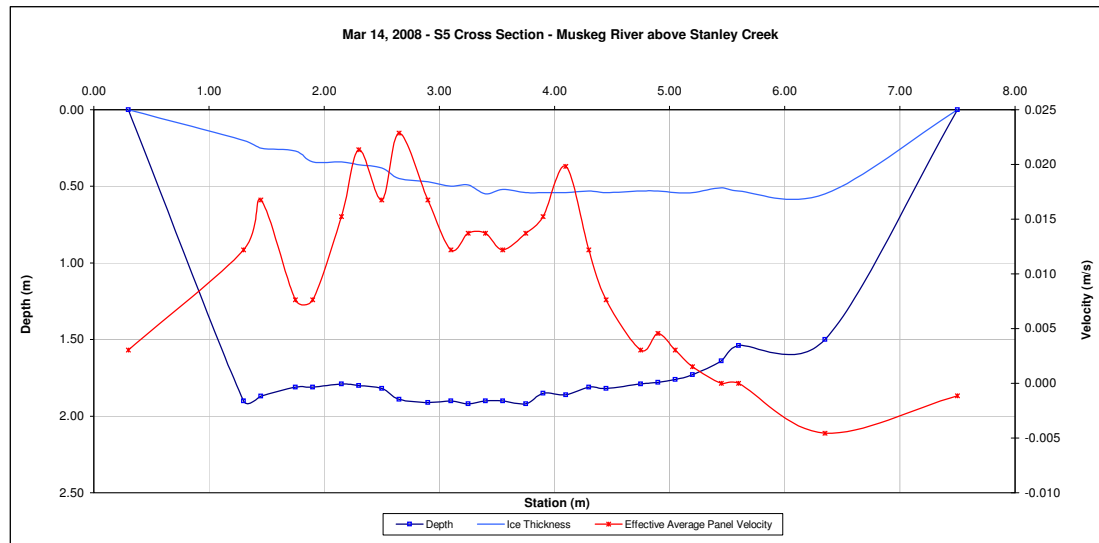
RB

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
0.30	0.00	0.00			0.000	1.00	1	0.30	0.80	0.003	0.003	0.43	0.21	0.001	1%	
1.30	1.90	0.20	0.021	0.003		1.00	2	0.80	1.38	0.012	0.012	1.70	0.98	0.012	16%	
1.45	1.87	0.25	0.024	0.009		1.00	3	1.38	1.60	0.017	0.017	1.62	0.36	0.006	8%	
1.75	1.81	0.27	0.009	0.006		1.00	4	1.60	1.83	0.008	0.008	1.54	0.35	0.003	3%	
1.90	1.81	0.34	0.009	0.006		1.00	5	1.83	2.03	0.008	0.008	1.47	0.29	0.002	3%	
2.15	1.79	0.34	0.021	0.009		1.00	6	2.03	2.23	0.015	0.015	1.45	0.29	0.004	6%	
2.30	1.80	0.36	0.021	0.021		1.00	7	2.23	2.40	0.021	0.021	1.44	0.25	0.005	7%	
2.50	1.82	0.38	0.018	0.015		1.00	8	2.40	2.58	0.017	0.017	1.44	0.25	0.004	6%	
2.65	1.89	0.45	0.018	0.027		1.00	9	2.58	2.78	0.023	0.023	1.44	0.29	0.007	9%	
2.90	1.91	0.47	0.015	0.018		1.00	10	2.78	3.00	0.017	0.017	1.44	0.32	0.005	7%	
3.10	1.90	0.50	0.018	0.006		1.00	11	3.00	3.18	0.012	0.012	1.40	0.25	0.003	4%	
3.25	1.92	0.49	0.012	0.015		1.00	12	3.18	3.33	0.014	0.014	1.43	0.21	0.003	4%	
3.40	1.90	0.55	0.012	0.015		1.00	13	3.33	3.48	0.014	0.014	1.35	0.20	0.003	4%	
3.55	1.90	0.52	0.012	0.012		1.00	14	3.48	3.65	0.012	0.012	1.38	0.24	0.003	4%	
3.75	1.92	0.54	0.015	0.012		1.00	15	3.65	3.83	0.014	0.014	1.38	0.24	0.003	4%	
3.90	1.85	0.54	0.012	0.018		1.00	16	3.83	4.00	0.015	0.015	1.31	0.23	0.003	5%	
4.10	1.86	0.54	0.012	0.027		1.00	17	4.00	4.20	0.020	0.020	1.32	0.26	0.005	7%	
4.30	1.81	0.53	0.009	0.015		1.00	18	4.20	4.38	0.012	0.012	1.28	0.22	0.003	4%	
4.45	1.82	0.54	0.009	0.006		1.00	19	4.38	4.60	0.008	0.008	1.28	0.29	0.002	3%	
4.75	1.79	0.53	0.003	0.003		1.00	20	4.60	4.83	0.003	0.003	1.26	0.28	0.001	1%	
4.90	1.78	0.53	0.006	0.003		1.00	21	4.83	4.98	0.005	0.005	1.25	0.19	0.001	1%	
5.05	1.76	0.54	0.003	0.003		1.00	22	4.98	5.13	0.003	0.003	1.22	0.18	0.001	1%	
5.20	1.73	0.54	0.000	0.003		1.00	23	5.13	5.33	0.002	0.002	1.19	0.24	0.000	0%	
5.45	1.64	0.51	0.000	0.000		1.00	24	5.33	5.53	0.000	0.000	1.13	0.23	0.000	0%	
5.60	1.54	0.53	0.000	0.000		1.00	25	5.53	5.98	0.000	0.000	1.01	0.45	0.000	0%	
6.35	1.50	0.55	-0.009	0.000		1.00	26	5.98	6.93	-0.005	-0.005	0.95	0.90	-0.004	-5%	
7.50	0.00	0.00			0.000	1.00	27	6.93	7.50	-0.001	-0.001	0.24	0.14	0.000	0%	
Total Flow:														0.077	100%	

Total Flow:	0.077	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	8.36	(m ²)
Top Width:	7.20	(m)
Hydraulic Depth:	1.162	(m)
Mean Velocity:	0.009	(m/s)
Froude Number	0.003	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:		
Data logger Internal Power:	4.23 V	
Data logger External Power:	15.14 V	
Data logger Memory Used:	57%	
Data logger Clock:	09:53	MST
Laptop Clock:	10:13	MST
Dessicant:	Good	
Data logger:	308190845	
PT:	104640	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: Light snow, becoming clear



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River above Stanley Creek



Measurement Location

River/Stream: Muskeg River
Location: Muskeg River above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: SMS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: February 15, 2008
Start Time: 11:15 AM MST
End Time: 11:44 AM MST

Level Readings

Bench Mark Reading: 1.0 m placed on 0.00 of 0.00
Water Level Reading: 0.780
Top of Ice Level Reading: 2.070
Transducer Reading & Est. El.: 1.164
Other:

Setup No. 1

El: 99.895
El: 97.590
El: 98.605
El: 96.426
El:

Setup No. 2

0.716
2.024
2.005
1.164
El:

Average

99.895
97.587
98.606
96.423
96.424

Weather Conditions:

overcast, sunny, -2 C
Ice cover with open spots u/s of logger

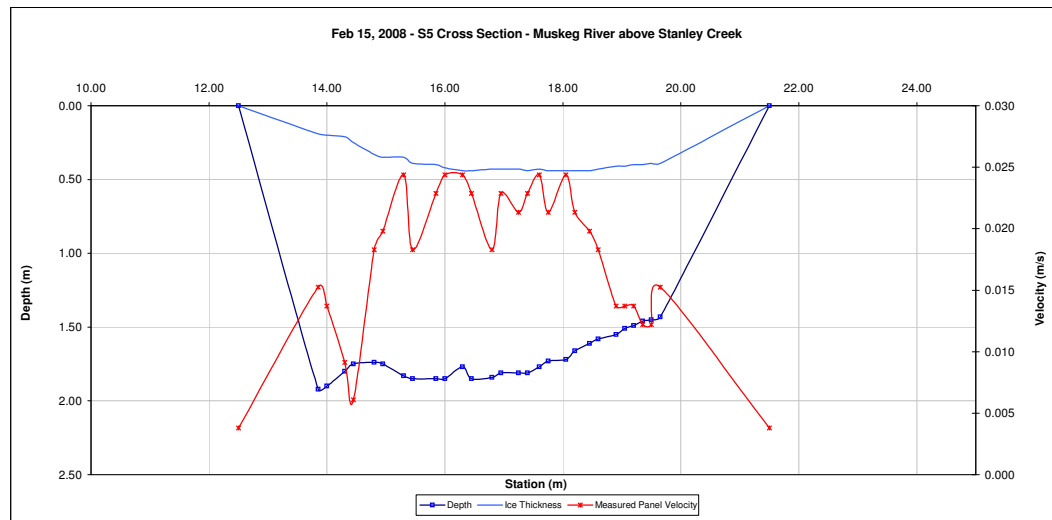
Measurement Data

Measured Data										Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
12.50	0.00	0.00			0	0.90	1	12.50	13.18	0.004	0.003	0.43	0.29	0.001	1%				
13.85	1.92	0.19		0.015		0.90	2	13.18	13.93	0.015	0.014	1.73	1.30	0.018	11%				
14.00	1.90	0.20	0.006	0.021		0.90	3	13.93	14.15	0.014	0.012	1.70	0.38	0.005	3%				
14.30	1.80	0.21	0.003	0.015		0.90	4	14.15	14.38	0.009	0.008	1.59	0.36	0.003	2%				
14.45	1.75	0.25	0.006			0.90	5	14.38	14.63	0.006	0.005	1.50	0.38	0.002	1%				
14.80	1.74	0.33	0.009	0.027		0.90	6	14.63	14.88	0.018	0.016	1.41	0.35	0.006	4%				
14.95	1.75	0.35	0.018	0.021		0.90	7	14.88	15.13	0.020	0.018	1.40	0.35	0.006	4%				
15.30	1.83	0.35	0.018	0.030		0.90	8	15.13	15.38	0.024	0.022	1.48	0.37	0.008	5%				
15.45	1.85	0.39	0.018	0.018		0.90	9	15.38	15.65	0.018	0.016	1.46	0.40	0.007	4%				
15.85	1.85	0.40	0.021	0.024		0.90	10	15.65	15.93	0.023	0.021	1.45	0.40	0.008	5%				
16.00	1.85	0.42	0.021	0.027		0.90	11	15.93	16.15	0.024	0.022	1.43	0.32	0.007	4%				
16.30	1.77	0.44	0.027	0.021		0.90	12	16.15	16.38	0.024	0.022	1.33	0.30	0.007	4%				
16.45	1.85	0.44	0.021	0.024		0.90	13	16.38	16.63	0.023	0.021	1.41	0.35	0.007	4%				
16.80	1.84	0.43	0.021	0.015		0.90	14	16.63	16.88	0.018	0.016	1.41	0.35	0.006	4%				
16.95	1.81	0.43	0.024	0.021		0.90	15	16.88	17.10	0.023	0.021	1.38	0.31	0.006	4%				
17.25	1.81	0.43	0.024	0.018		0.90	16	17.10	17.33	0.021	0.019	1.38	0.31	0.006	4%				
17.40	1.81	0.44	0.021	0.024		0.90	17	17.33	17.50	0.023	0.021	1.37	0.24	0.005	3%				
17.60	1.77	0.43	0.024	0.024		0.90	18	17.50	17.68	0.024	0.022	1.34	0.23	0.005	3%				
17.75	1.73	0.44	0.021	0.021		0.90	19	17.68	17.90	0.021	0.019	1.29	0.29	0.006	3%				
18.05	1.72	0.44	0.027	0.021		0.90	20	17.90	18.13	0.024	0.022	1.28	0.29	0.006	4%				
18.20	1.66	0.44	0.024	0.018		0.90	21	18.13	18.33	0.021	0.019	1.22	0.24	0.005	3%				
18.45	1.61	0.44	0.018	0.021		0.90	22	18.33	18.53	0.020	0.018	1.17	0.23	0.004	3%				
18.60	1.58	0.43	0.024	0.012		0.90	23	18.53	18.75	0.018	0.016	1.15	0.26	0.004	3%				
18.90	1.55	0.41	0.012	0.015		0.90	24	18.75	18.98	0.014	0.012	1.14	0.26	0.003	2%				
19.05	1.51	0.41	0.006	0.021		0.90	25	18.98	19.13	0.014	0.012	1.10	0.16	0.002	1%				
19.20	1.49	0.40	0.009	0.018		0.90	26	19.13	19.28	0.014	0.012	1.09	0.16	0.002	1%				
19.35	1.46	0.40	0.012	0.012		0.90	27	19.28	19.43	0.012	0.011	1.06	0.16	0.002	1%				
19.50	1.45	0.39	0.012	0.012		0.90	28	19.43	19.58	0.012	0.011	1.06	0.16	0.002	1%				
19.65	1.43	0.39	0.012	0.018		0.90	29	19.58	20.58	0.015	0.014	1.04	1.04	0.014	9%				
21.50	0.00	0.00			0	0.90	23	20.58	21.50	0.004	0.003	0.26	0.24	0.001	1%				
Total Flow:														0.163	100%				

Total Flow:	0.163	(m ³ /s)
Perceived Measurement Quality:	good	
Total Area:	10.50	(m ²)
Top Width:	9.00	(m)
Hydraulic Depth:	1.166	(m)
Mean Velocity:	0.016	(m/s)
Froude Number	0.005	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:		
Data logger Internal Power:	4.25 V	
Data logger External Power:	14.32	
Data logger Memory Used:	52%	
Data logger Clock:	11:26	MST
Laptop Clock:	11:35	MST
Dessicant:	Good	
Data logger:	308190845	
PT:	104640	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: TD Reading = 1164436



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

Time of Measurement

Date of Measurement: April 4, 2008
Start Time: 12:03 PM MDT
End Time: 12:30 PM MDT

Weather Conditions:

-15°C, Clear skies, Moderate Winds

River Conditions:

Ice cover

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: JS Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: 1.0 m placed on
top of DL box 0.785
Water Level Reading: 2.096
Top of Ice Level Reading: 2.070
Transducer Reading & Est. El.: 1.161
Other: bottom of logger box 0.215

Setup No. 1

El: 99.895
El: 97.584
El: 98.610
El: 96.423
El: 99.895

Setup No. 2

El: 99.895
El: 97.583
El: 98.609
El: 96.422
El: 99.891

Average

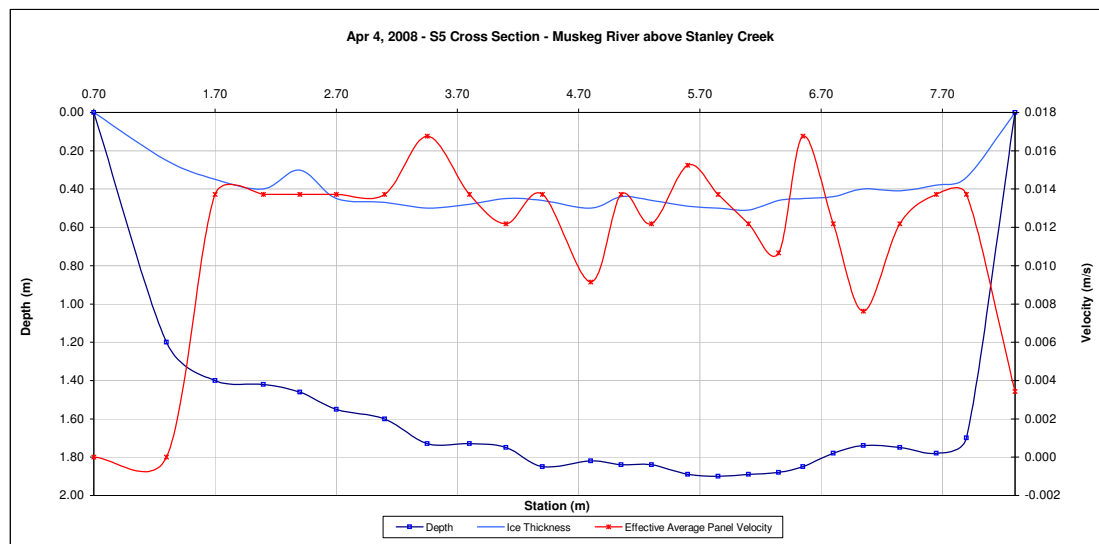
97.584
96.422
99.893

		Measurement Data														
Measured Data							Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)		(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	0.70	0.00	0.00			0.000	0.90	1	0.70	1.00	0.000	0.000	0.24	0.07	0.000	0%
	1.30	1.20	0.25			0.000	0.90	2	1.00	1.50	0.000	0.000	0.95	0.48	0.000	0%
	1.70	1.40	0.35			0.015	0.90	3	1.50	1.90	0.015	0.014	1.05	0.42	0.006	5%
	2.10	1.42	0.40			0.015	0.90	4	1.90	2.25	0.015	0.014	1.02	0.36	0.005	4%
	2.40	1.46	0.30			0.015	0.90	5	2.25	2.55	0.015	0.014	1.16	0.35	0.005	4%
	2.70	1.55	0.45			0.015	0.90	6	2.55	2.90	0.015	0.014	1.10	0.39	0.005	5%
	3.10	1.60	0.47	0.015	0.012		1.00	7	2.90	3.28	0.014	0.014	1.13	0.42	0.006	5%
	3.45	1.73	0.50	0.021	0.012		1.00	8	3.28	3.63	0.017	0.017	1.23	0.43	0.007	7%
	3.80	1.73	0.48	0.018	0.009		1.00	9	3.63	3.95	0.014	0.014	1.25	0.41	0.006	5%
	4.10	1.75	0.45	0.015	0.009		1.00	10	3.95	4.25	0.012	0.012	1.30	0.39	0.005	4%
	4.40	1.85	0.46	0.012	0.015		1.00	11	4.25	4.60	0.014	0.014	1.39	0.49	0.007	6%
	4.80	1.82	0.50	0.006	0.012		1.00	12	4.60	4.93	0.009	0.009	1.32	0.43	0.004	4%
	5.05	1.84	0.44	0.003	0.024		1.00	13	4.93	5.18	0.014	0.014	1.40	0.35	0.005	4%
	5.30	1.84	0.46	0.012	0.012		1.00	14	5.18	5.45	0.012	0.012	1.38	0.38	0.005	4%
	5.60	1.89	0.49	0.015	0.015		1.00	15	5.45	5.73	0.015	0.015	1.40	0.39	0.006	5%
	5.85	1.90	0.50	0.012	0.015		1.00	16	5.73	5.98	0.014	0.014	1.40	0.35	0.005	4%
	6.10	1.89	0.51	0.018	0.006		1.00	17	5.98	6.23	0.012	0.012	1.38	0.35	0.004	4%
	6.35	1.88	0.46	0.012	0.009		1.00	18	6.23	6.45	0.011	0.011	1.42	0.32	0.003	3%
	6.55	1.85	0.45	0.021	0.012		1.00	19	6.45	6.68	0.017	0.017	1.40	0.32	0.005	5%
	6.80	1.78	0.44	0.021	0.003		1.00	20	6.68	6.93	0.012	0.012	1.34	0.34	0.004	4%
	7.05	1.74	0.40	0.009	0.006		1.00	21	6.93	7.20	0.008	0.008	1.34	0.37	0.003	3%
	7.35	1.75	0.41	0.012	0.012		1.00	22	7.20	7.50	0.012	0.012	1.34	0.40	0.005	4%
	7.65	1.78	0.38	0.015	0.012		1.00	23	7.50	7.78	0.014	0.014	1.40	0.39	0.005	5%
	7.90	1.70	0.34	0.012	0.015		1.00	24	7.78	8.10	0.014	0.014	1.36	0.44	0.006	5%
	LB	8.30	0.00	0.00			0.000	1.00	25	8.10	8.30	0.003	0.003	0.34	0.07	0.000
Total Flow:													0.111	1.000		

Total Flow:	0.111	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	9.07	(m ²)
Top Width:	7.60	(m)
Hydraulic Depth:	1.193	(m)
Mean Velocity:	0.012	(m/s)
Froude Number	0.004	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	
Data logger Internal Power:	4.25 V
Data logger External Power:	14.97 V
Data logger Memory Used:	59%
Data logger Clock:	10:24 MST
Laptop Clock:	10:44 MST
Dessicant:	Good
Data logger:	308190845
PT:	104640
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes:



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

Time of Measurement

Date of Measurement: May 13, 2008
Start Time: 11:16 AM MDT
End Time: 11:40 AM MDT

Weather Conditions:

sunny, 10 C

River Conditions:

open, high stage

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: 0.080
Water Level Reading: 1.202
Top of Ice Level Reading: 2.394
Transducer Reading & Est. El.: 2.624
Other: rebar in PVC

Setup No. 1

El: 99.895
El: 98.613
El: 99.975
El: 96.219
El: 97.191

Setup No. 2

El: 99.895
El: 98.613
El: 99.992
El: 96.219
El: 97.190

Average

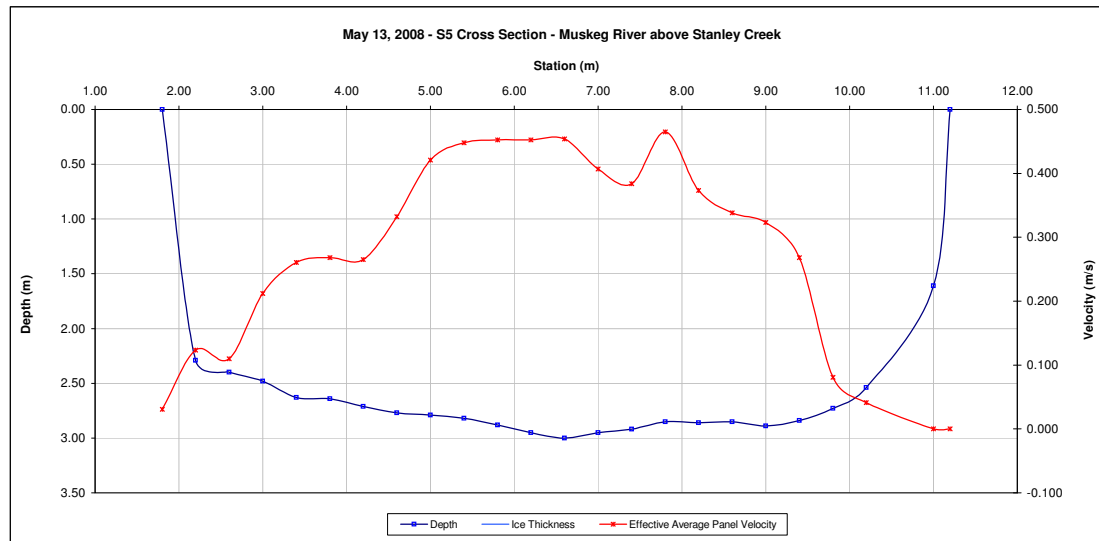
98.613
96.219

Measured Data							Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
1.80	0.00					1.00	1	1.80	2.00	0.031	0.031	0.57	0.11	0.004	0%
2.20	2.29		0.210	0.037		1.00	2	2.00	2.40	0.123	0.123	2.29	0.92	0.113	2%
2.60	2.40		0.125	0.094		1.00	3	2.40	2.80	0.110	0.110	2.40	0.96	0.105	1%
3.00	2.48		0.265	0.158		1.00	4	2.80	3.20	0.212	0.212	2.48	0.99	0.210	3%
3.40	2.63		0.311	0.210		1.00	5	3.20	3.60	0.261	0.261	2.63	1.05	0.274	4%
3.80	2.64		0.287	0.250		1.00	6	3.60	4.00	0.268	0.268	2.64	1.06	0.283	4%
4.20	2.71		0.256	0.274		1.00	7	4.00	4.40	0.265	0.265	2.71	1.08	0.287	4%
4.60	2.77		0.347	0.317		1.00	8	4.40	4.80	0.332	0.332	2.77	1.11	0.368	5%
5.00	2.79		0.387	0.454		1.00	9	4.80	5.20	0.421	0.421	2.79	1.12	0.469	6%
5.40	2.82		0.418	0.479		1.00	10	5.20	5.60	0.448	0.448	2.82	1.13	0.505	7%
5.80	2.88		0.375	0.530		1.00	11	5.60	6.00	0.453	0.453	2.88	1.15	0.521	7%
6.20	2.95		0.524	0.381		1.00	12	6.00	6.40	0.453	0.453	2.95	1.18	0.534	7%
6.60	3.00		0.543	0.366		1.00	13	6.40	6.80	0.454	0.454	3.00	1.20	0.545	7%
7.00	2.95		0.466	0.347		1.00	14	6.80	7.20	0.407	0.407	2.95	1.18	0.480	7%
7.40	2.92		0.457	0.311		1.00	15	7.20	7.60	0.384	0.384	2.92	1.17	0.449	6%
7.80	2.85		0.552	0.378		1.00	16	7.60	8.00	0.465	0.465	2.85	1.14	0.530	7%
8.20	2.86		0.466	0.280		1.00	17	8.00	8.40	0.373	0.373	2.86	1.14	0.427	6%
8.60	2.85		0.439	0.238		1.00	18	8.40	8.80	0.338	0.338	2.85	1.14	0.386	5%
9.00	2.89		0.329	0.317		1.00	19	8.80	9.20	0.323	0.323	2.89	1.16	0.373	5%
9.40	2.84		0.283	0.253		1.00	20	9.20	9.60	0.268	0.268	2.84	1.14	0.305	4%
9.80	2.73		0.040	0.122		1.00	21	9.60	10.00	0.081	0.081	2.73	1.09	0.088	1%
10.20	2.54		0.046	0.037		1.00	22	10.00	10.60	0.041	0.041	2.54	1.52	0.063	1%
11.00	1.61		0.000	0.000		1.00	23	10.60	11.10	0.000	0.000	1.61	0.81	0.000	0%
11.20	0.00					1.00	24	11.10	11.20	0.000	0.000	0.40	0.04	0.000	0%
Total Flow:														7.321	1.000

Total Flow:	7.321	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	24.58	(m ²)
Top Width:	9.40	(m)
Hydraulic Depth:	2.615	(m)
Mean Velocity:	0.298	(m/s)
Froude Number	0.059	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:
Data logger Internal Power: 4.3 V
Data logger External Power: 14.17 V
Data logger Memory Used: 60%
Data logger Clock: 10:40 MST
Laptop Clock: 10:50 MST
Dessicant: good
Data logger: 308190845
PT: 104640
Power: Magnacharge 20V 10A DC Battery and
PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: bank is flooded, flow in vegetation is difficult to measure



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

Time of Measurement

Date of Measurement: June 29, 2008
Start Time: 11:16 AM MDT
End Time: 11:36 AM MDT

Weather Conditions:

sunny, +27 C

River Conditions:

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: 0.263
Water Level Reading: 1.949
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.565
Other: 2.437

rod upside down
on logger box

Setup No. 1

El: 99.895
El: 97.683
El: 100.158
El: 96.118
El: 97.195

Setup No. 2

0.284 El: 99.895
1.93 El: 97.681
El: 100.179
1.565 El: 96.116
2.416 El: 97.195

Average

97.682
96.117
97.195

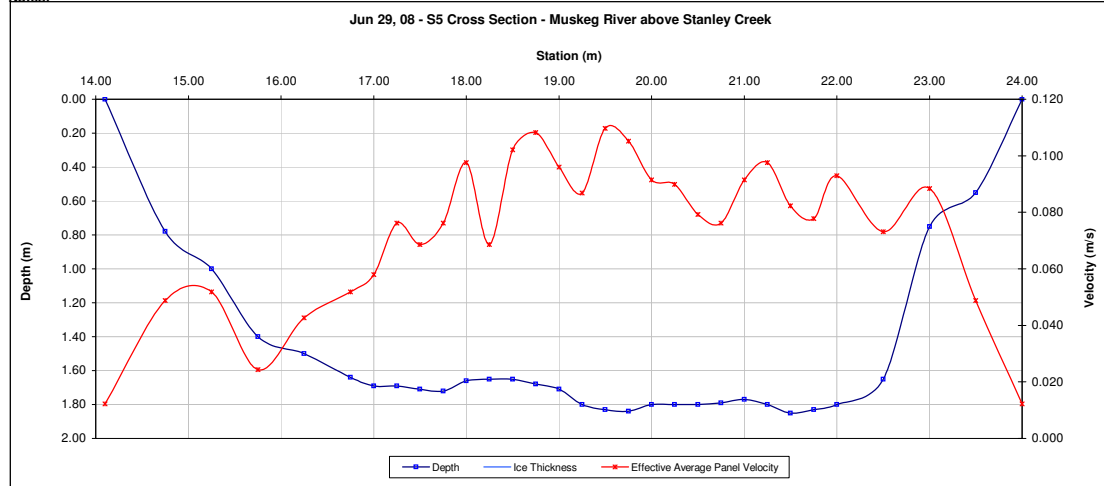
RB

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
14.10	0.00					1.00	1	14.10	14.43	0.012	0.012	0.20	0.06	0.001	0%	
14.75	0.78				0.049	1.00	2	14.43	15.00	0.049	0.049	0.78	0.45	0.022	2%	
15.25	1.00				0.052	1.00	3	15.00	15.50	0.052	0.052	1.00	0.50	0.026	2%	
15.75	1.40		0.027	0.021		1.00	4	15.50	16.00	0.024	0.024	1.40	0.70	0.017	2%	
16.25	1.50		0.064	0.021		1.00	5	16.00	16.50	0.043	0.043	1.50	0.75	0.032	3%	
16.75	1.64		0.058	0.046		1.00	6	16.50	16.88	0.052	0.052	1.64	0.62	0.032	3%	
17.00	1.69		0.055	0.061		1.00	7	16.88	17.13	0.058	0.058	1.69	0.42	0.024	2%	
17.25	1.69		0.073	0.079		1.00	8	17.13	17.38	0.076	0.076	1.69	0.42	0.032	3%	
17.50	1.71		0.094	0.043		1.00	9	17.38	17.63	0.069	0.069	1.71	0.43	0.029	3%	
17.75	1.72		0.091	0.061		1.00	10	17.63	17.88	0.076	0.076	1.72	0.43	0.033	3%	
18.00	1.66		0.101	0.094		1.00	11	17.88	18.13	0.098	0.098	1.66	0.42	0.040	4%	
18.25	1.65		0.070	0.067		1.00	12	18.13	18.38	0.069	0.069	1.65	0.41	0.028	3%	
18.50	1.65		0.101	0.104		1.00	13	18.38	18.63	0.102	0.102	1.65	0.41	0.042	4%	
18.75	1.68		0.104	0.113		1.00	14	18.63	18.88	0.108	0.108	1.68	0.42	0.045	4%	
19.00	1.71		0.091	0.101		1.00	15	18.88	19.13	0.096	0.096	1.71	0.43	0.041	4%	
19.25	1.80		0.098	0.076		1.00	16	19.13	19.38	0.087	0.087	1.80	0.45	0.039	4%	
19.50	1.83		0.122	0.098		1.00	17	19.38	19.63	0.110	0.110	1.83	0.46	0.050	5%	
19.75	1.84		0.131	0.079		1.00	18	19.63	19.88	0.105	0.105	1.84	0.46	0.048	5%	
20.00	1.80		0.107	0.076		1.00	19	19.88	20.13	0.091	0.091	1.80	0.45	0.041	4%	
20.25	1.80		0.091	0.088		1.00	20	20.13	20.38	0.090	0.090	1.80	0.45	0.040	4%	
20.50	1.80		0.073	0.085		1.00	21	20.38	20.63	0.079	0.079	1.80	0.45	0.036	3%	
20.75	1.79		0.088	0.064		1.00	22	20.63	20.88	0.076	0.076	1.79	0.45	0.034	3%	
21.00	1.77		0.119	0.064		1.00	23	20.88	21.13	0.091	0.091	1.77	0.44	0.040	4%	
21.25	1.80		0.107	0.088		1.00	24	21.13	21.38	0.098	0.098	1.80	0.45	0.044	4%	
21.50	1.85		0.094	0.070		1.00	25	21.38	21.63	0.082	0.082	1.85	0.46	0.038	4%	
21.75	1.83		0.064	0.091		1.00	26	21.63	21.88	0.078	0.078	1.83	0.46	0.036	3%	
22.00	1.80		0.079	0.107		1.00	27	21.88	22.25	0.093	0.093	1.80	0.68	0.063	6%	
22.50	1.65		0.076	0.070		1.00	28	22.25	22.75	0.073	0.073	1.65	0.83	0.060	6%	
23.00	0.75				0.088	1.00	29	22.75	23.25	0.088	0.088	0.75	0.38	0.033	3%	
23.50	0.55				0.049	1.00	30	23.25	23.75	0.049	0.049	0.55	0.28	0.013	1%	
24.00	0.00					1.00	31	23.75	24.00	0.012	0.012	0.14	0.03	0.000	0%	
Total Flow:															1.063	1.000

Total Flow:	1.063	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	14.03	(m ²)
Top Width:	9.90	(m)
Hydraulic Depth:	1.417	(m)
Mean Velocity:	0.076	(m/s)
Froude Number	0.020	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:
Data logger Internal Power: 4.35 V
Data logger External Power: 14.05 V
Data logger Memory Used: 4% used
Data logger Clock: 9:57:00 MST
Laptop Clock: 10:07:00 MST
Dessicant:
Data logger: 308190845
PT: 104640
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes:



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

Time of Measurement

Date of Measurement: August 9, 2008
Start Time: 11:36 AM MDT
End Time: 12:06 AM MDT

Weather Conditions:

sunny, +26 C

River Conditions:

Open Water

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: JS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Rebar in PVC 2.557
Water Level Reading: 1.824
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.835
Other: T-post (Newly Installed) 1.502

Setup No. 1

El: 97.195
El: 97.928
El: 99.752
El: 96.093
El: 98.250

Setup No. 2

El: 97.195
El: 97.932
El: 99.737
El: 96.097
El: 98.250

Average

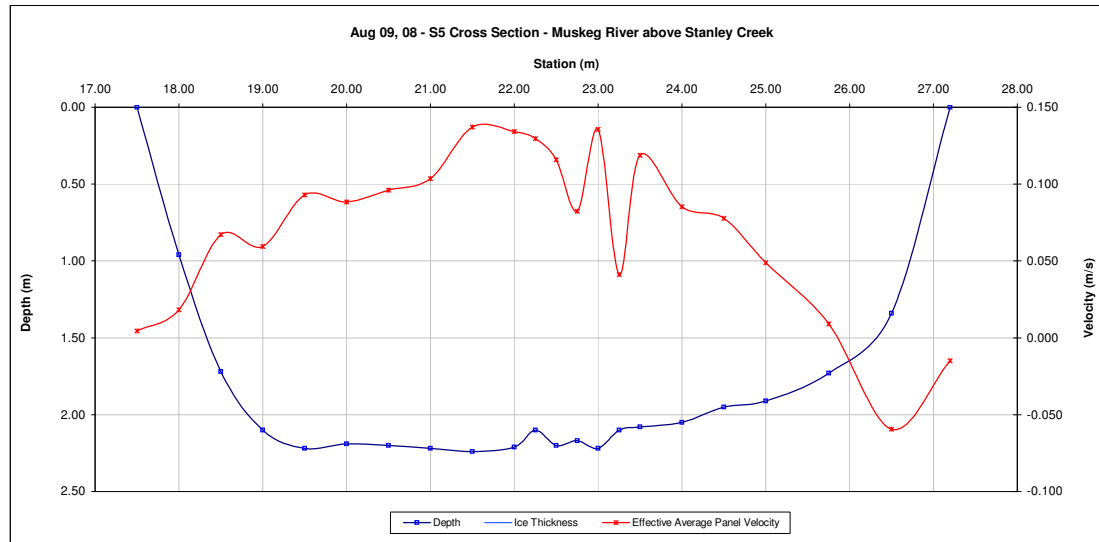
97.930
96.095
98.250

Measurement Data																
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	17.50	0.00				1.00	1	17.50	17.75	0.005	0.005	0.24	0.06	0.000	0%	
	18.00	0.96			0.018	1.00	2	17.75	18.25	0.018	0.018	0.96	0.48	0.009	1%	
	18.50	1.72	0.037	0.098		1.00	3	18.25	18.75	0.067	0.067	1.72	0.86	0.058	4%	
	19.00	2.10	0.049	0.070		1.00	4	18.75	19.25	0.059	0.059	2.10	1.05	0.062	5%	
	19.50	2.22	0.024	0.162		1.00	5	19.25	19.75	0.093	0.093	2.22	1.11	0.103	8%	
	20.00	2.19	0.076	0.101		1.00	6	19.75	20.25	0.088	0.088	2.19	1.10	0.097	7%	
	20.50	2.20	0.113	0.079		1.00	7	20.25	20.75	0.096	0.096	2.20	1.10	0.106	8%	
	21.00	2.22	0.125	0.082		1.00	8	20.75	21.25	0.104	0.104	2.22	1.11	0.115	8%	
	21.50	2.24	0.128	0.146		1.00	9	21.25	21.75	0.137	0.137	2.24	1.12	0.154	11%	
	22.00	2.21	0.131	0.137		1.00	10	21.75	22.13	0.134	0.134	2.21	0.83	0.111	8%	
	22.25	2.10	0.125	0.134		1.00	11	22.13	22.38	0.130	0.130	2.10	0.53	0.068	5%	
	22.50	2.20	0.076	0.155		1.00	12	22.38	22.63	0.116	0.116	2.20	0.55	0.064	5%	
	22.75	2.17	0.076	0.088		1.00	13	22.63	22.88	0.082	0.082	2.17	0.54	0.045	3%	
	23.00	2.22	0.131	0.140		1.00	14	22.88	23.13	0.136	0.136	2.22	0.56	0.075	6%	
	23.25	2.10	0.024	0.058		1.00	15	23.13	23.38	0.041	0.041	2.10	0.53	0.022	2%	
	23.50	2.08	0.131	0.107		1.00	16	23.38	23.75	0.119	0.119	2.08	0.78	0.093	7%	
	24.00	2.05	0.082	0.088		1.00	17	23.75	24.25	0.085	0.085	2.05	1.03	0.087	6%	
	24.50	1.95	0.067	0.088		1.00	18	24.25	24.75	0.078	0.078	1.95	0.98	0.076	6%	
	25.00	1.91	0.055	0.043		1.00	19	24.75	25.38	0.049	0.049	1.91	1.19	0.058	4%	
	25.75	1.73	0.027	-0.009		1.00	20	25.38	26.13	0.009	0.009	1.73	1.30	0.012	1%	
	26.50	1.34		-0.058	-0.061		1.00	21	26.13	26.85	-0.059	-0.059	1.34	0.97	-0.058	-4%
	27.20	0.00					1.00	22	26.85	27.20	-0.015	-0.015	0.34	0.12	-0.002	0%
Total Flow:														1.354	1.000	

Total Flow:	1.354	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	17.87	(m ²)
Top Width:	9.70	(m)
Hydraulic Depth:	1.842	(m)
Mean Velocity:	0.076	(m/s)
Froude Number	0.018	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:
Data logger Internal Power: 4.35 V
Data logger External Power: 14.05 V
Data logger Memory Used: 7% used
Data logger Clock: 10:21:00 MST
Laptop Clock: 10:30:00 MST
Dessicant: changed
Data logger:
PT: 104640
Power: Magnacharge 20V 10A DC Battery and
PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: New BM installed so that the upside down logger box measurement does not need to be performed.
The new BM is a Tpost located next to the logger box marked with orange flagging. Bring PVC pipe as cover on next trip
Data good



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4
Time of Measurement
Date of Measurement: September 13, 2008
Start Time: 1:25 PM MDT
End Time: 1:50 PM MDT

Weather Conditions: warm, partly cloudy
River Conditions: open low

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Rebar in PVC 2.440
Water Level Reading: 1.911
Top of Ice Level Reading: 1.514
Transducer Reading & Est. El.: 1.385
Other: T-post (Newly Installed) 1.78
Spare TD Reading and El: 1.78

Setup No. 1

El: 97.195
El: 97.724
El: 99.635
El: 96.210
El: 98.250
El: 95.944

Setup No. 2

El: 2.406
El: 1.872
El: 99.601
El: 96.215
El: 98.251
El: 95.949

Average

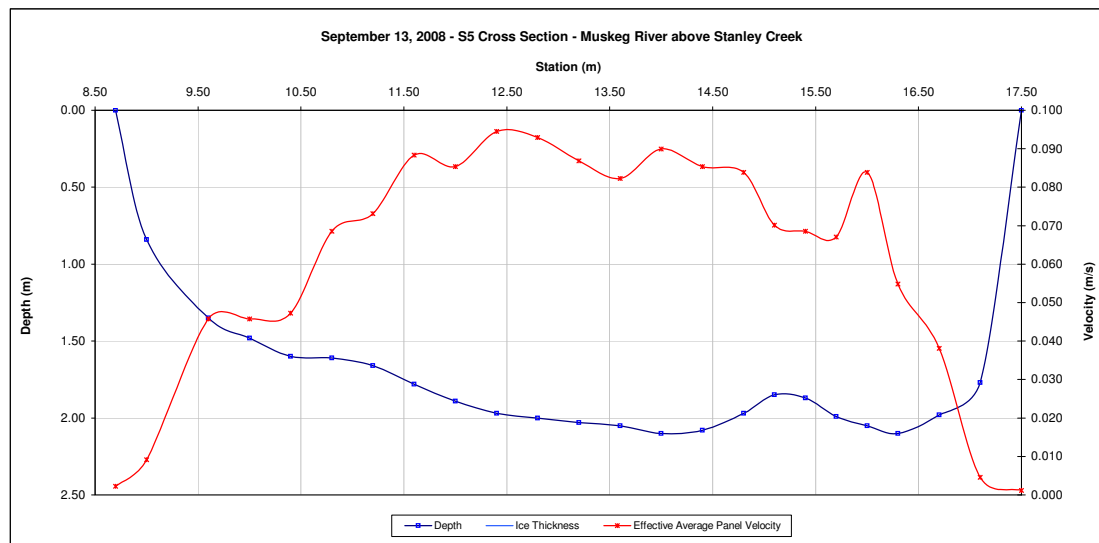
97.727
96.213
98.251
95.947

		Measurement Data																	
		Measured Data				Calculated Data													
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total			
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)				
LB	17.50	0.00					1.00	1	17.50	17.30	0.001	0.001	0.44	0.09	0.000	0%			
	17.10	1.77		0.006	0.003		1.00	2	17.30	16.90	0.005	0.005	1.77	0.71	0.003	0%			
	16.70	1.98		0.058	0.018		1.00	3	16.90	16.50	0.038	0.038	1.98	0.79	0.030	3%			
	16.30	2.10		0.076	0.034		1.00	4	16.50	16.15	0.055	0.055	2.10	0.74	0.040	4%			
	16.00	2.05		0.088	0.079		1.00	5	16.15	15.85	0.084	0.084	2.05	0.61	0.052	5%			
	15.70	1.99		0.073	0.061		1.00	6	15.85	15.55	0.067	0.067	1.99	0.60	0.040	4%			
	15.40	1.87		0.085	0.052		1.00	7	15.55	15.25	0.069	0.069	1.87	0.56	0.038	4%			
	15.10	1.85		0.101	0.040		1.00	8	15.25	14.95	0.070	0.070	1.85	0.56	0.039	4%			
	14.80	1.97		0.091	0.076		1.00	9	14.95	14.60	0.084	0.084	1.97	0.69	0.058	6%			
	14.40	2.08		0.116	0.055		1.00	10	14.60	14.20	0.085	0.085	2.08	0.83	0.071	7%			
	14.00	2.10		0.098	0.082		1.00	11	14.20	13.80	0.090	0.090	2.10	0.84	0.076	7%			
	13.60	2.05		0.098	0.067		1.00	12	13.80	13.40	0.082	0.082	2.05	0.82	0.067	6%			
	13.20	2.03		0.098	0.076		1.00	13	13.40	13.00	0.087	0.087	2.03	0.81	0.071	7%			
	12.80	2.00		0.076	0.110		1.00	14	13.00	12.60	0.093	0.093	2.00	0.80	0.074	7%			
	12.40	1.97		0.085	0.104		1.00	15	12.60	12.20	0.094	0.094	1.97	0.79	0.074	7%			
	12.00	1.89		0.079	0.091		1.00	16	12.20	11.80	0.085	0.085	1.89	0.76	0.065	6%			
	11.60	1.78		0.094	0.082		1.00	17	11.80	11.40	0.088	0.088	1.78	0.71	0.063	6%			
	11.20	1.66		0.067	0.079		1.00	18	11.40	11.00	0.073	0.073	1.66	0.66	0.049	5%			
	10.80	1.61		0.079	0.058		1.00	19	11.00	10.60	0.069	0.069	1.61	0.64	0.044	4%			
	10.40	1.60		0.061	0.034		1.00	20	10.60	10.20	0.047	0.047	1.60	0.64	0.030	3%			
	10.00	1.48		0.058	0.034		1.00	21	10.20	9.80	0.046	0.046	1.48	0.59	0.027	3%			
	9.60	1.35		0.055	0.037		1.00	22	9.80	9.30	0.046	0.046	1.35	0.68	0.031	3%			
	9.00	0.84				0.009	1.00	23	9.30	8.85	0.009	0.009	0.84	0.38	0.003	0%			
	8.70	0.00					1.00	24	8.85	8.70	0.002	0.002	0.21	0.03	0.000	0%			
RB																			
Total Flow:															1.046	1.000			

Total Flow:	1.046	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	15.33	(m ²)
Top Width:	8.80	(m)
Hydraulic Depth:	1.742	(m)
Mean Velocity:	0.068	(m/s)
Froude Number	0.017	
Photographs taken looking at:		
Photographs taken.		

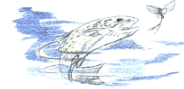
Data logger Notes:
Data logger Internal Power: 4.32 V
Data logger External Power: 14.3 V
Data logger Memory Used: 10% used
Data logger Clock: 12:00 PM MST
Laptop Clock: 12:10 PM MST
Dessicant: good
Data logger: 845
PT: 104640
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: Installed 2nd TD Serial Number: 39682 Calibrated April 2007
m=1.4061760 b=0
Depth reading 1.78 m, 5 PSI 2.5 Volts



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

Time of Measurement

Date of Measurement: October 21, 2008
Start Time: 12:25 PM MDT
End Time: 12:52 PM MDT

Weather Conditions:

Rain Cloud

River Conditions:

open low

Personnel & Equipment

Measurement Made By: SM/AM
Data Entry By: LS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rebar in PVC
Water Level Reading: 1.876
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.530
Other: T-post (Newly Installed) 1.440
Spare Transducer Read and El.: 1.878

Setup No. 1

El: 97.195
El: 97.814
El: 96.284
El: 98.250
El: 95.936

Setup No. 2

El: 2.4599
El: 1.846
El: 1.530
El: 1.406
El: 1.878

Average

97.196
97.810
99.656
96.280
98.250
95.932

Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
8.20	0.00					1.00	1	8.20	8.50	0.005	0.005	0.30	0.09	0.000	0%	
8.80	1.20		0.034	0.006		1.00	2	8.50	9.15	0.020	0.020	1.20	0.78	0.015	1%	
9.50	1.50		0.040	0.064		1.00	3	9.15	10.00	0.052	0.052	1.50	1.28	0.066	5%	
10.50	1.83		0.101	0.052		1.00	4	10.00	10.75	0.076	0.076	1.83	1.37	0.105	8%	
11.00	1.90		0.091	0.058		1.00	5	10.75	11.13	0.075	0.075	1.90	0.71	0.053	4%	
11.25	1.95		0.116	0.058		1.00	6	11.13	11.38	0.087	0.087	1.95	0.49	0.042	3%	
11.50	1.99		0.094	0.107		1.00	7	11.38	11.63	0.101	0.101	1.99	0.50	0.050	4%	
11.75	2.01		0.107	0.073		1.00	8	11.63	11.88	0.090	0.090	2.01	0.50	0.045	3%	
12.00	2.00		0.098	0.098		1.00	9	11.88	12.13	0.098	0.098	2.00	0.50	0.049	4%	
12.25	2.00		0.088	0.094		1.00	10	12.13	12.38	0.091	0.091	2.00	0.50	0.046	3%	
12.50	2.05		0.128	0.101		1.00	11	12.38	12.63	0.114	0.114	2.05	0.51	0.059	4%	
12.75	2.10		0.113	0.104		1.00	12	12.63	12.88	0.108	0.108	2.10	0.53	0.057	4%	
13.00	2.12		0.134	0.085		1.00	13	12.88	13.13	0.110	0.110	2.12	0.53	0.058	4%	
13.25	2.16		0.107	0.076		1.00	14	13.13	13.38	0.091	0.091	2.16	0.54	0.049	4%	
13.50	2.17		0.107	0.116		1.00	15	13.38	13.63	0.111	0.111	2.17	0.54	0.060	5%	
13.75	2.15		0.119	0.055		1.00	16	13.63	13.88	0.087	0.087	2.15	0.54	0.047	4%	
14.00	2.18		0.085	0.085		1.00	17	13.88	14.10	0.085	0.085	2.18	0.49	0.042	3%	
14.20	2.18		0.119	0.082		1.00	18	14.10	14.30	0.101	0.101	2.18	0.44	0.044	3%	
14.40	2.17		0.091	0.052		1.00	19	14.30	14.50	0.072	0.072	2.17	0.43	0.031	2%	
14.60	2.09		0.101	0.091		1.00	20	14.50	14.70	0.096	0.096	2.09	0.42	0.040	3%	
14.80	2.10		0.116	0.037		1.00	21	14.70	14.90	0.076	0.076	2.10	0.42	0.032	2%	
15.00	2.07		0.110	0.046		1.00	22	14.90	15.10	0.078	0.078	2.07	0.41	0.032	2%	
15.20	2.05		0.107	0.067		1.00	23	15.10	15.30	0.087	0.087	2.05	0.41	0.036	3%	
15.40	2.07		0.131	0.107		1.00	24	15.30	15.50	0.119	0.119	2.07	0.41	0.049	4%	
15.60	2.04		0.116	0.070		1.00	25	15.50	15.70	0.093	0.093	2.04	0.41	0.038	3%	
15.80	2.00		0.061	0.091		1.00	26	15.70	15.90	0.076	0.076	2.00	0.40	0.030	2%	
16.00	2.00		0.082	0.094		1.00	27	15.90	16.25	0.088	0.088	2.00	0.70	0.062	5%	
16.50	1.84		0.049	0.079		1.00	28	16.25	16.75	0.064	0.064	1.84	0.92	0.059	4%	
17.00	1.40		0.046	0.018		1.00	29	16.75	17.50	0.032	0.032	1.40	1.05	0.034	3%	
18.00	0.00					1.00	30	17.50	18.00	0.008	0.008	0.35	0.18	0.001	0%	
Total Flow:														1.332	1.000	

Total Flow:	1.332	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	16.99	(m ²)
Top Width:	9.80	(m)
Hydraulic Depth:	1.734	(m)
Mean Velocity:	0.078	(m/s)
Froude Number	0.019	
Photographs taken looking at:		
Photographs taken:		

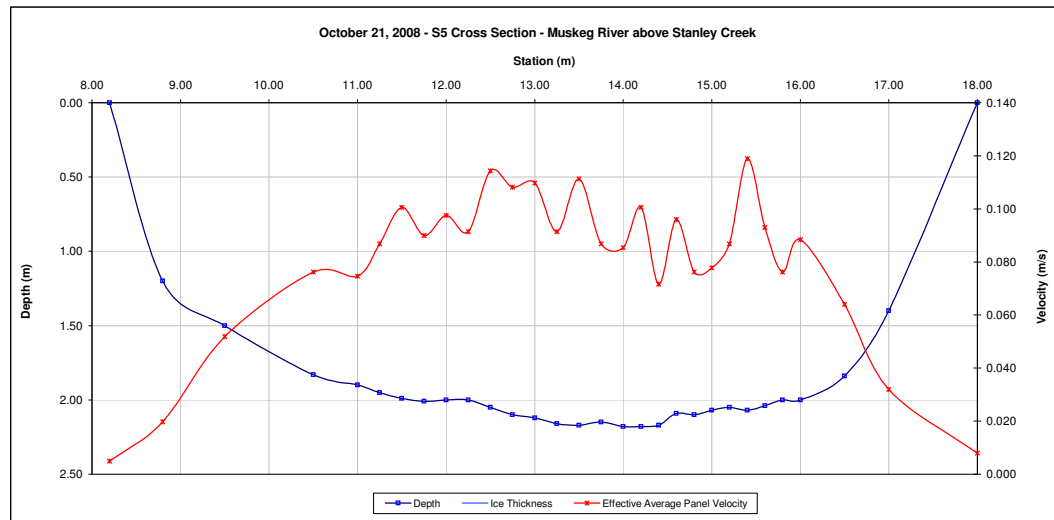
Data logger Notes:

Data logger Internal Power: 4.28 V
Data logger External Power: 13.62 V
Data logger Memory Used: 19% used
Data logger Clock: 10:56 AM MST
Laptop Clock: 11:06 AM MST
Dessicant: good

Data logger: 845
PT: 104640
Power: Magnacharge 20V 10A DC Battery and
PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes:

Spare TD - Reading 1.878



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

Time of Measurement

Date of Measurement: December 14, 2008
Start Time: 11:15 AM MST
End Time:

Weather Conditions: light snow, overcast, -32 C
River Conditions: ice-cover

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: new t-post	1.153	El: 98.250	1.121
Water Level Reading:	1.849	El: 97.554	1.82
Top of Ice Level Reading:	1.825	El: 97.578	1.792
Transducer Reading & Est. El.:	1.230	El: 96.324	1.230
Spare Transducer Read and El:	1.600	El: 95.954	1.600
		El: 95.951	95.953

Data logger Notes:

Data logger Internal Power: 4.19 V
Data logger External Power: 13.67 V
Data logger Memory Used: 21% used
Data logger Clock: 10:51 AM MST
Laptop Clock: 11:02 AM MST
Dessicant: half

Data logger: 845
PT: 104640
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: spare TD reading 1.60 m SN 39682
ice too thin to do discharge measurement

Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4
Time of Measurement
Date of Measurement: January 10, 2008
Start Time: 1:15 PM MST
End Time: 1:50 PM MST

Weather Conditions: Cloudy, -18 C
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: JS/UMS/JV
Data Entry By: SMS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.318
Water Level Reading: 2.539
Top of Ice Level Reading: 2.491
Transducer Reading & Est. El.: 0.930
Other:

Setup No. 1

El: 282.380
El: 281.159
El: 281.207
El: 280.229
El:

Setup No. 2

El: 282.380
El: 281.169
El: 281.206
El: 280.239
El:

Average

281.164
281.206
280.234

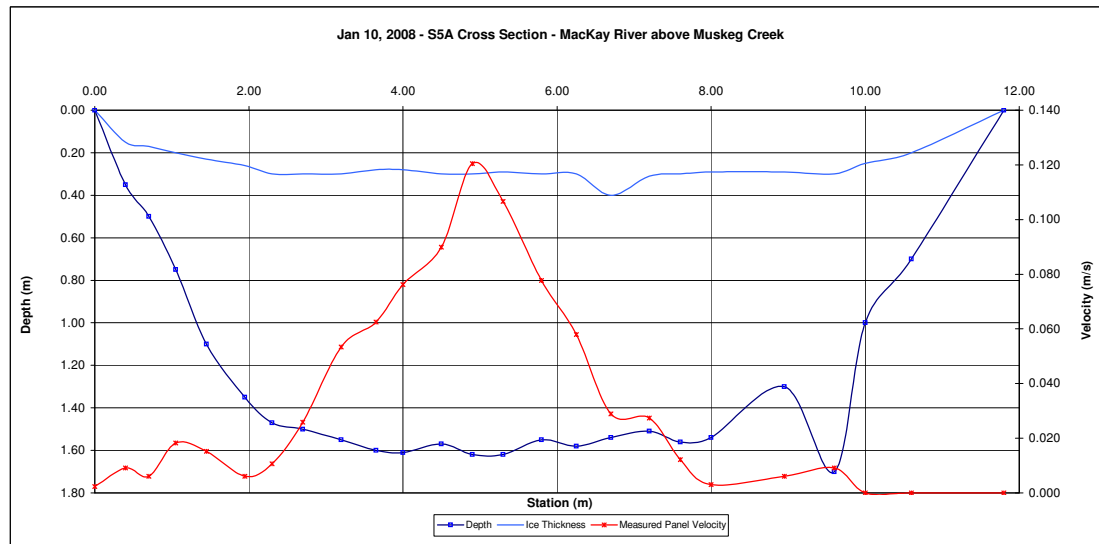
Measurement Data

	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
LB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
	0.00	0.00	0.00			0	0.90	1	0.00	0.20	0.002	0.002	0.05	0.01	0.000	0%
	0.40	0.35	0.15			0.009	0.90	2	0.20	0.55	0.009	0.008	0.20	0.07	0.001	0%
	0.70	0.50	0.17			0.006	0.90	3	0.55	0.88	0.006	0.005	0.33	0.11	0.001	0%
	1.05	0.75	0.20			0.018	0.90	4	0.88	1.25	0.018	0.016	0.55	0.21	0.003	1%
	1.45	1.10	0.23			0.015	0.90	5	1.25	1.70	0.015	0.014	0.87	0.39	0.005	1%
	1.95	1.35	0.26			0.006	0.90	6	1.70	2.13	0.006	0.005	1.09	0.46	0.003	1%
	2.30	1.47	0.30	0.015	0.006		1.00	7	2.13	2.50	0.011	0.011	1.17	0.44	0.005	1%
	2.70	1.50	0.30	0.024	0.027		1.00	8	2.50	2.95	0.026	0.026	1.20	0.54	0.014	3%
	3.20	1.55	0.30	0.058	0.049		1.00	9	2.95	3.43	0.053	0.053	1.25	0.59	0.032	7%
	3.65	1.60	0.28	0.049	0.076		1.00	10	3.43	3.83	0.062	0.062	1.32	0.53	0.033	7%
	4.00	1.61	0.28	0.088	0.064		1.00	11	3.83	4.25	0.076	0.076	1.33	0.57	0.043	10%
	4.50	1.57	0.30	0.101	0.079		1.00	12	4.25	4.70	0.090	0.090	1.27	0.57	0.051	11%
	4.90	1.62	0.30	0.116	0.125		1.00	13	4.70	5.10	0.120	0.120	1.32	0.53	0.064	14%
	5.30	1.62	0.29	0.113	0.101		1.00	14	5.10	5.55	0.107	0.107	1.33	0.60	0.064	14%
	5.80	1.55	0.30	0.085	0.070		1.00	15	5.55	6.03	0.078	0.078	1.25	0.59	0.046	10%
	6.25	1.58	0.30	0.079	0.037		1.00	16	6.03	6.48	0.058	0.058	1.28	0.58	0.033	7%
	6.70	1.54	0.40	0.043	0.015		1.00	17	6.48	6.95	0.029	0.029	1.14	0.54	0.016	4%
	7.20	1.51	0.31	0.040	0.015		1.00	18	6.95	7.40	0.027	0.027	1.20	0.54	0.015	3%
	7.60	1.56	0.30	0.018	0.006		1.00	19	7.40	7.80	0.012	0.012	1.26	0.50	0.006	1%
	8.00	1.54	0.29		0.003		1.00	20	7.80	8.48	0.003	0.003	1.25	0.84	0.003	1%
	8.95	1.30	0.29			0.006	0.90	21	8.48	9.28	0.006	0.005	1.01	0.81	0.004	1%
	9.60	1.70	0.30			0.009	0.90	22	9.28	9.80	0.009	0.008	1.40	0.74	0.006	1%
	10.00	1.00	0.25			0	0.90	23	9.80	10.30	0.000	0.000	0.75	0.38	0.000	0%
	RB	10.60	0.70	0.20			0	0.90	24	10.30	11.20	0.000	0.000	0.50	0.45	0.000
11.80		0.00	0.00			0	0.90	25	11.20	11.80	0.000	0.000	0.13	0.08	0.000	0%
Total Flow:															0.447	1.000

Total Flow:	0.447	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	11.65	(m ²)
Top Width:	11.80	(m)
Hydraulic Depth:	0.988	(m)
Mean Velocity:	0.038	(m/s)
Froude Number	0.012	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:
Data logger Internal Power: 4.78 V
Data logger External Power: 12.87 V
Data logger Memory Used: 39%
Data logger Clock: 12:49:00 PM MDT
Laptop Clock: 12:54:00 PM MDT
Dessicant: good
Data logger: 105010290
PT: 304988
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: Open Patches on River (see photos)
TD reading = 0.92994
Baro pressure = 970.74, water therm = 37.034



Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4
Time of Measurement
Date of Measurement: February 12, 2008
Start Time: 3:30 PM MST
End Time: 4:00 PM MST

Weather Conditions:

clear calm, -20 C
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: JS/JMS/JV
Data Entry By: SMS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.408
Water Level Reading: 2.727
Top of Ice Level Reading: 2.657
Transducer Reading & Est. El.: 0.810
Other:

Setup No. 1

El: 282.380
El: 281.061
El: 281.131
El: 280.251
El:

Setup No. 2

El: 282.380
El: 281.062
El: 281.732
El: 280.252
El:

Average

281.062
281.732
280.252

Measurement Data

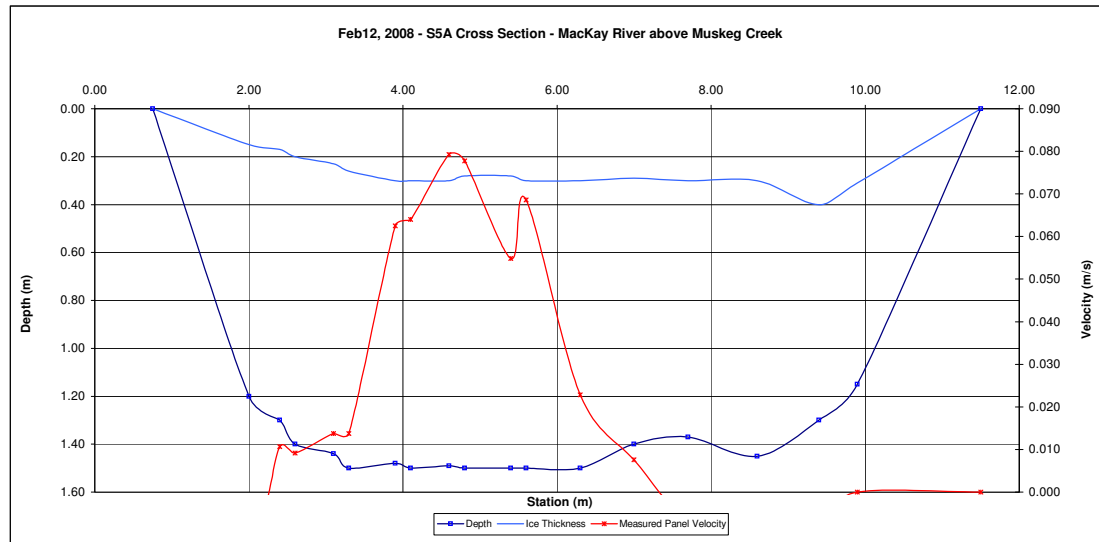
	Measured Data					Calculated Data											
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	0.75	0.00	0.00				1.00	1	0.75	1.38	-0.002	-0.002	0.26	0.16	0.000	0%	
	2.00	1.20	0.15		-0.009		1.00	2	1.38	2.20	-0.009	-0.009	1.05	0.87	-0.008	-4%	
	2.40	1.30	0.17	0.018	0.003		1.00	3	2.20	2.50	0.011	0.011	1.13	0.34	0.004	2%	
	2.60	1.40	0.20	0.015	0.003		1.00	4	2.50	2.85	0.009	0.009	1.20	0.42	0.004	2%	
	3.10	1.44	0.23	0.018	0.009		1.00	5	2.85	3.20	0.014	0.014	1.21	0.42	0.006	3%	
	3.30	1.50	0.26	0.024	0.003		1.00	6	3.20	3.60	0.014	0.014	1.24	0.50	0.007	3%	
	3.90	1.48	0.30	0.046	0.079		1.00	7	3.60	4.00	0.062	0.062	1.18	0.47	0.029	14%	
	4.10	1.50	0.30	0.076	0.052		1.00	8	4.00	4.35	0.064	0.064	1.20	0.42	0.027	13%	
	4.60	1.49	0.30	0.085	0.073		1.00	9	4.35	4.70	0.079	0.079	1.19	0.42	0.033	15%	
	4.80	1.50	0.28	0.076	0.079		1.00	10	4.70	5.10	0.078	0.078	1.22	0.49	0.038	18%	
	5.40	1.50	0.28	0.046	0.064		1.00	11	5.10	5.50	0.055	0.055	1.22	0.49	0.027	13%	
	5.60	1.50	0.30	0.073	0.064		1.00	12	5.50	5.95	0.069	0.069	1.20	0.54	0.037	17%	
	6.30	1.50	0.30	0.040	0.006		1.00	13	5.95	6.65	0.023	0.023	1.20	0.84	0.019	9%	
	7.00	1.40	0.29	0.009	0.006		1.00	14	6.65	7.35	0.008	0.008	1.11	0.78	0.006	3%	
	7.70	1.37	0.30		-0.006		1.00	15	7.35	8.15	-0.006	-0.006	1.07	0.86	-0.005	-2%	
	8.60	1.45	0.30	-0.006			1.00	16	8.15	9.00	-0.006	-0.006	1.15	0.98	-0.006	-3%	
	9.40	1.30	0.40		-0.006		1.00	17	9.00	9.65	-0.006	-0.006	0.90	0.59	-0.004	-2%	
	9.90	1.15	0.31				1.00	18	9.65	10.70	0.000	0.000	0.84	0.88	0.000	0%	
	11.50	0.00	0.00				1.00	19	10.70	11.50	0.000	0.000	0.21	0.17	0.000	0%	
RB	Total Flow:															0.213	1.000

Total Flow:	0.213	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	10.62	(m ²)
Top Width:	10.75	(m)
Hydraulic Depth:	0.988	(m)
Mean Velocity:	0.020	(m/s)
Froude Number	0.006	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power: 4.77
Data logger External Power: 14.85
Data logger Memory Used: 47%
Data logger Clock: 15:14:00 PM MDT
Laptop Clock: 15:24:00 PM MDT
Dessicant: good
Data logger: 105010290
PT: 304988
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: Flow is to the west data downloaded is good
TD reading = 0.810
Baro pressure = 986.36
m=1.406027
b=-0.0203019



Vertical Profile at Offset 3.9 m
Total Depth 1.48 m
Ice Thickness 0.4 m
Effective Depth 1.08 m

Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4
Time of Measurement
Date of Measurement: March 9, 2008
Start Time: 1:10 PM MST
End Time: 1:30 PM MST

Weather Conditions: +5 C, OC, light wind
River Conditions: Ice Covered

Personnel & Equipment

Measurement Made By: JS/UMS/JV
Data Entry By: LMM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.295
Water Level Reading: 2.637
Top of Ice Level Reading: 2.537
Transducer Reading & Est. El.: 0.790
Other:

Setup No. 1

El: 282.380
El: 281.038
El: 281.138
El: 280.248
El:

Setup No. 2

El: 282.380
El: 281.039
El: 281.152
El: 280.249
El:

Average

281.039
281.152
280.249

Measurement Data

	Measured Data						Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
RB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
	0.00	0.00	0.00				0.90	1	0.00	1.55	0.005	0.004	0.18	0.28	0.001	0%	
	3.10	1.01	0.30			0.018	0.90	2	1.55	3.33	0.018	0.016	0.71	1.26	0.021	7%	
	3.55	1.27	0.37			0.018	0.90	3	3.33	3.88	0.018	0.016	0.90	0.50	0.008	3%	
	4.20	1.44	0.43			0.015	0.90	4	3.88	4.50	0.015	0.014	1.01	0.63	0.009	3%	
	4.80	1.54	0.47			0.021	0.90	5	4.50	5.10	0.021	0.019	1.07	0.64	0.012	4%	
	5.40	1.56	0.50			0.012	0.90	6	5.10	5.60	0.012	0.011	1.06	0.53	0.006	2%	
	5.80	1.55	0.50			0.018	0.90	7	5.60	6.00	0.018	0.016	1.05	0.42	0.007	2%	
	6.20	1.48	0.50			0.015	0.90	8	6.00	6.43	0.015	0.014	0.98	0.42	0.006	2%	
	6.65	1.42	0.51			0.012	0.90	9	6.43	6.85	0.012	0.011	0.91	0.39	0.004	1%	
	7.05	1.43	0.52			0.006	0.90	10	6.85	7.28	0.006	0.005	0.91	0.39	0.002	1%	
	7.50	1.41	0.51			0.024	0.90	11	7.28	7.73	0.024	0.022	0.90	0.40	0.009	3%	
	7.95	1.56	0.51			0.018	0.90	12	7.73	8.15	0.018	0.016	1.05	0.45	0.007	2%	
	8.35	1.60	0.46	0.034	0.037		1.00	13	8.15	8.43	0.035	0.035	1.14	0.31	0.011	3%	
	8.50	1.61	0.46	0.027	0.043		1.00	14	8.43	8.70	0.035	0.035	1.15	0.32	0.011	4%	
	8.90	1.59	0.45	0.067	0.076		1.00	15	8.70	8.98	0.072	0.072	1.14	0.31	0.022	7%	
	9.05	1.60	0.45	0.067	0.064		1.00	16	8.98	9.25	0.066	0.066	1.15	0.32	0.021	7%	
	9.45	1.55	0.45			0.091	0.90	17	9.25	9.53	0.091	0.082	1.10	0.30	0.025	8%	
	9.60	1.55	0.44	0.067	0.091		1.00	18	9.53	9.75	0.079	0.079	1.11	0.25	0.020	6%	
	9.90	1.55	0.43	0.091	0.088		1.00	19	9.75	9.95	0.090	0.090	1.12	0.22	0.020	6%	
	10.00	1.50	0.44			0.101	0.90	20	9.95	10.23	0.101	0.091	1.06	0.29	0.026	8%	
	10.45	1.43	0.40			0.027	0.90	21	10.23	10.68	0.027	0.025	1.03	0.46	0.011	4%	
	10.90	1.40	0.40			0.049	0.90	22	10.68	11.13	0.049	0.044	1.00	0.45	0.020	6%	
	11.35	1.33	0.35			0.043	0.90	23	11.13	11.68	0.043	0.038	0.98	0.54	0.021	7%	
	12.00	1.18	0.30			0.021	0.90	24	11.68	12.50	0.021	0.019	0.88	0.73	0.014	4%	
13.00	0.00	0.00				0.90	25	12.50	13.00	0.005	0.005	0.22	0.11	0.001	0%		
LB	Total Flow:															0.315	1.000

Total Flow:	0.315	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	10.91	(m ²)
Top Width:	13.00	(m)
Hydraulic Depth:	0.839	(m)
Mean Velocity:	0.029	(m/s)
Froude Number	0.010	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

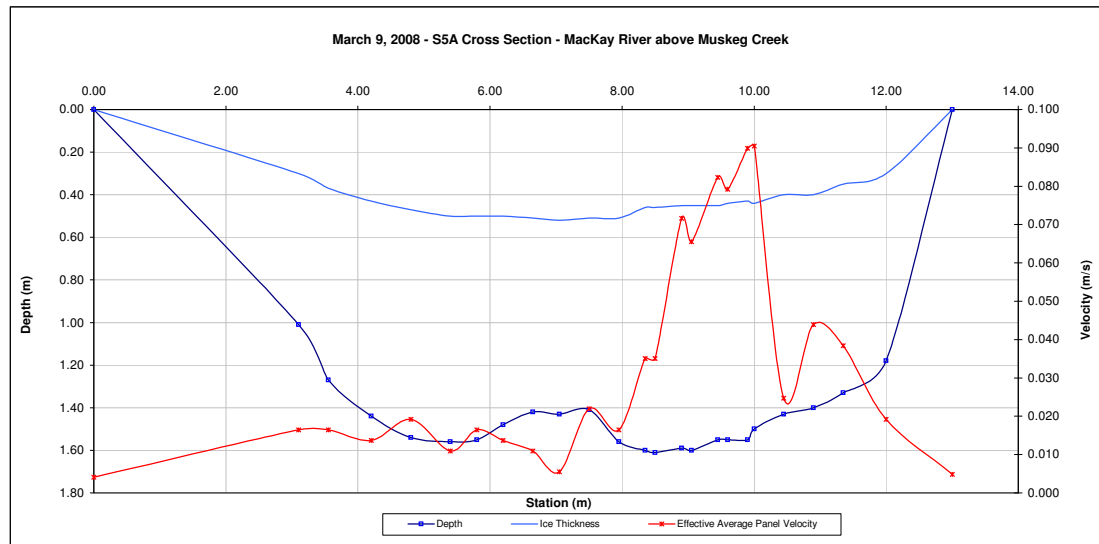
Data logger Internal Power: 4.86
Data logger External Power: 14.12
Data logger Memory Used: 53%
Data logger Clock: 11:45:00 AM MDT
Laptop Clock: 12:05:00 PM MDT
Dessicant: good

Data logger: 110220407

PT: 899

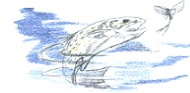
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes:



Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4
Time of Measurement
Date of Measurement: April 2, 2008
Start Time: 3:15 PM MST
End Time: 3:45 PM MST

Personnel & Equipment

Measurement Made By: js sm
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.082
Water Level Reading: 2.411
Top of Ice Level Reading: 2.381
Transducer Reading & Est. El.: 0.792
Other:

Setup No. 1

El: 282.380
El: 281.051
El: 281.081
El: 280.259
El:

Setup No. 2

El: 282.380
El: 281.042
El: 281.099
El: 280.250
El:

Average

281.047
281.099
280.255

Weather Conditions: +4 C, sunny, light wind
River Conditions: Ice Covered

Measurement Data

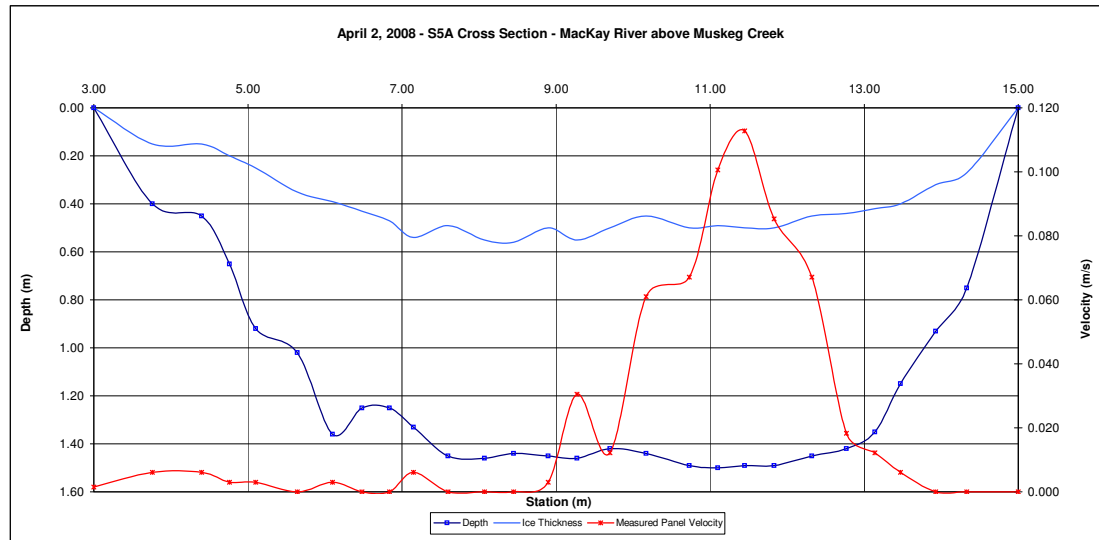
Measured Data							Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	3.00	0.00	0.00		0	0.90	1	3.00	3.38	0.002	0.001	0.06	0.02	0.000	0%
	3.76	0.40	0.15		0.006	0.90	2	3.38	4.08	0.006	0.005	0.25	0.18	0.001	0%
	4.40	0.45	0.15		0.006	0.90	3	4.08	4.58	0.006	0.005	0.30	0.15	0.001	0%
	4.76	0.65	0.20		0.003	0.90	4	4.58	4.93	0.003	0.003	0.45	0.16	0.000	0%
	5.10	0.92	0.25		0.003	0.90	5	4.93	5.37	0.003	0.003	0.67	0.29	0.001	0%
	5.64	1.02	0.35		0.000	0.90	6	5.37	5.87	0.000	0.000	0.67	0.34	0.000	0%
	6.10	1.36	0.39		0.003	0.90	7	5.87	6.29	0.003	0.003	0.97	0.41	0.001	1%
	6.48	1.25	0.43		0.000	0.90	8	6.29	6.66	0.000	0.000	0.82	0.30	0.000	0%
	6.84	1.25	0.47		0.000	0.90	9	6.66	7.00	0.000	0.000	0.78	0.26	0.000	0%
	7.15	1.33	0.54		0.006	0.90	10	7.00	7.38	0.006	0.005	0.79	0.30	0.002	1%
	7.60	1.45	0.49		0.000	0.90	11	7.38	7.84	0.000	0.000	0.96	0.44	0.000	0%
	8.07	1.46	0.55		0.000	0.90	12	7.84	8.26	0.000	0.000	0.91	0.39	0.000	0%
	8.45	1.44	0.56		0.000	0.90	13	8.26	8.68	0.000	0.000	0.88	0.37	0.000	0%
	8.90	1.45	0.50		0.003	0.90	14	8.68	9.09	0.003	0.003	0.95	0.39	0.001	0%
	9.27	1.46	0.55		0.030	0.90	15	9.09	9.49	0.030	0.027	0.91	0.36	0.010	5%
	9.70	1.42	0.50		0.012	0.90	16	9.49	9.94	0.012	0.011	0.92	0.41	0.005	2%
	10.17	1.44	0.45		0.061	0.90	17	9.94	10.45	0.061	0.055	0.99	0.51	0.028	13%
	10.73	1.49	0.50		0.067	0.90	18	10.45	10.92	0.067	0.060	0.99	0.46	0.028	13%
	11.10	1.50	0.49		0.101	0.90	19	10.92	11.28	0.101	0.091	1.01	0.36	0.033	15%
	11.45	1.49	0.50		0.113	0.90	20	11.28	11.64	0.113	0.101	0.99	0.36	0.037	17%
	11.83	1.49	0.50		0.085	0.90	21	11.64	12.08	0.085	0.077	0.99	0.43	0.033	15%
	12.32	1.45	0.45		0.067	0.90	22	12.08	12.55	0.067	0.060	1.00	0.47	0.028	13%
	12.77	1.42	0.44		0.018	0.90	23	12.55	12.96	0.018	0.016	0.98	0.40	0.007	3%
	13.14	1.35	0.42		0.012	0.90	24	12.96	13.31	0.012	0.011	0.93	0.33	0.004	2%
	13.47	1.15	0.40		0.006	0.90	25	13.31	13.70	0.006	0.005	0.75	0.30	0.002	1%
	13.93	0.93	0.32		0.000	0.90	26	13.70	14.13	0.000	0.000	0.61	0.26	0.000	0%
	14.33	0.75	0.27		0.000	0.90	27	14.13	14.67	0.000	0.000	0.48	0.26	0.000	0%
	15.00	0.00	0.00		0	0.90	28	14.67	15.00	0.000	0.000	0.12	0.04	0.000	0%
Total Flow:														0.220	100%

Total Flow:	0.220	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	8.95	(m ²)
Top Width:	12.00	(m)
Hydraulic Depth:	0.746	(m)
Mean Velocity:	0.025	(m/s)
Froude Number	0.009	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:
Data logger Internal Power: 4.86
Data logger External Power: 14.07
Data logger Memory Used: 59%
Data logger Clock: 1:47:00 PM MDT
Laptop Clock: 2:08:00 PM MDT
Dessicant: good
Data logger: 105010290
PT: 304988
Power: Magnacharge 20V 10A DC Battery and
PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: Flow is to the west

Baro pressure = 971.43665



Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4
Time of Measurement
Date of Measurement: May 8, 2008
Start Time: 11:03 AM MDT
End Time: 11:38 AM MDT

Weather Conditions: clear, calm, +5 C
River Conditions: open, high, overbank flow

Personnel & Equipment

Measurement Made By: SS/SM/SE
Data Entry By: SS Checked: March Mc Birney Flo-Mate 2000
Meter Type and No.: s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.181
Water Level Reading: 1.022
Top of Ice Level Reading:
Transducer Reading & Est. El.: 2.546
Other:

Setup No. 1

El: 282.380
El: 282.539
El: 283.561
El: 279.993
El:

Setup No. 2

El: 282.380
El: 282.545
El: 283.515
El: 279.999
El:

Average

282.542
283.515
279.996

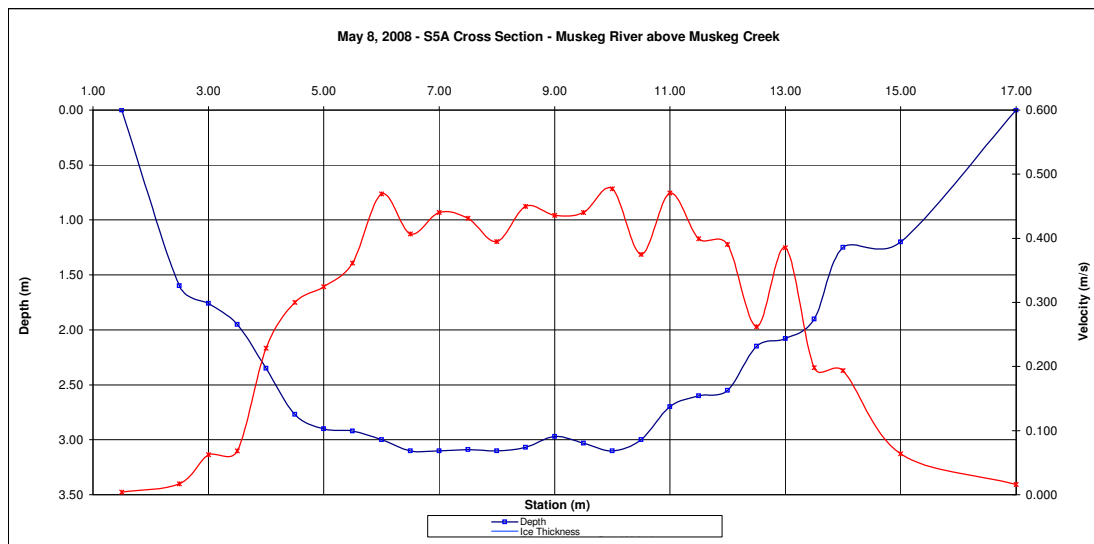
Measurement Data

Measured Data							Calculated Data									
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
LB	1.50	0.00				0.000	1.00	1	1.50	2.00	0.004	0.004	0.40	0.20	0.001	0%
	2.50	1.60		0.034	0.000		1.00	2	2.00	2.75	0.017	0.017	1.60	1.20	0.020	0%
	3.00	1.76		0.018	0.107		1.00	3	2.75	3.25	0.062	0.062	1.76	0.88	0.055	0%
	3.50	1.95		0.015	0.122		1.00	4	3.25	3.75	0.069	0.069	1.95	0.98	0.067	1%
	4.00	2.35		0.232	0.226		1.00	5	3.75	4.25	0.229	0.229	2.35	1.18	0.269	2%
	4.50	2.77		0.323	0.277		1.00	6	4.25	4.75	0.300	0.300	2.77	1.39	0.416	4%
	5.00	2.90		0.424	0.226		1.00	7	4.75	5.25	0.325	0.325	2.90	1.45	0.471	4%
	5.50	2.92		0.491	0.232		1.00	8	5.25	5.75	0.361	0.361	2.92	1.46	0.527	5%
	6.00	3.00		0.533	0.405		1.00	9	5.75	6.25	0.469	0.469	3.00	1.50	0.704	6%
	6.50	3.10		0.436	0.378		1.00	10	6.25	6.75	0.407	0.407	3.10	1.55	0.631	6%
	7.00	3.10		0.494	0.387		1.00	11	6.75	7.25	0.440	0.440	3.10	1.55	0.683	6%
	7.50	3.09		0.424	0.439		1.00	12	7.25	7.75	0.431	0.431	3.09	1.55	0.666	6%
	8.00	3.10		0.472	0.317		1.00	13	7.75	8.25	0.395	0.395	3.10	1.55	0.612	5%
	8.50	3.07		0.466	0.433		1.00	14	8.25	8.75	0.450	0.450	3.07	1.54	0.690	6%
	9.00	2.97		0.512	0.360		1.00	15	8.75	9.25	0.436	0.436	2.97	1.49	0.647	6%
	9.50	3.03		0.488	0.393		1.00	16	9.25	9.75	0.440	0.440	3.03	1.52	0.667	6%
	10.00	3.10		0.539	0.415		1.00	17	9.75	10.25	0.477	0.477	3.10	1.55	0.739	7%
	10.50	3.00		0.497	0.253		1.00	18	10.25	10.75	0.375	0.375	3.00	1.50	0.562	5%
	11.00	2.70		0.488	0.454		1.00	19	10.75	11.25	0.471	0.471	2.70	1.35	0.636	6%
	11.50	2.60		0.479	0.320		1.00	20	11.25	11.75	0.399	0.399	2.60	1.30	0.519	5%
	12.00	2.55		0.479	0.302		1.00	21	11.75	12.25	0.390	0.390	2.55	1.28	0.497	4%
	12.50	2.15		0.232	0.293		1.00	22	12.25	12.75	0.262	0.262	2.15	1.08	0.282	3%
	13.00	2.08		0.424	0.347		1.00	23	12.75	13.25	0.386	0.386	2.08	1.04	0.401	4%
	13.50	1.90		0.238	0.158		1.00	24	13.25	13.75	0.198	0.198	1.90	0.95	0.188	2%
	14.00	1.25		0.207	0.180		1.00	25	13.75	14.50	0.194	0.194	1.25	0.94	0.181	2%
15.00	1.20				0.064	1.00	26	14.50	16.00	0.064	0.064	1.20	1.80	0.115	1%	
RB	17.00	0.00				0.000	1.00	27	16.00	17.00	0.016	0.016	0.30	0.30	0.005	0%
Total Flow:															11.252	1.000

Total Flow:	11.252	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	34.03	(m ²)
Top Width:	15.50	(m)
Hydraulic Depth:	2.196	(m)
Mean Velocity:	0.331	(m/s)
Froude Number	0.071	
Photographs taken looking at:		
Photographs taken:		

Notes: Air Pressure = 989.183
Water Temp old thermistor = 54 C
Water Temp New Therm = 6C, Thermistor switched. Manual water temp 6C.
Lots of overbank flow on right bank. Impossible to measure. Memory cleared.

Data logger Notes:
Data logger Internal Power: 4.8 V
Data logger External Power: 14.37 V
Data logger Memory Used: 67%
Data logger Clock: 9:07 MST
Laptop Clock: 9:07 MST
Dessicant: good
Data logger: 011022407
PT: 000899
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller



Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-W4

Time of Measurement

Date of Measurement: June 23, 2008
Start Time: 9:30 AM MST
End Time: 9:49 AM MST

Weather Conditions:

+11 Heavy Rain

River Conditions:

Open Water

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: JS Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.163
Water Level Reading: 2.259
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.140
Other:

Setup No. 1

El: 282.380
El: 281.284
El: 283.543
El: 280.144

Setup No. 2

El: 282.380
El: 281.289
El: 283.582
El: 280.149

Average

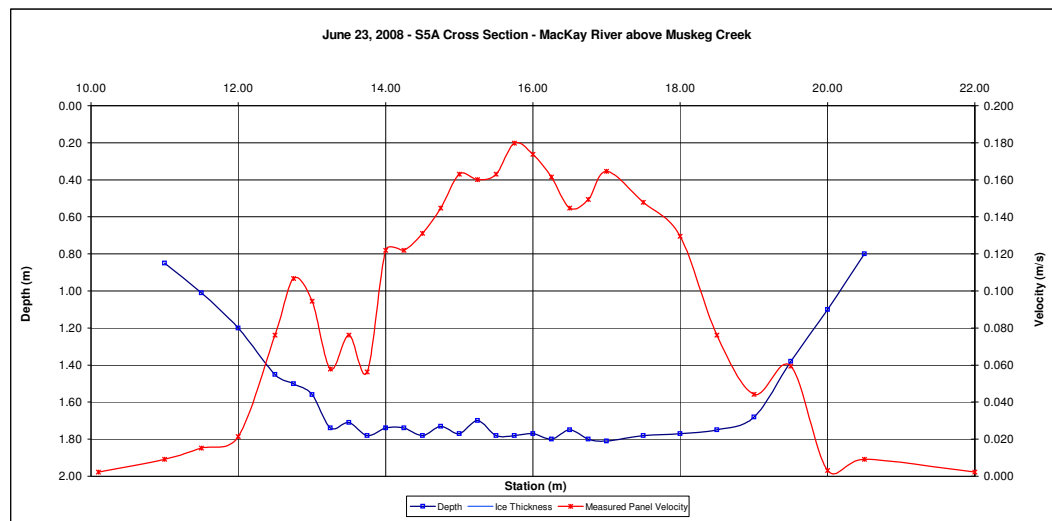
281.287
280.147

RB	Measured Data					Measurement Data										Calculated Data					Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge						
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)		(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)							
	10.10						1.00	1	10.10	10.55	0.002	0.002	0.21	0.10	0.000	0%					
	11.00	0.85				0.009	1.00	2	10.55	11.25	0.009	0.009	0.85	0.59	0.005	0%					
	11.50	1.01				0.015	1.00	3	11.25	11.75	0.015	0.015	1.01	0.51	0.008	0%					
	12.00	1.20		0.018	0.024		1.00	4	11.75	12.25	0.021	0.021	1.20	0.60	0.013	1%					
	12.50	1.45		0.134	0.018		1.00	5	12.25	12.63	0.076	0.076	1.45	0.54	0.041	3%					
	12.75	1.50		0.171	0.043		1.00	6	12.63	12.88	0.107	0.107	1.50	0.38	0.040	3%					
	13.00	1.56		0.155	0.034		1.00	7	12.88	13.13	0.094	0.094	1.56	0.39	0.037	2%					
	13.25	1.74		0.088	0.027		1.00	8	13.13	13.38	0.058	0.058	1.74	0.44	0.025	2%					
	13.50	1.71		0.113	0.040		1.00	9	13.38	13.63	0.076	0.076	1.71	0.43	0.033	2%					
	13.75	1.78		0.064	0.049		1.00	10	13.63	13.88	0.056	0.056	1.78	0.45	0.025	2%					
	14.00	1.74		0.158	0.085		1.00	11	13.88	14.13	0.122	0.122	1.74	0.44	0.053	3%					
	14.25	1.74		0.140	0.104		1.00	12	14.13	14.38	0.122	0.122	1.74	0.44	0.053	3%					
	14.50	1.78		0.158	0.104		1.00	13	14.38	14.63	0.131	0.131	1.78	0.45	0.058	4%					
	14.75	1.73		0.155	0.134		1.00	14	14.63	14.88	0.145	0.145	1.73	0.43	0.063	4%					
	15.00	1.77		0.180	0.146		1.00	15	14.88	15.13	0.163	0.163	1.77	0.44	0.072	5%					
	15.25	1.70		0.186	0.134		1.00	16	15.13	15.38	0.160	0.160	1.70	0.43	0.068	4%					
	15.50	1.78		0.186	0.140		1.00	17	15.38	15.63	0.163	0.163	1.78	0.45	0.073	5%					
	15.75	1.78		0.195	0.165		1.00	18	15.63	15.88	0.180	0.180	1.78	0.45	0.080	5%					
	16.00	1.77		0.204	0.143		1.00	19	15.88	16.13	0.174	0.174	1.77	0.44	0.077	5%					
	16.25	1.80		0.171	0.152		1.00	20	16.13	16.38	0.162	0.162	1.80	0.45	0.073	5%					
	16.50	1.75		0.177	0.113		1.00	21	16.38	16.63	0.145	0.145	1.75	0.44	0.063	4%					
	16.75	1.80		0.168	0.131		1.00	22	16.63	16.88	0.149	0.149	1.80	0.45	0.067	4%					
	17.00	1.81		0.207	0.122		1.00	23	16.88	17.25	0.165	0.165	1.81	0.68	0.112	7%					
	17.50	1.78		0.174	0.122		1.00	24	17.25	17.75	0.148	0.148	1.78	0.89	0.132	9%					
	18.00	1.77		0.165	0.094		1.00	25	17.75	18.25	0.130	0.130	1.77	0.89	0.115	7%					
	18.50	1.75		0.101	0.052		1.00	26	18.25	18.75	0.076	0.076	1.75	0.88	0.067	4%					
	19.00	1.68		0.061	0.027		1.00	27	18.75	19.25	0.044	0.044	1.68	0.84	0.037	2%					
	19.50	1.38		0.061	0.058		1.00	28	19.25	19.75	0.059	0.059	1.38	0.69	0.041	3%					
	20.00	1.10				0.003	1.00	29	19.75	20.25	0.003	0.003	1.10	0.55	0.002	0%					
	20.50	0.80				0.009	1.00	30	20.25	21.25	0.009	0.009	0.80	0.80	0.007	0%					
RB	22.00						1.00	31	21.25	22.00	0.002	0.002	0.20	0.15	0.000	0%					
Total Flow:															1.539	100%					

Total Flow:	1.539	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	16.06	(m ²)
Top Width:	11.90	(m)
Hydraulic Depth:	1.349	(m)
Mean Velocity:	0.096	(m/s)
Froude Number	0.026	
Photographs taken looking at:		
Photographs taken.		

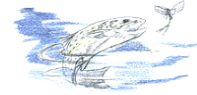
Data logger Notes:	
Data logger Internal Power:	4.85
Data logger External Power:	12.74
Data logger Memory Used:	11%
Data logger Clock:	08:00
Laptop Clock:	08:12
Dessicant:	good
Data logger:	407
PT:	899
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes:



Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4
Time of Measurement
Date of Measurement: July 25, 2008
Start Time: 11:00 AM MST
End Time: 11:30 AM MST

Weather Conditions: +28 sun
River Conditions: Open Water

Personnel & Equipment

Measurement Made By: js TE
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.283
Water Level Reading: 2.575
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.936
Other:

Setup No. 1

El: 282.380
El: 281.088
El: 283.663
El: 280.152
El:

Setup No. 2

El: 282.380
El: 281.069
El: 283.532
El: 280.133
El:

Average

281.079
283.532
280.142

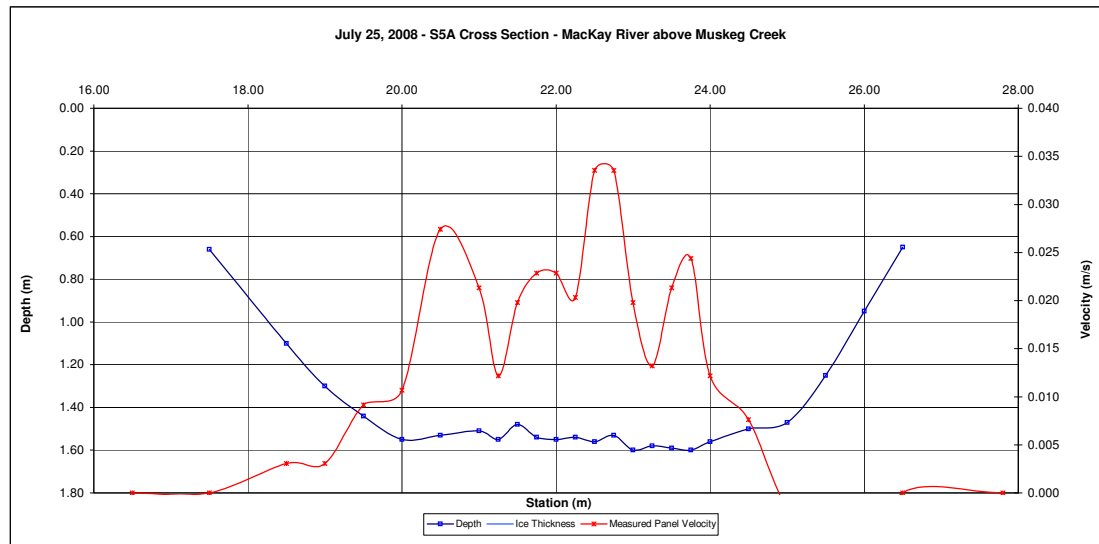
Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB 16.50					0	1.00	1	16.50	17.00	0.000	0.000	0.17	0.08	0.000	0%	
17.50	0.66				0	1.00	2	17.00	18.00	0.000	0.000	0.66	0.66	0.000	0%	
18.50	1.10				0.003	1.00	3	18.00	18.75	0.003	0.003	1.10	0.83	0.003	2%	
19.00	1.30		0.003	0.003		1.00	4	18.75	19.25	0.003	0.003	1.30	0.65	0.002	1%	
19.50	1.44		0.009			1.00	5	19.25	19.75	0.009	0.009	1.44	0.72	0.007	4%	
20.00	1.55		0.018	0.003		1.00	6	19.75	20.25	0.011	0.011	1.55	0.78	0.008	5%	
20.50	1.53		0.034	0.021		1.00	7	20.25	20.75	0.027	0.027	1.53	0.77	0.021	14%	
21.00	1.51		0.030	0.012		1.00	8	20.75	21.13	0.021	0.021	1.51	0.57	0.012	8%	
21.25	1.55		0.015	-0.009	0.030	1.00	9	21.13	21.38	0.012	0.012	1.55	0.39	0.005	3%	
21.50	1.48		0.027	0.012		1.00	10	21.38	21.63	0.020	0.020	1.48	0.37	0.007	5%	
21.75	1.54		0.043	0.003		1.00	11	21.63	21.88	0.023	0.023	1.54	0.39	0.009	6%	
22.00	1.55		0.034	0.012		1.00	12	21.88	22.13	0.023	0.023	1.55	0.39	0.009	6%	
22.25	1.54		0.037	0.009	0.015	1.00	13	22.13	22.38	0.020	0.020	1.54	0.39	0.008	5%	
22.50	1.56		0.049	0.018		1.00	14	22.38	22.63	0.034	0.034	1.56	0.39	0.013	9%	
22.75	1.53		0.043		0.024	1.00	15	22.63	22.88	0.034	0.034	1.53	0.38	0.013	8%	
23.00	1.60		0.034	0.006		1.00	16	22.88	23.13	0.020	0.020	1.60	0.40	0.008	5%	
23.25	1.58		0.040	-0.009	0.009	1.00	17	23.13	23.38	0.013	0.013	1.58	0.40	0.005	3%	
23.50	1.59		0.052	-0.009		1.00	18	23.38	23.63	0.021	0.021	1.59	0.40	0.008	6%	
23.75	1.60		0.040		0.009	1.00	19	23.63	23.88	0.024	0.024	1.60	0.40	0.010	6%	
24.00	1.56		0.034	-0.009		1.00	20	23.88	24.25	0.012	0.012	1.56	0.59	0.007	5%	
24.50	1.50		0.027	-0.012		1.00	21	24.25	24.75	0.008	0.008	1.50	0.75	0.006	4%	
25.00	1.47		0.006	-0.009		1.00	22	24.75	25.25	-0.002	-0.002	1.47	0.74	-0.001	-1%	
25.50	1.25		-0.003	-0.003		1.00	23	25.25	25.75	-0.003	-0.003	1.25	0.63	-0.002	-1%	
26.00	0.95		-0.009			1.00	24	25.75	26.25	-0.009	-0.009	0.95	0.48	-0.004	-3%	
26.50	0.65				0.000	1.00	25	26.25	26.50	0.000	0.000	0.65	0.16	0.000	0%	
RB 27.80					0.000	1.00	28	26.50	27.80	0.000	0.000	0.16	0.21	0.000	0%	
Total Flow:														0.153	100%	

Total Flow:	0.153	(m ³ /s)
Perceived Measurement Quality:	poor	
Total Area:	12.87	(m ²)
Top Width:	11.30	(m)
Hydraulic Depth:	1.139	(m)
Mean Velocity:	0.012	(m/s)
Froude Number	0.004	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:
Data logger Internal Power: 4.85
Data logger External Power: 12.74
Data logger Memory Used: 11%
Data logger Clock: 08:00
Laptop Clock: 08:12
Dessicant: good
Data logger: 407
PT: 899
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes:



Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4
Time of Measurement
Date of Measurement: August 8, 2008
Start Time: 11:55 AM MST
End Time: 12:22 PM MST

Weather Conditions:

Hot, clear
River Conditions: calm, visible flow

Personnel & Equipment

Measurement Made By: SM/JS/SE
Data Entry By: DW
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.127
Water Level Reading: 1.827
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.631
Other: T-Bar 0.842

Setup No. 1

El: 282.380
El: 281.680
El: 283.507
El: 280.049
El: 282.665

Setup No. 2

El: 282.380
El: 281.687
El: 283.507
El: 280.056
El: 282.666

Average

281.684
283.507
280.056
282.666

Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	16.40	0.00			0	1.00	1	16.40	16.45	-0.003	-0.003	0.13	0.01	0.000	0%	
	16.50	0.50			0	1.00	2	16.45	16.65	-0.012	-0.012	0.50	0.10	-0.001	0%	
	16.80	1.03			-0.003	1.00	3	16.65	17.15	-0.003	-0.003	1.03	0.52	-0.002	0%	
	17.50	1.22	0.085	-0.024		1.00	4	17.15	17.75	0.030	0.030	1.22	0.73	0.022	1%	
	18.00	1.47	0.216	-0.018		1.00	5	17.75	18.25	0.099	0.099	1.47	0.74	0.073	4%	
	18.50	1.72	0.177	-0.024		1.00	6	18.25	18.75	0.076	0.076	1.72	0.86	0.066	4%	
	19.00	1.86	0.171	-0.012		1.00	7	18.75	19.25	0.079	0.079	1.86	0.93	0.074	4%	
	19.50	2.16	0.183	-0.015		1.00	8	19.25	19.75	0.084	0.084	2.16	1.08	0.091	5%	
	20.00	2.16	0.116	-0.003		1.00	9	19.75	20.25	0.056	0.056	2.16	1.08	0.061	3%	
	20.50	2.13	0.110	-0.003		1.00	10	20.25	20.75	0.053	0.053	2.13	1.07	0.057	3%	
	21.00	2.10	0.128	0.027		1.00	11	20.75	21.25	0.078	0.078	2.10	1.05	0.082	5%	
	21.50	2.15	0.140	0.052		1.00	12	21.25	21.75	0.096	0.096	2.15	1.08	0.103	6%	
	22.00	2.15	0.119	0.091		1.00	13	21.75	22.25	0.105	0.105	2.15	1.08	0.113	6%	
	22.50	2.00	0.232	0.140		1.00	14	22.25	22.75	0.186	0.186	2.00	1.00	0.186	11%	
	23.00	2.20	0.256	0.137		1.00	15	22.75	23.25	0.197	0.197	2.20	1.10	0.216	12%	
	23.50	2.16	0.235	0.213		1.00	16	23.25	23.75	0.224	0.224	2.16	1.08	0.242	14%	
	24.00	2.15	0.259	0.162		1.00	17	23.75	24.25	0.210	0.210	2.15	1.08	0.226	13%	
	24.50	2.15	0.134	0.113		1.00	18	24.25	24.75	0.123	0.123	2.15	1.08	0.133	7%	
	25.00	2.15	0.110	0.006		1.00	19	24.75	25.25	0.058	0.058	2.15	1.08	0.062	4%	
	25.50	2.05	0.128	-0.043		1.00	20	25.25	25.75	0.043	0.043	2.05	1.03	0.044	2%	
	26.00	1.80	0.061	-0.067		1.00	21	25.75	26.50	-0.003	-0.003	1.80	1.35	-0.004	0%	
	27.00	1.06			-0.076	1.00	22	26.50	27.40	-0.076	-0.076	1.06	0.95	-0.073	-4%	
	27.80	0.00			0.000	1.00	23	27.40	27.80	0.000	0.000	0.00	0.00	0.000	0%	
Total Flow:														1.770	100%	

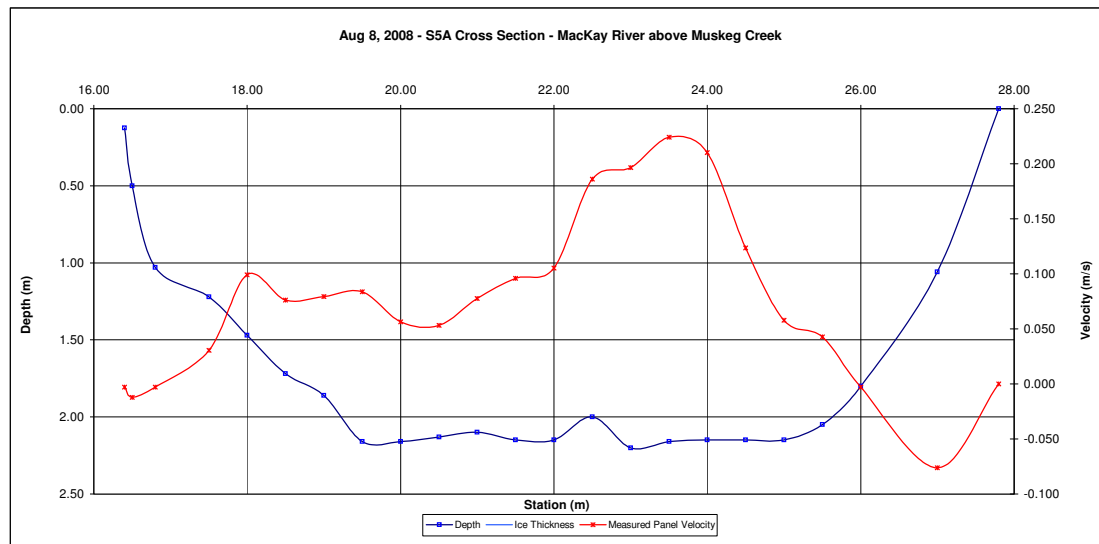
Total Flow:	1.770	(m ³ /s)
Perceived Measurement Quality:	good	
Total Area:	20.04	(m ²)
Top Width:	11.40	(m)
Hydraulic Depth:	1.758	(m)
Mean Velocity:	0.088	(m/s)
Froude Number	0.021	
Photographs taken looking at:		
Photos: d/s, Xchannel w/John, X channel w/o John, u/s		

Data logger Notes:

Data logger Internal Power: 4.90
Data logger External Power: 13.72
Data logger Memory Used: 23%
Data logger Clock: 10:37
Laptop Clock: 10:49
Dessicant: 0.50

Data logger: 407
PT: 899
Power: Magnacharge 20V 10A DC Battery and
PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: New TD = 1.82m



Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Time of Measurement

Date of Measurement: September 15, 2008
Start Time: 10:45 AM MST
End Time: 11:05 AM MST

Weather Conditions:

overcast, 10 C
River Conditions: open, low stage

Personnel & Equipment

Measurement Made By: SM/SS/JE
Data Entry By: SS Checked: March Mc Birney Flo-Mate 2000
Meter Type and No.: s/n 2004521

Level Readings

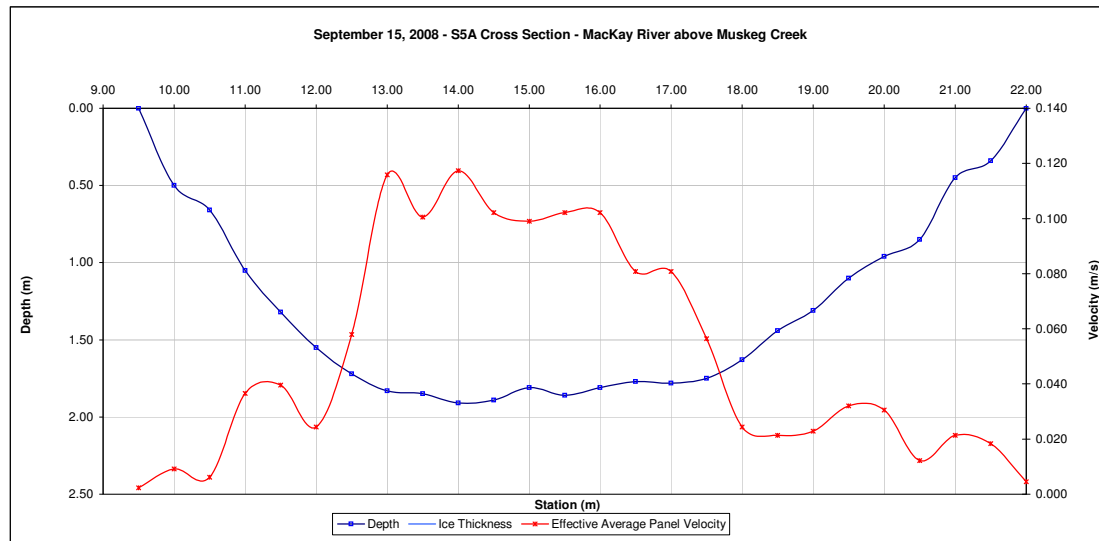
Bench Mark Reading: rebar in PVC 1.059 El.: 282.380
Water Level Reading: 2.095 El.: 281.344
Top of Ice Level Reading: El.:
Transducer Reading & Est. El.: 1.250 El.: 280.094
Other: T-Bar 0.774 El.: 282.665

Measured Data							Calculated Data								Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m²)	Panel Discharge (m³/s)	
22.00	0.00					1.00	1	22.00	21.75	0.005	0.005	0.09	0.02	0.000	0%
21.50	0.34				0.018	1.00	2	21.75	21.25	0.018	0.018	0.34	0.17	0.003	0%
21.00	0.45				0.021	1.00	3	21.25	20.75	0.021	0.021	0.45	0.23	0.005	0%
20.50	0.85				0.012	1.00	4	20.75	20.25	0.012	0.012	0.85	0.43	0.005	0%
20.00	0.96				0.030	1.00	5	20.25	19.75	0.030	0.030	0.96	0.48	0.015	1%
19.50	1.10		0.034	0.030		1.00	6	19.75	19.25	0.032	0.032	1.10	0.55	0.018	2%
19.00	1.31		0.021	0.024		1.00	7	19.25	18.75	0.023	0.023	1.31	0.66	0.015	1%
18.50	1.44		0.021	0.021		1.00	8	18.75	18.25	0.021	0.021	1.44	0.72	0.015	1%
18.00	1.63		0.030	0.018		1.00	9	18.25	17.75	0.024	0.024	1.63	0.82	0.020	2%
17.50	1.75		0.073	0.040		1.00	10	17.75	17.25	0.056	0.056	1.75	0.88	0.049	5%
17.00	1.78		0.088	0.073		1.00	11	17.25	16.75	0.081	0.081	1.78	0.89	0.072	7%
16.50	1.77		0.101	0.061		1.00	12	16.75	16.25	0.081	0.081	1.77	0.89	0.071	7%
16.00	1.81		0.122	0.082		1.00	13	16.25	15.75	0.102	0.102	1.81	0.91	0.092	8%
15.50	1.86		0.116	0.088		1.00	14	15.75	15.25	0.102	0.102	1.86	0.93	0.095	9%
15.00	1.81		0.134	0.064		1.00	15	15.25	14.75	0.099	0.099	1.81	0.91	0.090	8%
14.50	1.89		0.122	0.082		1.00	16	14.75	14.25	0.102	0.102	1.89	0.95	0.096	9%
14.00	1.91		0.137	0.098		1.00	17	14.25	13.75	0.117	0.117	1.91	0.96	0.112	10%
13.50	1.85		0.131	0.070		1.00	18	13.75	13.25	0.101	0.101	1.85	0.93	0.093	9%
13.00	1.83		0.146	0.085		1.00	19	13.25	12.75	0.116	0.116	1.83	0.92	0.106	10%
12.50	1.72		0.067	0.049		1.00	20	12.75	12.25	0.058	0.058	1.72	0.86	0.050	5%
12.00	1.55		0.037	0.012		1.00	21	12.25	11.75	0.024	0.024	1.55	0.78	0.019	2%
11.50	1.32		0.070	0.009		1.00	22	11.75	11.25	0.040	0.040	1.32	0.66	0.026	2%
11.00	1.05		0.070	0.003		1.00	23	11.25	10.75	0.037	0.037	1.05	0.53	0.019	2%
10.50	0.66				0.006	1.00	24	10.75	10.25	0.006	0.006	0.66	0.33	0.002	0%
10.00	0.50				0.009	1.00	25	10.25	9.75	0.009	0.009	0.50	0.25	0.002	0%
9.50	0.00					1.00	26	9.75	9.50	0.002	0.002	0.13	0.03	0.000	0%
Total Flow:														1.091	1.000

Total Flow:	1.091	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	16.62	(m ²)
Top Width:	12.50	(m)
Hydraulic Depth:	1.330	(m)
Mean Velocity:	0.066	(m/s)
Froude Number	0.018	
Photographs taken looking at:		
Photos: d/s, Xchannel w/John, X channel w/o John, u/s		

Data logger Notes:
Data logger Internal Power: 4.86 V
Data logger External Power: 13.95 V
Data logger Memory Used: 34%
Data logger Clock: 9:20 AM MST
Laptop Clock: 9:30 AM MST
Dessicant:
Data logger: 220407
PT: 899
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: New campbell scientific equipment placed at site second TD 1.49m
Modem lock 57880 IP: 70.25.218.134
25923 Transducer Serial Number



Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Time of Measurement

Date of Measurement: October 17, 2008
Start Time: 10:45 AM MDT
End Time: 11:15 AM MDT

Weather Conditions: cloudy, 4 C
River Conditions: open, low

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked:
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.238
Water Level Reading: 2.113
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.420
Other: T-Bar 0.954

Setup No. 1

El: 282.380
El: 281.505
El: 280.085
El: 282.664

Setup No. 2

El: 282.380
El: 281.502
El: 280.082
El: 282.664

Average

281.504
280.084
282.664

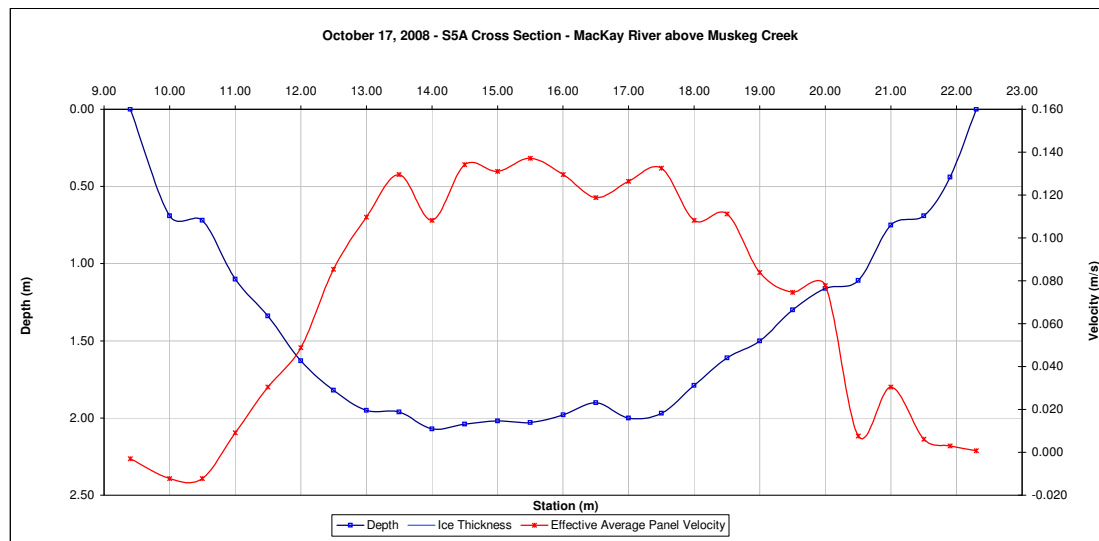
Measurement Data

Measured Data															Calculated Data						
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)						
LB	9.40	0.00					1.00	1	9.40	9.70	-0.003	-0.003	0.17	0.05	0.000	0%					
	10.00	0.69				-0.012	1.00	2	9.70	10.25	-0.012	-0.012	0.69	0.38	-0.005	0%					
	10.50	0.72				-0.012	1.00	3	10.25	10.75	-0.012	-0.012	0.72	0.36	-0.004	0%					
	11.00	1.10		0.018	0.000		1.00	4	10.75	11.25	0.009	0.009	1.10	0.55	0.005	0%					
	11.50	1.34		0.049	0.012		1.00	5	11.25	11.75	0.030	0.030	1.34	0.67	0.020	1%					
	12.00	1.63		0.076	0.021		1.00	6	11.75	12.25	0.049	0.049	1.63	0.82	0.040	2%					
	12.50	1.82		0.122	0.049		1.00	7	12.25	12.75	0.085	0.085	1.82	0.91	0.078	4%					
	13.00	1.95		0.152	0.067		1.00	8	12.75	13.25	0.110	0.110	1.95	0.98	0.107	6%					
	13.50	1.96		0.162	0.098		1.00	9	13.25	13.75	0.130	0.130	1.96	0.98	0.127	7%					
	14.00	2.07		0.158	0.058		1.00	10	13.75	14.25	0.108	0.108	2.07	1.04	0.112	6%					
	14.50	2.04		0.168	0.101		1.00	11	14.25	14.75	0.134	0.134	2.04	1.02	0.137	8%					
	15.00	2.02		0.155	0.107		1.00	12	14.75	15.25	0.131	0.131	2.02	1.01	0.132	8%					
	15.50	2.03		0.155	0.119		1.00	13	15.25	15.75	0.137	0.137	2.03	1.02	0.139	8%					
	16.00	1.98		0.149	0.110		1.00	14	15.75	16.25	0.130	0.130	1.98	0.99	0.128	7%					
	16.50	1.90		0.122	0.116		1.00	15	16.25	16.75	0.119	0.119	1.90	0.95	0.113	6%					
	17.00	2.00		0.143	0.110		1.00	16	16.75	17.25	0.126	0.126	2.00	1.00	0.126	7%					
	17.50	1.97		0.180	0.085		1.00	17	17.25	17.75	0.133	0.133	1.97	0.99	0.131	7%					
	18.00	1.79		0.171	0.046		1.00	18	17.75	18.25	0.108	0.108	1.79	0.90	0.097	6%					
	18.50	1.61		0.177	0.046		1.00	19	18.25	18.75	0.111	0.111	1.61	0.81	0.090	5%					
	19.00	1.50		0.125	0.043		1.00	20	18.75	19.25	0.084	0.084	1.50	0.75	0.063	4%					
	19.50	1.30		0.101	0.049		1.00	21	19.25	19.75	0.075	0.075	1.30	0.65	0.049	3%					
	20.00	1.16		0.073	0.082		1.00	22	19.75	20.25	0.078	0.078	1.16	0.58	0.045	3%					
	20.50	1.11		0.018	-0.003		1.00	23	20.25	20.75	0.008	0.008	1.11	0.56	0.004	0%					
	21.00	0.75				0.030	1.00	24	20.75	21.25	0.030	0.030	0.75	0.38	0.011	1%					
	21.50	0.69				0.006	1.00	25	21.25	21.70	0.006	0.006	0.69	0.31	0.002	0%					
	21.90	0.44				0.003	1.00	26	21.70	22.10	0.003	0.003	0.44	0.18	0.001	0%					
	RB	22.30	0.00				1.00	27	22.10	22.30	0.001	0.001	0.11	0.02	0.000	0%					
Total Flow:														1.747	1.000						

Total Flow:	1.747	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	18.81	(m ²)
Top Width:	12.90	(m)
Hydraulic Depth:	1.459	(m)
Mean Velocity:	0.093	(m/s)
Froude Number	0.025	
Photographs taken looking at:		
Photos: d/s, Xchannel w/John, X channel w/o John, u/s		

Data logger Notes:	Site 407
Data logger Internal Power:	4.81 V
Data logger External Power:	12.54 V
Data logger Memory Used:	43%
Data logger Clock:	9:16 AM MST
Laptop Clock:	9:29 AM MST
Dessicant:	NEW
Data logger:	220407
PT:	899
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: 0836000078 - CS445 Serial Number



Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Time of Measurement

Date of Measurement: November 27, 2008
Start Time: 10:10 AM MST
End Time:

Weather Conditions:

clear, -10 C

River Conditions:

ice and snow

Personnel & Equipment

Measurement Made By: Hatfield - JE/SE
Data Entry By: SS Checked:
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

		Setup No. 1		Setup No. 2		Average		
Bench Mark Reading:	rebar in PVC	1.144	El:	282.380	1.151	El:	282.380	
Water Level Reading:		2.349	El:	281.175	2.345	El:	281.186	281.181
Top of Ice Level Reading:		2.286	El:	281.238	2.172	El:	281.359	281.299
Transducer Reading & Est. El.:			El:	281.175		El:	281.186	281.181
Other:	T-Bar	0.861	El:	282.663	0.857	El:	282.674	282.669

Hydrometric Measurement / Site Visit Record

Muskeg River above Muskeg Creek - S5A



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S5A
Site Name: Muskeg River above Muskeg Creek
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Time of Measurement

Date of Measurement: December 15, 2008
Start Time: 9:06 AM MST
End Time:

Weather Conditions: overcast, -26 C

River Conditions: thin ice cover

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked:
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 1.276
Water Level Reading: 2.535
Top of Ice Level Reading: 2.411
Transducer Reading & Est. El.: 1.007
Other: T-Bar 0.995

Setup No. 1

El: 282.380
El: 281.121
El: 281.245
El: 280.114
El: 282.661

Setup No. 2

El: 1.225
El: 2.487
El: 2.359
El: 1.007
El: 0.946

Average

281.120
281.246
280.113
282.660

Data logger Notes:	Site 407
Data logger Internal Power:	4.01 V
Data logger External Power:	12.16 V
Data logger Memory Used:	4%
Data logger Clock:	9:17 AM MST
Laptop Clock:	9:09 AM MST
Dessicant:	good
Data logger:	220407
PT:	899
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: new batty installed Campbell Sci: 12.38 V internal battery
water temp 0.11 C water temp 0.09 C
2nd TD 0.812 m depth 0.83 m
baro pressure 991.24

Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek at Hwy 63
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Time of Measurement

Date of Measurement: January 12, 2008
Start Time: 3:07 PM MST
End Time: 3:22 PM MST

Weather Conditions:

Cloudy

River Conditions:

Thin ice around edges of v notch weir approx. 4cm
Open at measurement location

Notes:

Battery changed, new reading = 71% @ 11.07 V
Change dessicant on next trip

Personnel & Equipment

Measurement Made By: JMS/JS
Data Entry By: JMS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521
Checked: s/n 2004521

Level Readings and Meas:

	Setup No. 1	Setup No. 2	Average
Bench Mark Readbar in PVI	1.234	El: 273.600	1.115
Water Level Read	2.886	El: 271.948	2.772
Top of Ice level Reading:			
Transducer Reading & Est.	0.480	El: 271.469	0.480
Other:		El: 271.464	271.466

Data logger Note

Data logger Internal Powe 1.00
Data logger External Powe 0.71
Data logger Memory Used 35%
Data logger Cloc December 1, 2008 03:07 AM MST
Laptop Clock: December 2, 2008 03:22 AM MST
Dessicant:

Data logger: s/n 203149
PT: s/n 609001-5903
Power: Lakewood battery

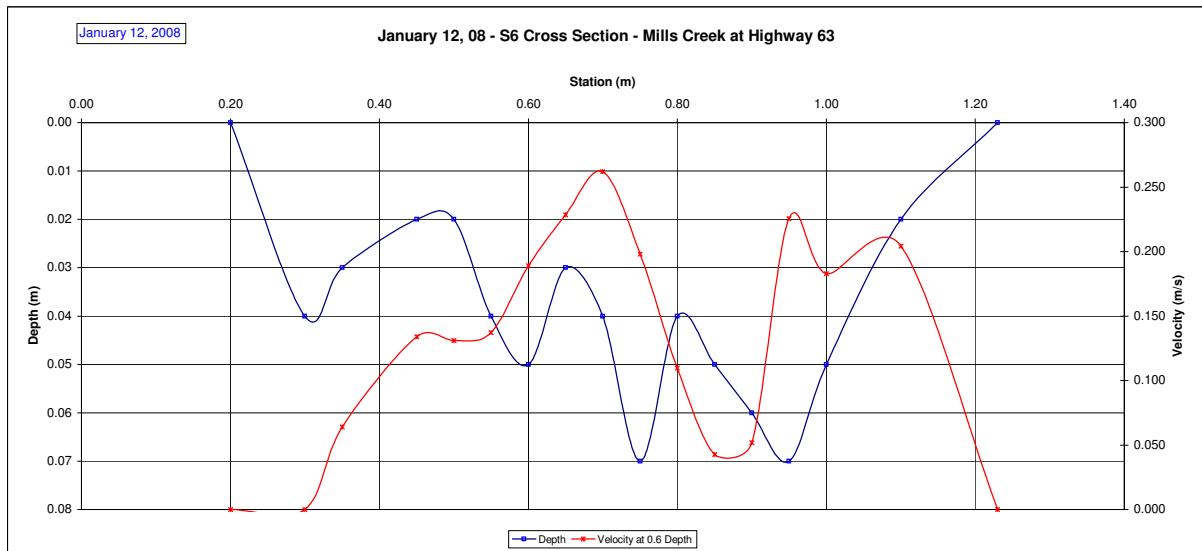
Measurement Data															
Measured Data								Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB 0.20	0.00				0.000	1.00	1	0.20	0.25	0.000	0.000	0.01	0.00	0.000	0%
0.30	0.04				0.000	1.00	2	0.25	0.33	0.000	0.000	0.04	0.00	0.000	0%
0.35	0.03				0.064	1.00	3	0.33	0.40	0.064	0.064	0.03	0.00	0.000	3%
0.45	0.02				0.134	1.00	4	0.40	0.48	0.134	0.134	0.02	0.00	0.000	4%
0.50	0.02				0.131	1.00	5	0.48	0.53	0.131	0.131	0.02	0.00	0.000	3%
0.55	0.04				0.137	1.00	6	0.53	0.58	0.137	0.137	0.04	0.00	0.000	5%
0.60	0.05				0.189	1.00	7	0.58	0.63	0.189	0.189	0.05	0.00	0.000	9%
0.65	0.03				0.229	1.00	8	0.63	0.68	0.229	0.229	0.03	0.00	0.000	7%
0.70	0.04				0.262	1.00	9	0.68	0.73	0.262	0.262	0.04	0.00	0.001	10%
0.75	0.07				0.198	1.00	10	0.73	0.78	0.198	0.198	0.07	0.00	0.001	13%
0.80	0.04				0.110	1.00	11	0.78	0.83	0.110	0.110	0.04	0.00	0.000	4%
0.85	0.05				0.043	1.00	12	0.83	0.88	0.043	0.043	0.05	0.00	0.000	2%
0.90	0.06				0.052	1.00	13	0.88	0.93	0.052	0.052	0.06	0.00	0.000	3%
0.95	0.07				0.226	1.00	14	0.93	0.98	0.226	0.226	0.07	0.00	0.001	15%
1.00	0.05				0.183	1.00	15	0.98	1.05	0.183	0.183	0.05	0.00	0.001	13%
1.10	0.02				0.204	1.00	16	1.05	1.17	0.204	0.204	0.02	0.00	0.000	9%
RB 1.23	0.00				0.000	1.00	17	1.17	1.23	0.051	0.051	0.01	0.00	0.000	0%
Total Flow:														0.005	100%

Total Flow:	0.005	(m³/s)
Perceived Measurement Quality:	Fair	
Total Area:	0.04	(m²)
Top Width:	1.03	(m)
Hydraulic Depth:	0.036	(m)
Mean Velocity:	0.141	(m/s)
Froude Number	0.237	
Photographs taken looking at:	Upstream, downstream, across	

Notes:

TSS sample collected
weir crest is 55 mm wide

Data logger Notes:	
Data logger Internal Power:	100%
Data logger External Power:	71%
Data logger Memory Used:	35%
Data logger Clock:	January 12, 2008 02:32 PM MST
Laptop Clock:	January 12, 2008 02:50 PM MST
Dessicant:	40% used
Data logger:	s/n 203149
PT:	s/n 609001-5903
Power:	Lakewood battery



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek at Hwy 63
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Time of Measurement

Date of Measurement: February 16, 2008
Start Time: 3:05 PM MST
End Time: 3:16 PM MST

Weather Conditions:

overcast -9
ice

Notes:

Personnel & Equipment

Measurement Made By: JS/SMS/JV
Data Entry By: JV Checked:
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings and Measure

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: bar in PVI	1.299	El: 273.600	1.413
Water Level Reading:	3.384	El: 271.515	3.503
Top of Ice level Reading:			
Transducer Reading & Est. El.:	0.486	El: 271.029	0.486
Other:		El: 271.024	271.027

Data logger Notes:

Data logger Internal Power: 11.34
Data logger External Power: 11.07
Data logger Memory Used: 45%
Data logger Clock: February 16, 2008 02:31 PM MST
Laptop Clock: February 16, 2008 02:51 PM MST
Dessicant:
Data logger: s/n 203149
PT: s/n 609001-5903
Power: Lakewood battery

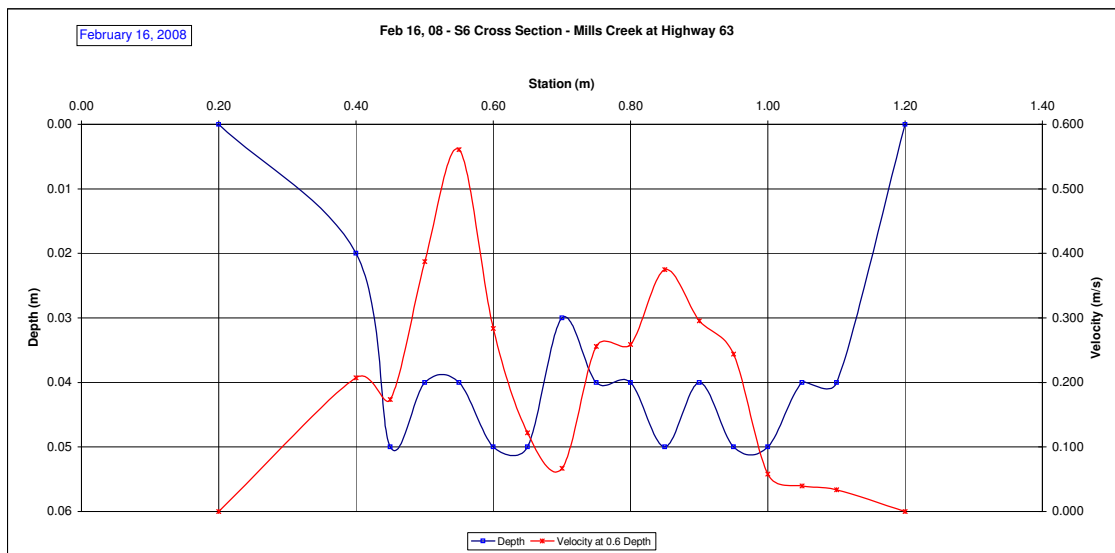
Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	0.20	0.00			0.000	1.00	1	0.20	0.30	0.052	0.052	0.01	0.00	0.000	0%
	0.40	0.02			0.207	1.00	2	0.30	0.43	0.207	0.207	0.02	0.00	0.001	7%
	0.45	0.05			0.174	1.00	3	0.43	0.48	0.174	0.174	0.05	0.00	0.000	6%
	0.50	0.04			0.387	1.00	4	0.48	0.53	0.387	0.387	0.04	0.00	0.001	10%
	0.55	0.04			0.561	1.00	5	0.53	0.58	0.561	0.561	0.04	0.00	0.001	15%
	0.60	0.05			0.283	1.00	6	0.58	0.63	0.283	0.283	0.05	0.00	0.001	9%
	0.65	0.05			0.122	1.00	7	0.63	0.68	0.122	0.122	0.05	0.00	0.000	4%
	0.70	0.03			0.067	1.00	8	0.68	0.73	0.067	0.067	0.03	0.00	0.000	1%
	0.75	0.04			0.256	1.00	9	0.73	0.78	0.256	0.256	0.04	0.00	0.001	7%
	0.80	0.04			0.259	1.00	10	0.78	0.83	0.259	0.259	0.04	0.00	0.001	7%
	0.85	0.05			0.375	1.00	11	0.83	0.88	0.375	0.375	0.05	0.00	0.001	13%
	0.90	0.04			0.296	1.00	12	0.88	0.93	0.296	0.296	0.04	0.00	0.001	8%
	0.95	0.05			0.244	1.00	13	0.93	0.98	0.244	0.244	0.05	0.00	0.001	8%
	1.00	0.05			0.058	1.00	14	0.98	1.03	0.058	0.058	0.05	0.00	0.000	2%
	1.05	0.04			0.040	1.00	15	1.03	1.08	0.040	0.040	0.04	0.00	0.000	1%
RB	1.10	0.04			0.034	1.00	16	1.08	1.15	0.034	0.034	0.04	0.00	0.000	1%
	1.20	0.00			0.000	1.00	17	1.15	1.20	0.008	0.008	0.01	0.00	0.000	0%
Total Flow:														0.007	100%

Total Flow:	0.007	(m³/s)
Perceived Measurement Quality:	Fair	
Total Area:	0.04	(m²)
Top Width:	1.00	(m)
Hydraulic Depth:	0.035	(m)
Mean Velocity:	0.214	(m/s)
Froude Number	0.365	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	100%	
Data logger External Power:	71%	Good
Data logger Memory Used:	35%	cleared
Data logger Clock:	January 12, 2008 02:32 PM	MST
Laptop Clock:	January 12, 2008 02:50 PM	MST
Dessicant:	40% used	
Data logger:	s/n 203149	
PT:	s/n 609001-5903	
Power:	Lakewood battery	

Notes:

Mills Creek at Highway 63



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek at Hwy 63
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Time of Measurement

Date of Measurement: March 8, 2008
Start Time: 7:51 AM MST
End Time: 8:08 AM MST

Weather Conditions:

overcast -7C, Pt, Cloudy, Lt wind

River Conditions:

ice

Personnel & Equipment

Measurement Made By: JS/SMS
Data Entry By: sm Checked: jms & Imm
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings and Measurem

Bench Mark Reading: bar in PV 1.476
Water Level Reading: 3.125
Top of Ice level Reading:
Transducer Reading & Est. El.: 0.486
Other:

Setup No. 1

El: 273.600
El: 271.951
El: 271.465
El:

Setup No. 2

El: 273.600
El: 271.950
El: 271.464
El:

Average

271.951
271.465

		Measured Data						Measurement Data									
								Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)			
LB	1.00	0.00			0.000	1.00	1	1.00	1.05	0.091	0.091	0.02	0.00	0.000	1%		
	1.10	0.06			0.366	1.00	2	1.05	1.13	0.366	0.366	0.06	0.00	0.002	17%		
	1.15	0.07			0.040	1.00	3	1.13	1.18	0.040	0.040	0.07	0.00	0.000	1%		
	1.20	0.05			0.290	1.00	4	1.18	1.23	0.290	0.290	0.05	0.00	0.001	7%		
	1.25	0.06			0.235	1.00	5	1.23	1.28	0.235	0.235	0.06	0.00	0.001	7%		
	1.30	0.08			0.244	1.00	6	1.28	1.33	0.244	0.244	0.08	0.00	0.001	10%		
	1.35	0.06			0.323	1.00	7	1.33	1.38	0.323	0.323	0.06	0.00	0.001	10%		
	1.40	0.03			0.415	1.00	8	1.38	1.43	0.415	0.415	0.03	0.00	0.001	6%		
	1.45	0.03			0.155	1.00	9	1.43	1.48	0.155	0.155	0.03	0.00	0.000	2%		
	1.50	0.03			0.040	1.00	10	1.48	1.53	0.040	0.040	0.03	0.00	0.000	1%		
	1.55	0.03			0.332	1.00	11	1.53	1.58	0.332	0.332	0.03	0.00	0.000	5%		
	1.60	0.06			0.332	1.00	12	1.58	1.63	0.332	0.332	0.06	0.00	0.001	10%		
	1.65	0.05			0.381	1.00	13	1.63	1.68	0.381	0.381	0.05	0.00	0.001	10%		
	1.70	0.05			0.049	1.00	14	1.68	1.73	0.049	0.049	0.05	0.00	0.000	1%		
	1.75	0.04			0.247	1.00	15	1.73	1.78	0.247	0.247	0.04	0.00	0.000	5%		
	1.80	0.03			0.204	1.00	16	1.78	1.85	0.204	0.204	0.03	0.00	0.000	5%		
	1.90	0.00			0.000	1.00	17	1.85	1.90	0.051	0.051	0.01	0.00	0.000	0%		
Total Flow:														0.010	100%		

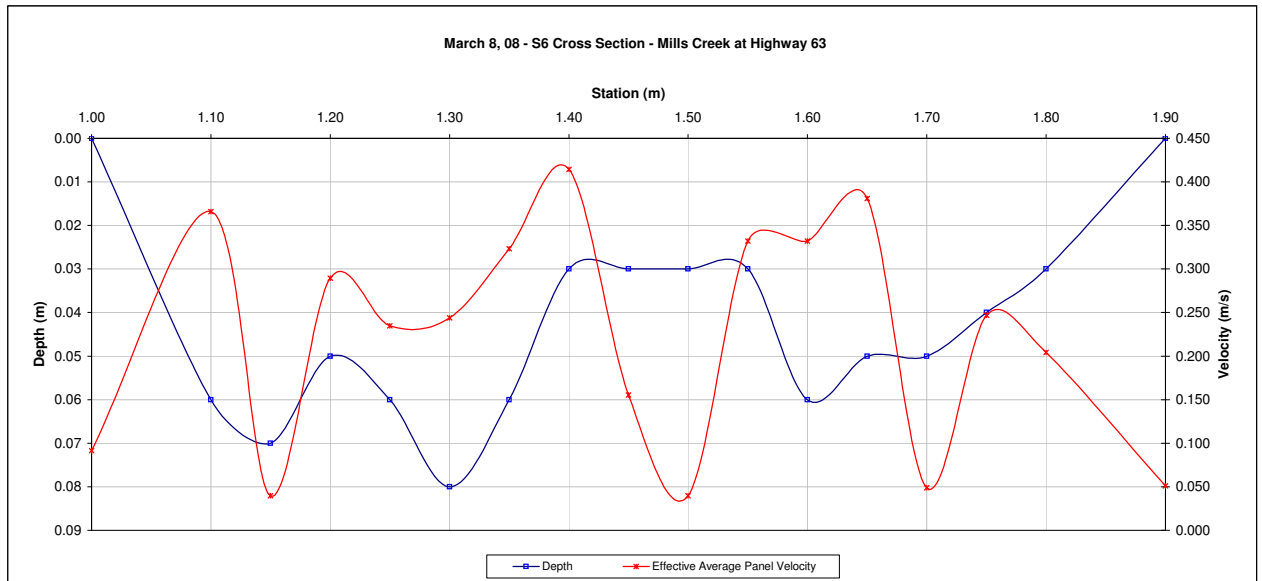
Total Flow:	0.010	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.04	(m ²)
Top Width:	0.90	(m)
Hydraulic Depth:	0.044	(m)
Mean Velocity:	0.243	(m/s)
Froude Number	0.368	
Photographs taken looking at: Upstream, downstream, across		

Notes:

no ice
new battery installed

Data logger Notes:

Data logger Internal Power: 11.34 100%
Data logger External Power: 10.95 71%
Data logger Memory Used: 50%
Data logger Clock: March 7, 2008 07:45 AM MST
Laptop Clock: March 7, 2008 07:45 AM MST
Dessicant: 40% used
Data logger: s/n 203149
PT: s/n 609001-5903
Power: Lakewood battery



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek at Hwy 63
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Time of Measurement

Date of Measurement: April 1, 2008
Start Time: 8:31 AM MST
End Time: 8:40 AM MST

Weather Conditions:

sunny -6

River Conditions:

open

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: sm
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings and Measure

Bench Mark Reading: bar in PV 1.420
Water Level Reading: 3.060
Top of Ice level Reading:
Transducer Reading & Est. El.: 0.491
Other: mast 0.942

Setup No. 1

El: 273.600
El: 271.960
El: 271.469
El: 274.078

Setup No. 2

El: 273.600
El: 271.961
El: 271.470
El: 274.079

Average

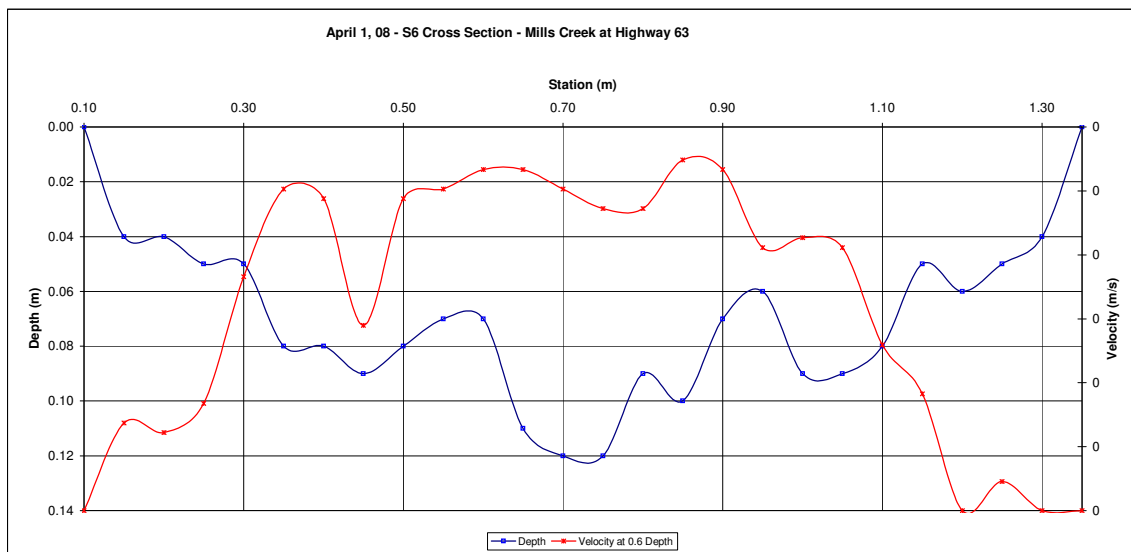
271.961
271.470
274.079

		Measurement Data															
Measured Data						Calculated Data											
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)			
LB	0.10	0.00			0	1.00	1	0.10	0.13	0.007	0.007	0.01	0.00	0.000	0%		
	0.15	0.04			0.027	1.00	2	0.13	0.18	0.027	0.027	0.04	0.00	0.000	1%		
	0.20	0.04			0.024	1.00	3	0.18	0.23	0.024	0.024	0.04	0.00	0.000	1%		
	0.25	0.05			0.034	1.00	4	0.23	0.28	0.034	0.034	0.05	0.00	0.000	1%		
	0.30	0.05			0.073	1.00	5	0.28	0.33	0.073	0.073	0.05	0.00	0.000	3%		
	0.35	0.08			0.101	1.00	6	0.33	0.38	0.101	0.101	0.08	0.00	0.000	6%		
	0.40	0.08			0.098	1.00	7	0.38	0.43	0.098	0.098	0.08	0.00	0.000	6%		
	0.45	0.09			0.058	1.00	8	0.43	0.48	0.058	0.058	0.09	0.00	0.000	4%		
	0.50	0.08			0.098	1.00	9	0.48	0.53	0.098	0.098	0.08	0.00	0.000	6%		
	0.55	0.07			0.101	1.00	10	0.53	0.58	0.101	0.101	0.07	0.00	0.000	5%		
	0.60	0.07			0.107	1.00	11	0.58	0.63	0.107	0.107	0.07	0.00	0.000	5%		
	0.65	0.11			0.107	1.00	12	0.63	0.68	0.107	0.107	0.11	0.01	0.001	8%		
	0.70	0.12			0.101	1.00	13	0.68	0.73	0.101	0.101	0.12	0.01	0.001	9%		
	0.75	0.12			0.094	1.00	14	0.73	0.78	0.094	0.094	0.12	0.01	0.001	8%		
	0.80	0.09			0.094	1.00	15	0.78	0.83	0.094	0.094	0.09	0.00	0.000	6%		
	0.85	0.10			0.110	1.00	16	0.83	0.88	0.110	0.110	0.10	0.01	0.001	8%		
	0.90	0.07			0.107	1.00	17	0.88	0.93	0.107	0.107	0.07	0.00	0.000	5%		
	0.95	0.06			0.082	1.00	18	0.93	0.98	0.082	0.082	0.06	0.00	0.000	4%		
	1.00	0.09			0.085	1.00	19	0.98	1.03	0.085	0.085	0.09	0.00	0.000	6%		
	1.05	0.09			0.082	1.00	20	1.03	1.08	0.082	0.082	0.09	0.00	0.000	5%		
	1.10	0.08			0.052	1.00	21	1.08	1.13	0.052	0.052	0.08	0.00	0.000	3%		
	1.15	0.05			0.037	1.00	22	1.13	1.18	0.037	0.037	0.05	0.00	0.000	1%		
	1.20	0.06			0.000	1.00	23	1.18	1.23	0.000	0.000	0.06	0.00	0.000	0%		
	1.25	0.05			0.009	1.00	24	1.23	1.28	0.009	0.009	0.05	0.00	0.000	0%		
	RB	1.30	0.04			0.000	1.00	25	1.28	1.33	0.000	0.000	0.04	0.00	0.000	0%	
		1.35	0.00			0	1.00	26	1.33	1.35	0.000	0.000	0.01	0.00	0.000	0%	
															100%		

Total Flow:	0.007	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.09	(m ²)
Top Width:	1.25	(m)
Hydraulic Depth:	0.072	(m)
Mean Velocity:	0.078	(m/s)
Froude Number	0.093	
Photographs taken looking at:		
Upstream, downstream, across		
Notes:		

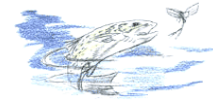
battery changed, new reading 74%
Td erratic
order new battery plug

Data logger Notes:			
Data logger Internal Power:	11.34	100%	
Data logger External Power:	11.07	71%	
Data logger Memory Used:	60%		Good cleared
Data logger Clock:	April 1, 2008 06:48 AM		MST
Laptop Clock:	April 1, 2008 07:21 AM		MST
Dessicant:	40% used		
Data logger:	s/n 203149		
PT:	s/n 609001-5903		
Power:	Lakewood battery		



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek at Hwy 63
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Time of Measurement

Date of Measurement: May 8, 2008
Start Time: 3:30 PM MDT
End Time: 3:38 PM MDT

Weather Conditions:

clear, 5 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked:
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings and Measurem

Bench Mark Reading: bar in PV 0.814
Water Level Reading: 2.325
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.642
Other: mast

Setup No. 1

El: 273.600
El: 272.089
El: 271.447

Setup No. 2

El: 273.600
El: 272.085
El: 271.443

Average

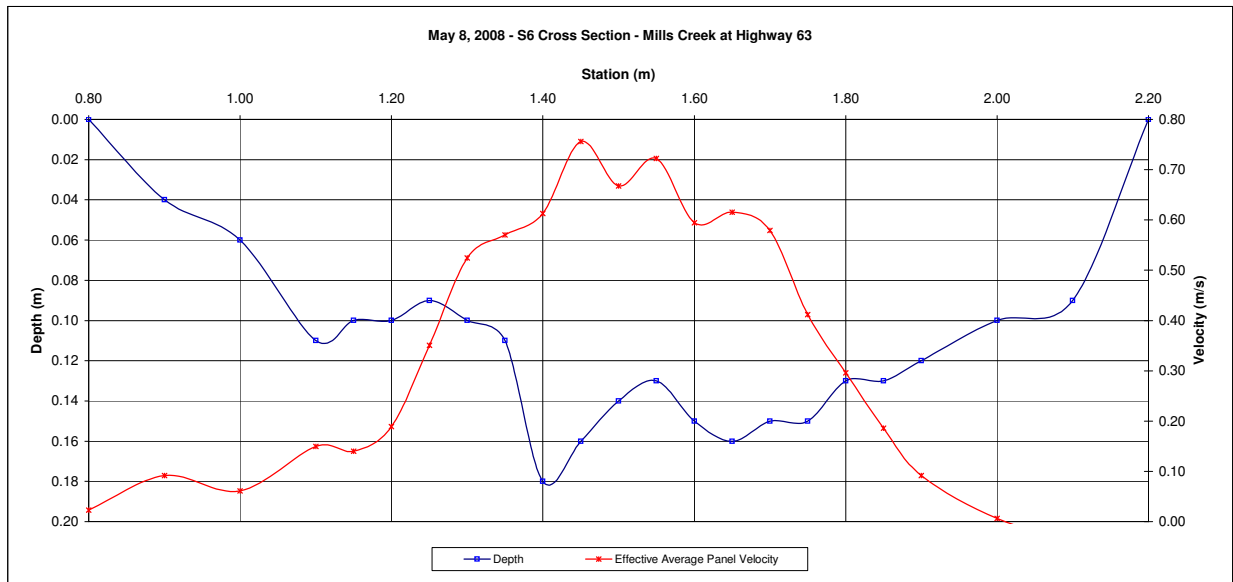
272.087
271.445

Measurement Data																
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	0.80	0.00				1.00	1	0.80	0.85	0.023	0.023	0.01	0.00	0.000	0%	
	0.90	0.04			0.091	1.00	2	0.85	0.95	0.091	0.091	0.04	0.00	0.000	1%	
	1.00	0.06			0.061	1.00	3	0.95	1.05	0.061	0.061	0.06	0.01	0.000	1%	
	1.10	0.11			0.149	1.00	4	1.05	1.13	0.149	0.149	0.11	0.01	0.001	2%	
	1.15	0.10			0.140	1.00	5	1.13	1.18	0.140	0.140	0.10	0.00	0.001	1%	
	1.20	0.10			0.189	1.00	6	1.18	1.23	0.189	0.189	0.10	0.01	0.001	2%	
	1.25	0.09			0.351	1.00	7	1.23	1.28	0.351	0.351	0.09	0.00	0.002	3%	
	1.30	0.10			0.524	1.00	8	1.28	1.33	0.524	0.524	0.10	0.01	0.003	5%	
	1.35	0.11			0.570	1.00	9	1.33	1.38	0.570	0.570	0.11	0.01	0.003	6%	
	1.40	0.18			0.613	1.00	10	1.38	1.43	0.613	0.613	0.18	0.01	0.006	11%	
	1.45	0.16			0.756	1.00	11	1.43	1.48	0.756	0.756	0.16	0.01	0.006	12%	
	1.50	0.14			0.668	1.00	12	1.48	1.53	0.668	0.668	0.14	0.01	0.005	9%	
	1.55	0.13			0.722	1.00	13	1.53	1.58	0.722	0.722	0.13	0.01	0.005	9%	
	1.60	0.15			0.594	1.00	14	1.58	1.63	0.594	0.594	0.15	0.01	0.004	9%	
	1.65	0.16			0.616	1.00	15	1.63	1.68	0.616	0.616	0.16	0.01	0.005	9%	
	1.70	0.15			0.579	1.00	16	1.68	1.73	0.579	0.579	0.15	0.01	0.004	8%	
	1.75	0.15			0.411	1.00	17	1.73	1.78	0.411	0.411	0.15	0.01	0.003	6%	
1.80	0.13			0.296	1.00	18	1.78	1.83	0.296	0.296	0.13	0.01	0.002	4%		
1.85	0.13			0.186	1.00	19	1.83	1.88	0.186	0.186	0.13	0.01	0.001	2%		
1.90	0.12			0.091	1.00	20	1.88	1.95	0.091	0.091	0.12	0.01	0.001	2%		
2.00	0.10			0.006	1.00	21	1.95	2.05	0.006	0.006	0.10	0.01	0.000	0%		
2.10	0.09			-0.030	1.00	22	2.05	2.15	-0.030	-0.030	0.09	0.01	0.000	-1%		
2.20	0.00				1.00	23	2.15	2.20	-0.008	-0.008	0.02	0.00	0.000	0%		
Total Flow:														0.052	1.000	

Total Flow:	0.052	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.15	(m ²)
Top Width:	1.40	(m)
Hydraulic Depth:	0.105	(m)
Mean Velocity:	0.357	(m/s)
Froude Number	0.352	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	11.8 V	76%
Data logger Memory Used:	70%	
Data logger Clock:	13:45	MST
Laptop Clock:	14:08	MST
Dessicant:	new	
Data logger:	s/n 203149	
PT:	s/n 609001-5903	
Power:	Lakewood battery	

Notes:



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek at Hwy 63
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Time of Measurement

Date of Measurement: June 23, 2008
Start Time: 1:15 PM MDT
End Time: 1:30 PM MDT

Weather Conditions:

cloud, rain, +13 C

River Conditions:

no ice

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: SS Checked:
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings and Measurem

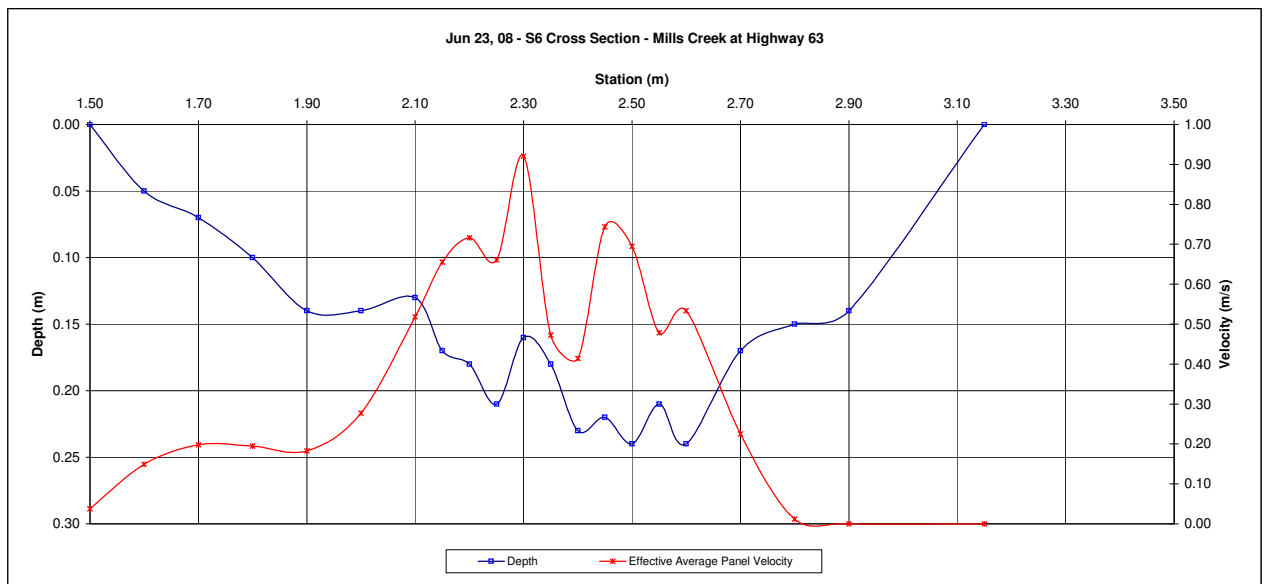
	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: bar in PV	1.080	1.069	272.162
Water Level Reading:	2.518	2.507	272.162
Top of Ice Level Reading:			
Transducer Reading & Est. El.:	0.703	0.703	271.459
Other: mast	0.608	0.595	274.074

Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
RB 1.50	0.00					1.00	1	1.50	1.55	0.037	0.037	0.01	0.00	0.000	0%				
1.60	0.05				0.149	1.00	2	1.55	1.65	0.149	0.149	0.05	0.00	0.001	1%				
1.70	0.07				0.198	1.00	3	1.65	1.75	0.198	0.198	0.07	0.01	0.001	2%				
1.80	0.10				0.195	1.00	4	1.75	1.85	0.195	0.195	0.10	0.01	0.002	2%				
1.90	0.14				0.183	1.00	5	1.85	1.95	0.183	0.183	0.14	0.01	0.003	3%				
2.00	0.14				0.277	1.00	6	1.95	2.05	0.277	0.277	0.14	0.01	0.004	5%				
2.10	0.13				0.518	1.00	7	2.05	2.13	0.518	0.518	0.13	0.01	0.005	6%				
2.15	0.17				0.655	1.00	8	2.13	2.18	0.655	0.655	0.17	0.01	0.006	6%				
2.20	0.18				0.716	1.00	9	2.18	2.23	0.716	0.716	0.18	0.01	0.006	7%				
2.25	0.21				0.661	1.00	10	2.23	2.28	0.661	0.661	0.21	0.01	0.007	8%				
2.30	0.16				0.920	1.00	11	2.28	2.33	0.920	0.920	0.16	0.01	0.007	9%				
2.35	0.18				0.472	1.00	12	2.33	2.38	0.472	0.472	0.18	0.01	0.004	5%				
2.40	0.23				0.415	1.00	13	2.38	2.43	0.415	0.415	0.23	0.01	0.005	6%				
2.45	0.22				0.744	1.00	14	2.43	2.48	0.744	0.744	0.22	0.01	0.008	10%				
2.50	0.24				0.695	1.00	15	2.48	2.53	0.695	0.695	0.24	0.01	0.008	10%				
2.55	0.21				0.479	1.00	16	2.53	2.58	0.479	0.479	0.21	0.01	0.005	6%				
2.60	0.24				0.533	1.00	17	2.58	2.65	0.533	0.533	0.24	0.02	0.010	11%				
2.70	0.17				0.226	1.00	18	2.65	2.75	0.226	0.226	0.17	0.02	0.004	4%				
2.80	0.15				0.012	1.00	19	2.75	2.85	0.012	0.012	0.15	0.01	0.000	0%				
2.90	0.14				0.000	1.00	20	2.85	3.03	0.000	0.000	0.14	0.02	0.000	0%				
LB 3.15	0.00					1.00	21	3.03	3.15	0.000	0.000	0.04	0.00	0.000	0%				
														Total Flow:	0.086	1.000			

Total Flow:	0.086	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.23	(m ²)
Top Width:	1.65	(m)
Hydraulic Depth:	0.139	(m)
Mean Velocity:	0.376	(m/s)
Froude Number	0.322	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	
Data logger External Power:	11.31 V	
Data logger Memory Used:	0%	used
Data logger Clock:	11:38 AM	MST
Laptop Clock:	12:02 PM	MST
Dessicant:	change next trip	
Data logger:	s/n 203149	
PT:	s/n 609001-5903	
Power:	Lakewood battery	

Notes:



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek at Hwy 63
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Time of Measurement

Date of Measurement: August 6, 2008
Start Time: 5:00 PM MDT
End Time: 5:07 PM MDT

Weather Conditions:

28 C sunny

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: SS Checked:
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings and Measurem

Bench Mark Reading: bar in PV 0.874
Water Level Reading: 2.377
Top of Ice level Reading:
Transducer Reading & Est. El.: 0.640
Other: mast 0.405

Setup No. 1

El: 273.600
El: 272.097
El: 271.457
El: 274.069

Setup No. 2

El: 273.600
El: 272.094
El: 271.454
El: 274.091

Average

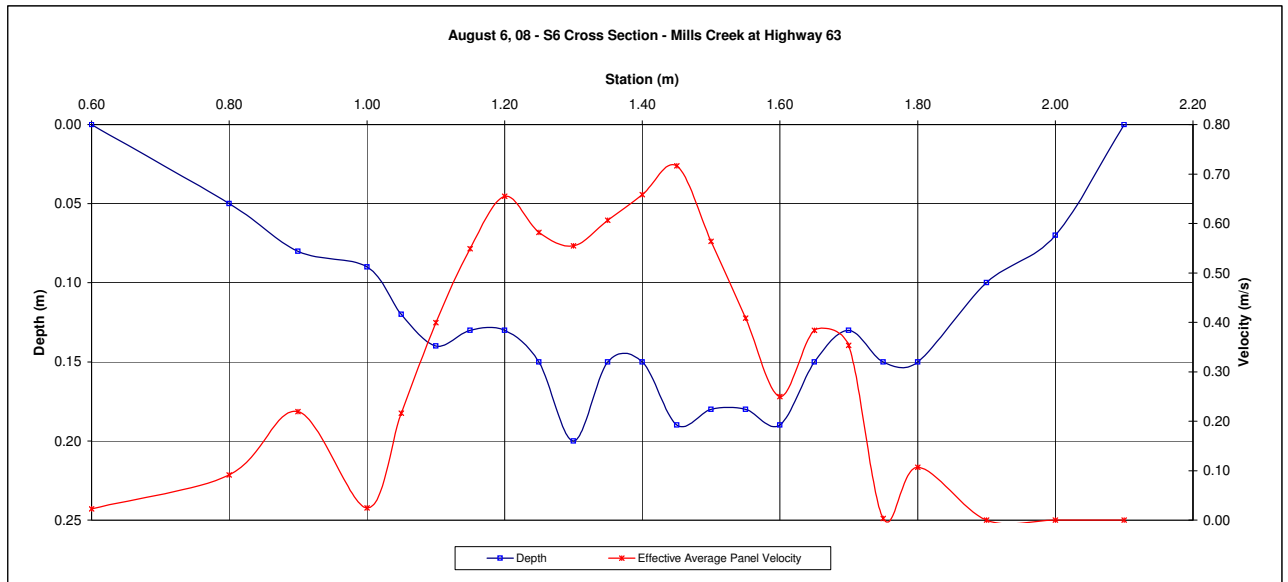
272.096
271.456
274.080

Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
RB	0.60	0.00				1.00	1	0.60	0.70	0.023	0.023	0.01	0.00	0.000	0%				
	0.80	0.05			0.091	1.00	2	0.70	0.85	0.091	0.091	0.05	0.01	0.001	1%				
	0.90	0.08			0.219	1.00	3	0.85	0.95	0.219	0.219	0.08	0.01	0.002	3%				
	1.00	0.09			0.024	1.00	4	0.95	1.03	0.024	0.024	0.09	0.01	0.000	0%				
	1.05	0.12			0.216	1.00	5	1.03	1.08	0.216	0.216	0.12	0.01	0.001	2%				
	1.10	0.14			0.399	1.00	6	1.08	1.13	0.399	0.399	0.14	0.01	0.003	5%				
	1.15	0.13			0.549	1.00	7	1.13	1.18	0.549	0.549	0.13	0.01	0.004	6%				
	1.20	0.13			0.655	1.00	8	1.18	1.23	0.655	0.655	0.13	0.01	0.004	7%				
	1.25	0.15			0.582	1.00	9	1.23	1.28	0.582	0.582	0.15	0.01	0.004	7%				
	1.30	0.20			0.555	1.00	10	1.28	1.33	0.555	0.555	0.20	0.01	0.006	10%				
	1.35	0.15			0.607	1.00	11	1.33	1.38	0.607	0.607	0.15	0.01	0.005	8%				
	1.40	0.15			0.658	1.00	12	1.38	1.43	0.658	0.658	0.15	0.01	0.005	8%				
	1.45	0.19			0.716	1.00	13	1.43	1.48	0.716	0.716	0.19	0.01	0.007	12%				
	1.50	0.18			0.564	1.00	14	1.48	1.53	0.564	0.564	0.18	0.01	0.005	9%				
	1.55	0.18			0.408	1.00	15	1.53	1.58	0.408	0.408	0.18	0.01	0.004	6%				
	1.60	0.19			0.250	1.00	16	1.58	1.63	0.250	0.250	0.19	0.01	0.002	4%				
	1.65	0.15			0.384	1.00	17	1.63	1.68	0.384	0.384	0.15	0.01	0.003	5%				
	1.70	0.13			0.354	1.00	18	1.68	1.73	0.354	0.354	0.13	0.01	0.002	4%				
LB	1.75	0.15			0.003	1.00	19	1.73	1.78	0.003	0.003	0.15	0.01	0.000	0%				
	1.80	0.15			0.107	1.00	20	1.78	1.85	0.107	0.107	0.15	0.01	0.001	2%				
	1.90	0.10			0.000	1.00	21	1.85	1.95	0.000	0.000	0.10	0.01	0.000	0%				
	2.00	0.07			0.000	1.00	22	1.95	2.05	0.000	0.000	0.07	0.01	0.000	0%				
	2.10	0.00				1.00	23	2.05	2.10	0.000	0.000	0.02	0.00	0.000	0%				
Total Flow:															0.058	1.000			

Total Flow:	0.058	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.50	(m ²)
Top Width:	1.50	(m)
Hydraulic Depth:	0.113	(m)
Mean Velocity:	0.344	(m/s)
Froude Number	0.326	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.65 V	81%
Data logger Memory Used:	15%	used
Data logger Clock:	3:46 PM	MST
Laptop Clock:	3:47 PM	MST
Dessicant:	new	
Data logger:	s/n 203149	
PT:	s/n 609001-5903	
Power:	Lakewood battery	

Notes:



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek at Hwy 63
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Time of Measurement

Date of Measurement: September 14, 2008
Start Time: 3:40 PM MDT
End Time: 3:45 PM MDT

Weather Conditions:

cloudy, 15 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings and Measure

Bench Mark Reading: bar in PV 1.291
Water Level Reading: 2.815
Top of Ice level Reading:
Transducer Reading & Est. El.: 0.487
Other: mast 0.821

Setup No. 1

El: 273.600
El: 272.076
El: 271.589
El: 274.070

Setup No. 2

El: 273.600
El: 272.078
El: 271.591
El: 274.070

Average

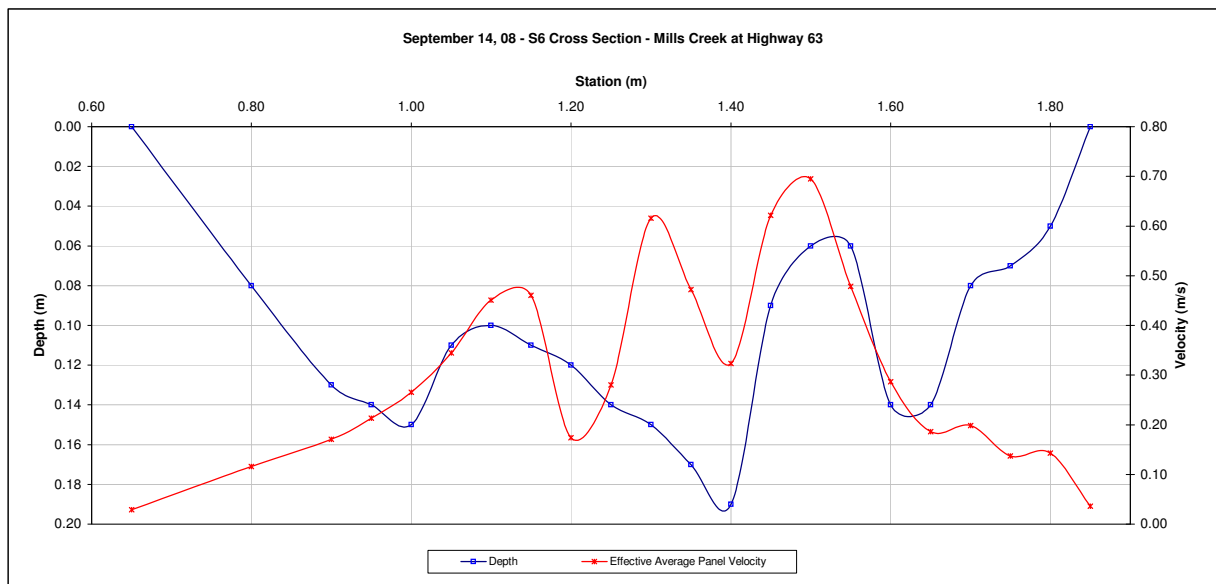
272.077
271.590
274.070

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	0.65	0.00				1.00	1	0.65	0.73	0.029	0.029	0.02	0.00	0.000	0%
	0.80	0.08			0.116	1.00	2	0.73	0.85	0.116	0.116	0.08	0.01	0.001	3%
	0.90	0.13			0.171	1.00	3	0.85	0.93	0.171	0.171	0.13	0.01	0.002	4%
	0.95	0.14			0.213	1.00	4	0.93	0.98	0.213	0.213	0.14	0.01	0.001	4%
	1.00	0.15			0.265	1.00	5	0.98	1.03	0.265	0.265	0.15	0.01	0.002	5%
	1.05	0.11			0.344	1.00	6	1.03	1.08	0.344	0.344	0.11	0.01	0.002	5%
	1.10	0.10			0.451	1.00	7	1.08	1.13	0.451	0.451	0.10	0.00	0.002	6%
	1.15	0.11			0.460	1.00	8	1.13	1.18	0.460	0.460	0.11	0.01	0.003	6%
	1.20	0.12			0.174	1.00	9	1.18	1.23	0.174	0.174	0.12	0.01	0.001	3%
	1.25	0.14			0.280	1.00	10	1.23	1.28	0.280	0.280	0.14	0.01	0.002	5%
	1.30	0.15			0.616	1.00	11	1.28	1.33	0.616	0.616	0.15	0.01	0.005	12%
	1.35	0.17			0.472	1.00	12	1.33	1.38	0.472	0.472	0.17	0.01	0.004	10%
	1.40	0.19			0.323	1.00	13	1.38	1.43	0.323	0.323	0.19	0.01	0.003	8%
	1.45	0.09			0.622	1.00	14	1.43	1.48	0.622	0.622	0.09	0.00	0.003	7%
	1.50	0.06			0.695	1.00	15	1.48	1.53	0.695	0.695	0.06	0.00	0.002	5%
RB	1.55	0.06			0.479	1.00	16	1.53	1.58	0.479	0.479	0.06	0.00	0.001	4%
	1.60	0.14			0.287	1.00	17	1.58	1.63	0.287	0.287	0.14	0.01	0.002	5%
	1.65	0.14			0.186	1.00	18	1.63	1.68	0.186	0.186	0.14	0.01	0.001	3%
	1.70	0.08			0.198	1.00	19	1.68	1.73	0.198	0.198	0.08	0.00	0.001	2%
	1.75	0.07			0.137	1.00	20	1.73	1.78	0.137	0.137	0.07	0.00	0.000	1%
	1.80	0.05			0.143	1.00	21	1.78	1.83	0.143	0.143	0.05	0.00	0.000	1%
	1.85	0.00				1.00	22	1.83	1.85	0.036	0.036	0.01	0.00	0.000	0%
Total Flow:														0.039	1.000

Total Flow:	0.039	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.13	(m ²)
Top Width:	1.20	(m)
Hydraulic Depth:	0.104	(m)
Mean Velocity:	0.312	(m/s)
Froude Number	0.308	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.29 V	79%
Data logger Memory Used:	25%	
Data logger Clock:	2:38 PM	MST
Laptop Clock:	2:38 PM	MST
Dessicant:	NEW	
Data logger:	s/n 203149	
PT:	s/n 609001-5903	
Power:	Lakewood battery	

Notes: data seems good but TD elevation is out
depth should be deeper or WLS is out



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek at Hwy 63
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4
Time of Measurement: October 14, 2008
Date of Measurement: 5:55 PM MDT
Start Time: 6:05 PM MDT
End Time:

Weather Conditions:

cloudy, windy, 4 C

River Conditions:

open, low

Personnel & Equipment

Measurement Made By: SM/JSL
Data Entry By: SS Checked:
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings and Measurem

Bench Mark Reading: bar in PV 1.379
Water Level Reading: 2.885
Top of Ice level Reading:
Transducer Reading & Est. El.: 0.503
Other: mast 0.905
Other: new TD depth an 0.563

Setup No. 1

El: 273.600
El: 272.094
El: 271.591
El: 274.074
El: 271.531

Setup No. 2

El: 273.600
El: 272.094
El: 271.591
El: 274.074
El: 271.531

Average

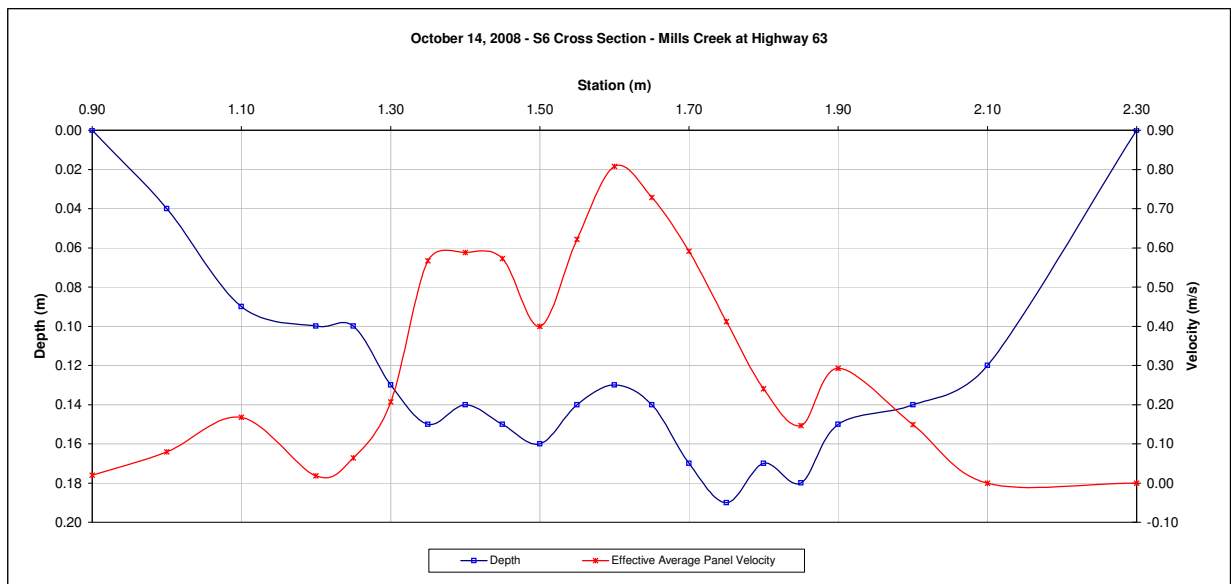
272.094
271.591
274.074
271.531

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)		(m²)	(m³/s)	
RB	0.90	0.00				1.00	1	0.90	0.95	0.020	0.020	0.01	0.00	0.000	0%
	1.00	0.04			0.079	1.00	2	0.95	1.05	0.079	0.079	0.04	0.00	0.000	1%
	1.10	0.09			0.168	1.00	3	1.05	1.15	0.168	0.168	0.09	0.01	0.002	3%
	1.20	0.10			0.018	1.00	4	1.15	1.23	0.018	0.018	0.10	0.01	0.000	0%
	1.25	0.10			0.064	1.00	5	1.23	1.28	0.064	0.064	0.10	0.00	0.000	1%
	1.30	0.13			0.207	1.00	6	1.28	1.33	0.207	0.207	0.13	0.01	0.001	3%
	1.35	0.15			0.567	1.00	7	1.33	1.38	0.567	0.567	0.15	0.01	0.004	8%
	1.40	0.14			0.588	1.00	8	1.38	1.43	0.588	0.588	0.14	0.01	0.004	8%
	1.45	0.15			0.573	1.00	9	1.43	1.48	0.573	0.573	0.15	0.01	0.004	8%
	1.50	0.16			0.399	1.00	10	1.48	1.53	0.399	0.399	0.16	0.01	0.003	6%
LB	1.55	0.14			0.622	1.00	11	1.53	1.58	0.622	0.622	0.14	0.01	0.004	8%
	1.60	0.13			0.808	1.00	12	1.58	1.63	0.808	0.808	0.13	0.01	0.005	10%
	1.65	0.14			0.728	1.00	13	1.63	1.68	0.728	0.728	0.14	0.01	0.005	10%
	1.70	0.17			0.591	1.00	14	1.68	1.73	0.591	0.591	0.17	0.01	0.005	10%
	1.75	0.19			0.411	1.00	15	1.73	1.78	0.411	0.411	0.19	0.01	0.004	8%
	1.80	0.17			0.241	1.00	16	1.78	1.83	0.241	0.241	0.17	0.01	0.002	4%
	1.85	0.18			0.146	1.00	17	1.83	1.88	0.146	0.146	0.18	0.01	0.001	3%
	1.90	0.15			0.293	1.00	18	1.88	1.95	0.293	0.293	0.15	0.01	0.003	6%
	2.00	0.14			0.149	1.00	19	1.95	2.05	0.149	0.149	0.14	0.01	0.002	4%
	2.10	0.12			0.000	1.00	20	2.05	2.20	0.000	0.000	0.12	0.02	0.000	0%
	2.30	0.00				1.00	21	2.20	2.30	0.000	0.000	0.03	0.00	0.000	0%
Total Flow:														0.052	1.000

Total Flow:	0.052	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.16	(m ²)
Top Width:	1.40	(m)
Hydraulic Depth:	0.118	(m)
Mean Velocity:	0.315	(m/s)
Froude Number	0.293	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:	
Data logger Internal Power:	11.34 V 100%
Data logger External Power:	12.04 V 77%
Data logger Memory Used:	30%
Data logger Clock:	4:41 PM MST
Laptop Clock:	4:42 PM MST
Dessicant:	good
Data logger:	s/n 203149
PT:	s/n 609001-5903
Power:	Lakewood battery

Notes: New TD installed at site, from S12. Serial Number 0604001



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek at Hwy 63
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Time of Measurement

Date of Measurement: December 9, 2008
Start Time: 3:37 PM MST
End Time: 3:42 PM MST

Weather Conditions:

snow, cloudy, -22 C

River Conditions:

thin ice cover

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked:
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings and Measurem

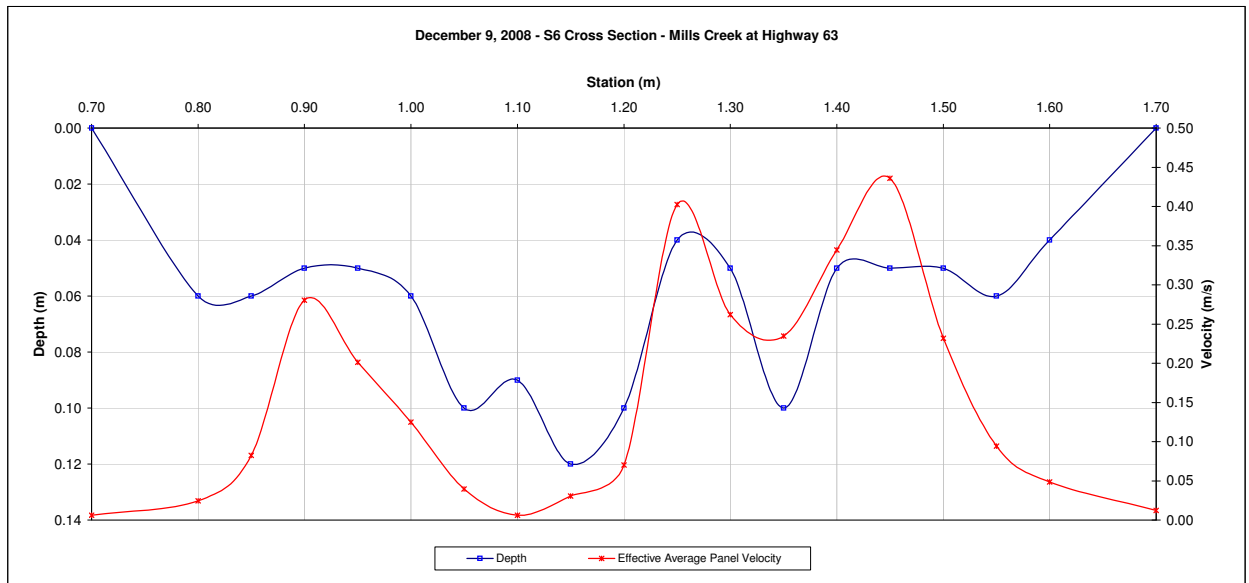
	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: bar in PV	0.955	El: 273.600	0.943
Water Level Reading:	2.565	El: 271.990	2.56
Top of Ice level Reading:	2.572	El: 271.983	2.562
Transducer Reading & Est. El.:	0.479	El: 271.511	0.479
Other: mast	0.483	El: 274.072	0.47

Measured Data										Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
LB 0.70	0.00				0.024	1.00	1	0.70	0.75	0.006	0.006	0.02	0.00	0.000	0%				
0.80	0.06				0.082	1.00	2	0.75	0.83	0.024	0.024	0.06	0.00	0.000	1%				
0.85	0.06				0.280	1.00	3	0.83	0.88	0.082	0.082	0.06	0.00	0.000	3%				
0.90	0.05				0.201	1.00	4	0.88	0.93	0.280	0.280	0.05	0.00	0.001	8%				
0.95	0.05				0.125	1.00	5	0.93	0.98	0.201	0.201	0.05	0.00	0.001	6%				
1.00	0.06				0.040	1.00	6	0.98	1.03	0.125	0.125	0.06	0.00	0.000	5%				
1.05	0.10				0.006	1.00	7	1.03	1.08	0.040	0.040	0.10	0.01	0.000	2%				
1.10	0.09				0.030	1.00	8	1.08	1.13	0.006	0.006	0.09	0.00	0.000	0%				
1.15	0.12				0.070	1.00	9	1.13	1.18	0.030	0.030	0.12	0.01	0.000	2%				
1.20	0.10				0.402	1.00	10	1.18	1.23	0.070	0.070	0.10	0.01	0.000	4%				
1.25	0.04				0.262	1.00	11	1.23	1.28	0.402	0.402	0.04	0.00	0.001	10%				
1.30	0.05				0.235	1.00	12	1.28	1.33	0.262	0.262	0.05	0.00	0.001	8%				
1.35	0.10				0.344	1.00	13	1.33	1.38	0.235	0.235	0.10	0.00	0.001	14%				
1.40	0.05				0.436	1.00	14	1.38	1.43	0.344	0.344	0.05	0.00	0.001	10%				
1.45	0.05				0.232	1.00	15	1.43	1.48	0.436	0.436	0.05	0.00	0.001	13%				
1.50	0.05				0.094	1.00	16	1.48	1.53	0.232	0.232	0.05	0.00	0.001	7%				
1.55	0.06				0.049	1.00	17	1.53	1.58	0.094	0.094	0.06	0.00	0.000	3%				
1.60	0.04				1.00	1.00	18	1.58	1.65	0.049	0.049	0.04	0.00	0.000	2%				
RB 1.70	0.00				1.00	1.00	19	1.65	1.70	0.012	0.012	0.01	0.00	0.000	0%				
														Total Flow:	0.008	1.000			

Total Flow:	0.008	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.06	(m ²)
Top Width:	1.00	(m)
Hydraulic Depth:	0.060	(m)
Mean Velocity:	0.138	(m/s)
Froude Number	0.179	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	11.19 V	72%
Data logger Memory Used:	15%	
Data logger Clock:	3:48 PM	MST
Laptop Clock:	3:51 PM	MST
Dessicant:	50%	
Data logger:	s/n 203149	
PT:	604001	
Power:	Lakewood battery	

Notes: Ice broken open below weir to make MMT, thin ice u/s and d/s of MMT section
See pics for details



Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: January 9, 2008
Start Time: 3:00 PM
End Time:

Weather Conditions: Overcast, -23 C

River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: JS/UMS
Data Entry By: SMS
Meter Type and No.:

Level Readings

Bench Mark Reading: pin in tree
Water Level Reading: 4.261
Top of Ice Level Reading: 4.252
Transducer Reading & Calc'd El.: 0.830
Other: Rod in ABS 0.892

Setup No. 1

El: 275.565
El: 272.043
El: 271.313
El: 271.213
El: 275.412

Setup No. 2

El: 275.565
El: 272.048
El: 271.525
El: 271.218
El: 275.412

272.046

271.216

Data logger Notes:	
Data logger Internal Power:	4.56
Data logger External Power:	13.25
Data logger Memory Used:	70%
Data logger Clock:	15:17
Laptop Clock:	15:33
Dessicant:	Good
Data logger:	104170269
PT:	101345
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: Ice very slushy, John fell through. Jon and John decided it was too dangerous and did not complete a flow mmt.
TD reading = 0.829527
Photos taken.

Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: January 15, 2008
Start Time: 1:43 PM
End Time: 2:05 PM

Weather Conditions:

Sunny, -18 C
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: JS/JMS
Data Entry By: JS checked SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

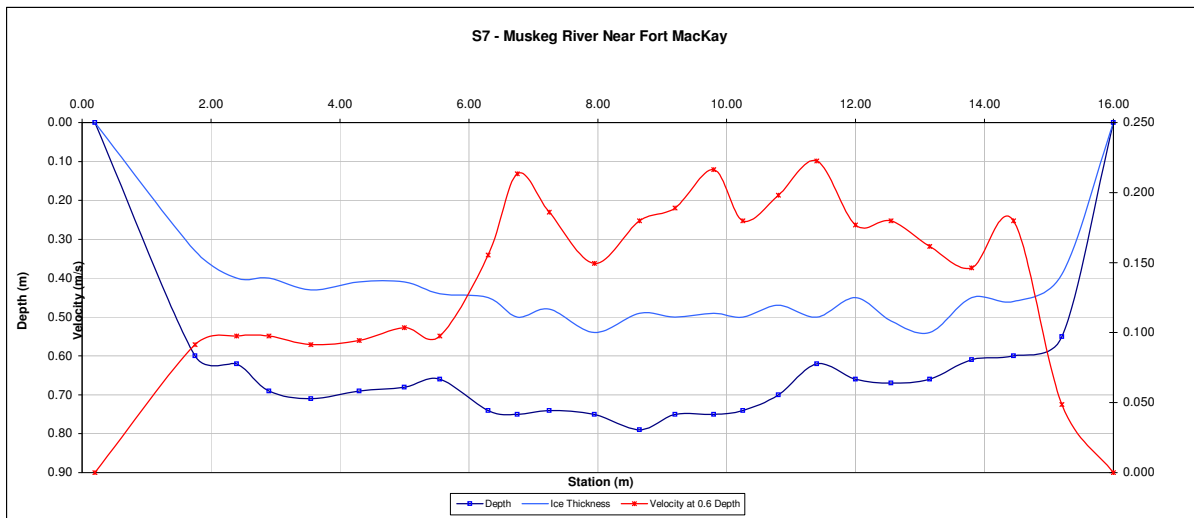
Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: pin in tree	0.312	0.398
Water Level Reading:	3.827	3.917
Top of Ice Level Reading:	3.799	3.978
Transducer Reading & Calc'd El.:	0.837	0.837
Other: Rod in ABS	0.466	0.549

Measured Data										Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
0.20	0.00	0.00			0.000	0.90	1	0.20	0.98	0.023	0.021	0.07	0.05	0.001	0%				
1.75	0.60	0.33			0.091	0.90	2	0.98	2.08	0.091	0.082	0.27	0.30	0.024	6%				
2.40	0.62	0.40			0.098	0.90	3	2.08	2.65	0.098	0.088	0.22	0.13	0.011	3%				
2.90	0.69	0.40			0.098	0.90	4	2.65	3.23	0.098	0.088	0.29	0.17	0.015	3%				
3.55	0.71	0.43			0.091	0.90	5	3.23	3.93	0.091	0.082	0.28	0.20	0.016	4%				
4.30	0.69	0.41			0.094	0.90	6	3.93	4.65	0.094	0.085	0.28	0.20	0.017	4%				
5.00	0.68	0.41			0.104	0.90	7	4.65	5.28	0.104	0.093	0.27	0.17	0.016	4%				
5.55	0.66	0.44			0.098	0.90	8	5.28	5.93	0.098	0.088	0.22	0.14	0.013	3%				
6.30	0.74	0.45			0.155	0.90	9	5.93	6.53	0.155	0.140	0.29	0.17	0.024	6%				
6.75	0.75	0.50			0.213	0.90	10	6.53	7.00	0.213	0.192	0.25	0.12	0.023	5%				
7.25	0.74	0.48			0.186	0.90	11	7.00	7.60	0.186	0.167	0.26	0.16	0.026	6%				
7.95	0.75	0.54			0.149	0.90	12	7.60	8.30	0.149	0.134	0.21	0.15	0.020	5%				
8.65	0.79	0.49			0.180	0.90	13	8.30	8.93	0.180	0.162	0.30	0.19	0.030	7%				
9.20	0.75	0.50			0.189	0.90	14	8.93	9.50	0.189	0.170	0.25	0.14	0.024	6%				
9.80	0.75	0.49			0.216	0.90	15	9.50	10.03	0.216	0.195	0.26	0.14	0.027	6%				
10.25	0.74	0.50			0.180	0.90	16	10.03	10.53	0.180	0.162	0.24	0.12	0.019	5%				
10.80	0.70	0.47			0.198	0.90	17	10.53	11.10	0.198	0.178	0.23	0.13	0.024	6%				
11.40	0.62	0.50			0.223	0.90	18	11.10	11.70	0.223	0.200	0.12	0.07	0.014	3%				
12.00	0.66	0.45			0.177	0.90	19	11.70	12.28	0.177	0.159	0.21	0.12	0.019	5%				
12.55	0.67	0.51			0.180	0.90	20	12.28	12.85	0.180	0.162	0.16	0.09	0.015	4%				
13.15	0.66	0.54			0.162	0.90	21	12.85	13.48	0.162	0.145	0.12	0.08	0.011	3%				
13.80	0.61	0.45			0.146	0.90	22	13.48	14.13	0.146	0.132	0.16	0.10	0.014	3%				
14.45	0.60	0.46			0.180	0.90	23	14.13	14.83	0.180	0.162	0.14	0.10	0.016	4%				
15.20	0.55	0.39			0.049	0.90	24	14.83	15.60	0.049	0.044	0.16	0.12	0.005	1%				
16.00	0.00	0.00			0.000	0.90	25	15.60	16.00	0.012	0.011	0.04	0.02	0.000	0%				
										0.00			Total Flow:		0.425	100%			

Total Flow:	0.425	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	3.37	(m ²)
Top Width:	15.80	(m)
Hydraulic Depth:	0.213	(m)
Mean Velocity:	0.126	(m/s)
Froude Number	0.087	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:	
Data logger Internal Power:	4.58
Data logger External Power:	14.71
Data logger Memory Used:	70%
Data logger Clock:	13:10
Laptop Clock:	13:27
Dessicant:	Good
Data logger: 104170269	
PT:	101345
Power: Magnacharge 20V 10A DC Battery and	
PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	



Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: February 16, 2008
Start Time: 1:30 PM
End Time: 1:50 PM

Weather Conditions:

Sunny, -5 C
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: SS, JVR, JS
Data Entry By: SM checked SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

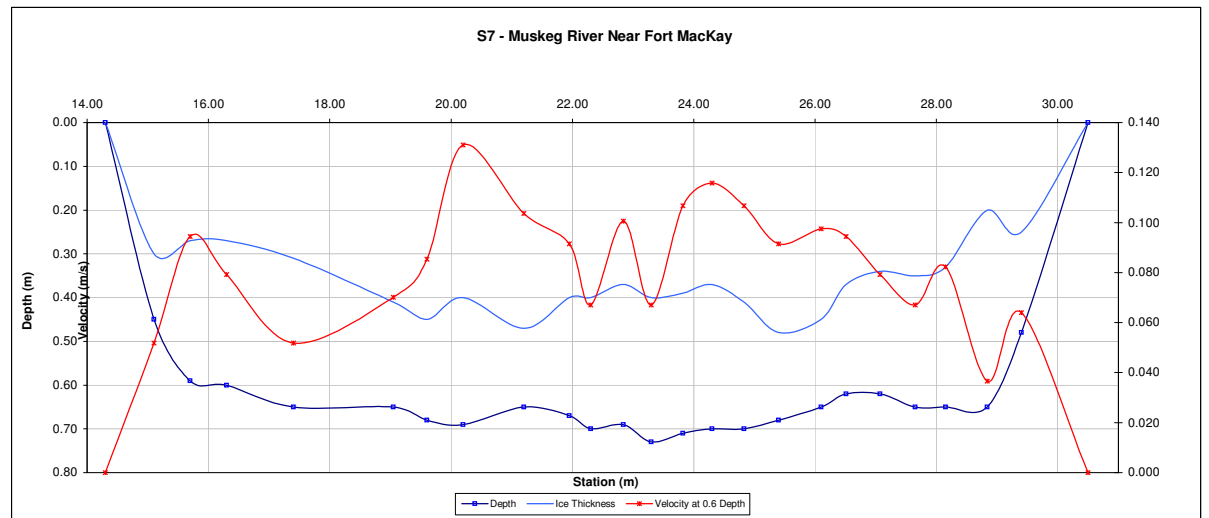
Level Readings

Bench Mark Reading: pin in tree
Water Level Reading: 4.060 El: 272.007 4.085 El: 272.007 272.007
Top of Ice Level Reading: 4.070 El: 271.997 4.095 El: 271.997
Transducer Reading & Calc'd El.: 0.790 El: 271.217 0.790 El: 271.217 271.217
Other: Rod in ABS 0.655 El: 275.412 0.680 El: 275.412

Measured Data						Measurement Data										
						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
14.30	0.00	0.00			0.000	0.90	1	14.30	14.70	0.013	0.012	0.04	0.01	0.000	0%	
15.10	0.45	0.30			0.052	0.90	2	14.70	15.40	0.052	0.047	0.15	0.11	0.005	2%	
15.70	0.59	0.27			0.094	0.90	3	15.40	16.00	0.094	0.085	0.32	0.19	0.016	5%	
16.30	0.60	0.27			0.079	0.90	4	16.00	16.85	0.079	0.071	0.33	0.28	0.020	6%	
17.40	0.65	0.31			0.052	0.90	5	16.85	18.23	0.052	0.047	0.34	0.47	0.022	7%	
19.05	0.65	0.41			0.070	0.90	6	18.23	19.33	0.070	0.063	0.24	0.26	0.017	5%	
19.60	0.68	0.45			0.085	0.90	7	19.33	19.90	0.085	0.077	0.23	0.13	0.010	3%	
20.20	0.69	0.40			0.131	0.90	8	19.90	20.70	0.131	0.118	0.29	0.23	0.027	9%	
21.20	0.65	0.47			0.104	0.90	9	20.70	21.58	0.104	0.093	0.18	0.16	0.015	5%	
21.95	0.67	0.40			0.091	0.90	10	21.58	22.13	0.091	0.082	0.27	0.15	0.012	4%	
22.30	0.70	0.40			0.067	0.90	11	22.13	22.57	0.067	0.060	0.30	0.13	0.008	3%	
22.84	0.69	0.37			0.101	0.90	12	22.57	23.07	0.101	0.091	0.32	0.16	0.014	5%	
23.30	0.73	0.40			0.067	0.90	13	23.07	23.56	0.067	0.060	0.33	0.16	0.010	3%	
23.82	0.71	0.39			0.107	0.90	14	23.56	24.06	0.107	0.096	0.32	0.16	0.015	5%	
24.30	0.70	0.37			0.116	0.90	15	24.06	24.57	0.116	0.104	0.33	0.17	0.017	6%	
24.83	0.70	0.41			0.107	0.90	16	24.57	25.12	0.107	0.096	0.29	0.16	0.015	5%	
25.40	0.68	0.48			0.091	0.90	17	25.12	25.75	0.091	0.082	0.20	0.13	0.010	3%	
26.10	0.65	0.45			0.098	0.90	18	25.75	26.31	0.098	0.088	0.20	0.11	0.010	3%	
26.51	0.62	0.37			0.094	0.90	19	26.31	26.79	0.094	0.085	0.25	0.12	0.010	3%	
27.07	0.62	0.34			0.079	0.90	20	26.79	27.36	0.079	0.071	0.28	0.16	0.011	4%	
27.65	0.65	0.35			0.067	0.90	21	27.36	27.90	0.067	0.060	0.30	0.16	0.010	3%	
28.15	0.65	0.33			0.082	0.90	22	27.90	28.50	0.082	0.074	0.32	0.19	0.014	5%	
28.84	0.65	0.20			0.037	0.90	23	28.50	29.12	0.037	0.033	0.45	0.28	0.009	3%	
29.40	0.48	0.25			0.064	0.90	24	29.12	29.95	0.064	0.058	0.23	0.19	0.011	4%	
30.50	0.00	0.00			0.000	0.90	25	29.95	30.50	0.016	0.014	0.06	0.03	0.000	0%	
Total Flow:														0.311	100%	

Total Flow:	0.311	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	4.31	(m ²)
Top Width:	16.20	(m)
Hydraulic Depth:	0.266	(m)
Mean Velocity:	0.072	(m/s)
Froude Number	0.045	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:	
Data logger Internal Power:	4.61
Data logger External Power:	13.32
Data logger Memory Used:	73%
Data logger Clock:	13:17
Laptop Clock:	13:36
Dessicant:	Good
Data logger:	104170269
PT:	101345
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller



Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: March 8, 2008
Start Time: 11:32 AM
End Time: 11:50 AM

Weather Conditions:

Sunny, +5 C
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: SM JS JVR
Data Entry By: SM checked SM
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

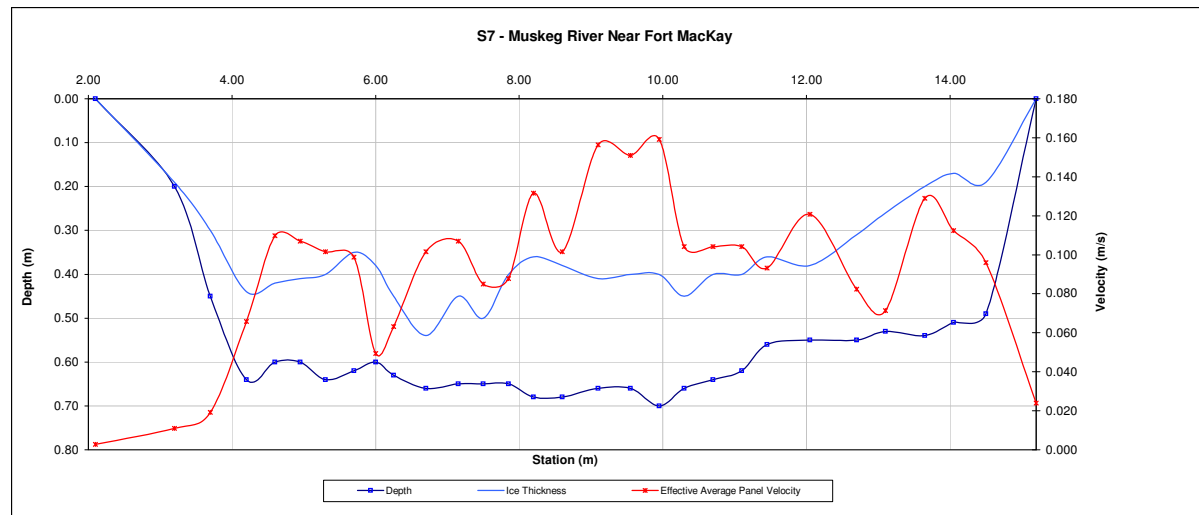
Bench Mark Reading: pin in tree 0.612 El: 275.565
Water Level Reading: 4.246 El: 271.932 0.524 El: 275.565
Top of Ice Level Reading: 4.236 El: 271.942 4.162 El: 271.926 271.929
Transducer Reading & Calc'd El.: 0.729 El: 271.203 4.145 El: 271.943
Other: Rod in ABS 0.766 El: 275.412 0.729 El: 271.197 271.200
0.676 El: 275.412

Measurement Data

LB	Measured Data					Calculated Data										Percentage of Total
	Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m ²)	Panel Discharge (m ³ /s)	
	2.10	0.00	0.00			0.000	0.90	1	2.10	2.65	0.003	0.003	0.00	0.00	0.000	0%
	3.20	0.20	0.19			0.012	0.90	2	2.65	3.45	0.012	0.011	0.01	0.01	0.000	0%
	3.70	0.45	0.30			0.021	0.90	3	3.45	3.95	0.021	0.019	0.15	0.08	0.001	1%
	4.20	0.64	0.44			0.073	0.90	4	3.95	4.40	0.073	0.066	0.20	0.09	0.006	2%
	4.60	0.60	0.42			0.122	0.90	5	4.40	4.78	0.122	0.110	0.18	0.07	0.007	3%
	4.95	0.60	0.41			0.119	0.90	6	4.78	5.13	0.119	0.107	0.19	0.07	0.007	3%
	5.30	0.64	0.40			0.113	0.90	7	5.13	5.50	0.113	0.101	0.24	0.09	0.009	3%
	5.70	0.62	0.35			0.110	0.90	8	5.50	5.85	0.110	0.099	0.27	0.09	0.009	3%
	6.00	0.60	0.38			0.055	0.90	9	5.85	6.13	0.055	0.049	0.22	0.06	0.003	1%
	6.25	0.63	0.45			0.070	0.90	10	6.13	6.48	0.070	0.063	0.18	0.06	0.004	1%
	6.70	0.66	0.54			0.113	0.90	11	6.48	6.93	0.113	0.101	0.12	0.05	0.005	2%
	7.15	0.65	0.45			0.119	0.90	12	6.93	7.33	0.119	0.107	0.20	0.08	0.009	3%
	7.50	0.65	0.50			0.094	0.90	13	7.33	7.68	0.094	0.085	0.15	0.05	0.004	2%
	7.85	0.65	0.40			0.098	0.90	14	7.68	8.03	0.098	0.088	0.25	0.09	0.008	3%
	8.20	0.68	0.36			0.146	0.90	15	8.03	8.40	0.146	0.132	0.32	0.12	0.016	6%
	8.60	0.68	0.38			0.113	0.90	16	8.40	8.85	0.113	0.101	0.30	0.14	0.014	5%
	9.10	0.66	0.41			0.174	0.90	17	8.85	9.33	0.174	0.156	0.25	0.12	0.019	7%
	9.55	0.66	0.40			0.168	0.90	18	9.33	9.75	0.168	0.151	0.26	0.11	0.017	6%
	9.95	0.70	0.40			0.177	0.90	19	9.75	10.13	0.177	0.159	0.30	0.11	0.018	6%
	10.30	0.66	0.45			0.116	0.90	20	10.13	10.50	0.116	0.104	0.21	0.08	0.008	3%
	10.70	0.64	0.40			0.116	0.90	21	10.50	10.90	0.116	0.104	0.24	0.10	0.010	4%
	11.10	0.62	0.40			0.116	0.90	22	10.90	11.28	0.116	0.104	0.22	0.08	0.009	3%
	11.45	0.56	0.36			0.104	0.90	23	11.28	11.75	0.104	0.093	0.20	0.10	0.009	3%
	12.05	0.55	0.38			0.134	0.90	24	11.75	12.38	0.134	0.121	0.17	0.11	0.013	5%
	12.70	0.55	0.31			0.091	0.90	25	12.38	12.90	0.091	0.082	0.24	0.13	0.010	4%
	13.10	0.53	0.26			0.079	0.90	26	12.90	13.38	0.079	0.071	0.27	0.13	0.009	3%
	13.65	0.54	0.20			0.143	0.90	27	13.38	13.85	0.143	0.129	0.34	0.16	0.021	7%
	14.05	0.51	0.17			0.125	0.90	28	13.85	14.28	0.125	0.112	0.34	0.14	0.016	6%
	14.50	0.49	0.19			0.107	0.90	29	14.28	14.85	0.107	0.096	0.30	0.17	0.017	6%
	15.20	0.00	0.00			0.000	0.90	30	14.85	15.20	0.027	0.024	0.08	0.03	0.001	0%
RB	Total Flow:														0.279	100%

Total Flow:	0.279	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.70	(m ²)
Top Width:	13.10	(m)
Hydraulic Depth:	0.206	(m)
Mean Velocity:	0.103	(m/s)
Froude Number	0.072	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:	
Data logger Internal Power:	4.65
Data logger External Power:	14.57
Data logger Memory Used:	75%
Data logger Clock:	10:48
Laptop Clock:	11:18
Dessicant:	Good
Data logger: 104170269	
PT: 101345	
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	



Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: April 1, 2008
Start Time: 9:27 AM MDT
End Time: 9:41 AM MDT

Weather Conditions:

overcast, -5 C
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: SM JS
Data Entry By: SM checked SM
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

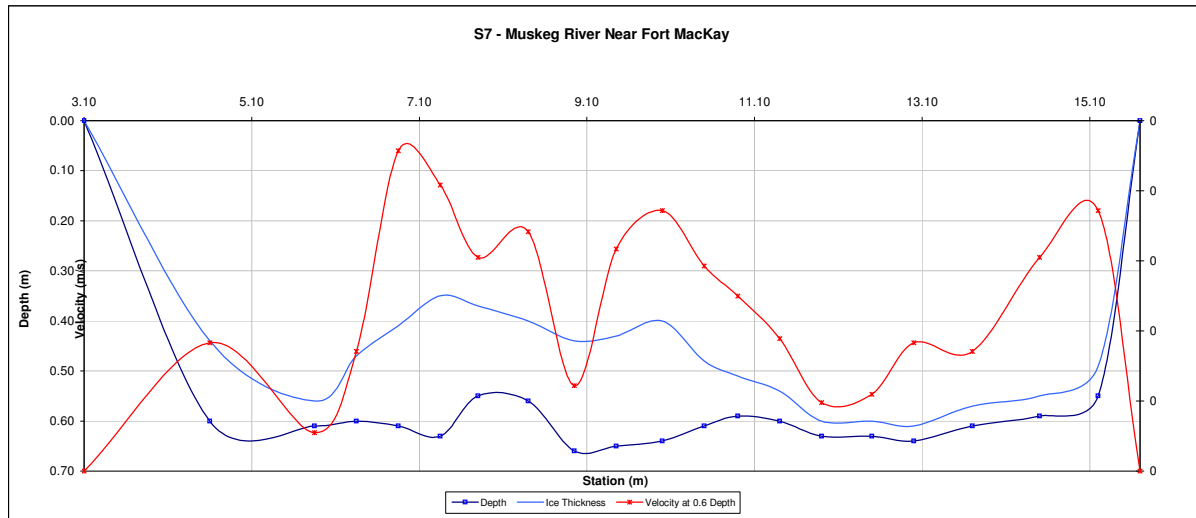
Level Readings

Bench Mark Reading: pin in tree 0.123 El: 275.565
Water Level Reading: 3.750 El: 271.938 3.723 El: 271.941 271.940
Top of Ice Level Reading: 3.717 El: 271.977 3.688 El: 271.980
Transducer Reading & Calc'd El.: 0.724 El: 271.214 0.724 El: 271.217 271.215
Other: Rod in ABS 0.282 El: 275.412 0.256 El: 275.412 275.412

		Measurement Data														
Measured Data							Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	3.10	0.00	0.00		0	0.90	1	3.10	3.85	0.023	0.021	0.04	0.03	0.001	0%	
	4.60	0.60	0.44		0.091	0.90	2	3.85	5.23	0.091	0.082	0.16	0.22	0.018	11%	
	5.85	0.61	0.56		0.027	0.90	3	5.23	6.10	0.027	0.025	0.05	0.04	0.001	1%	
	6.35	0.60	0.47		0.085	0.90	4	6.10	6.60	0.085	0.077	0.13	0.07	0.005	3%	
	6.85	0.61	0.41		0.229	0.90	5	6.60	7.10	0.229	0.206	0.20	0.10	0.021	12%	
	7.35	0.63	0.35		0.204	0.90	6	7.10	7.58	0.204	0.184	0.28	0.13	0.024	14%	
	7.80	0.55	0.37		0.152	0.90	7	7.58	8.10	0.152	0.137	0.18	0.09	0.013	8%	
	8.40	0.56	0.40		0.171	0.90	8	8.10	8.68	0.171	0.154	0.16	0.09	0.014	8%	
	8.95	0.66	0.44		0.061	0.90	9	8.68	9.20	0.061	0.055	0.22	0.12	0.006	4%	
	9.45	0.65	0.43		0.158	0.90	10	9.20	9.73	0.158	0.143	0.22	0.12	0.016	10%	
10.00	0.64	0.40		0.186	0.90	11	9.73	10.25	0.186	0.167	0.24	0.13	0.021	12%		
10.50	0.61	0.48		0.146	0.90	12	10.25	10.70	0.146	0.132	0.13	0.06	0.008	5%		
10.90	0.59	0.51		0.125	0.90	13	10.70	11.15	0.125	0.112	0.08	0.04	0.004	2%		
11.40	0.60	0.54		0.094	0.90	14	11.15	11.65	0.094	0.085	0.06	0.03	0.003	1%		
11.90	0.63	0.60		0.049	0.90	15	11.65	12.20	0.049	0.044	0.03	0.02	0.001	0%		
12.50	0.63	0.60		0.055	0.90	16	12.20	12.75	0.055	0.049	0.03	0.02	0.001	0%		
13.00	0.64	0.61		0.091	0.90	17	12.75	13.35	0.091	0.082	0.03	0.02	0.001	1%		
13.70	0.61	0.57		0.085	0.90	18	13.35	14.10	0.085	0.077	0.04	0.03	0.002	1%		
14.50	0.59	0.55		0.152	0.90	19	14.10	14.85	0.152	0.137	0.04	0.03	0.004	2%		
15.20	0.55	0.49		0.186	0.90	20	14.85	15.45	0.186	0.167	0.06	0.04	0.006	4%		
RB	15.70	0.00	0.00		0	0.90	21	15.45	15.70	0.046	0.042	0.02	0.00	0.000	0%	
Total Flow:														0.171	100%	

Total Flow:	0.171	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.41	(m ²)
Top Width:	12.60	(m)
Hydraulic Depth:	0.112	(m)
Mean Velocity:	0.121	(m/s)
Froude Number	0.116	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:	
Data logger Internal Power:	4.60
Data logger External Power:	14.91
Data logger Memory Used:	21%
Data logger Clock:	08:09
Laptop Clock:	08:10
Dessicant:	Good
Data logger:	104170269
PT:	101345
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller



Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: May 12, 2008
Start Time: 8:45 AM MDT
End Time:

Weather Conditions: sunny, 5 C

River Conditions: open, overbank

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: pin in tree	0.975	0.951	
Water Level Reading:	3.485	3.452	273.060
Top of Ice Level Reading:			276.516
Transducer Reading & Calc'd El.:	1.867	1.867	271.197
Other: Rod in ABS	1.131	1.108	275.409

Data logger Notes:			
Data logger Internal Power:	4.63 V		
Data logger External Power:	14.57 V		
Data logger Memory Used:	5%		
Data logger Clock:	07:58	MST	
Laptop Clock:	07:49	MST	
Dessicant:	75.00	%	
Data logger:	104170269		
PT:	101345		
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller		

Notes: no flow mmt done, just a download

Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: June 23, 2008
Start Time: 10:25 AM MDT
End Time:

Weather Conditions: rainy, 14 C

River Conditions:

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: LM Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: nail in tree	0.665	0.640	275.565
Water Level Reading:	4.168	4.150	272.055
Top of Ice Level Reading:			276.205
Transducer Reading & Calc'd El.:	0.859	0.859	271.196
Other: rebar	0.823	0.798	275.407

Data logger Notes:	
Data logger Internal Power:	4.65 V
Data logger External Power:	13.99 V
Data logger Memory Used:	9%
Data logger Clock:	13:11 MST
Laptop Clock:	13:03 MST
Dessicant:	%
Data logger:	269
PT:	101345
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: No flow mmt done, just a download
Water temp 12.5 C

Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: August 6, 2008
Start Time: 11:15 AM MDT
End Time:

Weather Conditions:

sunny

River Conditions:

Personnel & Equipment

Measurement Made By: LM/SM
Data Entry By: DW Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

		Setup No. 1		Setup No. 2	
Bench Mark Reading:	nail in tree	0.500	El: 275.565	0.470	El: 275.565
Water Level Reading:		4.035	El: 272.030	4.000	El: 272.035
Top of Ice Level Reading:			El:		El:
Transducer Reading & Calc'd El.:		0.857	El: 271.173	0.857	El: 271.178
Other:	rebar	0.699	El: 275.366	0.665	El: 275.370

Data logger Notes:	Site 269
Data logger Internal Power:	4.67 V
Data logger External Power:	14.24 V
Data logger Memory Used:	12%
Data logger Clock:	8:57 AM MST
Laptop Clock:	8:48 AM MST
Dessicant:	new
Data logger:	
PT:	101345
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes:

Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: September 14, 2008
Start Time: 8:00 AM MDT
End Time:

Weather Conditions: cloudy, 8 C

River Conditions: open

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

		Setup No. 1		Setup No. 2	
Bench Mark Reading:	nail in tree	0.712	El: 275.565	0.669	El: 275.565
Water Level Reading:		4.244	El: 272.033	4.202	El: 272.032 272.033
Top of Ice Level Reading:			El:		El:
Transducer Reading & Calc'd El.:		0.830	El: 271.203	0.830	El: 271.202 271.203
Other: rebar		0.867	El: 275.410	0.825	El: 275.409 275.410

Data logger Notes:	Site 269
Data logger Internal Power:	4.62 V
Data logger External Power:	13.02 V
Data logger Memory Used:	15%
Data logger Clock:	7:06 AM MST
Laptop Clock:	6:56 AM MST
Dessicant:	75 percent
Data logger:	
PT:	101345
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes:

Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: October 23, 2008
Start Time: 5:42 PM MDT
End Time: 5:59 PM MDT

Weather Conditions:

River Conditions: open

Personnel & Equipment

Measurement Made By: SM AM
Data Entry By: SM Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

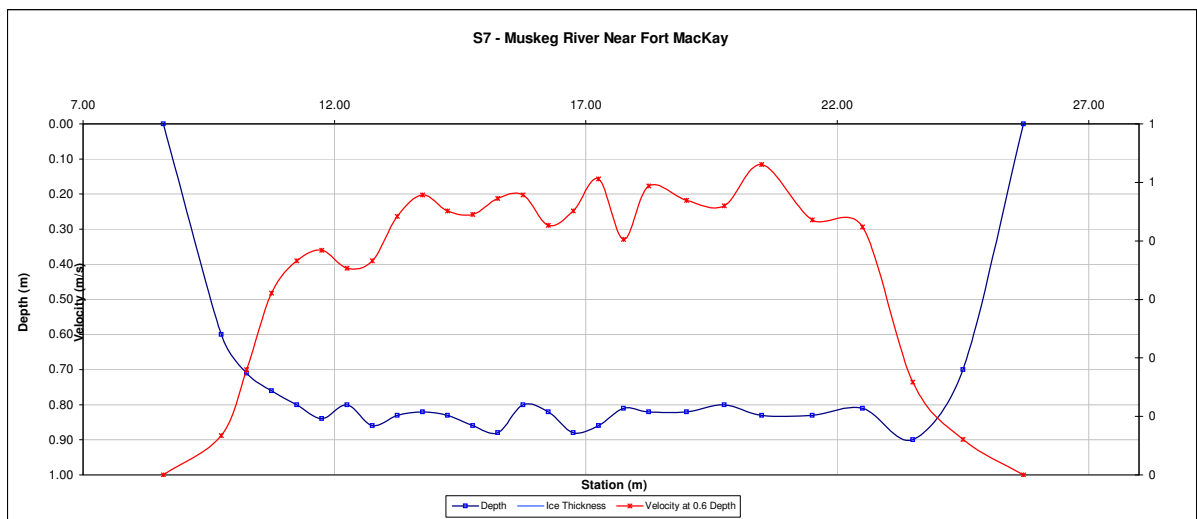
	Setup No. 1	Setup No. 2	
Bench Mark Reading: pin in tree	0.223	El: 275.565	0.446
Water Level Reading:	3.641	El: 272.147	3.890
Top of Ice Level Reading:		El:	
Transducer Reading & Calc'd El.:	0.938	El: 271.209	0.938
Other: Rod in ABS	0.385	El: 275.403	0.605

Measured Data										Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.6 Depth	Velocity at 0.8 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
LB	8.60	0.00			0	1.00	1	8.60	9.18	0.017	0.017	0.15	0.09	0.001	0%				
	9.75	0.60			0.067	1.00	2	9.18	10.00	0.067	0.067	0.60	0.50	0.033	1%				
	10.25	0.71			0.180	1.00	3	10.00	10.50	0.180	0.180	0.71	0.36	0.064	1%				
	10.75	0.76			0.311	1.00	4	10.50	11.00	0.311	0.311	0.76	0.38	0.118	2%				
	11.25	0.80			0.366	1.00	5	11.00	11.50	0.366	0.366	0.80	0.40	0.146	3%				
	11.75	0.84			0.384	1.00	6	11.50	12.00	0.384	0.384	0.84	0.42	0.161	3%				
	12.25	0.80			0.354	1.00	7	12.00	12.50	0.354	0.354	0.80	0.40	0.141	3%				
	12.75	0.86			0.366	1.00	8	12.50	13.00	0.366	0.366	0.86	0.43	0.157	3%				
	13.25	0.83			0.442	1.00	9	13.00	13.50	0.442	0.442	0.83	0.42	0.183	4%				
	13.75	0.82			0.479	1.00	10	13.50	14.00	0.479	0.479	0.82	0.41	0.196	4%				
	14.25	0.83			0.451	1.00	11	14.00	14.50	0.451	0.451	0.83	0.42	0.187	4%				
	14.75	0.86			0.445	1.00	12	14.50	15.00	0.445	0.445	0.86	0.43	0.191	4%				
	15.25	0.88			0.472	1.00	13	15.00	15.50	0.472	0.472	0.88	0.44	0.208	4%				
	15.75	0.80			0.479	1.00	14	15.50	16.00	0.479	0.479	0.80	0.40	0.191	4%				
	16.25	0.82			0.427	1.00	15	16.00	16.50	0.427	0.427	0.82	0.41	0.175	4%				
	16.75	0.88			0.451	1.00	16	16.50	17.00	0.451	0.451	0.88	0.44	0.198	4%				
	17.25	0.86			0.506	1.00	17	17.00	17.50	0.506	0.506	0.86	0.43	0.218	5%				
	17.75	0.81			0.402	1.00	18	17.50	18.00	0.402	0.402	0.81	0.41	0.163	3%				
	18.25	0.82			0.494	1.00	19	18.00	18.63	0.494	0.494	0.82	0.51	0.253	5%				
	19.00	0.82			0.469	1.00	20	18.63	19.38	0.469	0.469	0.82	0.62	0.289	6%				
	19.75	0.80			0.460	1.00	21	19.38	20.13	0.460	0.460	0.80	0.60	0.276	6%				
	20.50	0.83			0.530	1.00	22	20.13	21.00	0.530	0.530	0.83	0.73	0.385	8%				
	21.50	0.83			0.436	1.00	23	21.00	22.00	0.436	0.436	0.83	0.83	0.362	7%				
	22.50	0.81			0.424	1.00	24	22.00	23.00	0.424	0.424	0.81	0.81	0.343	7%				
	23.50	0.90			0.158	1.00	25	23.00	24.00	0.158	0.158	0.90	0.90	0.143	3%				
	24.50	0.70			0.061	1.00	26	24.00	25.10	0.061	0.061	0.70	0.77	0.047	1%				
RB	25.70	0.00			0	1.00	27	25.10	25.70	0.015	0.015	0.18	0.11	0.002	0%				
Total Flow:														4.834	100%				

Total Flow:	4.834	(m ³ /s)
Perceived Measurement Quality:	excellent	
Total Area:	13.03	(m ²)
Top Width:	17.10	(m)
Hydraulic Depth:	0.762	(m)
Mean Velocity:	0.371	(m/s)
Froude Number	0.136	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:	
Data logger Internal Power:	4.65
Data logger External Power:	13.62
Data logger Memory Used:	21%
Data logger Clock:	16:29
Laptop Clock:	16:20
Dessicant:	Good
Data logger:	104170269
PT:	101345
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

New TD installed memory cleared
SN 0101353



Hydrometric Measurement / Site Visit Record

S7 - Muskeg River near Fort MacKay



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River near Fort MacKay
Site Name: S7
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

Time of Measurement

Date of Measurement: December 9, 2008
Start Time: 2:40 PM MST
End Time: 2:51 PM MST

Weather Conditions:

snow, cloudy, -23 C
River Conditions: ice-cover

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: pin in tree	0.979	El: 275.565	0.920
Water Level Reading:	4.492	El: 272.052	4.432
Top of Ice Level Reading:	4.398	El: 272.146	4.342
Transducer Reading & Calc'd El.:	0.905	El: 271.147	0.905
Other: Rod in ABS	1.147	El: 275.397	1.083

RB

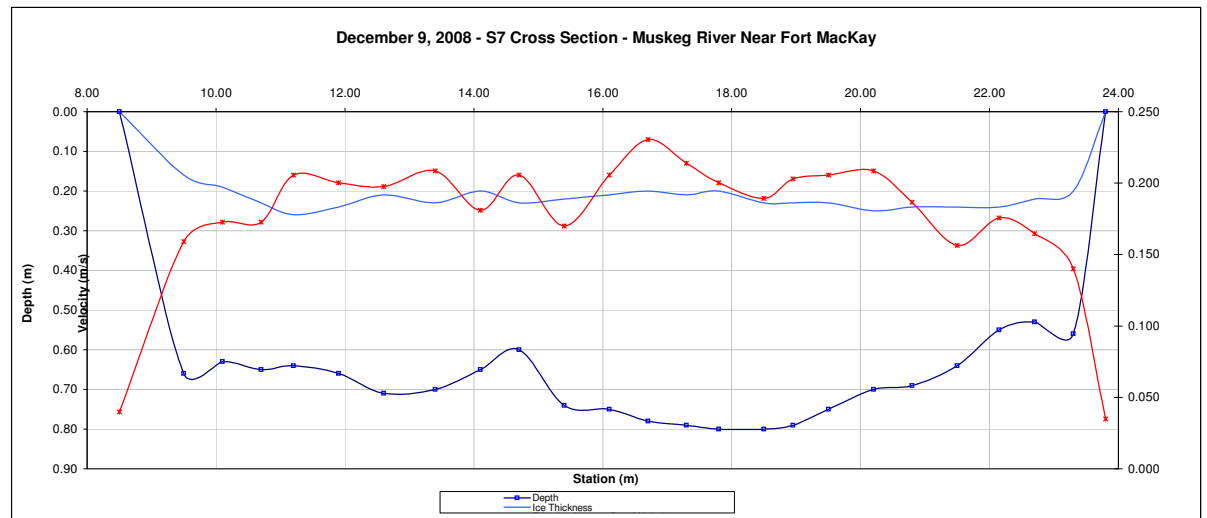
LB

Measured Data						Measurement Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
23.80	0.00	0.00				0.90	1	23.80	23.55	0.039	0.035	0.09	0.02	0.001	0%	
23.30	0.56	0.20			0.155	0.90	2	23.55	23.00	0.155	0.140	0.36	0.20	0.028	2%	
22.70	0.53	0.22			0.183	0.90	3	23.00	22.43	0.183	0.165	0.31	0.18	0.029	2%	
22.15	0.55	0.24			0.195	0.90	4	22.43	21.83	0.195	0.176	0.31	0.19	0.033	3%	
21.50	0.64	0.24			0.174	0.90	5	21.83	21.15	0.174	0.156	0.40	0.27	0.042	3%	
20.80	0.69	0.24			0.207	0.90	6	21.15	20.50	0.207	0.187	0.45	0.29	0.055	4%	
20.20	0.70	0.25			0.232	0.90	7	20.50	19.85	0.232	0.208	0.45	0.29	0.061	5%	
19.50	0.75	0.23			0.229	0.90	8	19.85	19.23	0.229	0.206	0.52	0.33	0.067	5%	
18.95	0.79	0.23			0.226	0.90	9	19.23	18.73	0.226	0.203	0.56	0.28	0.057	4%	
18.50	0.80	0.23			0.210	0.90	10	18.73	18.15	0.210	0.189	0.57	0.33	0.062	5%	
17.80	0.80	0.20			0.223	0.90	11	18.15	17.55	0.223	0.200	0.60	0.36	0.072	6%	
17.30	0.79	0.21			0.238	0.90	12	17.55	17.00	0.238	0.214	0.58	0.32	0.068	5%	
16.70	0.78	0.20			0.256	0.90	13	17.00	16.40	0.256	0.230	0.58	0.35	0.080	6%	
16.10	0.75	0.21			0.229	0.90	14	16.40	15.75	0.229	0.206	0.54	0.35	0.072	6%	
15.40	0.74	0.22			0.189	0.90	15	15.75	15.05	0.189	0.170	0.52	0.36	0.062	5%	
14.70	0.60	0.23			0.229	0.90	16	15.05	14.40	0.229	0.206	0.37	0.24	0.049	4%	
14.10	0.65	0.20			0.201	0.90	17	14.40	13.75	0.201	0.181	0.45	0.29	0.053	4%	
13.40	0.70	0.23			0.232	0.90	18	13.75	13.00	0.232	0.208	0.47	0.35	0.073	6%	
12.60	0.71	0.21			0.219	0.90	19	13.00	12.25	0.219	0.198	0.50	0.38	0.074	6%	
11.90	0.66	0.24			0.223	0.90	20	12.25	11.55	0.223	0.200	0.42	0.29	0.059	5%	
11.20	0.64	0.26			0.229	0.90	21	11.55	10.95	0.229	0.206	0.38	0.23	0.047	4%	
10.70	0.65	0.23			0.192	0.90	22	10.95	10.40	0.192	0.173	0.42	0.23	0.040	3%	
10.10	0.63	0.19			0.192	0.90	23	10.40	9.80	0.192	0.173	0.44	0.26	0.046	4%	
9.50	0.66	0.16			0.177	0.90	24	9.80	9.00	0.177	0.159	0.50	0.40	0.064	5%	
8.50	0.00	0.00				0.90	25	9.00	8.50	0.044	0.040	0.13	0.06	0.002	0%	
Total Flow:														1.296	100%	

Total Flow:	1.296	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	6.85	(m ²)
Top Width:	15.30	(m)
Hydraulic Depth:	0.448	(m)
Mean Velocity:	0.189	(m/s)
Froude Number	0.090	
Photographs taken looking at:		
Upstream, downstream, across		

Notes: Trucks pumping water from site (lakeshore contracting)

Data logger Notes:		
Data logger Internal Power:		
Data logger External Power:		
Data logger Memory Used:	4%	
Data logger Clock:	14:34	MST
Laptop Clock:	14:28	MST
Dessicant:	50 percent	
Data logger: 104170269		
PT: 101345		
Power: Magnacharge 20V 10A DC Battery and		
PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller		



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

Time of Measurement

Date of Measurement: January 9, 2008
Start Time: 12:00 PM
End Time: 12:17 PM

Weather Conditions:

Sunny, overcast, -20 C
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: JS/JMS
Data Entry By: SMS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Tpost 0.173
Water Level Reading: 2.122
Top of Ice Level Reading: 1.889
Transducer Reading & Est. El.:
Other:

Setup No. 1

El: 330.979
El: 329.030
El: 329.263
El: 329.030
El: 331.152

Setup No. 2

El: 330.979
El: 329.028
El: 329.262
El: 329.028
El: 331.231

Average

329.029
329.029
329.029
331.192

Measurement Data

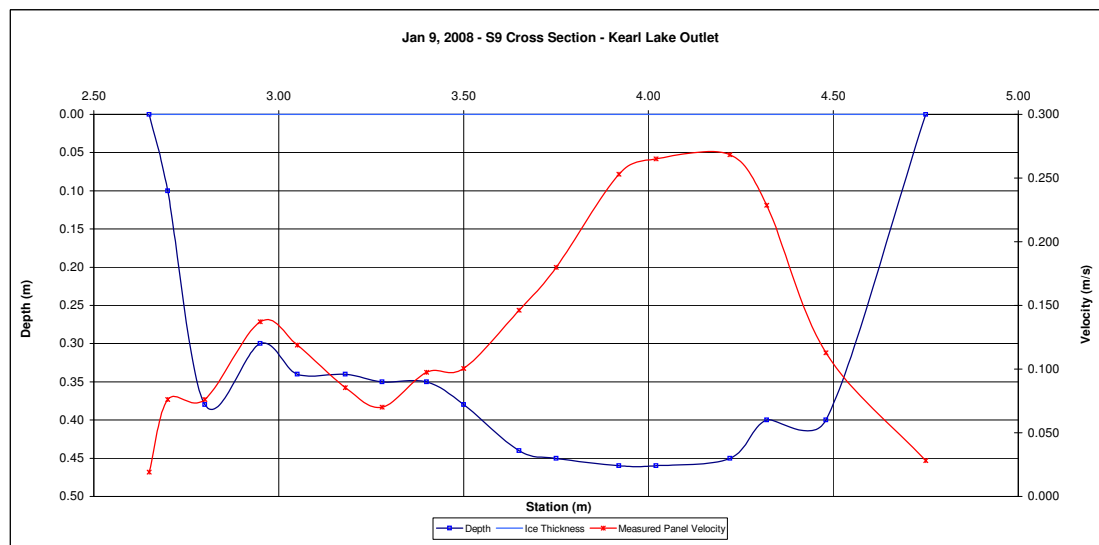
	Measured Data						Calculated Data									
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
RB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
	2.65	0.00	0.00				1.00	1	2.65	2.68	0.019	0.019	0.03	0.00	0.000	0%
	2.70	0.10	0.00			0.076	1.00	2	2.68	2.75	0.076	0.076	0.10	0.01	0.001	0%
	2.80	0.38	0.00			0.076	1.00	3	2.75	2.88	0.076	0.076	0.38	0.05	0.004	3%
	2.95	0.30	0.00			0.137	1.00	4	2.88	3.00	0.137	0.137	0.30	0.04	0.005	4%
	3.05	0.34	0.00			0.119	1.00	5	3.00	3.12	0.119	0.119	0.34	0.04	0.005	4%
	3.18	0.34	0.00			0.085	1.00	6	3.12	3.23	0.085	0.085	0.34	0.04	0.003	3%
	3.28	0.35	0.00			0.070	1.00	7	3.23	3.34	0.070	0.070	0.35	0.04	0.003	2%
	3.40	0.35	0.00			0.098	1.00	8	3.34	3.45	0.098	0.098	0.35	0.04	0.004	3%
	3.50	0.38	0.00			0.101	1.00	9	3.45	3.58	0.101	0.101	0.38	0.05	0.005	4%
	3.65	0.44	0.00			0.146	1.00	10	3.58	3.70	0.146	0.146	0.44	0.06	0.008	7%
	3.75	0.45	0.00			0.180	1.00	11	3.70	3.84	0.180	0.180	0.45	0.06	0.011	9%
	3.92	0.46	0.00			0.253	1.00	12	3.84	3.97	0.253	0.253	0.46	0.06	0.016	13%
	4.02	0.46	0.00			0.265	1.00	13	3.97	4.12	0.265	0.265	0.46	0.07	0.018	15%
	4.22	0.45	0.00			0.268	1.00	14	4.12	4.27	0.268	0.268	0.45	0.07	0.018	15%
	4.32	0.40	0.00			0.229	1.00	15	4.27	4.40	0.229	0.229	0.40	0.05	0.012	10%
LB	4.48	0.40	0.00			0.113	1.00	16	4.40	4.62	0.113	0.113	0.40	0.09	0.010	8%
	4.75	0.00	0.00				1.00	17	4.62	4.75	0.028	0.028	0.10	0.01	0.000	0%
	Total Flow:															0.122

Total Flow:	0.122	(m ³ /s)
Perceived Measurement Quality:	fair	
Total Area:	0.76	(m ²)
Top Width:	2.10	(m)
Hydraulic Depth:	0.363	(m)
Mean Velocity:	0.160	(m/s)
Froude Number	0.085	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes: Ice above water level (2 layers of ice with snow between layers)



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

Time of Measurement

Date of Measurement: February 16, 2008
Start Time: 8:20 AM MST
End Time: 8:30 AM MST

Weather Conditions:

Snowy, overcast, -6 C

River Conditions:

perched

Personnel & Equipment

Measurement Made By: JS/SMS/JV
Data Entry By: SMS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Tpost 0.767 El: 330.979
Water Level Reading: 2.774 El: 328.972
Top of Ice Level Reading: 2.506 El: 329.240
Transducer Reading & Est. El.: 328.972 El: 328.974
Other: 331.746 El: 331.585

Setup No. 1

El: 330.979

El: 328.972

El: 329.240

El: 328.972

El: 331.746

Setup No. 2

El: 330.979

El: 328.974

El: 329.239

El: 328.974

El: 331.585

Average

328.973

328.973

328.973

331.666

Measurement Data

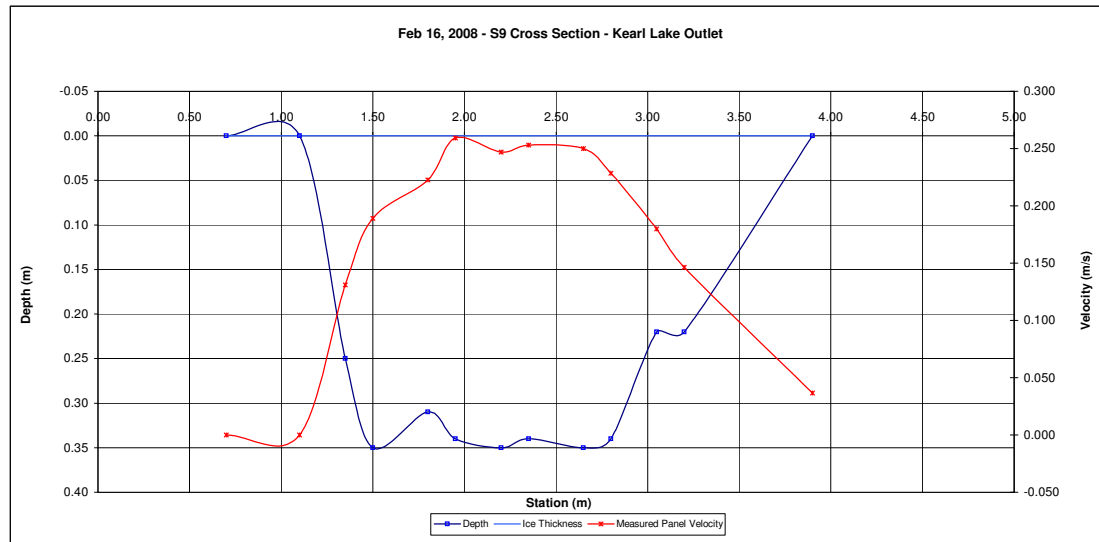
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
0.70	0.00	0.00				1.00	1	0.70	0.90	0.000	0.000	0.00	0.00	0.000	0%
1.10	0.00	0.00				1.00	2	0.90	1.23	0.000	0.000	0.00	0.00	0.000	0%
1.35	0.25	0.00			0.131	1.00	3	1.23	1.43	0.131	0.131	0.25	0.05	0.007	4%
1.50	0.35	0.00			0.189	1.00	4	1.43	1.65	0.189	0.189	0.35	0.08	0.015	10%
1.80	0.31	0.00			0.223	1.00	5	1.65	1.88	0.223	0.223	0.31	0.07	0.016	10%
1.95	0.34	0.00			0.259	1.00	6	1.88	2.08	0.259	0.259	0.34	0.07	0.018	12%
2.20	0.35	0.00			0.247	1.00	7	2.08	2.28	0.247	0.247	0.35	0.07	0.017	12%
2.35	0.34	0.00			0.253	1.00	8	2.28	2.50	0.253	0.253	0.34	0.08	0.019	13%
2.65	0.35	0.00			0.250	1.00	9	2.50	2.73	0.250	0.250	0.35	0.08	0.020	13%
2.80	0.34	0.00			0.229	1.00	10	2.73	2.93	0.229	0.229	0.34	0.07	0.016	10%
3.05	0.22	0.00			0.180	1.00	11	2.93	3.13	0.180	0.180	0.22	0.04	0.008	5%
3.20	0.22	0.00			0.146	1.00	12	3.13	3.55	0.146	0.146	0.22	0.09	0.014	9%
3.90	0.00	0.00				1.00	13	3.55	3.90	0.037	0.037	0.06	0.02	0.001	0%
Total Flow:														0.149	1.000

Total Flow:	0.149	(m ³ /s)
Perceived Measurement Quality:	fair	
Total Area:	0.72	(m ²)
Top Width:	3.20	(m)
Hydraulic Depth:	0.224	(m)
Mean Velocity:	0.208	(m/s)
Froude Number	0.140	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes: perched ice all the way across



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

Time of Measurement

Date of Measurement: March 9, 2008
Start Time: 4:30 PM MDT
End Time: 4:45 PM MDT

Weather Conditions:

overcast, 0C

River Conditions:

perched

Personnel & Equipment

Measurement Made By: JS/SM/JV
Data Entry By: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Checked by: LMM

Level Readings

Bench Mark Reading: Tpost 0.374
Water Level Reading: 2.409
Top of Ice Level Reading: 2.063
Transducer Reading & Est. El.:
Other: nail in tree

Setup No. 1

El: 330.979
El: 328.944
El: 329.290
El: 328.944
El: 331.353

Setup No. 2

El: 330.979
El: 328.942
El: 329.291
El: 328.942
El: 329.776

Average

328.943
328.943
328.943
328.943
328.943

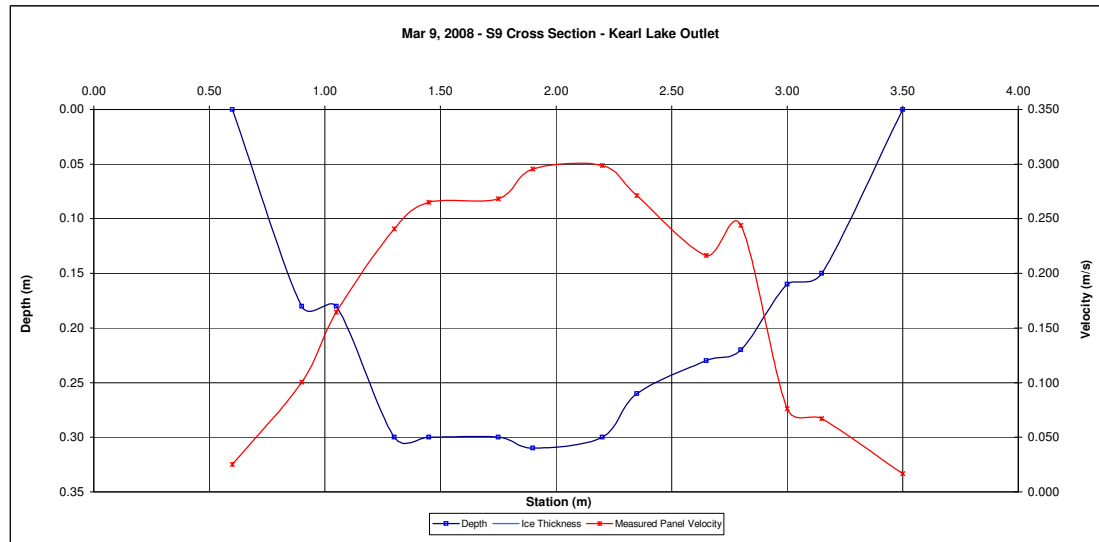
		Measurement Data															
Measured Data						Calculated Data											
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)			
LB	0.60	0.00				1.00	1	0.60	0.75	0.025	0.025	0.05	0.01	0.000	0%		
	0.90	0.18			0.101	1.00	2	0.75	0.98	0.101	0.101	0.18	0.04	0.004	3%		
	1.05	0.18			0.165	1.00	3	0.98	1.18	0.165	0.165	0.18	0.04	0.006	4%		
	1.30	0.30			0.241	1.00	4	1.18	1.38	0.241	0.241	0.30	0.06	0.014	10%		
	1.45	0.30			0.265	1.00	5	1.38	1.60	0.265	0.265	0.30	0.07	0.018	13%		
	1.75	0.30			0.268	1.00	6	1.60	1.83	0.268	0.268	0.30	0.07	0.018	13%		
	1.90	0.31			0.296	1.00	7	1.83	2.05	0.296	0.296	0.31	0.07	0.021	14%		
	2.20	0.30			0.299	1.00	8	2.05	2.28	0.299	0.299	0.30	0.07	0.020	14%		
	2.35	0.26			0.271	1.00	9	2.28	2.50	0.271	0.271	0.26	0.06	0.016	11%		
	2.65	0.23			0.216	1.00	10	2.50	2.73	0.216	0.216	0.23	0.05	0.011	8%		
	2.80	0.22			0.244	1.00	11	2.73	2.90	0.244	0.244	0.22	0.04	0.009	7%		
	3.00	0.16			0.076	1.00	12	2.90	3.08	0.076	0.076	0.16	0.03	0.002	1%		
	3.15	0.15			0.067	1.00	13	3.08	3.33	0.067	0.067	0.15	0.04	0.003	2%		
RB	3.50	0.00				1.00	13	3.33	3.50	0.017	0.017	0.04	0.01	0.000	0%		
Total Flow:														0.143	1.000		

Total Flow:	0.143	(m ³ /s)
Perceived Measurement Quality:	good	
Total Area:	0.64	(m ²)
Top Width:	2.90	(m)
Hydraulic Depth:	0.219	(m)
Mean Velocity:	0.224	(m/s)
Froude Number	0.153	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes: perched ice all the way across



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

Time of Measurement

Date of Measurement: April 3, 2008
Start Time: 2:40 PM
End Time: 2:50 PM

Weather Conditions:

overcast, -6C
River Conditions: perched

Personnel & Equipment

Measurement Made By: JS SM
Data Entry By: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Tpost 0.356 El: 330.979 0.336 El: 330.979
Water Level Reading: 2.481 El: 328.854 2.458 El: 328.857
Top of Ice Level Reading: 2.042 El: 329.293 2.021 El: 329.294
Transducer Reading & Est. El.: 328.854 El: 328.857
Other: nail in tree 1.555 El: 329.780 1.533 El: 329.782

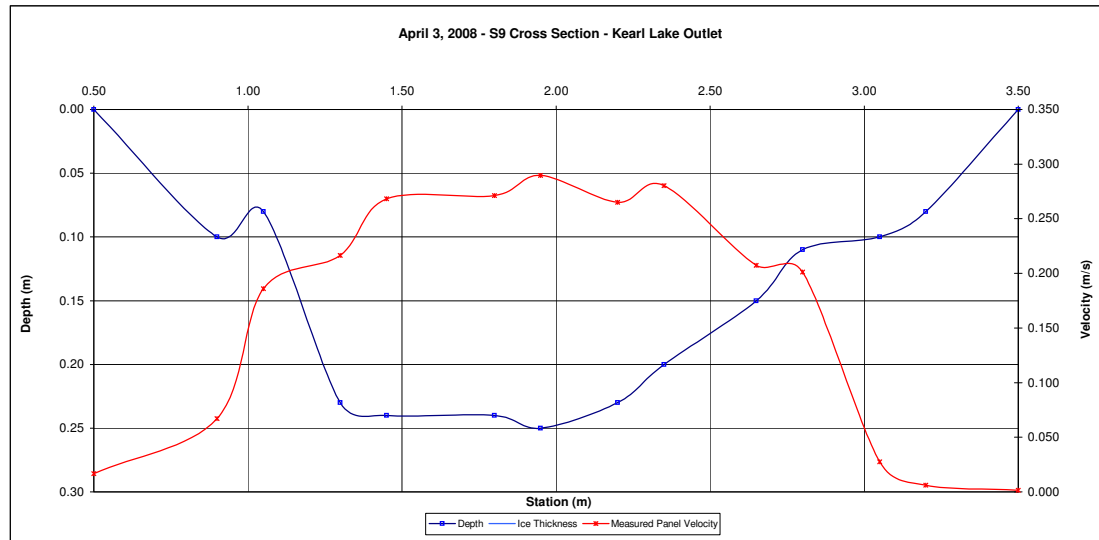
		Measurement Data														
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	0.50	0.00			0.000	1.00	1	0.50	0.70	0.017	0.017	0.03	0.01	0.000	0%	
	0.90	0.10			0.067	1.00	2	0.70	0.98	0.067	0.067	0.10	0.03	0.002	2%	
	1.05	0.08			0.186	1.00	3	0.98	1.18	0.186	0.186	0.08	0.02	0.003	3%	
	1.30	0.23			0.216	1.00	4	1.18	1.38	0.216	0.216	0.23	0.05	0.010	10%	
	1.45	0.24			0.268	1.00	5	1.38	1.63	0.268	0.268	0.24	0.06	0.016	16%	
	1.80	0.24			0.271	1.00	6	1.63	1.88	0.271	0.271	0.24	0.06	0.016	17%	
	1.95	0.25			0.290	1.00	7	1.88	2.08	0.290	0.290	0.25	0.05	0.014	15%	
	2.20	0.23			0.265	1.00	8	2.08	2.28	0.265	0.265	0.23	0.05	0.012	12%	
	2.35	0.20			0.280	1.00	9	2.28	2.50	0.280	0.280	0.20	0.04	0.013	13%	
	2.65	0.15			0.207	1.00	10	2.50	2.73	0.207	0.207	0.15	0.03	0.007	7%	
	2.80	0.11			0.201	1.00	11	2.73	2.93	0.201	0.201	0.11	0.02	0.004	4%	
	3.05	0.10			0.027	1.00	12	2.93	3.13	0.027	0.027	0.10	0.02	0.001	1%	
RB	3.20	0.08			0.006	1.00	13	3.13	3.35	0.006	0.006	0.08	0.02	0.000	0%	
	3.50	0.00			0.000	1.00	13	3.35	3.50	0.002	0.002	0.02	0.00	0.000	0%	
	Total Flow:														0.099	100%

Total Flow:	0.099	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.45	(m ²)
Top Width:	3.00	(m)
Hydraulic Depth:	0.151	(m)
Mean Velocity:	0.218	(m/s)
Froude Number	0.179	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

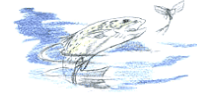
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes: perched ice all the way across



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

Time of Measurement

Date of Measurement: May 8, 2008
Start Time: 3:30 PM MDT
End Time:

Weather Conditions: clear, sunny, 8 C
River Conditions: high, open

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked:
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

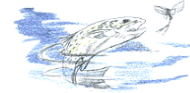
	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: Tpost	0.102	0.041	330.979
Water Level Reading:	1.916	1.869	329.151
Top of Ice Level Reading:			331.020
Transducer Reading & Est. El.:	0.499	0.499	328.652
Other: nail in tree	1.281	1.218	329.802

Notes:
co=-0.34291
c1=0.69654
c2 = 0.00007

trucks pumping water out of the stream for dust suppression.
installed logger and td but will return to do flow measurement and re level.

Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4
Time of Measurement
Date of Measurement: May 10, 2008
Start Time: 7:30 PM MDT
End Time: 7:45 PM MDT

Weather Conditions: partly cloudy, 8 C
River Conditions: open

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: March Mc Birney Flo-Mate 2000
Meter Type and No.: s/n 2004521

Level Readings

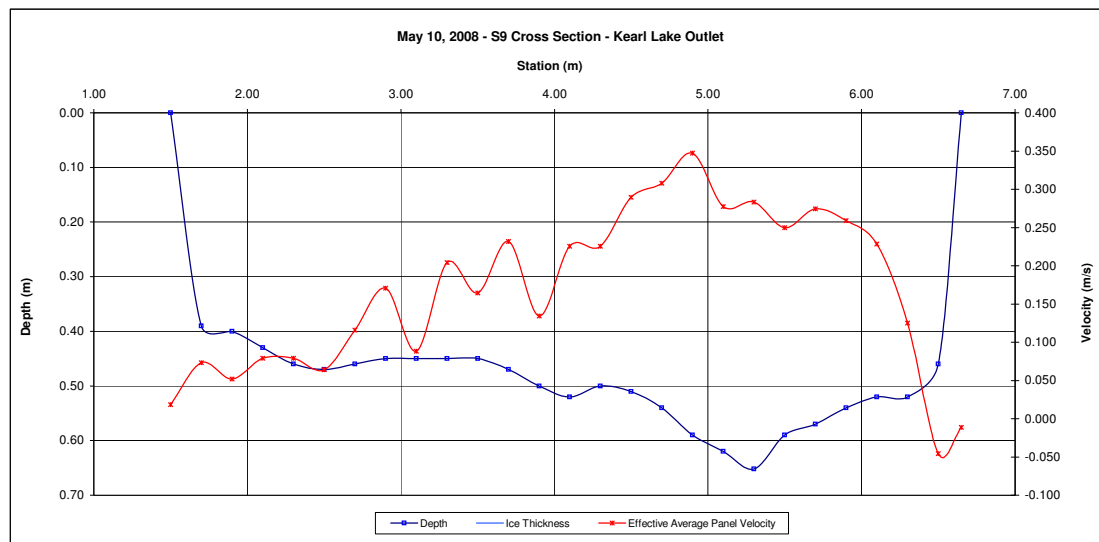
Bench Mark Reading: Tpost 0.782 El: 330.979
Water Level Reading: 2.542 El: 329.219
Top of Ice Level Reading: El: 331.761
Transducer Reading & Est. El.: 0.557 El: 328.662
Other: nail in tree 1.985 El: 329.776

Measured Data										Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Average				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
1.50	0.00					1.00	1	1.50	1.60	0.018	0.018	0.10	0.01	0.000	0%				
1.70	0.39				0.073	1.00	2	1.60	1.80	0.073	0.073	0.39	0.08	0.006	1%				
1.90	0.40				0.052	1.00	3	1.80	2.00	0.052	0.052	0.40	0.08	0.004	1%				
2.10	0.43				0.079	1.00	4	2.00	2.20	0.079	0.079	0.43	0.09	0.007	1%				
2.30	0.46				0.079	1.00	5	2.20	2.40	0.079	0.079	0.46	0.09	0.007	2%				
2.50	0.47				0.064	1.00	6	2.40	2.60	0.064	0.064	0.47	0.09	0.006	1%				
2.70	0.46				0.116	1.00	7	2.60	2.80	0.116	0.116	0.46	0.09	0.011	2%				
2.90	0.45				0.171	1.00	8	2.80	3.00	0.171	0.171	0.45	0.09	0.015	3%				
3.10	0.45				0.088	1.00	9	3.00	3.20	0.088	0.088	0.45	0.09	0.008	2%				
3.30	0.45				0.204	1.00	10	3.20	3.40	0.204	0.204	0.45	0.09	0.018	4%				
3.50	0.45				0.165	1.00	11	3.40	3.60	0.165	0.165	0.45	0.09	0.015	3%				
3.70	0.47				0.232	1.00	12	3.60	3.80	0.232	0.232	0.47	0.09	0.022	5%				
3.90	0.50				0.134	1.00	13	3.80	4.00	0.134	0.134	0.50	0.10	0.013	3%				
4.10	0.52				0.226	1.00	14	4.00	4.20	0.226	0.226	0.52	0.10	0.023	5%				
4.30	0.50				0.226	1.00	15	4.20	4.40	0.226	0.226	0.50	0.10	0.023	5%				
4.50	0.51				0.290	1.00	16	4.40	4.60	0.290	0.290	0.51	0.10	0.030	6%				
4.70	0.54				0.308	1.00	17	4.60	4.80	0.308	0.308	0.54	0.11	0.033	7%				
4.90	0.59				0.347	1.00	18	4.80	5.00	0.347	0.347	0.59	0.12	0.041	9%				
5.10	0.62				0.277	1.00	19	5.00	5.20	0.277	0.277	0.62	0.12	0.034	7%				
5.30	0.65				0.283	1.00	20	5.20	5.40	0.283	0.283	0.65	0.13	0.037	8%				
5.50	0.59				0.250	1.00	21	5.40	5.60	0.250	0.250	0.59	0.12	0.029	6%				
5.70	0.57				0.274	1.00	22	5.60	5.80	0.274	0.274	0.57	0.11	0.031	7%				
5.90	0.54				0.259	1.00	23	5.80	6.00	0.259	0.259	0.54	0.11	0.028	6%				
6.10	0.52				0.229	1.00	24	6.00	6.20	0.229	0.229	0.52	0.10	0.024	5%				
6.30	0.52				0.125	1.00	25	6.20	6.40	0.125	0.125	0.52	0.10	0.013	3%				
6.50	0.46				-0.046	1.00	26	6.40	6.58	-0.046	-0.046	0.46	0.08	-0.004	-1%				
6.65	0.00				1.00	1.00	27	6.58	6.65	-0.011	-0.011	0.12	0.01	0.000	0%				
Total Flow:														0.475	1.000				

Total Flow:	0.475	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.51	(m ²)
Top Width:	5.15	(m)
Hydraulic Depth:	0.487	(m)
Mean Velocity:	0.189	(m/s)
Froude Number	0.087	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	
Data logger Internal Power:	11.34 V
Data logger External Power:	12.29 V
Data logger Memory Used:	1%
Data logger Clock:	18:07 MST
Laptop Clock:	18:07 MST
Dessicant:	new
Data logger:	000871
PT:	
Power:	

Notes:



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

Time of Measurement

Date of Measurement: June 23, 2008
Start Time: 3:08 PM MDT
End Time: 3:19 PM MDT

Weather Conditions:

light rain, 12 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: LM Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar 0.192 El: 330.979
Water Level Reading: 2.100 El: 329.071
Top of Ice Level Reading: El: 331.171
Transducer Reading & Est. El.: 0.469 El: 328.602
Other: tree 1.408 El: 329.763

Setup No. 1

El: 330.979
El: 329.071
El: 331.171
El: 328.602
El: 329.763

Setup No. 2

El: 330.979
El: 329.069
El: 331.157
El: 328.601
El: 329.763

Average

329.070
328.601
329.763

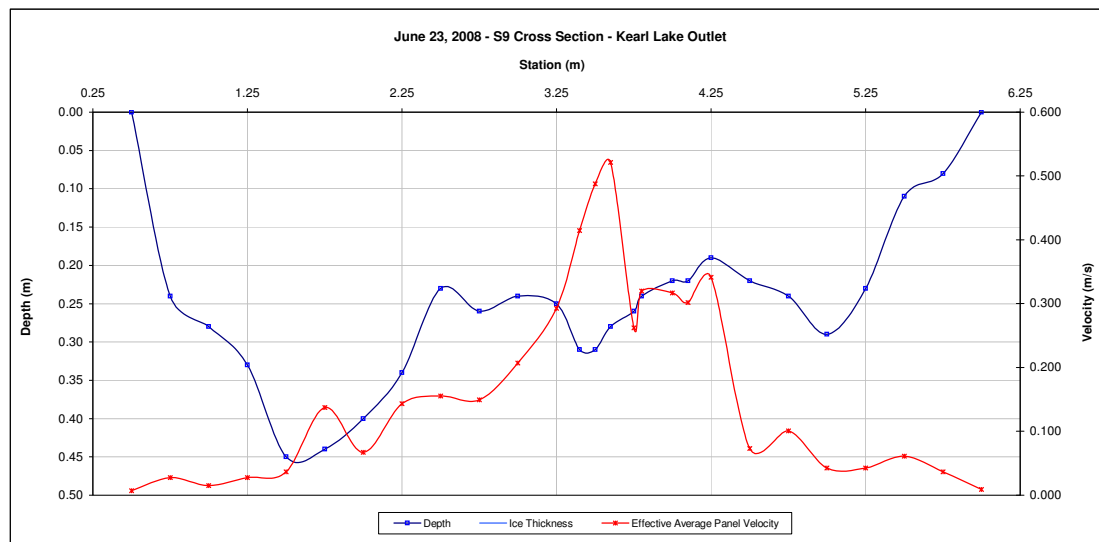
Measurement Data

Measured Data						Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
LB	6.00	0.00					1.00	1	6.00	5.88	0.009	0.009	0.02	0.00	0.000	0%
	5.75	0.08				0.037	1.00	2	5.88	5.63	0.037	0.037	0.08	0.02	0.001	0%
	5.50	0.11				0.061	1.00	3	5.63	5.38	0.061	0.061	0.11	0.03	0.002	1%
	5.25	0.23				0.043	1.00	4	5.38	5.13	0.043	0.043	0.23	0.06	0.002	1%
	5.00	0.29				0.043	1.00	5	5.13	4.88	0.043	0.043	0.29	0.07	0.003	2%
	4.75	0.24				0.101	1.00	6	4.88	4.63	0.101	0.101	0.24	0.06	0.006	3%
	4.50	0.22				0.073	1.00	7	4.63	4.38	0.073	0.073	0.22	0.06	0.004	2%
	4.25	0.19				0.341	1.00	8	4.38	4.18	0.341	0.341	0.19	0.04	0.013	6%
	4.10	0.22				0.302	1.00	9	4.18	4.05	0.302	0.302	0.22	0.03	0.008	4%
	4.00	0.22				0.317	1.00	10	4.05	3.90	0.317	0.317	0.22	0.03	0.010	5%
	3.80	0.24				0.320	1.00	11	3.90	3.78	0.320	0.320	0.24	0.03	0.010	5%
	3.75	0.26				0.262	1.00	12	3.78	3.68	0.262	0.262	0.26	0.03	0.007	3%
	3.60	0.28				0.521	1.00	13	3.68	3.55	0.521	0.521	0.28	0.04	0.018	9%
	3.50	0.31				0.488	1.00	14	3.55	3.45	0.488	0.488	0.31	0.03	0.015	7%
	3.40	0.31				0.415	1.00	15	3.45	3.33	0.415	0.415	0.31	0.04	0.016	8%
	3.25	0.25				0.293	1.00	16	3.33	3.13	0.293	0.293	0.25	0.05	0.015	7%
	3.00	0.24				0.207	1.00	17	3.13	2.88	0.207	0.207	0.24	0.06	0.012	6%
	2.75	0.26				0.149	1.00	18	2.88	2.63	0.149	0.149	0.26	0.07	0.010	5%
	2.50	0.23				0.155	1.00	19	2.63	2.38	0.155	0.155	0.23	0.06	0.009	4%
	2.25	0.34				0.143	1.00	20	2.38	2.13	0.143	0.143	0.34	0.09	0.012	6%
	2.00	0.40				0.067	1.00	21	2.13	1.88	0.067	0.067	0.40	0.10	0.007	3%
	1.75	0.44				0.137	1.00	22	1.88	1.63	0.137	0.137	0.44	0.11	0.015	7%
	1.50	0.45				0.037	1.00	23	1.63	1.38	0.037	0.037	0.45	0.11	0.004	2%
	1.25	0.33				0.027	1.00	24	1.38	1.13	0.027	0.027	0.33	0.08	0.002	1%
	1.00	0.28				0.015	1.00	25	1.13	0.88	0.015	0.015	0.28	0.07	0.001	1%
	0.75	0.24				0.027	1.00	26	0.88	0.63	0.027	0.027	0.24	0.06	0.002	1%
	RB	0.50	0.00					1.00	27	0.63	0.50	0.007	0.007	0.06	0.01	0.000
Total Flow:															0.204	1.000

Total Flow:	0.204	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.41	(m ²)
Top Width:	5.50	(m)
Hydraulic Depth:	0.257	(m)
Mean Velocity:	0.145	(m/s)
Froude Number	0.091	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	
Data logger Internal Power:	11.34 V
Data logger External Power:	11.92 V
Data logger Memory Used:	23137
Data logger Clock:	2:01 PM MST
Laptop Clock:	2:02 PM MST
Dessicant:	
Data logger:	951805
PT:	
Power:	

Notes: Water temperature is 16 C.



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

Time of Measurement

Date of Measurement: August 6, 2008
Start Time: 11:48 AM MDT
End Time: 11:55 AM MDT

Weather Conditions:

River Conditions: sunny

Personnel & Equipment

Measurement Made By: LM/SM
Data Entry By: DW Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar 0.223
Water Level Reading: 2.324
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.228
Other: nail in tree 1.403

Setup No. 1

El: 330.979
El: 328.878
El: 331.202
El: 328.650
El: 329.799

Setup No. 2

El: 330.979
El: 328.871
El: 331.155
El: 328.643
El: 329.795

Average

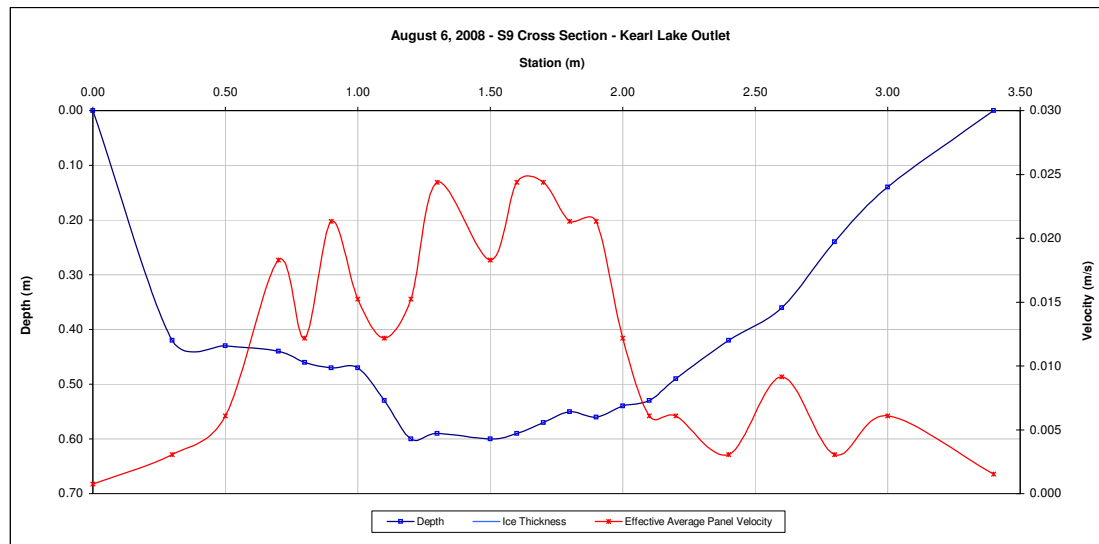
328.875
328.647
329.797

		Measurement Data															
Measured Data							Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)			
LB	0.00	0.00				1.00	1	0.00	0.15	0.001	0.001	0.11	0.02	0.000	0%		
	0.30	0.42			0.003	1.00	2	0.15	0.40	0.003	0.003	0.42	0.11	0.000	2%		
	0.50	0.43			0.006	1.00	3	0.40	0.60	0.006	0.006	0.43	0.09	0.001	3%		
	0.70	0.44			0.018	1.00	4	0.60	0.75	0.018	0.018	0.44	0.07	0.001	7%		
	0.80	0.46			0.012	1.00	5	0.75	0.85	0.012	0.012	0.46	0.05	0.001	3%		
	0.90	0.47			0.021	1.00	6	0.85	0.95	0.021	0.021	0.47	0.05	0.001	6%		
	1.00	0.47			0.015	1.00	7	0.95	1.05	0.015	0.015	0.47	0.05	0.001	4%		
	1.10	0.53			0.012	1.00	8	1.05	1.15	0.012	0.012	0.53	0.05	0.001	4%		
	1.20	0.60			0.015	1.00	9	1.15	1.25	0.015	0.015	0.60	0.06	0.001	5%		
	1.30	0.59			0.024	1.00	10	1.25	1.40	0.024	0.024	0.59	0.09	0.002	12%		
	1.50	0.60			0.018	1.00	11	1.40	1.55	0.018	0.018	0.60	0.09	0.002	9%		
	1.60	0.59			0.024	1.00	12	1.55	1.65	0.024	0.024	0.59	0.06	0.001	8%		
	1.70	0.57			0.024	1.00	13	1.65	1.75	0.024	0.024	0.57	0.06	0.001	8%		
	1.80	0.55			0.021	1.00	14	1.75	1.85	0.021	0.021	0.55	0.06	0.001	7%		
	1.90	0.56			0.021	1.00	15	1.85	1.95	0.021	0.021	0.56	0.06	0.001	7%		
	2.00	0.54			0.012	1.00	16	1.95	2.05	0.012	0.012	0.54	0.05	0.001	4%		
	2.10	0.53			0.006	1.00	17	2.05	2.15	0.006	0.006	0.53	0.05	0.000	2%		
	2.20	0.49			0.006	1.00	18	2.15	2.30	0.006	0.006	0.49	0.07	0.000	3%		
	2.40	0.42			0.003	1.00	19	2.30	2.50	0.003	0.003	0.42	0.08	0.000	1%		
	2.60	0.36			0.009	1.00	20	2.50	2.70	0.009	0.009	0.36	0.07	0.001	4%		
2.80	0.24			0.003	1.00	21	2.70	2.90	0.003	0.003	0.24	0.05	0.000	1%			
3.00	0.14			0.006	1.00	22	2.90	3.20	0.006	0.006	0.14	0.04	0.000	1%			
RB	3.40	0.00				1.00	23	3.20	3.40	0.002	0.002	0.04	0.01	0.000	0%		
Total Flow:														0.018	1.000		

Total Flow:	0.018	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.36	(m ²)
Top Width:	3.40	(m)
Hydraulic Depth:	0.401	(m)
Mean Velocity:	0.013	(m/s)
Froude Number	0.007	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.04 V	77%
Data logger Memory Used:	55%	used
Data logger Clock:	10:22 AM	MST
Laptop Clock:	10:23 AM	MST
Dessicant:	NEW	
Data logger:		
PT:		
Power:		

Notes:



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

Time of Measurement

Date of Measurement: September 11, 2008
Start Time: 6:29 PM MDT
End Time: 6:40 PM MDT

Weather Conditions:

partly cloudy, 12 C
River Conditions: higher than august

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: March Mc Birney Flo-Mate 2000
Meter Type and No.: s/n 2004521

Level Readings

Bench Mark Reading: rebar 0.333
Water Level Reading: 2.105
Top of Ice Level Reading: 0.600
Transducer Reading & Est. El.: 0.600
Other: nail in tree 1.550

Setup No. 1

El: 330.979
El: 329.207
El: 331.312
El: 328.607
El: 329.762

Setup No. 2

El: 330.979
El: 329.207
El: 331.297
El: 328.607
El: 329.763

Average

329.207
328.607
329.763

Measurement Data

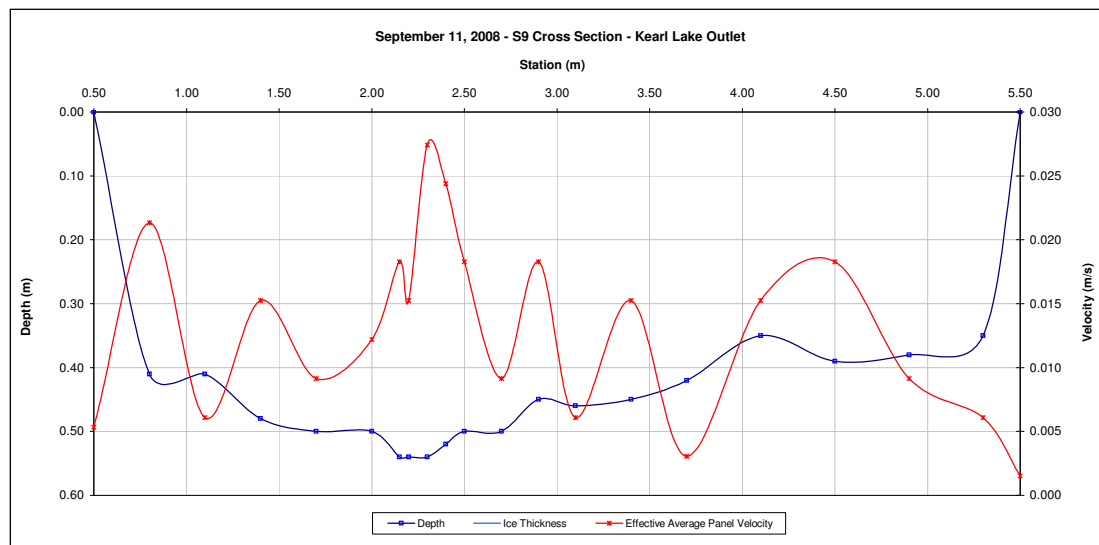
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	0.50	0.00				1.00	1	0.50	0.65	0.005	0.005	0.10	0.02	0.000	0%	
	0.80	0.41			0.021	1.00	2	0.65	0.95	0.021	0.021	0.41	0.12	0.003	10%	
	1.10	0.41			0.006	1.00	3	0.95	1.25	0.006	0.006	0.41	0.12	0.001	3%	
	1.40	0.48			0.015	1.00	4	1.25	1.55	0.015	0.015	0.48	0.14	0.002	8%	
	1.70	0.50			0.009	1.00	5	1.55	1.85	0.009	0.009	0.50	0.15	0.001	5%	
	2.00	0.50			0.012	1.00	6	1.85	2.08	0.012	0.012	0.50	0.11	0.001	5%	
	2.15	0.54			0.018	1.00	7	2.08	2.18	0.018	0.018	0.54	0.05	0.001	4%	
	2.20	0.54			0.015	1.00	8	2.18	2.25	0.015	0.015	0.54	0.04	0.001	2%	
	2.30	0.54			0.027	1.00	9	2.25	2.35	0.027	0.027	0.54	0.05	0.001	6%	
	2.40	0.52			0.024	1.00	10	2.35	2.45	0.024	0.024	0.52	0.05	0.001	5%	
	2.50	0.50			0.018	1.00	11	2.45	2.60	0.018	0.018	0.50	0.08	0.001	5%	
	2.70	0.50			0.009	1.00	12	2.60	2.80	0.009	0.009	0.50	0.10	0.001	3%	
	2.90	0.45			0.018	1.00	13	2.80	3.00	0.018	0.018	0.45	0.09	0.002	6%	
	3.10	0.46			0.006	1.00	14	3.00	3.25	0.006	0.006	0.46	0.12	0.001	3%	
	3.40	0.45			0.015	1.00	15	3.25	3.55	0.015	0.015	0.45	0.14	0.002	8%	
	3.70	0.42			0.003	1.00	16	3.55	3.90	0.003	0.003	0.42	0.15	0.000	2%	
	4.10	0.35			0.015	1.00	17	3.90	4.30	0.015	0.015	0.35	0.14	0.002	8%	
	4.50	0.39			0.018	1.00	18	4.30	4.70	0.018	0.018	0.39	0.16	0.003	11%	
	4.90	0.38			0.009	1.00	19	4.70	5.10	0.009	0.009	0.38	0.15	0.001	5%	
	5.30	0.35			0.006	1.00	20	5.10	5.40	0.006	0.006	0.35	0.11	0.001	2%	
	5.50	0.00				1.00	21	5.40	5.50	0.002	0.002	0.09	0.01	0.000	0%	
RB																
Total Flow:														0.027	1.000	

Total Flow:	0.027	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	2.09	(m ²)
Top Width:	5.00	(m)
Hydraulic Depth:	0.418	(m)
Mean Velocity:	0.013	(m/s)
Froude Number	0.006	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

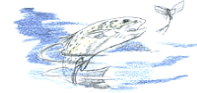
Data logger Internal Power: 11.34 V 100%
Data logger External Power: 11.68 V 75%
Data logger Memory Used: 75% used
Data logger Clock: 5:23 PM MST
Laptop Clock: 5:24 PM MST
Dessicant: NEW
Data logger: 95185-05
PT: 871
Power:

Notes: lots of vegetation throughout flow area



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

Time of Measurement

Date of Measurement: October 23, 2008
Start Time: 8:11 PM MDT
End Time: 8:17 PM MDT

Weather Conditions:

River Conditions: Up

Personnel & Equipment

Measurement Made By: SM/AM
Data Entry By: LS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar 0.111 El: 330.979
Water Level Reading: 1.882 El: 329.208
Top of Ice Level Reading: El: 331.090
Transducer Reading & Est. El.: 0.620 El: 328.588
Other: nail in tree 1.321 El: 329.769

Setup No. 1

El: 330.979
El: 329.214
El: 331.074
El: 328.591
El: 329.767

Setup No. 2

El: 330.979
El: 329.214
El: 331.074
El: 328.591
El: 329.767

Average

329.211
328.591
329.768

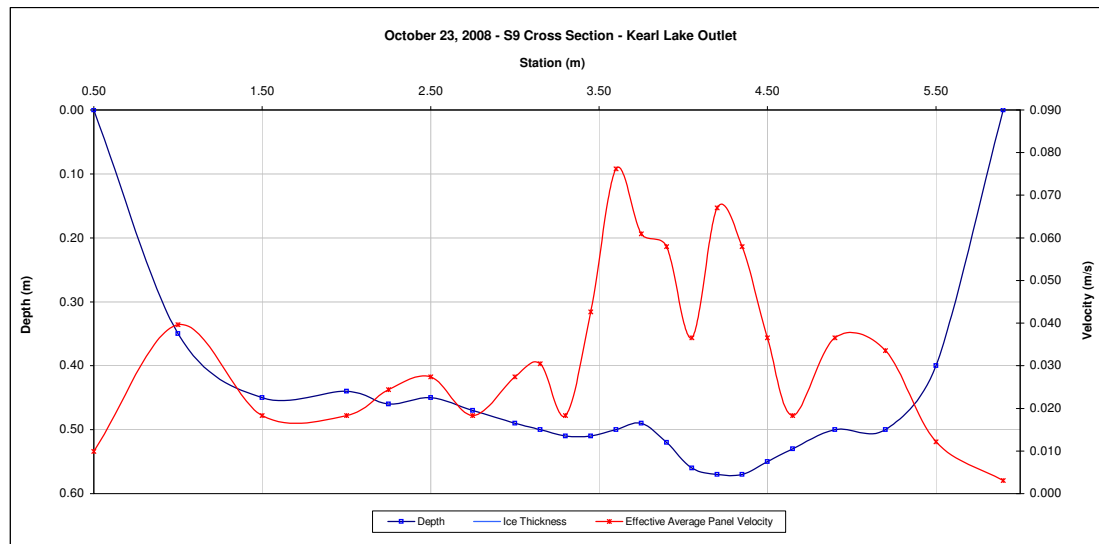
Measurement Data

	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	0.50	0.00					1.00	1	0.50	0.75	0.010	0.010	0.09	0.02	0.000	0%
	1.00	0.35				0.040	1.00	2	0.75	1.25	0.040	0.040	0.35	0.18	0.007	9%
	1.50	0.45				0.018	1.00	3	1.25	1.75	0.018	0.018	0.45	0.23	0.004	5%
	2.00	0.44				0.018	1.00	4	1.75	2.13	0.018	0.018	0.44	0.17	0.003	4%
	2.25	0.46				0.024	1.00	5	2.13	2.38	0.024	0.024	0.46	0.12	0.003	4%
	2.50	0.45				0.027	1.00	6	2.38	2.63	0.027	0.027	0.45	0.11	0.003	4%
	2.75	0.47				0.018	1.00	7	2.63	2.88	0.018	0.018	0.47	0.12	0.002	3%
	3.00	0.49				0.027	1.00	8	2.88	3.08	0.027	0.027	0.49	0.10	0.003	3%
	3.15	0.50				0.030	1.00	9	3.08	3.23	0.030	0.030	0.50	0.07	0.002	3%
	3.30	0.51				0.018	1.00	10	3.23	3.38	0.018	0.018	0.51	0.08	0.001	2%
	3.45	0.51				0.043	1.00	11	3.38	3.53	0.043	0.043	0.51	0.08	0.003	4%
	3.60	0.50				0.076	1.00	12	3.53	3.68	0.076	0.076	0.50	0.07	0.006	7%
	3.75	0.49				0.061	1.00	13	3.68	3.83	0.061	0.061	0.49	0.07	0.004	6%
	3.90	0.52				0.058	1.00	14	3.83	3.98	0.058	0.058	0.52	0.08	0.005	6%
	4.05	0.56				0.037	1.00	15	3.98	4.13	0.037	0.037	0.56	0.08	0.003	4%
	4.20	0.57				0.067	1.00	16	4.13	4.28	0.067	0.067	0.57	0.09	0.006	7%
	4.35	0.57				0.058	1.00	17	4.28	4.43	0.058	0.058	0.57	0.09	0.005	6%
	4.50	0.55				0.037	1.00	18	4.43	4.58	0.037	0.037	0.55	0.08	0.003	4%
	4.65	0.53				0.018	1.00	19	4.58	4.78	0.018	0.018	0.53	0.11	0.002	3%
	4.90	0.50				0.037	1.00	20	4.78	5.05	0.037	0.037	0.50	0.14	0.005	7%
LB	5.20	0.50				0.034	1.00	21	5.05	5.35	0.034	0.034	0.50	0.15	0.005	7%
	5.50	0.40				0.012	1.00	22	5.35	5.70	0.012	0.012	0.40	0.14	0.002	2%
	5.90	0.00					1.00	23	5.70	5.90	0.003	0.003	0.10	0.02	0.000	0%
Total Flow:															0.077	1.000

Total Flow:	0.077	(m ³ /s)
Perceived Measurement Quality:	good	
Total Area:	2.38	(m ²)
Top Width:	5.40	(m)
Hydraulic Depth:	0.440	(m)
Mean Velocity:	0.033	(m/s)
Froude Number	0.016	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	11.31 V	73%
Data logger Memory Used:	25%	used
Data logger Clock:	6:57 PM	MST
Laptop Clock:	6:58 PM	MST
Dessicant:	Good	
Data logger:	95185-05	
PT:	871	
Power:		

Notes:



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Kearl Lake Outlet
Location: S9
Site Name: Kearl Lake Outlet
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

Time of Measurement

Date of Measurement: December 9, 2008
Start Time: 10:45 AM MST
End Time: 10:55 AM MST

Weather Conditions:

cloudy, -27 C
River Conditions: ice-cover

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: March Mc Birney Flo-Mate 2000
Meter Type and No.: s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: rebar	1.421	1.372	329.177
Water Level Reading:	3.227	3.171	329.180
Top of Ice Level Reading:	3.180	3.133	329.218
Transducer Reading & Est. El.:			
Other: nail in tree	2.630	2.582	329.770

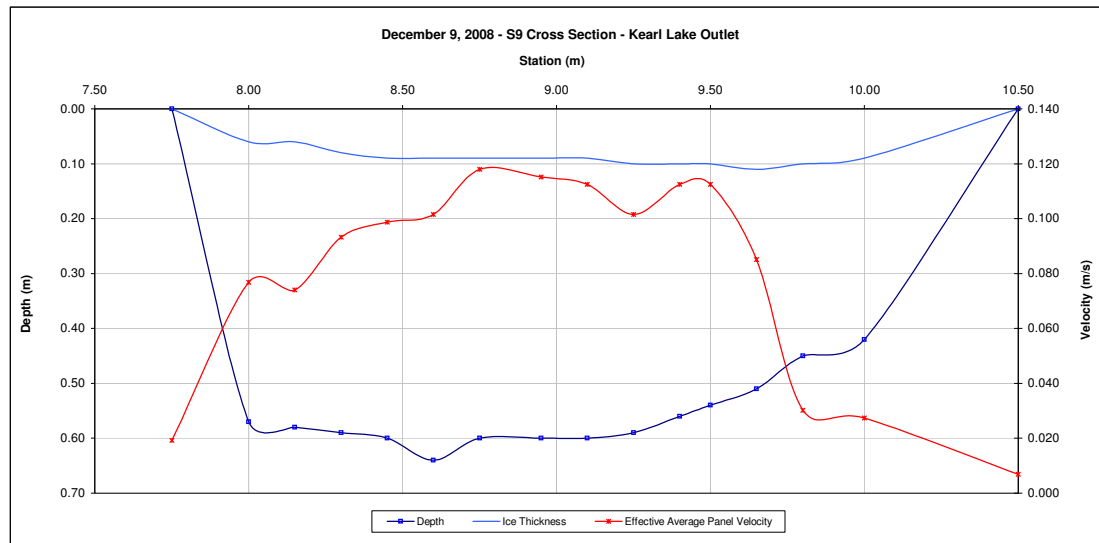
		Measurement Data														
Measured Data							Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	7.75	0.00	0.00			0.90	1	7.75	7.88	0.021	0.019	0.13	0.02	0.000	0%	
	8.00	0.57	0.06		0.085	0.90	2	7.88	8.08	0.085	0.077	0.51	0.10	0.008	8%	
	8.15	0.58	0.06		0.082	0.90	3	8.08	8.23	0.082	0.074	0.52	0.08	0.006	6%	
	8.30	0.59	0.08		0.104	0.90	4	8.23	8.38	0.104	0.093	0.51	0.08	0.007	7%	
	8.45	0.60	0.09		0.110	0.90	5	8.38	8.53	0.110	0.099	0.51	0.08	0.008	8%	
	8.60	0.64	0.09		0.113	0.90	6	8.53	8.68	0.113	0.101	0.55	0.08	0.008	9%	
	8.75	0.60	0.09		0.131	0.90	7	8.68	8.85	0.131	0.118	0.51	0.09	0.011	11%	
	8.95	0.60	0.09		0.128	0.90	8	8.85	9.03	0.128	0.115	0.51	0.09	0.010	11%	
	9.10	0.60	0.09		0.125	0.90	9	9.03	9.18	0.125	0.112	0.51	0.08	0.009	9%	
	9.25	0.59	0.10		0.113	0.90	10	9.18	9.33	0.113	0.101	0.49	0.07	0.007	8%	
	9.40	0.56	0.10		0.125	0.90	11	9.33	9.45	0.125	0.112	0.46	0.06	0.006	7%	
	9.50	0.54	0.10		0.125	0.90	12	9.45	9.58	0.125	0.112	0.44	0.06	0.006	6%	
	9.65	0.51	0.11		0.094	0.90	13	9.58	9.73	0.094	0.085	0.40	0.06	0.005	5%	
	9.80	0.45	0.10		0.034	0.90	14	9.73	9.90	0.034	0.030	0.35	0.06	0.002	2%	
	10.00	0.42	0.09		0.030	0.90	15	9.90	10.25	0.030	0.027	0.33	0.12	0.003	3%	
	RB	10.50	0.00	0.00			0.90	16	10.25	10.50	0.008	0.007	0.08	0.02	0.000	0%
Total Flow:														0.097	1.000	

Total Flow:	0.097	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.13	(m ²)
Top Width:	2.75	(m)
Hydraulic Depth:	0.411	(m)
Mean Velocity:	0.086	(m/s)
Froude Number	0.043	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: January 9, 2008
Start Time: 8:30 AM MST
End Time: 9:00 AM MST

Weather Conditions:

Overcast, -25 C

River Conditions:

Ice Cover

Personnel & Equipment

Measurement Made By: JS/JMS
Data Entry By: SMS checked SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 1.085
Water Level Reading: 2.454
Top of Ice Level Reading: 2.402
Transducer Reading & Est. El.: 0.336
Other:

Setup No. 1

El: 100.721
El: 99.352
El: 99.404
El: 99.016

Setup No. 2

El: 100.721
El: 99.344
El: 99.404
El: 99.008

Average

99.348
99.404
99.012

		Measurement Data														Percentage of Total
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
LB	0.90	0.00	0.00			0.90	1	0.90	1.08	0.001	0.001	0.01	0.00	0.000	0%	
	1.26	0.06	0.03		0.003	0.90	2	1.08	1.30	0.003	0.003	0.03	0.01	0.000	0%	
	1.33	0.07	0.02		0.113	0.90	3	1.30	1.38	0.113	0.101	0.05	0.00	0.000	2%	
	1.42	0.11	0.02		0.122	0.90	4	1.38	1.46	0.122	0.110	0.09	0.01	0.001	3%	
	1.50	0.26	0.01		0.183	0.90	5	1.46	1.54	0.183	0.165	0.25	0.02	0.003	13%	
	1.58	0.26	0.00		0.143	1.00	6	1.54	1.64	0.143	0.143	0.26	0.03	0.004	14%	
	1.70	0.27	0.00		0.168	1.00	7	1.64	1.75	0.168	0.168	0.27	0.03	0.005	19%	
	1.80	0.27	0.00		0.216	1.00	8	1.75	1.84	0.216	0.216	0.27	0.02	0.005	20%	
	1.88	0.25	0.00		0.174	1.00	9	1.84	1.92	0.174	0.174	0.25	0.02	0.003	12%	
	1.95	0.20	0.00		0.094	1.00	10	1.92	2.03	0.094	0.094	0.20	0.02	0.002	8%	
	2.10	0.05	0.01		0.158	0.90	11	2.03	2.14	0.158	0.143	0.04	0.00	0.001	2%	
	2.17	0.05	0.02		0.094	0.90	12	2.14	2.21	0.094	0.085	0.03	0.00	0.000	1%	
	2.25	0.05	0.02		0.104	0.90	13	2.21	2.73	0.104	0.093	0.03	0.02	0.001	6%	
	3.20	0.00	0.00			0.90	14	2.73	3.20	0.026	0.023	0.01	0.00	0.000	0%	
													Total Flow:		0.026	1.000

Total Flow:	0.026	(m ³ /s)
Perceived Measurement Quality:	fair	
Total Area:	0.19	(m ²)
Top Width:	2.30	(m)
Hydraulic Depth:	0.081	(m)
Mean Velocity:	0.141	(m/s)
Froude Number	0.158	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power: 100%

Data logger External Power: 69%

Data logger Memory Used: 99%

Data logger Clock: 09:13

Laptop Clock: 09:19

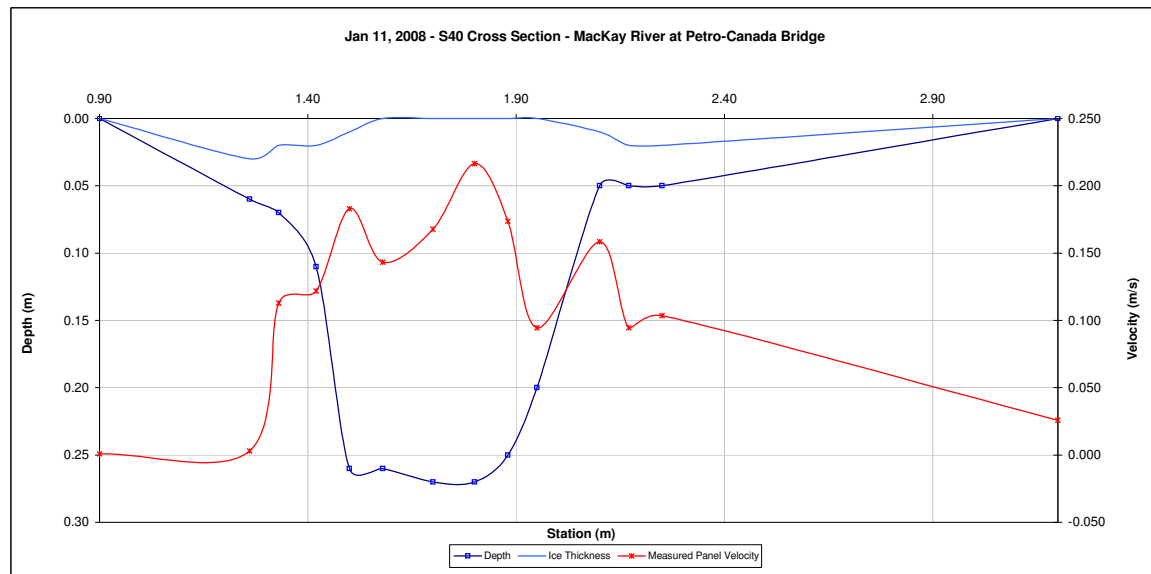
Dessicant: Good

Data logger: 203895

PT: 966022

Power: Lakewood battery

Notes: TD reading = 0.3359
Changed battery (new reading = 70%). Data downloaded, reset clock to erase memory.
Ice broke, we fell in. Poor mmt is due to having to do the MMT under the bridge by the rip rap.



Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: February 15, 2008
Start Time: 12:16 PM MST
End Time: 12:49 PM MST

Weather Conditions:

Overcast, -8 C

River Conditions:

Ice Cover

Personnel & Equipment

Measurement Made By: js jvr Checked: SM
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 1.622
Water Level Reading: 3.000
Top of Ice Level Reading: 2.928
Transducer Reading & Est. El.: 0.337
Other:

Setup No. 1

El: 100.721
El: 99.343
El: 99.415
El: 99.007
El: 102.343

Setup No. 2

El: 1.365
El: 2.748
El: 2.668
El: 0.337
El: 102.086

Average

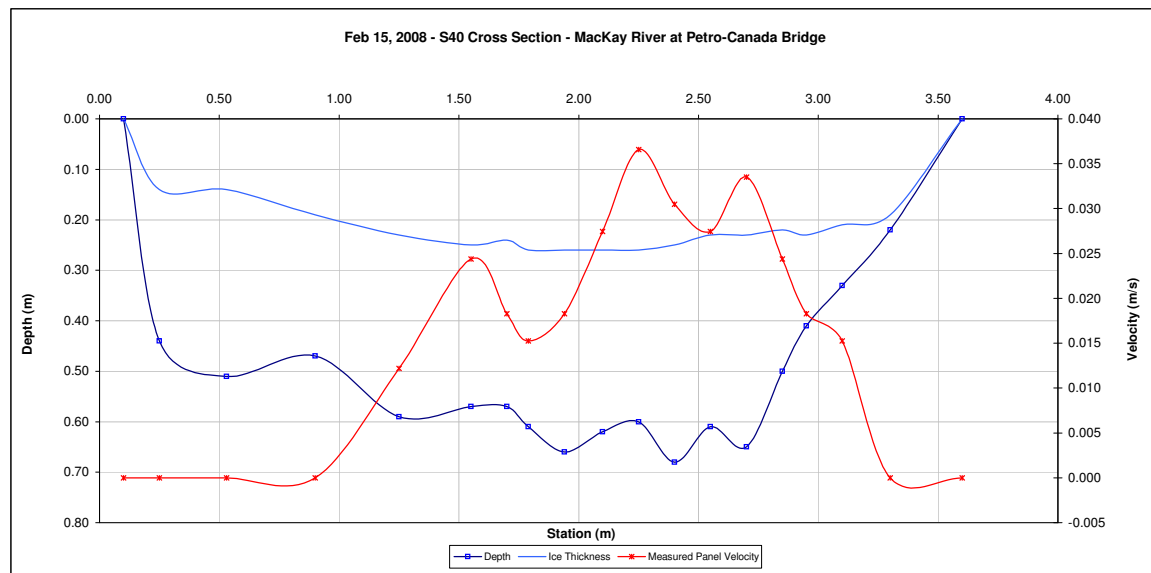
100.721
99.338
99.418
99.002
99.004

Measured Data							Calculated Data								Percentage of Total	
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
LB	0.10	0.00	0.00		0.000	0.90	1	0.10	0.18	0.000	0.000	0.08	0.01	0.000	0%	
	0.25	0.44	0.14		0.000	0.90	2	0.18	0.39	0.000	0.000	0.30	0.06	0.000	0%	
	0.53	0.51	0.14		0.000	0.90	3	0.39	0.72	0.000	0.000	0.37	0.12	0.000	0%	
	0.90	0.47	0.19		0.000	0.90	4	0.72	1.08	0.000	0.000	0.28	0.10	0.000	0%	
	1.25	0.59	0.23		0.012	0.90	5	1.08	1.40	0.012	0.011	0.36	0.12	0.001	9%	
	1.55	0.57	0.25		0.024	0.90	6	1.40	1.63	0.024	0.022	0.32	0.07	0.002	11%	
	1.70	0.57	0.24		0.018	0.90	7	1.63	1.75	0.018	0.016	0.33	0.04	0.001	4%	
	1.79	0.61	0.26		0.015	0.90	8	1.75	1.87	0.015	0.014	0.35	0.04	0.001	4%	
	1.94	0.66	0.26		0.018	0.90	9	1.87	2.02	0.018	0.016	0.40	0.06	0.001	7%	
	2.10	0.62	0.26		0.027	0.90	10	2.02	2.18	0.027	0.025	0.36	0.06	0.001	9%	
	2.25	0.60	0.26		0.037	0.90	11	2.18	2.33	0.037	0.033	0.34	0.05	0.002	11%	
	2.40	0.68	0.25		0.030	0.90	12	2.33	2.48	0.030	0.027	0.43	0.06	0.002	12%	
RB	2.55	0.61	0.23		0.027	0.90	13	2.48	2.63	0.027	0.025	0.38	0.06	0.001	10%	
	2.70	0.65	0.23		0.034	0.90	14	2.63	2.78	0.034	0.030	0.42	0.06	0.002	13%	
	2.85	0.50	0.22		0.024	0.90	15	2.78	2.90	0.024	0.022	0.28	0.04	0.001	5%	
	2.95	0.41	0.23		0.018	0.90	16	2.90	3.03	0.018	0.016	0.18	0.02	0.000	3%	
	3.10	0.33	0.21		0.015	0.90	17	3.03	3.20	0.015	0.014	0.12	0.02	0.000	2%	
	3.30	0.22	0.19		0.000	0.90	18	3.20	3.45	0.000	0.000	0.03	0.01	0.000	0%	
	3.60	0.00	0.00		0.000	0.90	18	3.45	3.60	0.000	0.000	0.01	0.00	0.000	0%	
	Total Flow:														0.015	1.000

Total Flow:	0.015	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.00	(m ²)
Top Width:	3.50	(m)
Hydraulic Depth:	0.286	(m)
Mean Velocity:	0.015	(m/s)
Froude Number	0.009	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:	
Data logger Internal Power:	100%
Data logger External Power:	69%
Data logger Memory Used:	47%
Data logger Clock:	11:42
Laptop Clock:	11:59
Dessicant:	Good
Data logger:	203895
PT:	966022
Power:	Lakewood battery

Notes:



Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: March 13, 2008
Start Time: 8:30 AM MDT
End Time: 8:44 AM MDT

Weather Conditions:

River Conditions: Ice Covered

Personnel & Equipment

Measurement Made By: JS JVS SM
Data Entry By: LM Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

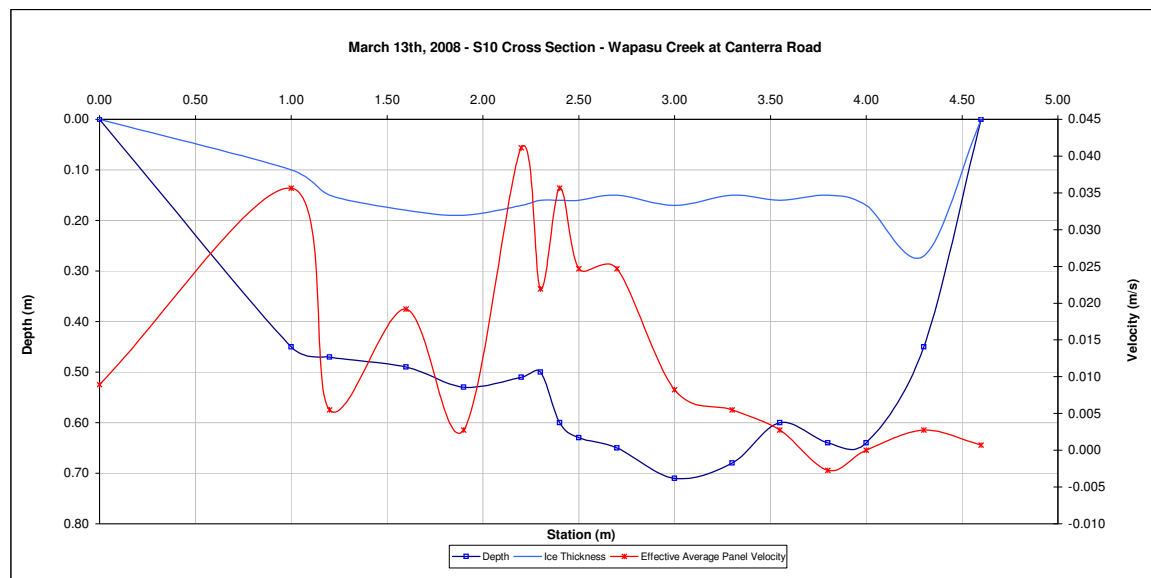
	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: nail in tree	1.299	1.215	1.257
Water Level Reading:	2.753	2.672	2.713
Top of Ice Level Reading:	2.623	2.537	2.580
Transducer Reading & Est. El.:	0.325	0.325	0.325
Other: rebar	1.128	1.045	1.087

Measured Data										Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
0.00	0.00	0.00			0.000	0.90	1	0.00	0.50	0.010	0.009	0.09	0.04	0.000	2%				
1.00	0.45	0.10			0.040	0.90	2	0.50	1.10	0.040	0.036	0.35	0.21	0.007	33%				
1.20	0.47	0.15			0.006	0.90	3	1.10	1.40	0.006	0.005	0.32	0.10	0.001	2%				
1.60	0.49	0.18			0.021	0.90	4	1.40	1.75	0.021	0.019	0.31	0.11	0.002	9%				
1.90	0.53	0.19			0.003	0.90	5	1.75	2.05	0.003	0.003	0.34	0.10	0.000	1%				
2.20	0.51	0.17			0.046	0.90	6	2.05	2.25	0.046	0.041	0.34	0.07	0.003	12%				
2.30	0.50	0.16			0.024	0.90	7	2.25	2.35	0.024	0.022	0.34	0.03	0.001	3%				
2.40	0.60	0.16			0.040	0.90	8	2.35	2.45	0.040	0.036	0.44	0.04	0.002	7%				
2.50	0.63	0.16			0.027	0.90	9	2.45	2.60	0.027	0.025	0.47	0.07	0.002	8%				
2.70	0.65	0.15			0.027	0.90	10	2.60	2.85	0.027	0.025	0.50	0.13	0.003	13%				
3.00	0.71	0.17			0.009	0.90	11	2.85	3.15	0.009	0.008	0.54	0.16	0.001	6%				
3.30	0.68	0.15			0.006	0.90	12	3.15	3.43	0.006	0.005	0.53	0.15	0.001	3%				
3.55	0.60	0.16			0.003	0.90	13	3.43	3.68	0.003	0.003	0.44	0.11	0.000	1%				
3.80	0.64	0.15			-0.003	0.90	14	3.68	3.90	-0.003	-0.003	0.49	0.11	0.000	-1%				
4.00	0.64	0.17			0.000	0.90	15	3.90	4.15	0.000	0.000	0.47	0.12	0.000	0%				
4.30	0.45	0.27			0.003	0.90	16	4.15	4.45	0.003	0.003	0.18	0.05	0.000	1%				
4.60	0.00	0.00			0.000	0.90	17	4.45	4.60	0.001	0.001	0.05	0.01	0.000	0%				
Total Flow:														0.023	100%				

Total Flow:	0.023	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	1.61	(m ²)
Top Width:	4.60	(m)
Hydraulic Depth:	0.350	(m)
Mean Velocity:	0.014	(m/s)
Froude Number	0.008	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:		
Data logger Internal Power:	85%	9.64
Data logger External Power:	57%	8.9
Data logger Memory Used:	75%	
Data logger Clock:	06:51	
Laptop Clock:	07:08	
Dessicant:	Good	
Data logger:	203895	
PT:	966022	
Power:	Lakewood battery	

Notes: Battery changed new readings = Aux: 72% @ 11.19V, main = 100% @ 11.34V.
Sampling time = 15 min, sensor warm up = 0.410 sec. Clocks synced and data cleared.



Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: April 3, 2008
Start Time: 12:35 PM MDT
End Time: 12:45 PM MDT

Weather Conditions:

-12 , overcast LT wind

River Conditions:

Ice Covered

Personnel & Equipment

Measurement Made By: JS SM
Data Entry By: SM Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 1.058
Water Level Reading: 2.550
Top of Ice Level Reading: 2.389
Transducer Reading & Est. El.: 0.306
Other: rebar 0.840

Setup No. 1

El: 100.721
El: 99.211
El: 99.390
El: 98.905
El: 100.921

Setup No. 2

El: 0.986
El: 2.469
El: 2.315
El: 0.306
El: 0.821

Average

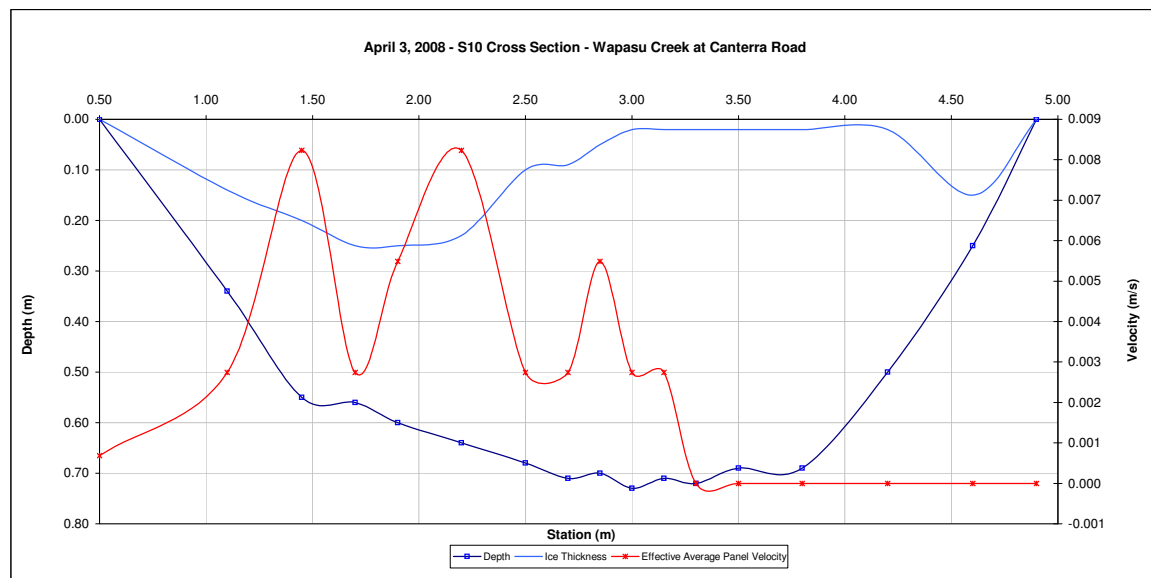
100.721
99.242
99.392
98.936
100.921

		Measurement Data														Percentage of Total
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
LB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)		(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
	0.50	0.00	0.00			0.000	0.90	1	0.50	0.80	0.001	0.001	0.05	0.02	0.000	0%
	1.10	0.34	0.14			0.003	0.90	2	0.80	1.28	0.003	0.003	0.20	0.10	0.000	6%
	1.45	0.55	0.20			0.009	0.90	3	1.28	1.58	0.009	0.008	0.35	0.11	0.001	19%
	1.70	0.56	0.25			0.003	0.90	4	1.58	1.80	0.003	0.003	0.31	0.07	0.000	4%
	1.90	0.60	0.25			0.006	0.90	5	1.80	2.05	0.006	0.005	0.35	0.09	0.000	10%
	2.20	0.64	0.23			0.009	0.90	6	2.05	2.35	0.009	0.008	0.41	0.12	0.001	22%
	2.50	0.68	0.10			0.003	0.90	7	2.35	2.60	0.003	0.003	0.58	0.15	0.000	9%
	2.70	0.71	0.09			0.003	0.90	8	2.60	2.78	0.003	0.003	0.62	0.11	0.000	6%
	2.85	0.70	0.05			0.006	0.90	9	2.78	2.93	0.006	0.005	0.65	0.10	0.001	12%
	3.00	0.73	0.02			0.003	0.90	10	2.93	3.08	0.003	0.003	0.71	0.11	0.000	6%
	3.15	0.71	0.02			0.003	0.90	11	3.08	3.23	0.003	0.003	0.69	0.10	0.000	6%
	3.30	0.72	0.02			0.000	0.90	12	3.23	3.40	0.000	0.000	0.70	0.12	0.000	0%
	3.50	0.69	0.02			0.000	0.90	13	3.40	3.65	0.000	0.000	0.67	0.17	0.000	0%
	3.80	0.69	0.02			0.000	0.90	14	3.65	4.00	0.000	0.000	0.67	0.23	0.000	0%
	4.20	0.50	0.02			0.000	0.90	15	4.00	4.40	0.000	0.000	0.48	0.19	0.000	0%
	4.60	0.25	0.15			0.000	0.90	16	4.40	4.75	0.000	0.000	0.10	0.04	0.000	0%
4.90	0.00	0.00			0.000	0.90	17	4.75	4.90	0.000	0.000	0.03	0.00	0.000	0%	
RB																
Total Flow:													0.005	100%		

Total Flow:	0.005	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	1.81	(m ²)
Top Width:	4.40	(m)
Hydraulic Depth:	0.412	(m)
Mean Velocity:	0.003	(m/s)
Froude Number	0.001	
Photographs taken looking at:		
Photographs taken.		

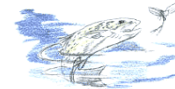
Data logger Notes:		
Data logger Internal Power:	100%	11.34
Data logger External Power:	72%	11.2
Data logger Memory Used:	15%	
Data logger Clock:	11:25	
Laptop Clock:	11:26	
Dessicant:	Good	
Data logger:	203895	
PT:	966022	
Power:	Lakewood battery	

Notes: water temp 0.1486



Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: May 10, 2008
Start Time: 6:05 PM MDT
End Time: 6:24 PM MDT

Weather Conditions:

Cloudy, light wind, +10

River Conditions:

Open, high, bank full

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

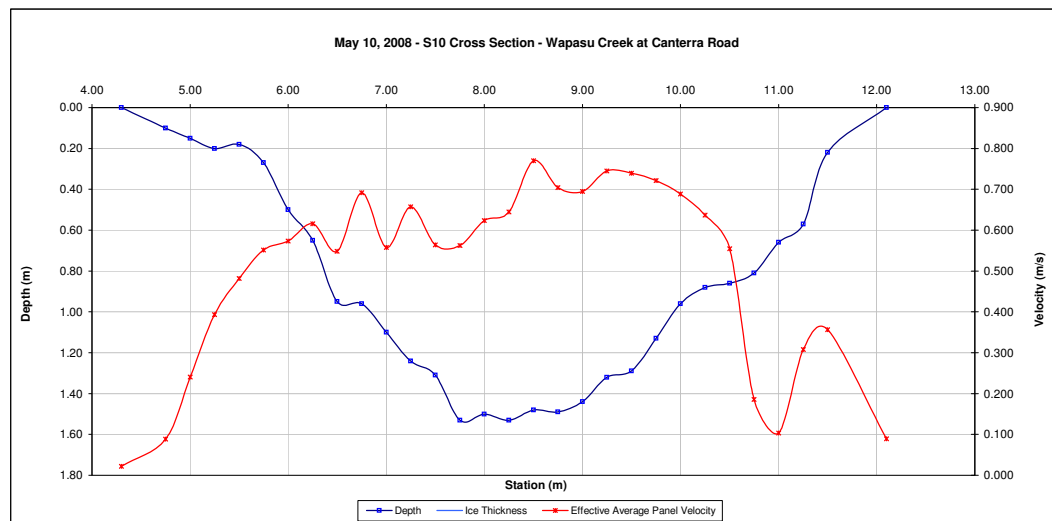
	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: nail in tree	1.134	1.087	1.000
Water Level Reading:	1.437	1.39	100.418
Top of Ice Level Reading:			
Transducer Reading & Est. El.:	1.450	1.450	98.968
Other: rebar	0.960	0.911	100.896

	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
LB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
	4.30	0.00					1.00	1	4.30	4.53	0.022	0.022	0.03	0.01	0.000	0%
	4.75	0.10				0.088	1.00	2	4.53	4.88	0.088	0.088	0.10	0.04	0.003	0%
	5.00	0.15				0.241	1.00	3	4.88	5.13	0.241	0.241	0.15	0.04	0.009	0%
	5.25	0.20				0.393	1.00	4	5.13	5.38	0.393	0.393	0.20	0.05	0.020	1%
	5.50	0.18				0.482	1.00	5	5.38	5.63	0.482	0.482	0.18	0.05	0.022	1%
	5.75	0.27				0.552	1.00	6	5.63	5.88	0.552	0.552	0.27	0.07	0.037	1%
	6.00	0.50				0.573	1.00	7	5.88	6.13	0.573	0.573	0.50	0.13	0.072	2%
	6.25	0.65				0.616	1.00	8	6.13	6.38	0.616	0.616	0.65	0.16	0.100	3%
	6.50	0.95				0.549	1.00	9	6.38	6.63	0.549	0.549	0.95	0.24	0.130	3%
	6.75	0.96				0.692	1.00	10	6.63	6.88	0.692	0.692	0.96	0.24	0.166	4%
	7.00	1.10				0.558	1.00	11	6.88	7.13	0.558	0.558	1.10	0.28	0.153	4%
	7.25	1.24		0.756	0.558		1.00	12	7.13	7.38	0.657	0.657	1.24	0.31	0.204	5%
	7.50	1.31		0.792	0.335		1.00	13	7.38	7.63	0.564	0.564	1.31	0.33	0.185	5%
	7.75	1.53		0.762	0.363		1.00	14	7.63	7.88	0.562	0.562	1.53	0.38	0.215	6%
	8.00	1.50		0.823	0.424		1.00	15	7.88	8.13	0.623	0.623	1.50	0.38	0.234	6%
	8.25	1.53		0.701	0.588		1.00	16	8.13	8.38	0.645	0.645	1.53	0.38	0.247	6%
	8.50	1.48		0.792	0.747		1.00	17	8.38	8.63	0.770	0.770	1.48	0.37	0.285	7%
	8.75	1.49		0.738	0.671		1.00	18	8.63	8.88	0.704	0.704	1.49	0.37	0.262	7%
	9.00	1.44		0.664	0.725		1.00	19	8.88	9.13	0.695	0.695	1.44	0.36	0.250	7%
	9.25	1.32		0.762	0.728		1.00	20	9.13	9.38	0.745	0.745	1.32	0.33	0.246	6%
	9.50	1.29		0.710	0.768		1.00	21	9.38	9.63	0.739	0.739	1.29	0.32	0.238	6%
	9.75	1.13		0.689	0.750	0.725	1.00	22	9.63	9.88	0.721	0.721	1.13	0.28	0.204	5%
	10.00	0.96				0.689	1.00	23	9.88	10.13	0.689	0.689	0.96	0.24	0.165	4%
	10.25	0.88				0.637	1.00	24	10.13	10.38	0.637	0.637	0.88	0.22	0.140	4%
10.50	0.86				0.555	1.00	25	10.38	10.63	0.555	0.555	0.86	0.22	0.119	3%	
10.75	0.81				0.186	1.00	26	10.63	10.88	0.186	0.186	0.81	0.20	0.038	1%	
11.00	0.66				0.104	1.00	27	10.88	11.13	0.104	0.104	0.66	0.17	0.017	0%	
11.25	0.57				0.308	1.00	28	11.13	11.38	0.308	0.308	0.57	0.14	0.044	1%	
11.50	0.22				0.357	1.00	29	11.38	11.80	0.357	0.357	0.22	0.09	0.033	1%	
RB	12.10	0.00					1.00	30	11.80	12.10	0.089	0.089	0.06	0.02	0.001	0%
Total Flow:															3.839	1.000

Total Flow:	3.839	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	6.39	(m ²)
Top Width:	7.80	(m)
Hydraulic Depth:	0.819	(m)
Mean Velocity:	0.601	(m/s)
Froude Number	0.212	
Photographs taken looking at:		
Photographs taken:		

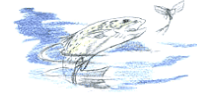
Data logger Notes:	
Data logger Internal Power:	100% 11.34 V
Data logger External Power:	74% 11.44 V
Data logger Memory Used:	70%
Data logger Clock:	16:54 MST
Laptop Clock:	16:46 MST
Dessicant:	good
Data logger:	203095
PT:	966022
Power:	Lakewood battery

Notes: rocks near banks, flow done under bridge
memory cleared



Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: June 30, 2008
Start Time: 10:30 AM MDT
End Time: 10:46 AM MDT

Weather Conditions:

Sunny, +26

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 0.938
Water Level Reading: 1.954
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.742
Other: rebar 0.748

Setup No. 1

El: 100.721
El: 99.705
El:
El: 98.963
El: 100.911

Setup No. 2

El: 100.721
El: 99.710
El:
El: 98.968
El: 100.912

Average

99.708
98.965
100.912

Measurement Data

	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	16.00	0.00					1.00	1	16.00	16.35	0.022	0.022	0.06	0.02	0.000	0%
	16.70	0.25				0.088	1.00	2	16.35	16.80	0.088	0.088	0.25	0.11	0.010	4%
	16.90	0.27				0.131	1.00	3	16.80	17.00	0.131	0.131	0.27	0.05	0.007	3%
	17.10	0.46				0.189	1.00	4	17.00	17.20	0.189	0.189	0.46	0.09	0.017	7%
	17.30	0.39				0.177	1.00	5	17.20	17.40	0.177	0.177	0.39	0.08	0.014	5%
	17.50	0.31				0.223	1.00	6	17.40	17.60	0.223	0.223	0.31	0.06	0.014	5%
	17.70	0.52				0.238	1.00	7	17.60	17.80	0.238	0.238	0.52	0.10	0.025	10%
	17.90	0.59				0.140	1.00	8	17.80	17.95	0.140	0.140	0.59	0.09	0.012	5%
	18.00	0.57				0.192	1.00	9	17.95	18.05	0.192	0.192	0.57	0.06	0.011	4%
	18.10	0.54				0.238	1.00	10	18.05	18.15	0.238	0.238	0.54	0.05	0.013	5%
	18.20	0.53				0.219	1.00	11	18.15	18.25	0.219	0.219	0.53	0.05	0.012	5%
	18.30	0.54				0.204	1.00	12	18.25	18.35	0.204	0.204	0.54	0.05	0.011	4%
	18.40	0.49				0.235	1.00	13	18.35	18.45	0.235	0.235	0.49	0.05	0.012	5%
	18.50	0.55				0.174	1.00	14	18.45	18.55	0.174	0.174	0.55	0.06	0.010	4%
	18.60	0.44				0.219	1.00	15	18.55	18.65	0.219	0.219	0.44	0.04	0.010	4%
	18.70	0.50				0.213	1.00	16	18.65	18.75	0.213	0.213	0.50	0.05	0.011	4%
	18.80	0.43				0.219	1.00	17	18.75	18.85	0.219	0.219	0.43	0.04	0.009	4%
	18.90	0.47				0.162	1.00	18	18.85	18.95	0.162	0.162	0.47	0.05	0.008	3%
	19.00	0.46				0.186	1.00	19	18.95	19.05	0.186	0.186	0.46	0.05	0.009	3%
	19.10	0.33				0.204	1.00	20	19.05	19.20	0.204	0.204	0.33	0.05	0.010	4%
	19.30	0.30				0.177	1.00	21	19.20	19.40	0.177	0.177	0.30	0.06	0.011	4%
	19.50	0.34				0.152	1.00	22	19.40	19.60	0.152	0.152	0.34	0.07	0.010	4%
	19.70	0.20				0.143	1.00	23	19.60	19.80	0.143	0.143	0.20	0.04	0.006	2%
	19.90	0.15				0.110	1.00	24	19.80	20.00	0.110	0.110	0.15	0.03	0.003	1%
	20.10	0.05				0.049	1.00	25	20.00	20.25	0.049	0.049	0.05	0.01	0.001	0%
	20.40	0.00					1.00	26	20.25	20.40	0.012	0.012	0.01	0.00	0.000	0%
RB																
Total Flow:														0.254	1.000	

Total Flow:	0.254	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.43	(m ²)
Top Width:	4.40	(m)
Hydraulic Depth:	0.324	(m)
Mean Velocity:	0.178	(m/s)
Froude Number	0.100	
Photographs taken looking at:		
Photographs taken.		

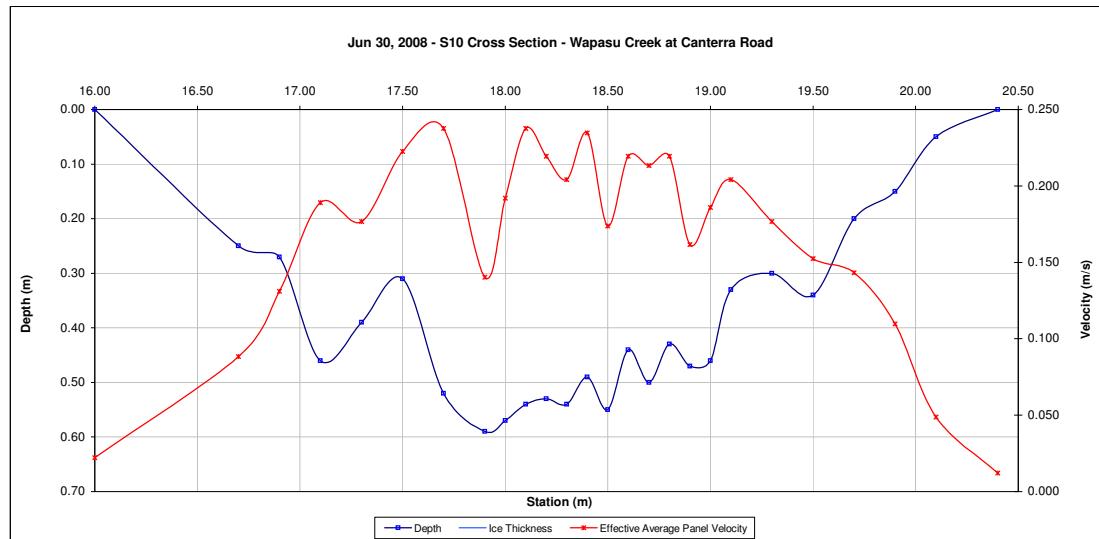
Data logger Notes:

Data logger Internal Power: 95%
Data logger External Power: 65%
Data logger Memory Used: 12486
Data logger Clock: 9:15 AM MST
Laptop Clock: 9:15 AM MST

Dessicant:

Data logger: 203095
PT: 966022
Power: Lakewood battery

Notes:



Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: August 6, 2008
Start Time: 2:00 PM MDT
End Time: 2:15 PM MDT

Weather Conditions:

Sunny, +27

River Conditions:

Open

Personnel & Equipment

Measurement Made By: SM/LM
Data Entry By: DW Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 0.805
Water Level Reading: 1.546
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.027
Other: rebar

Setup No. 1

El: 100.721
El: 99.980
El: 98.953
El: 101.526

Setup No. 2

El: 100.721
El: 99.981
El: 98.954
El: 101.515

Average

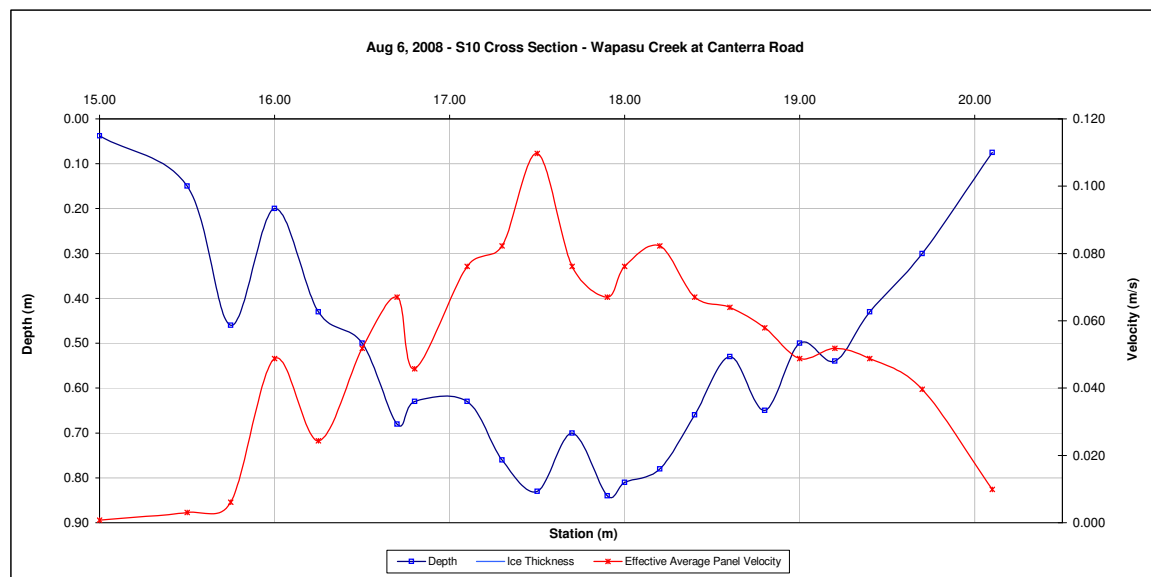
99.981
98.954
101.521

		Measurement Data																	
		Measured Data					Calculated Data												
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at	Panel Ends at	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
								Station	Station	(m/s)	(m/s)	(m/s)	(m/s)	(m)		(m²)	(m³/s)		
LB	15.00	0.00				1.00	1	15.00	15.25	0.001	0.001	0.04	0.01	0.000	0%				
	15.50	0.15			0.003	1.00	2	15.25	15.63	0.003	0.003	0.15	0.06	0.000	0%				
	15.75	0.46			0.006	1.00	3	15.63	15.88	0.006	0.006	0.46	0.12	0.001	0%				
	16.00	0.20			0.049	1.00	4	15.88	16.13	0.049	0.049	0.20	0.05	0.002	2%				
	16.25	0.43			0.024	1.00	5	16.13	16.38	0.024	0.024	0.43	0.11	0.003	2%				
	16.50	0.50			0.052	1.00	6	16.38	16.60	0.052	0.052	0.50	0.11	0.006	4%				
	16.70	0.68			0.067	1.00	7	16.60	16.75	0.067	0.067	0.68	0.10	0.007	5%				
	16.80	0.63			0.046	1.00	8	16.75	16.95	0.046	0.046	0.63	0.13	0.006	4%				
	17.10	0.63			0.076	1.00	9	16.95	17.20	0.076	0.076	0.63	0.16	0.012	8%				
	17.30	0.76			0.082	1.00	10	17.20	17.40	0.082	0.082	0.76	0.15	0.013	8%				
	17.50	0.83			0.110	1.00	11	17.40	17.60	0.110	0.110	0.83	0.17	0.018	12%				
	17.70	0.70			0.076	1.00	12	17.60	17.80	0.076	0.076	0.70	0.14	0.011	7%				
	17.90	0.84			0.067	1.00	13	17.80	17.95	0.067	0.067	0.84	0.13	0.008	6%				
	18.00	0.81			0.076	1.00	14	17.95	18.10	0.076	0.076	0.81	0.12	0.009	6%				
	18.20	0.78			0.082	1.00	15	18.10	18.30	0.082	0.082	0.78	0.16	0.013	8%				
	18.40	0.66			0.067	1.00	16	18.30	18.50	0.067	0.067	0.66	0.13	0.009	6%				
	18.60	0.53			0.064	1.00	17	18.50	18.70	0.064	0.064	0.53	0.11	0.007	4%				
	18.80	0.65			0.058	1.00	18	18.70	18.90	0.058	0.058	0.65	0.13	0.008	5%				
	19.00	0.50			0.049	1.00	19	18.90	19.10	0.049	0.049	0.50	0.10	0.005	3%				
	19.20	0.54			0.052	1.00	20	19.10	19.30	0.052	0.052	0.54	0.11	0.006	4%				
	19.40	0.43			0.049	1.00	21	19.30	19.55	0.049	0.049	0.43	0.11	0.005	3%				
	19.70	0.30			0.040	1.00	22	19.55	19.90	0.040	0.040	0.30	0.11	0.004	3%				
	20.10	0.00			0.000	1.00	23	19.90	20.10	0.010	0.010	0.08	0.02	0.000	0%				
												Total Flow:		0.151	1.000				

Total Flow:	0.151	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.50	(m ²)
Top Width:	5.10	(m)
Hydraulic Depth:	0.490	(m)
Mean Velocity:	0.061	(m/s)
Froude Number	0.028	
Photographs taken looking at:		
Photographs taken.		

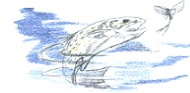
Data logger Notes:	
Data logger Internal Power:	100% 11.34 V
Data logger External Power:	79% 12.29 V
Data logger Memory Used:	90% used
Data logger Clock:	1:16 PM MST
Laptop Clock:	1:17 PM MST
Dessicant:	New
Data logger:	203095
PT:	966022-5
Power:	Lakewood battery

Notes: Water temp. 15.77°C
Memory cleared



Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: September 11, 2008
Start Time: 4:30 PM MDT
End Time: 4:50 PM MDT

Weather Conditions:

partly cloudy, 15 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 0.914 El: 100.721
Water Level Reading: 1.583 El: 100.052
Top of Ice Level Reading: El: 100.056
Transducer Reading & Est. El.: 1.087 El: 98.965
Other: rebar in PVC RB 0.977 El: 100.657

Setup No. 1

El: 100.721
El: 100.052
El: 100.056
El: 98.965
El: 100.657

Setup No. 2

El: 100.721
El: 100.056
El: 100.056
El: 98.969
El: 100.657

Average

100.054
100.056
100.056
98.967
100.658

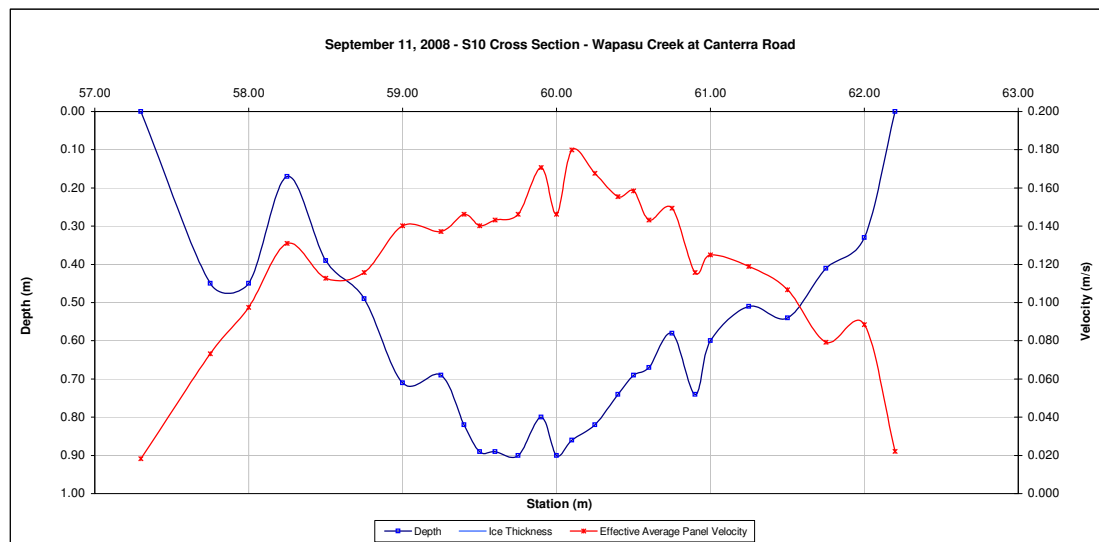
Measurement Data

	Measured Data						Calculated Data										Percentage of Total
	Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m ²)	Panel Discharge (m ³ /s)		
RB	62.20	0.00					1.00	1	62.20	62.10	0.022	0.022	0.08	0.01	0.000	0%	
	62.00	0.33				0.088	1.00	2	62.10	61.88	0.088	0.088	0.33	0.07	0.007	2%	
	61.75	0.41				0.079	1.00	3	61.88	61.63	0.079	0.079	0.41	0.10	0.008	2%	
	61.50	0.54				0.107	1.00	4	61.63	61.38	0.107	0.107	0.54	0.14	0.014	4%	
	61.25	0.51				0.119	1.00	5	61.38	61.13	0.119	0.119	0.51	0.13	0.015	4%	
	61.00	0.60				0.125	1.00	6	61.13	60.95	0.125	0.125	0.60	0.10	0.013	4%	
	60.90	0.74				0.116	1.00	7	60.95	60.83	0.116	0.116	0.74	0.09	0.011	3%	
	60.75	0.58				0.149	1.00	8	60.83	60.68	0.149	0.149	0.58	0.09	0.013	4%	
	60.60	0.67				0.143	1.00	9	60.68	60.55	0.143	0.143	0.67	0.08	0.012	3%	
	60.50	0.69				0.158	1.00	10	60.55	60.45	0.158	0.158	0.69	0.07	0.011	3%	
	60.40	0.74				0.155	1.00	11	60.45	60.33	0.155	0.155	0.74	0.09	0.014	4%	
	60.25	0.82				0.168	1.00	12	60.33	60.18	0.168	0.168	0.82	0.12	0.021	6%	
	60.10	0.86				0.180	1.00	13	60.18	60.05	0.180	0.180	0.86	0.11	0.019	6%	
	60.00	0.90				0.146	1.00	14	60.05	59.95	0.146	0.146	0.90	0.09	0.013	4%	
	59.90	0.80				0.171	1.00	15	59.95	59.83	0.171	0.171	0.80	0.10	0.017	5%	
	59.75	0.90				0.146	1.00	16	59.83	59.68	0.146	0.146	0.90	0.14	0.020	6%	
	59.60	0.89				0.143	1.00	17	59.68	59.55	0.143	0.143	0.89	0.11	0.016	5%	
	59.50	0.89				0.140	1.00	18	59.55	59.45	0.140	0.140	0.89	0.09	0.012	4%	
	59.40	0.82				0.146	1.00	19	59.45	59.33	0.146	0.146	0.82	0.10	0.015	4%	
	59.25	0.69				0.137	1.00	20	59.33	59.13	0.137	0.137	0.69	0.14	0.019	5%	
LB	59.00	0.71				0.140	1.00	21	59.13	58.88	0.140	0.140	0.71	0.18	0.025	7%	
	58.75	0.49				0.116	1.00	22	58.88	58.63	0.116	0.116	0.49	0.12	0.014	4%	
	58.50	0.39				0.113	1.00	23	58.63	58.38	0.113	0.113	0.39	0.10	0.011	3%	
	58.25	0.17				0.131	1.00	24	58.38	58.13	0.131	0.131	0.17	0.04	0.006	2%	
	58.00	0.45				0.098	1.00	25	58.13	57.88	0.098	0.098	0.45	0.11	0.011	3%	
	57.75	0.45				0.073	1.00	26	57.88	57.53	0.073	0.073	0.45	0.16	0.012	3%	
	57.30	0.00					1.00	27	57.53	57.30	0.018	0.018	0.11	0.03	0.000	0%	
Total Flow:															0.349	1.000	

Total Flow:	0.349	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	2.71	(m ²)
Top Width:	4.90	(m)
Hydraulic Depth:	0.553	(m)
Mean Velocity:	0.129	(m/s)
Froude Number	0.055	
Photographs taken looking at:		
Photographs taken.		

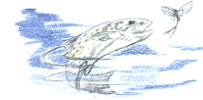
Data logger Notes:	
Data logger Internal Power:	
Data logger External Power:	
Data logger Memory Used:	
Data logger Clock:	
Laptop Clock:	
Dessicant:	good
Data logger:	
PT:	
Power:	

Notes: Q done under bridge
New benchmark installed, rebar in PVC, on RB just upstream of logger box
memory cleared, clocks reset



Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: October 17, 2008
Start Time: 2:45 PM MDT
End Time: 3:00 PM MDT

Weather Conditions:

cloudy, 8 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 1.086
Water Level Reading: 1.640
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.210
Other: rebar in PVC RB 1.152

Setup No. 1

El: 100.721
El: 100.167
El: 98.957
El: 100.655

Setup No. 2

El: 100.721
El: 100.166
El: 98.956
El: 100.656

Average

100.167
100.167
98.957
100.656

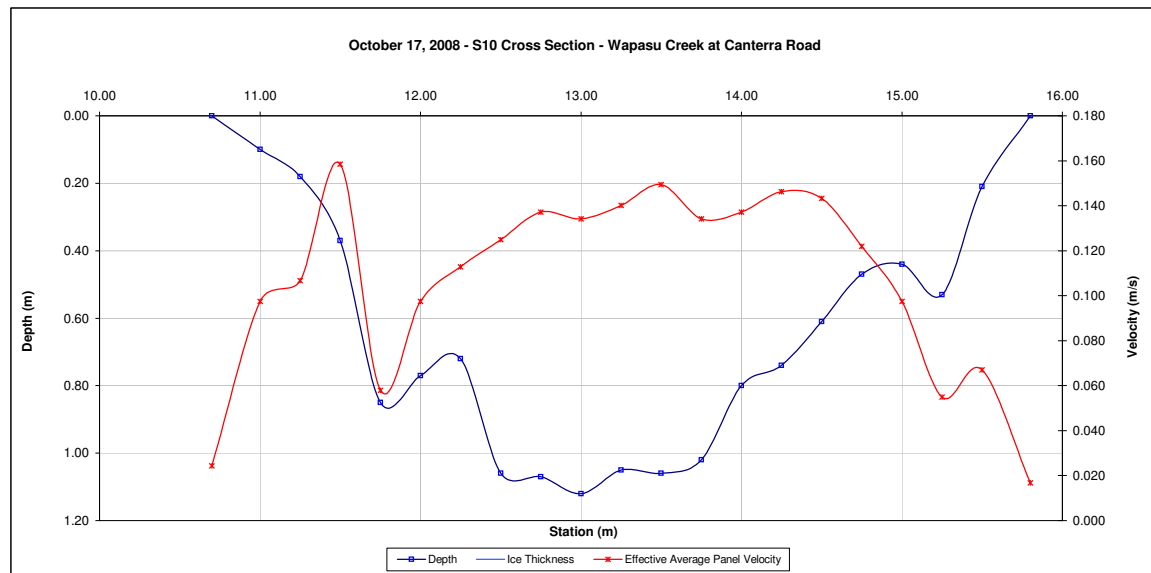
		Measurement Data																	
		Measured Data					Calculated Data												
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
																(m)	(m)	(m/s)	(m/s)
LB	10.70	0.00				1.00	1	10.70	10.85	0.024	0.024	0.03	0.00	0.000	0%				
	11.00	0.10			0.098	1.00	2	10.85	11.13	0.098	0.098	0.10	0.03	0.003	1%				
	11.25	0.18			0.107	1.00	3	11.13	11.38	0.107	0.107	0.18	0.05	0.005	1%				
	11.50	0.37			0.158	1.00	4	11.38	11.63	0.158	0.158	0.37	0.09	0.015	4%				
	11.75	0.85			0.058	1.00	5	11.63	11.88	0.058	0.058	0.85	0.21	0.012	3%				
	12.00	0.77			0.098	1.00	6	11.88	12.13	0.098	0.098	0.77	0.19	0.019	5%				
	12.25	0.72			0.113	1.00	7	12.13	12.38	0.113	0.113	0.72	0.18	0.020	5%				
	12.50	1.06			0.125	1.00	8	12.38	12.63	0.125	0.125	1.06	0.27	0.033	8%				
	12.75	1.07			0.137	1.00	9	12.63	12.88	0.137	0.137	1.07	0.27	0.037	9%				
	13.00	1.12		0.155	0.113	1.00	10	12.88	13.13	0.134	0.134	1.12	0.28	0.038	9%				
	13.25	1.05			0.140	1.00	11	13.13	13.38	0.140	0.140	1.05	0.26	0.037	9%				
	13.50	1.06			0.149	1.00	12	13.38	13.63	0.149	0.149	1.06	0.27	0.040	10%				
	13.75	1.02			0.134	1.00	13	13.63	13.88	0.134	0.134	1.02	0.26	0.034	8%				
	14.00	0.80			0.137	1.00	14	13.88	14.13	0.137	0.137	0.80	0.20	0.027	7%				
	14.25	0.74			0.146	1.00	15	14.13	14.38	0.146	0.146	0.74	0.19	0.027	7%				
	14.50	0.61			0.143	1.00	16	14.38	14.63	0.143	0.143	0.61	0.15	0.022	5%				
	14.75	0.47			0.122	1.00	17	14.63	14.88	0.122	0.122	0.47	0.12	0.014	4%				
	15.00	0.44			0.098	1.00	18	14.88	15.13	0.098	0.098	0.44	0.11	0.011	3%				
	15.25	0.53			0.055	1.00	19	15.13	15.38	0.055	0.055	0.53	0.13	0.007	2%				
	15.50	0.21			0.067	1.00	20	15.38	15.65	0.067	0.067	0.21	0.06	0.004	1%				
	15.80	0.00				1.00	21	15.65	15.80	0.017	0.017	0.05	0.01	0.000	0%				
RB																			
	Total Flow:														0.404	1.000			

Total Flow:	0.404	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	3.31	(m ²)
Top Width:	5.10	(m)
Hydraulic Depth:	0.649	(m)
Mean Velocity:	0.122	(m/s)
Froude Number	0.048	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power: 11.34 V 100%
Data logger External Power: 11.8 V 76%
Data logger Memory Used: 40%
Data logger Clock: 1:37 PM
Laptop Clock: 1:38 PM
Dessicant: NEW
Data logger: 203085
PT: 9966022-5
Power:

Notes: Q done under bridge
Water temp = 2.59 C



Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: October 23, 2008
Start Time: 10:00 AM MDT
End Time: MDT

Weather Conditions:

River Conditions:

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: LS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

	Setup No. 1		Setup No. 2		Average
Bench Mark Reading: nail in tree	1.048	El: 100.721	1.07	El: 100.721	
Water Level Reading:	1.616	El: 100.153	1.635	El: 100.156	100.155
Top of Ice Level Reading:		El:		El:	
Transducer Reading & Est. El.:	1.186	El: 98.967	1.186	El: 98.970	98.969
Other: rebar in PVC RB	1.116	El: 100.653	1.139	El: 100.652	100.653

Notes: New TD Installed SN # 0001747
No flow measurement bec. MMT done Oct 17/08

Hydrometric Measurement / Site Visit Record

Wapasu Creek at Canterra Road - S10



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: S10
Site Name: Wapasu Creek at Canterra Road
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: December 9, 2008
Start Time: 9:50 AM MST
End Time: 10:05 AM MST

Weather Conditions:

thin clouds, -30 C
River Conditions: ice cover, thin in places

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: nail in tree	1.075	1.036	1.055
Water Level Reading:	1.861	1.82	1.840
Top of Ice Level Reading:	1.748	1.706	1.727
Transducer Reading & Est. El.:	0.977	0.977	0.977
Other: rebar in PVC LB	0.875	0.835	0.855

LB

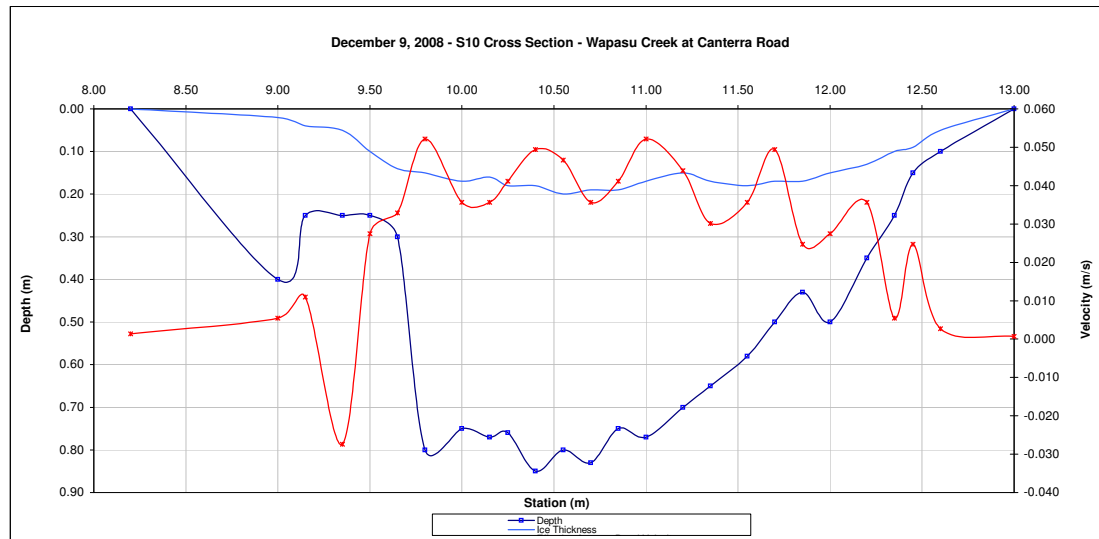
RB

Measured Data							Measurement Data									Calculated Data				
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Panel Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)						
8.20	0.00	0.00				0.90	1	8.20	8.60	0.002	0.001	0.10	0.04	0.000	0%					
9.00	0.40	0.02			0.006	0.90	2	8.60	9.08	0.006	0.005	0.38	0.18	0.001	2%					
9.15	0.25	0.04			0.012	0.90	3	9.08	9.25	0.012	0.011	0.21	0.04	0.000	1%					
9.35	0.25	0.05			-0.030	0.90	4	9.25	9.43	-0.030	-0.027	0.20	0.04	-0.001	-2%					
9.50	0.25	0.10			0.030	0.90	5	9.43	9.58	0.030	0.027	0.15	0.02	0.001	1%					
9.65	0.30	0.14			0.037	0.90	6	9.58	9.73	0.037	0.033	0.16	0.02	0.001	1%					
9.80	0.80	0.15			0.058	0.90	7	9.73	9.90	0.058	0.052	0.65	0.11	0.006	11%					
10.00	0.75	0.17			0.040	0.90	8	9.90	10.08	0.040	0.036	0.58	0.10	0.004	7%					
10.15	0.77	0.16			0.040	0.90	9	10.08	10.20	0.040	0.036	0.61	0.08	0.003	5%					
10.25	0.76	0.18			0.046	0.90	10	10.20	10.33	0.046	0.041	0.58	0.07	0.003	5%					
10.40	0.85	0.18			0.055	0.90	11	10.33	10.48	0.055	0.049	0.67	0.10	0.005	9%					
10.55	0.80	0.20			0.052	0.90	12	10.48	10.63	0.052	0.047	0.60	0.09	0.004	8%					
10.70	0.83	0.19			0.040	0.90	13	10.63	10.78	0.040	0.036	0.64	0.10	0.003	6%					
10.85	0.75	0.19			0.046	0.90	14	10.78	10.93	0.046	0.041	0.56	0.08	0.003	6%					
11.00	0.77	0.17			0.058	0.90	15	10.93	11.10	0.058	0.052	0.60	0.10	0.005	10%					
11.20	0.70	0.15			0.049	0.90	16	11.10	11.28	0.049	0.044	0.55	0.10	0.004	8%					
11.35	0.65	0.17			0.034	0.90	17	11.28	11.45	0.034	0.030	0.48	0.08	0.003	5%					
11.55	0.58	0.18			0.040	0.90	18	11.45	11.63	0.040	0.036	0.40	0.07	0.002	5%					
11.70	0.50	0.17			0.055	0.90	19	11.63	11.78	0.055	0.049	0.33	0.05	0.002	4%					
11.85	0.43	0.17			0.027	0.90	20	11.78	11.93	0.027	0.025	0.26	0.04	0.001	2%					
12.00	0.50	0.15			0.030	0.90	21	11.93	12.10	0.030	0.027	0.35	0.06	0.002	3%					
12.20	0.35	0.13			0.040	0.90	22	12.10	12.28	0.040	0.036	0.22	0.04	0.001	3%					
12.35	0.25	0.10			0.006	0.90	23	12.28	12.40	0.006	0.005	0.15	0.02	0.000	0%					
12.45	0.15	0.09			0.027	0.90	24	12.40	12.53	0.027	0.025	0.06	0.01	0.000	0%					
12.60	0.10	0.05			0.003	0.90	25	12.53	12.80	0.003	0.003	0.05	0.01	0.000	0%					
13.00	0.00	0.00				0.90	26	12.80	13.00	0.001	0.001	0.01	0.00	0.000	0%					
Total Flow:														0.055	100%					

Total Flow:	0.055	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.66	(m ²)
Top Width:	4.80	(m)
Hydraulic Depth:	0.345	(m)
Mean Velocity:	0.033	(m/s)
Froude Number	0.018	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	10.95 V	
Data logger Memory Used:	100%	
Data logger Clock:	09:12	MST
Laptop Clock:	09:16	MST
Dessicant:	good	
Data logger:	203095	
PT:	1747	
Power:	Lakewood battery	

Notes: MMT taken under bridge
new battery installed
Water temp 0.2445 C



Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

Time of Measurement

Date of Measurement: January 14, 2008
Start Time: 4:35 PM MST
End Time: 4:52 PM MST

Weather Conditions:

River Conditions: Ice Covered, thin ice by bank. Broke through

Personnel & Equipment

Measurement Made By: JS/JMS/SM
Data Entry By: JMS checked SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

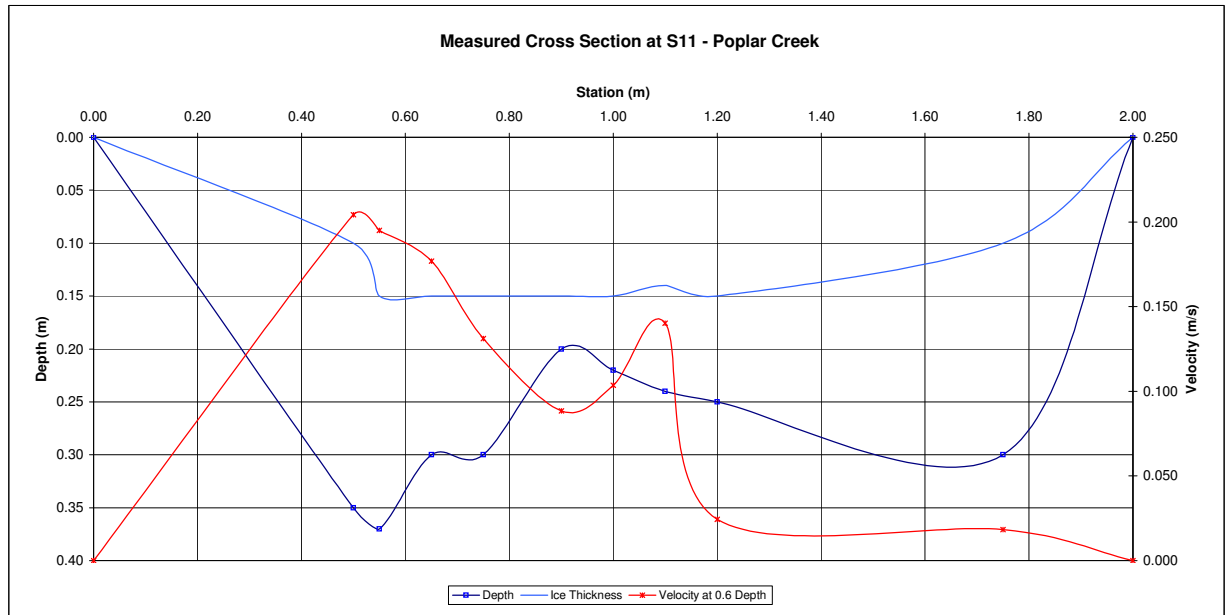
Level Readings and Measurements

Bench Mark Reading: ASCM Marker El: 242.081
Water Level Reading: 2.566 El: 240.839 2.526 El: 240.825 240.832
Top of Ice Level Reading: 2.505 El: 240.900 2.449 El: 240.902
Transducer Reading & Est. El.: El: 240.839 El: 240.825
Other: Rebar on LB 1.035 El: 242.370 0.981 El: 242.370

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	0.00	0.00	0.00		0.000	0.90	1	0.00	0.25	0.051	0.046	0.06	0.02	0.001	3%
	0.50	0.35	0.10		0.204	0.90	2	0.25	0.53	0.204	0.184	0.25	0.07	0.013	49%
	0.55	0.37	0.15		0.195	0.90	3	0.53	0.60	0.195	0.176	0.22	0.02	0.003	11%
	0.65	0.30	0.15		0.177	0.90	4	0.60	0.70	0.177	0.159	0.15	0.02	0.002	9%
	0.75	0.30	0.15		0.131	0.90	5	0.70	0.83	0.131	0.118	0.15	0.02	0.002	9%
	0.90	0.20	0.15		0.088	0.90	6	0.83	0.95	0.088	0.080	0.05	0.01	0.000	2%
	1.00	0.22	0.15		0.104	0.90	7	0.95	1.05	0.104	0.093	0.07	0.01	0.001	3%
	1.10	0.24	0.14		0.140	0.90	8	1.05	1.15	0.140	0.126	0.10	0.01	0.001	5%
	1.20	0.25	0.15		0.024	0.90	9	1.15	1.48	0.024	0.022	0.10	0.03	0.001	3%
	1.75	0.30	0.10		0.018	0.90	10	1.48	1.88	0.018	0.016	0.20	0.08	0.001	5%
RB	2.00	0.00	0.00		0.000	0.90	11	0.53	2.00	0.005	0.004	0.05	0.07	0.000	1%
Total Flow:														0.026	100%

Total Flow:	0.026	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	0.34	(m ²)
Top Width:	2.00	(m)
Hydraulic Depth:	0.172	(m)
Mean Velocity:	0.074	(m/s)
Froude Number	0.057	
Photographs taken looking at:		
Upstream, downstream, across		
Notes:		

Data logger Notes:	
Data logger Internal Power:	
Data logger External Power:	
Data logger Memory Used:	
Data logger Clock:	
Laptop Clock:	
Dessicant:	
Data logger:	Ultra Logger RX-1 s/n 203058
PT:	Keller 8363K s/n 101183
Power:	Lakewood battery



Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

Personnel & Equipment

Measurement Made By: sm sms jvr
Data Entry By: sm checked SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: February 11, 2008
Start Time: 12:30 PM MSt
End Time: 12:45 PM MSt

Level Readings and Measurements

Bench Mark Reading: ASCM Marker 1.474 El: 242.081 1.366 El: 242.081
Water Level Reading: 2.304 El: 241.251 2.205 El: 241.242 241.247
Top of Ice Level Reading: 1.869 El: 241.686 1.76 El: 241.687 241.687
Transducer Reading & Est. El.: El: 242.375 1.072 El: 242.375 242.375
Other: Rebar on LB 1.180 El: 242.375 1.072 El: 242.375 242.375

Weather Conditions:

large volumes of re-frozen surface water

River Conditions:

Measured Data						Measurement Data										Percenta ge of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective	Panel Effective Depth	Panel Area	Panel Discharge		
											Average				Panel Velocity	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
0.50	0.00	0.00			0.000	1.00	1	0.50	1.50	0.000	0.000	0.07	0.07	0.000	0%	
2.50	0.60	0.34			0.000	1.00	2	1.50	2.75	0.000	0.000	0.26	0.33	0.000	0%	
3.00	0.63	0.32			0.000	1.00	3	2.75	3.30	0.000	0.000	0.31	0.17	0.000	0%	
3.60	0.70	0.30			0.006	1.00	4	3.30	3.85	0.006	0.006	0.40	0.22	0.001	1%	
4.10	0.60	0.20			0.518	1.00	5	3.85	4.35	0.518	0.518	0.40	0.20	0.104	84%	
4.60	0.68	0.25			0.000	1.00	6	4.35	4.85	0.000	0.000	0.43	0.22	0.000	0%	
5.10	0.72	0.35			0.003	1.00	7	4.85	5.30	0.003	0.003	0.37	0.17	0.001	0%	
5.50	0.75	0.35			0.009	1.00	8	5.30	5.78	0.009	0.009	0.40	0.19	0.002	1%	
6.05	0.75	0.35			0.006	1.00	9	5.78	6.58	0.006	0.006	0.40	0.32	0.002	2%	
6.60	0.75	0.33			0.049	1.00	10	6.58	7.17	0.049	0.049	0.42	0.25	0.012	10%	
7.10	0.80	0.30			0.015	1.00	11	7.17	7.45	0.015	0.015	0.50	0.14	0.002	2%	
7.80	0.00	0.00			0.000	1.00	12	7.45	7.80	0.004	0.004	0.13	0.04	0.000	0%	
Total Flow:														0.123	100%	

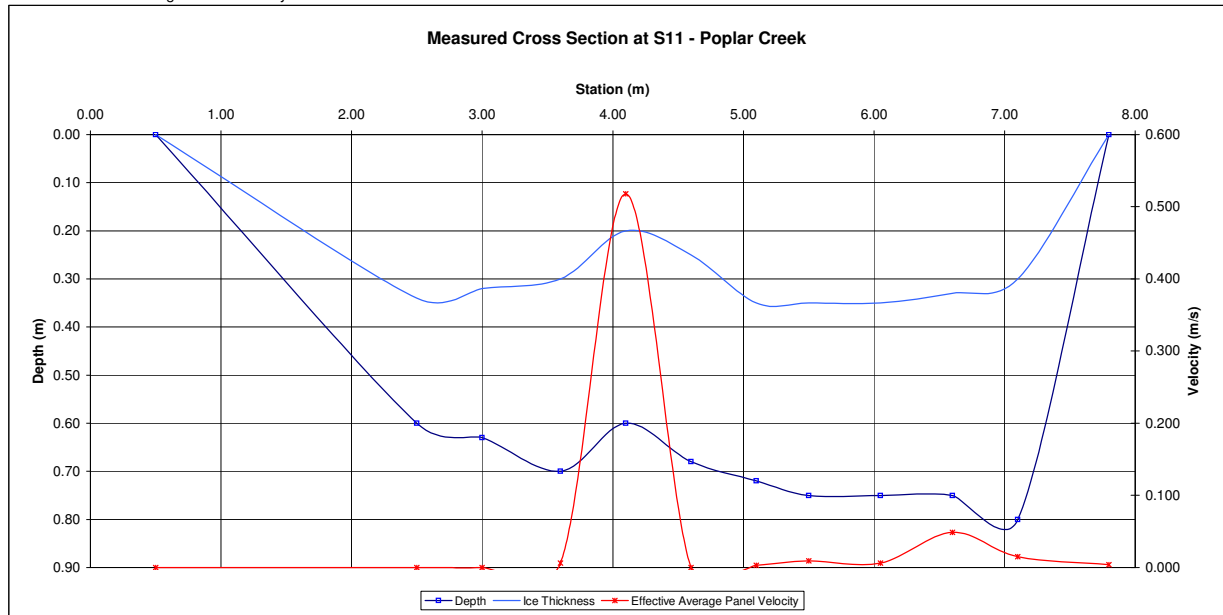
Total Flow:	0.123	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	2.31	(m ²)
Top Width:	7.30	(m)
Hydraulic Depth:	0.316	(m)
Mean Velocity:	0.054	(m/s)
Froude Number	0.030	
Photographs taken looking at:		
Upstream, downstream, across		

Notes:

large amounts of water saturated the channel snowpack then refroze
there is one localized under-ice channel visibly moving large volumes of water
adjacent to this channel is thick slush with a marginal space between the bottom of the channel and the bottom of this slush layer
flow is higher than January

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger: Ultra Logger RX-1 s/n 203058
PT: Keller 8363K s/n 101183
Power: Lakewood battery



Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

Time of Measurement

Date of Measurement: March 8, 2008
Start Time: 4:00 PM MST
End Time: 4:15 PM MST

Weather Conditions:

-10C clear light wind
River Conditions: perched ice

Personnel & Equipment

Measurement Made By: sm sms jvr checked by: lm
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: ASCM Marker 1.483 El: 242.081 1.366 El: 242.081
Water Level Reading: 2.610 El: 240.954 2.491 El: 240.956 240.955
Top of Ice Level Reading: 1.994 El: 241.570 1.87 El: 241.577
Transducer Reading & Est. El.: El: 240.954 El: 240.956
Other: Rebar on LB 1.201 El: 242.363 1.08 El: 242.367 242.365

		Measured Data						Measurement Data									Calculated Data				Percenta ge of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge						
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)						
RB	0.30	0.00				0.000	0.90	1	0.30	0.45	0.050	0.045	0.03	0.00	0.000	0%					
	0.60	0.10				0.201	0.90	2	0.45	0.68	0.201	0.181	0.10	0.02	0.004	4%					
	0.75	0.10				0.262	0.90	3	0.68	0.88	0.262	0.236	0.10	0.02	0.005	4%					
	1.00	0.15				0.198	0.90	4	0.88	1.10	0.198	0.178	0.15	0.03	0.006	6%					
	1.20	0.15				0.235	0.90	5	1.10	1.37	0.235	0.211	0.15	0.04	0.009	8%					
	1.54	0.15				0.299	0.90	6	1.37	1.63	0.299	0.269	0.15	0.04	0.010	9%					
	1.71	0.15				0.247	0.90	7	1.63	1.88	0.247	0.222	0.15	0.04	0.008	8%					
	2.05	0.20				0.219	0.90	8	1.88	2.13	0.219	0.198	0.20	0.05	0.010	9%					
	2.20	0.20				0.165	0.90	9	2.13	2.33	0.165	0.148	0.20	0.04	0.006	5%					
	2.45	0.20				0.165	0.90	10	2.33	2.53	0.165	0.148	0.20	0.04	0.006	5%					
	2.60	0.20				0.110	0.90	11	2.53	2.74	0.110	0.099	0.20	0.04	0.004	4%					
	2.87	0.25				0.143	0.90	12	2.74	2.95	0.143	0.129	0.25	0.05	0.007	6%					
	3.02	0.25				0.165	0.90	13	2.95	3.16	0.165	0.148	0.25	0.05	0.008	7%					
	3.30	0.25				0.189	0.90	14	3.16	3.38	0.189	0.170	0.25	0.05	0.009	8%					
	3.45	0.25				0.192	0.90	15	3.38	3.60	0.192	0.173	0.25	0.06	0.010	9%					
	3.75	0.15				0.180	0.90	16	3.60	3.83	0.180	0.162	0.15	0.03	0.005	5%					
	3.90	0.20				0.049	0.90	17	3.83	4.00	0.049	0.044	0.20	0.04	0.002	1%					
	4.10	0.00				0.000	0.90	18	4.00	4.10	0.012	0.011	0.05	0.00	0.000	0%					
LB	Total Flow:															0.109	100%				

Total Flow:	0.109	(m ³ /s)
Perceived Measurement Quality:	good	
Total Area:	0.66	(m ²)
Top Width:	3.80	(m)
Hydraulic Depth:	0.173	(m)
Mean Velocity:	0.165	(m/s)
Froude Number	0.127	
Photographs taken looking at: Upstream, downstream, across		
Notes:		

perched ice

Data logger Notes:

Data logger Internal Power:

Data logger External Power:

Data logger Memory Used:

Data logger Clock:

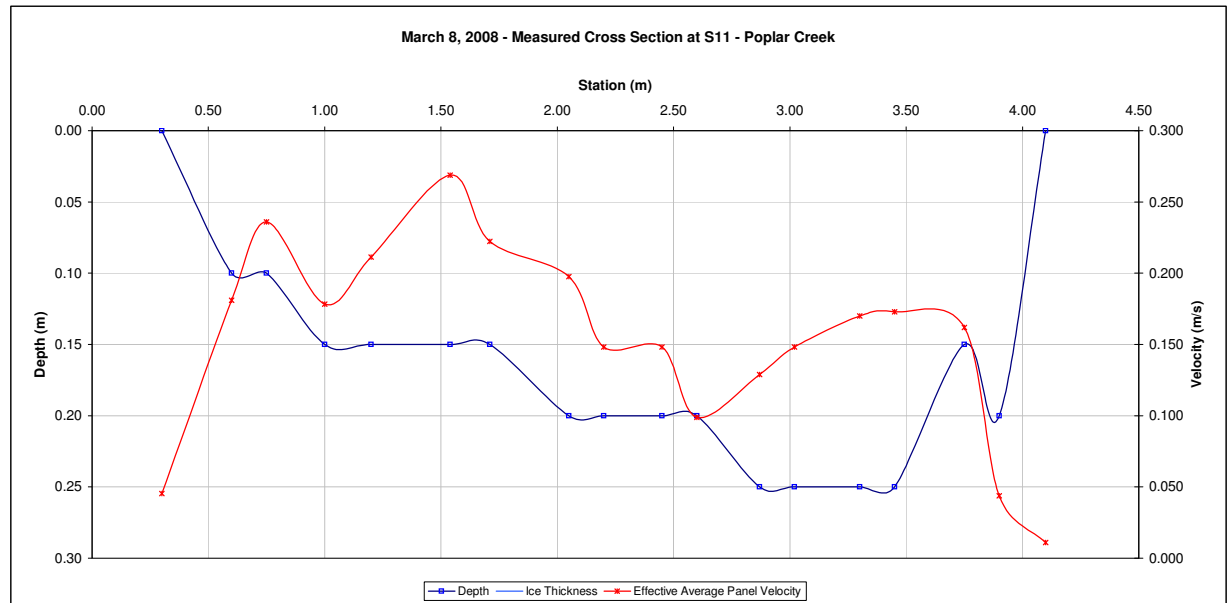
Laptop Clock:

Dessicant:

Data logger: Ultra Logger RX-1 s/n 203058

PT: Keller 8363K s/n 101183

Power: Lakewood battery



Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

Time of Measurement

Date of Measurement: April 1, 2008
Start Time: 5:50 PM MSt
End Time: 6:05 PM MSt

Weather Conditions:

3C clear light wind
River Conditions: perched ice

Personnel & Equipment

Measurement Made By: sm js
Data Entry By: sm checked SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: ASCM Marker El: 242.081
Water Level Reading: 2.549 El: 240.880 2.541 El: 240.878 240.879
Top of Ice Level Reading: 1.849 El: 241.580 1.841 El: 241.578
Transducer Reading & Est. El.: El: 240.880 El: 240.878
Other: Rebar on LB 1.059 El: 242.370 1.049 El: 242.370

		Measurement Data														
Measured Data						Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB		1.20	0.00	0.00		0.000	0.90	1	1.20	1.40	0.062	0.056	0.03	0.01	0.000	0%
		1.60	0.11	0.00		0.250	0.90	2	1.40	1.70	0.250	0.225	0.11	0.03	0.007	6%
		1.80	0.10	0.00		0.341	0.90	3	1.70	2.23	0.341	0.307	0.10	0.05	0.016	13%
		2.65	0.18	0.07		0.006	0.90	4	2.23	2.68	0.006	0.005	0.11	0.05	0.000	0%
		2.70	0.22	0.10		0.088	0.90	5	2.68	2.95	0.088	0.080	0.12	0.03	0.003	2%
		3.20	0.35	0.10		0.094	0.90	6	2.95	3.33	0.094	0.085	0.25	0.09	0.008	6%
		3.45	0.50	0.15		0.085	0.90	7	3.33	3.55	0.085	0.077	0.35	0.08	0.006	5%
		3.65	0.56	0.15		0.104	0.90	8	3.55	3.75	0.104	0.093	0.41	0.08	0.008	6%
		3.85	0.60	0.02		0.308	0.90	9	3.75	3.93	0.308	0.277	0.58	0.10	0.028	22%
		4.00	0.59	0.02		0.277	0.90	10	3.93	4.25	0.277	0.250	0.57	0.19	0.046	37%
LB		4.50	0.00	0.00		0.000	0.90	11	4.25	4.50	0.069	0.062	0.14	0.04	0.002	2%
	Total Flow:														0.125	100%

Total Flow:	0.125	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	0.75	(m ²)
Top Width:	3.30	(m)
Hydraulic Depth:	0.227	(m)
Mean Velocity:	0.167	(m/s)
Froude Number	0.112	
Photographs taken looking at: Upstream, downstream, across		
Notes:		

ice very thick, but flow very shallow

Data logger Notes:

Data logger Internal Power:

Data logger External Power:

Data logger Memory Used:

Data logger Clock:

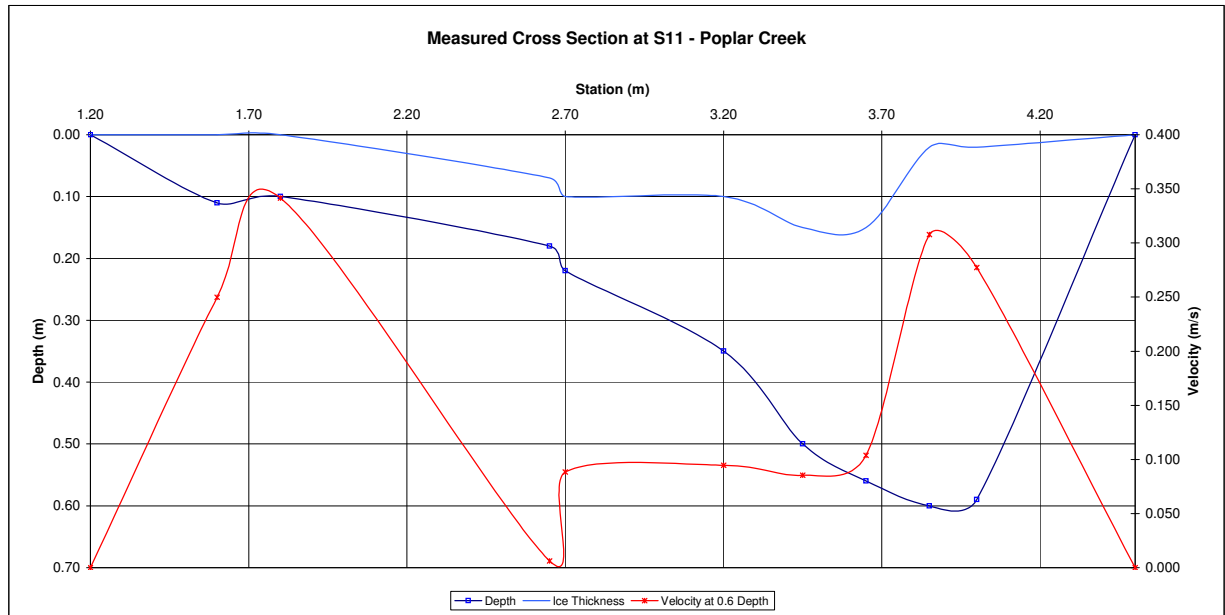
Laptop Clock:

Dessicant:

Data logger: Ultra Logger RX-1 s/n 203058

PT: Keller 8363K s/n 101183

Power: Lakewood battery



Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

Time of Measurement

Date of Measurement: May 14, 2008
Start Time: 6:30 PM MDT
End Time: 7:00 PM MDT

Weather Conditions:

part cloud, light wind, 10 C

River Conditions:

bank full, open, turbulent

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

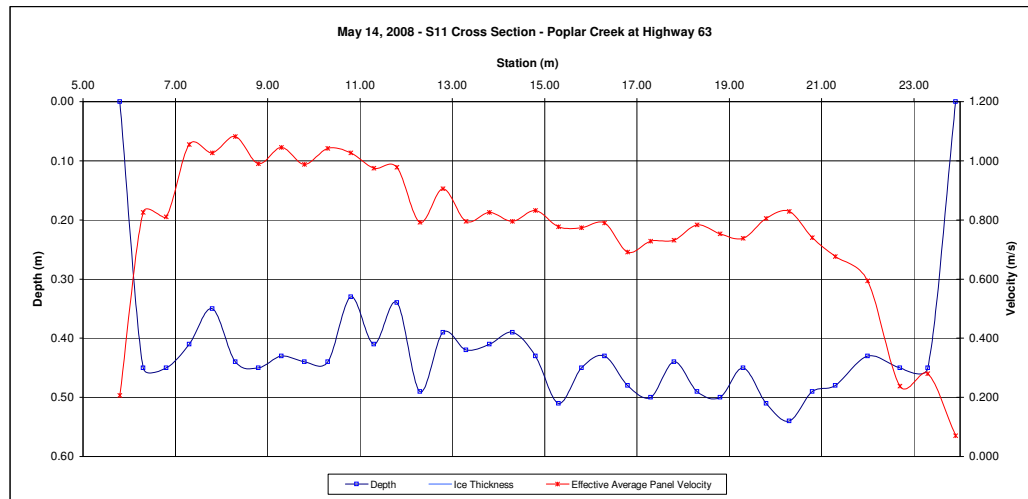
Bench Mark Reading: ASCM Marker 1.278 El: 242.081 1.26 El: 242.081
Water Level Reading: 1.999 El: 241.360 1.974 El: 241.367 241.364
Top of Ice Level Reading: El: 243.359 El: 243.341
Transducer Reading & Est. El.: 0.548 El: 240.812 0.548 El: 240.819 240.816
Other: Rebar on LB 0.994 El: 242.365 0.977 El: 242.364 242.365

	Measured Data					Measurement Data										Calculated Data					Percentage of Total
	Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m²)	Panel Discharge (m³/s)						
LB	5.80	0.00				1.00	1	5.80	6.05	0.207	0.207	0.11	0.03	0.006	0%						
	6.30	0.45			0.826	1.00	2	6.05	6.55	0.826	0.826	0.45	0.23	0.186	3%						
	6.80	0.45			0.811	1.00	3	6.55	7.05	0.811	0.811	0.45	0.23	0.182	3%						
	7.30	0.41			1.055	1.00	4	7.05	7.55	1.055	1.055	0.41	0.21	0.216	3%						
	7.80	0.35			1.027	1.00	5	7.55	8.05	1.027	1.027	0.35	0.18	0.180	3%						
	8.30	0.44			1.082	1.00	6	8.05	8.55	1.082	1.082	0.44	0.22	0.238	4%						
	8.80	0.45			0.991	1.00	7	8.55	9.05	0.991	0.991	0.45	0.23	0.223	4%						
	9.30	0.43			1.045	1.00	8	9.05	9.55	1.045	1.045	0.43	0.22	0.225	4%						
	9.80	0.44			0.988	1.00	9	9.55	10.05	0.988	0.988	0.44	0.22	0.217	3%						
	10.30	0.44			1.042	1.00	10	10.05	10.55	1.042	1.042	0.44	0.22	0.229	4%						
	10.80	0.33			1.027	1.00	11	10.55	11.05	1.027	1.027	0.33	0.17	0.169	3%						
	11.30	0.41			0.975	1.00	12	11.05	11.55	0.975	0.975	0.41	0.21	0.200	3%						
	11.80	0.34			0.978	1.00	13	11.55	12.05	0.978	0.978	0.34	0.17	0.166	3%						
	12.30	0.49			0.792	1.00	14	12.05	12.55	0.792	0.792	0.49	0.25	0.194	3%						
	12.80	0.39			0.905	1.00	15	12.55	13.05	0.905	0.905	0.39	0.20	0.177	3%						
	13.30	0.42			0.796	1.00	16	13.05	13.55	0.796	0.796	0.42	0.21	0.167	3%						
	13.80	0.41			0.826	1.00	17	13.55	14.05	0.826	0.826	0.41	0.21	0.169	3%						
	14.30	0.39			0.796	1.00	18	14.05	14.55	0.796	0.796	0.39	0.20	0.155	2%						
	14.80	0.43			0.832	1.00	19	14.55	15.05	0.832	0.832	0.43	0.22	0.179	3%						
	15.30	0.51			0.777	1.00	20	15.05	15.55	0.777	0.777	0.51	0.26	0.198	3%						
	15.80	0.45			0.774	1.00	21	15.55	16.05	0.774	0.774	0.45	0.23	0.174	3%						
	16.30	0.43			0.789	1.00	22	16.05	16.55	0.789	0.789	0.43	0.22	0.170	3%						
	16.80	0.48			0.692	1.00	23	16.55	17.05	0.692	0.692	0.48	0.24	0.166	3%						
	17.30	0.50			0.728	1.00	24	17.05	17.55	0.728	0.728	0.50	0.25	0.182	3%						
	17.80	0.44			0.732	1.00	25	17.55	18.05	0.732	0.732	0.44	0.22	0.161	3%						
	18.30	0.49			0.783	1.00	26	18.05	18.55	0.783	0.783	0.49	0.25	0.192	3%						
	18.80	0.50			0.753	1.00	27	18.55	19.05	0.753	0.753	0.50	0.25	0.188	3%						
	19.30	0.45			0.738	1.00	28	19.05	19.55	0.738	0.738	0.45	0.23	0.166	3%						
	19.80	0.51			0.805	1.00	29	19.55	20.05	0.805	0.805	0.51	0.26	0.205	3%						
	20.30	0.54			0.829	1.00	30	20.05	20.55	0.829	0.829	0.54	0.27	0.224	4%						
	20.80	0.49			0.741	1.00	31	20.55	21.05	0.741	0.741	0.49	0.25	0.181	3%						
	21.30	0.48			0.677	1.00	32	21.05	21.65	0.677	0.677	0.48	0.29	0.195	3%						
	22.00	0.43			0.594	1.00	33	21.65	22.35	0.594	0.594	0.43	0.30	0.179	3%						
	22.70	0.45			0.238	1.00	34	22.35	23.00	0.238	0.238	0.45	0.29	0.070	1%						
	23.30	0.45			0.280	1.00	35	23.00	23.60	0.280	0.280	0.45	0.27	0.076	1%						
	23.90	0.00				1.00	36	23.60	23.90	0.070	0.070	0.11	0.03	0.002	0%						
RB																					

Total Flow:	6.208	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	7.84	(m²)
Top Width:	18.10	(m)
Hydraulic Depth:	0.433	(m)
Mean Velocity:	0.792	(m/s)
Froude Number	0.384	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	11.8 V	76%
Data logger Memory Used:	0%	
Data logger Clock:	6:06 PM	MST
Laptop Clock:	6:06 PM	MST
Dessicant:	change asap	
Data logger:	41045-0406	
PT:		
Power:	Lakewood battery	

Notes: TD installed near previous location



Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E
NE-24-91-19-W4

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: June 25, 2008
Start Time: 8:23 AM MDT
End Time: 8:40 AM MDT

Level Readings and Measurements

Bench Mark Reading: 1.443
Water Level Reading: 2.410
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.294
Other: Rebar on LB 1.150

Setup 1

El.: 242.081
El.: 241.114
El.:
El.: 240.820
El.: 242.374

Setup 2

El.: 242.081
El.: 241.106
El.:
El.: 240.812
El.: 242.372

Average

241.110
240.816
242.372

Weather Conditions: part cloud, sunny, 17 C
River Conditions: open

Measurement Data

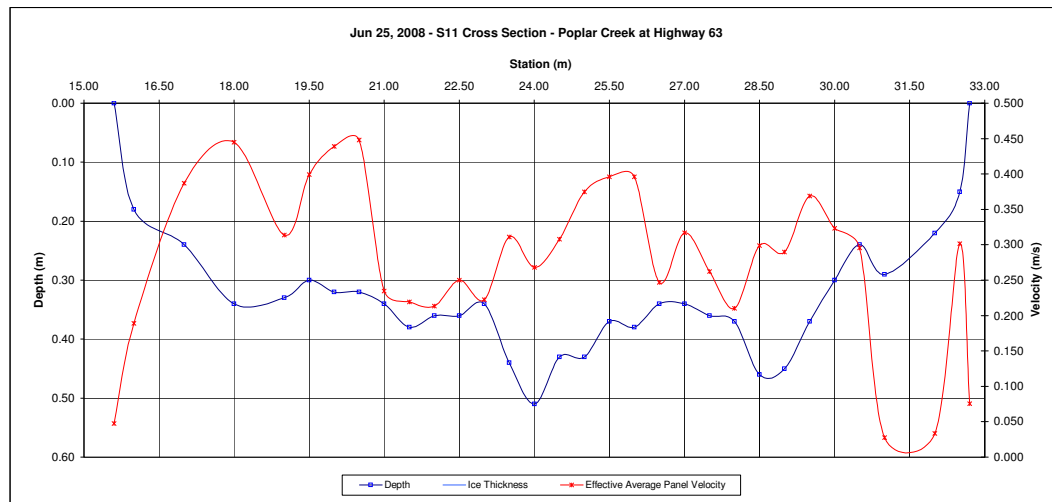
	Measured Data						Calculated Data								Percentage of Total	
	Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m ²)		Panel Discharge (m ³ /s)
LB	15.60	0.00					1.00	1	15.60	15.80	0.047	0.047	0.05	0.01	0.000	0%
	16.00	0.18				0.189	1.00	2	15.80	16.50	0.189	0.189	0.18	0.13	0.024	1%
	17.00	0.24				0.387	1.00	3	16.50	17.50	0.387	0.387	0.24	0.24	0.093	6%
	18.00	0.34				0.445	1.00	4	17.50	18.50	0.445	0.445	0.34	0.34	0.151	9%
	19.00	0.33				0.314	1.00	5	18.50	19.25	0.314	0.314	0.33	0.25	0.078	5%
	19.50	0.30				0.399	1.00	6	19.25	19.75	0.399	0.399	0.30	0.15	0.060	4%
	20.00	0.32				0.439	1.00	7	19.75	20.25	0.439	0.439	0.32	0.16	0.070	4%
	20.50	0.32				0.448	1.00	8	20.25	20.75	0.448	0.448	0.32	0.16	0.072	4%
	21.00	0.34				0.235	1.00	9	20.75	21.25	0.235	0.235	0.34	0.17	0.040	2%
	21.50	0.38				0.219	1.00	10	21.25	21.75	0.219	0.219	0.38	0.19	0.042	2%
	22.00	0.36				0.213	1.00	11	21.75	22.25	0.213	0.213	0.36	0.18	0.038	2%
	22.50	0.36				0.250	1.00	12	22.25	22.75	0.250	0.250	0.36	0.18	0.045	3%
	23.00	0.34				0.223	1.00	13	22.75	23.25	0.223	0.223	0.34	0.17	0.038	2%
	23.50	0.44				0.311	1.00	14	23.25	23.75	0.311	0.311	0.44	0.22	0.068	4%
	24.00	0.51				0.268	1.00	15	23.75	24.25	0.268	0.268	0.51	0.26	0.068	4%
	24.50	0.43				0.308	1.00	16	24.25	24.75	0.308	0.308	0.43	0.22	0.066	4%
	25.00	0.43				0.375	1.00	17	24.75	25.25	0.375	0.375	0.43	0.22	0.081	5%
	25.50	0.37				0.396	1.00	18	25.25	25.75	0.396	0.396	0.37	0.19	0.073	4%
	26.00	0.38				0.396	1.00	19	25.75	26.25	0.396	0.396	0.38	0.19	0.075	4%
	26.50	0.34				0.247	1.00	20	26.25	26.75	0.247	0.247	0.34	0.17	0.042	3%
	27.00	0.34				0.317	1.00	21	26.75	27.25	0.317	0.317	0.34	0.17	0.054	3%
	27.50	0.36				0.262	1.00	22	27.25	27.75	0.262	0.262	0.36	0.18	0.047	3%
	28.00	0.37				0.210	1.00	23	27.75	28.25	0.210	0.210	0.37	0.19	0.039	2%
	28.50	0.46				0.299	1.00	24	28.25	28.75	0.299	0.299	0.46	0.23	0.069	4%
	29.00	0.45				0.290	1.00	25	28.75	29.25	0.290	0.290	0.45	0.23	0.065	4%
	29.50	0.37				0.369	1.00	26	29.25	29.75	0.369	0.369	0.37	0.19	0.068	4%
	30.00	0.30				0.323	1.00	27	29.75	30.25	0.323	0.323	0.30	0.15	0.048	3%
	30.50	0.24				0.296	1.00	28	30.25	30.75	0.296	0.296	0.24	0.12	0.035	2%
	31.00	0.29				0.027	1.00	29	30.75	31.50	0.027	0.027	0.29	0.22	0.006	0%
		32.00	0.22			0.034	1.00	30	31.50	32.25	0.034	0.034	0.22	0.17	0.006	0%
		32.50	0.15			0.302	1.00	31	32.25	32.60	0.302	0.302	0.15	0.05	0.016	1%
	RB	32.70	0.00				1.00	32	32.60	32.70	0.075	0.075	0.04	0.00	0.000	0%
Total Flow:															1.679	1.000

Total Flow:	1.679	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	5.66	(m ²)
Top Width:	17.10	(m)
Hydraulic Depth:	0.331	(m)
Mean Velocity:	0.297	(m/s)
Froude Number	0.165	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power: 11.34 V 100%
Data logger External Power: 11.44 V 74%
Data logger Memory Used: 45%
Data logger Clock: 7:13 AM MST
Laptop Clock: 7:14 AM MST
Dessicant: new
Data logger:
PT: 101183
Power:

Notes:



Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E
NE-24-91-19-W4

Personnel & Equipment

Measurement Made By: SM/LM
Data Entry By: DW Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: August 6, 2008
Start Time: 8:45 AM MDT
End Time: 8:51 AM MDT

Level Readings and Measurements

Bench Mark Reading: 1.273
Water Level Reading: 2.393
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.156
Other: Rebar on LB 0.985

Setup 1

El.: 242.081
El.: 240.961
El.:
El.: 240.805
El.: 242.369

Setup 2

El.: 242.081
El.: 240.963
El.:
El.: 240.807
El.: 242.369

Average

240.962
240.806
242.369

Weather Conditions: hot, sunny
River Conditions: open

Measurement Data

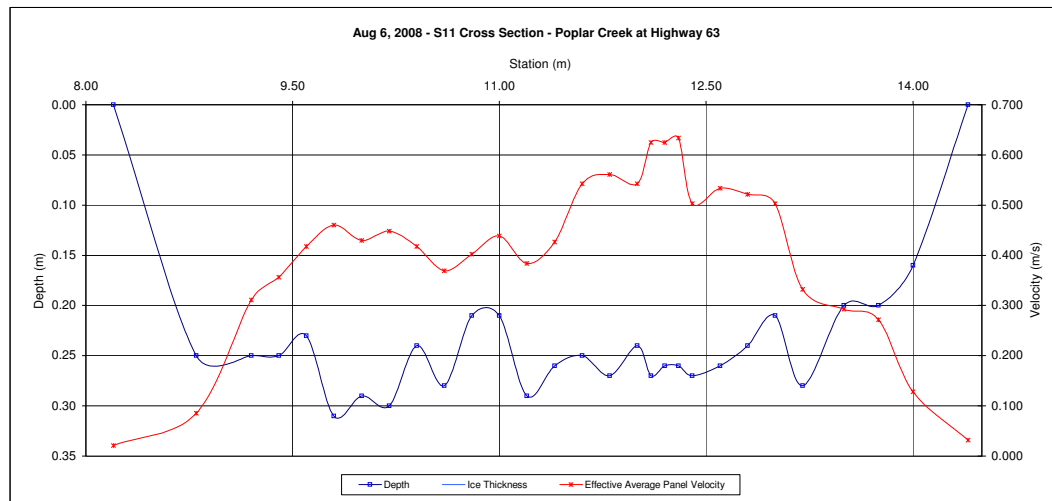
	Measured Data						Calculated Data								Percentage of Total	
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area		Panel Discharge
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
RB	8.20	0.00					1.00	1	8.20	8.50	0.021	0.021	0.06	0.02	0.000	0%
	8.80	0.25			0.085	1.00	2	8.50	9.00	0.085	0.085	0.25	0.13	0.011	2%	
	9.20	0.25			0.311	1.00	3	9.00	9.30	0.311	0.311	0.25	0.08	0.023	4%	
	9.40	0.25			0.357	1.00	4	9.30	9.50	0.357	0.357	0.25	0.05	0.018	3%	
	9.60	0.23			0.418	1.00	5	9.50	9.70	0.418	0.418	0.23	0.05	0.019	3%	
	9.80	0.31			0.460	1.00	6	9.70	9.90	0.460	0.460	0.31	0.06	0.029	5%	
	10.00	0.29			0.430	1.00	7	9.90	10.10	0.430	0.430	0.29	0.06	0.025	5%	
	10.20	0.30			0.448	1.00	8	10.10	10.30	0.448	0.448	0.30	0.06	0.027	5%	
	10.40	0.24			0.418	1.00	9	10.30	10.50	0.418	0.418	0.24	0.05	0.020	4%	
	10.60	0.28			0.369	1.00	10	10.50	10.70	0.369	0.369	0.28	0.06	0.021	4%	
	10.80	0.21			0.402	1.00	11	10.70	10.90	0.402	0.402	0.21	0.04	0.017	3%	
	11.00	0.21			0.439	1.00	12	10.90	11.10	0.439	0.439	0.21	0.04	0.018	3%	
	11.20	0.29			0.384	1.00	13	11.10	11.30	0.384	0.384	0.29	0.06	0.022	4%	
	11.40	0.26			0.427	1.00	14	11.30	11.50	0.427	0.427	0.26	0.05	0.022	4%	
	11.60	0.25			0.543	1.00	15	11.50	11.70	0.543	0.543	0.25	0.05	0.027	5%	
	11.80	0.27			0.561	1.00	16	11.70	11.90	0.561	0.561	0.27	0.05	0.030	5%	
	12.00	0.24			0.543	1.00	17	11.90	12.05	0.543	0.543	0.24	0.04	0.020	4%	
	12.10	0.27			0.625	1.00	18	12.05	12.15	0.625	0.625	0.27	0.03	0.017	3%	
	12.20	0.26			0.625	1.00	19	12.15	12.25	0.625	0.625	0.26	0.03	0.016	3%	
	12.30	0.26			0.634	1.00	20	12.25	12.35	0.634	0.634	0.26	0.03	0.016	3%	
	12.40	0.27			0.503	1.00	21	12.35	12.50	0.503	0.503	0.27	0.04	0.020	4%	
	12.60	0.26			0.533	1.00	22	12.50	12.70	0.533	0.533	0.26	0.05	0.028	5%	
	12.80	0.24			0.521	1.00	23	12.70	12.90	0.521	0.521	0.24	0.05	0.025	5%	
	13.00	0.21			0.503	1.00	24	12.90	13.10	0.503	0.503	0.21	0.04	0.021	4%	
	13.20	0.28			0.332	1.00	25	13.10	13.35	0.332	0.332	0.28	0.07	0.023	4%	
	13.50	0.20			0.293	1.00	26	13.35	13.63	0.293	0.293	0.20	0.06	0.016	3%	
	13.75	0.20			0.271	1.00	27	13.63	13.88	0.271	0.271	0.20	0.05	0.014	2%	
	14.00	0.16			0.128	1.00	28	13.88	14.20	0.128	0.128	0.16	0.05	0.007	1%	
LB	14.40	0.00			0.000	1.00	29	14.20	14.40	0.032	0.032	0.04	0.01	0.000	0%	
Total Flow:															0.553	1.000

Total Flow:	0.553	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.43	(m ²)
Top Width:	6.20	(m)
Hydraulic Depth:	0.231	(m)
Mean Velocity:	0.387	(m/s)
Froude Number	0.257	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power: 11.34 V 100%
Data logger External Power: 11.19 V 72%
Data logger Memory Used: 80% used
Data logger Clock: 7:10 AM MST
Laptop Clock: 7:10 AM MST
Dessicant: new
Data logger: 410 45 0406
PT: 101183
Power:

Notes: Water Temp. 18.11 C



Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E
NE-24-91-19-W4

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: September 13, 2008
Start Time: 6:05 PM MDT
End Time: 6:20 PM MDT

Level Readings and Measurements

Bench Mark Reading: ASCM Marker
Water Level Reading: 1.312
Top of Ice Level Reading: 2.310
Transducer Reading & Est. El.: 0.263
Other: Rebar on LB 1.022

Setup 1

El: 242.081
El: 241.083
El: 240.820
El: 242.371

Setup 2

El: 1.295
El: 242.081
El: 241.086
El: 240.823
El: 242.371

Average

241.085
240.822
242.371

Weather Conditions:

cloudy, 18 C

River Conditions:

open, faster than last month

Measurement Data

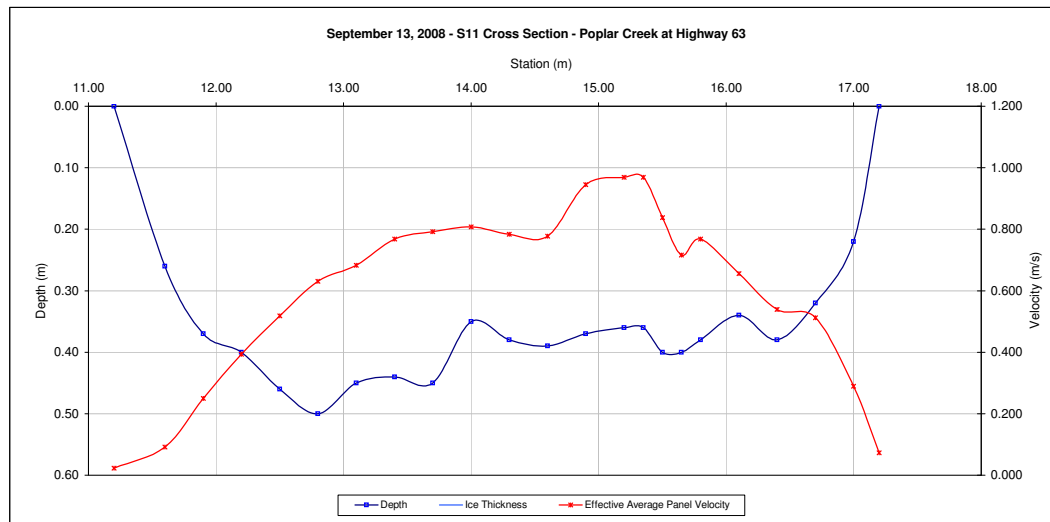
Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
11.20	0.00					1.00	1	11.20	11.40	0.023	0.023	0.07	0.01	0.000	0%
11.60	0.26				0.091	1.00	2	11.40	11.75	0.091	0.091	0.26	0.09	0.008	1%
11.90	0.37				0.250	1.00	3	11.75	12.05	0.250	0.250	0.37	0.11	0.028	2%
12.20	0.40				0.393	1.00	4	12.05	12.35	0.393	0.393	0.40	0.12	0.047	3%
12.50	0.46				0.518	1.00	5	12.35	12.65	0.518	0.518	0.46	0.14	0.072	5%
12.80	0.50				0.631	1.00	6	12.65	12.95	0.631	0.631	0.50	0.15	0.095	7%
13.10	0.45				0.683	1.00	7	12.95	13.25	0.683	0.683	0.45	0.14	0.092	7%
13.40	0.44				0.768	1.00	8	13.25	13.55	0.768	0.768	0.44	0.13	0.101	7%
13.70	0.45				0.792	1.00	9	13.55	13.85	0.792	0.792	0.45	0.14	0.107	8%
14.00	0.35				0.808	1.00	10	13.85	14.15	0.808	0.808	0.35	0.11	0.085	6%
14.30	0.38				0.783	1.00	11	14.15	14.45	0.783	0.783	0.38	0.11	0.089	6%
14.60	0.39				0.777	1.00	12	14.45	14.75	0.777	0.777	0.39	0.12	0.091	6%
14.90	0.37				0.945	1.00	13	14.75	15.05	0.945	0.945	0.37	0.11	0.105	7%
15.20	0.36				0.969	1.00	14	15.05	15.28	0.969	0.969	0.36	0.08	0.079	6%
15.35	0.36				0.969	1.00	15	15.28	15.43	0.969	0.969	0.36	0.05	0.052	4%
15.50	0.40				0.838	1.00	16	15.43	15.58	0.838	0.838	0.40	0.06	0.050	4%
15.65	0.40				0.716	1.00	17	15.58	15.73	0.716	0.716	0.40	0.06	0.043	3%
15.80	0.38				0.768	1.00	18	15.73	15.95	0.768	0.768	0.38	0.09	0.066	5%
16.10	0.34				0.655	1.00	19	15.95	16.25	0.655	0.655	0.34	0.10	0.067	5%
16.40	0.38				0.539	1.00	20	16.25	16.55	0.539	0.539	0.38	0.11	0.062	4%
16.70	0.32				0.512	1.00	21	16.55	16.85	0.512	0.512	0.32	0.10	0.049	4%
17.00	0.22				0.290	1.00	22	16.85	17.10	0.290	0.290	0.22	0.06	0.016	1%
17.20	0.00					1.00	23	17.10	17.20	0.072	0.072	0.06	0.01	0.000	0%
Total Flow:														1.404	1.000

Total Flow:	1.404	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.19	(m ²)
Top Width:	6.00	(m)
Hydraulic Depth:	0.364	(m)
Mean Velocity:	0.642	(m/s)
Froude Number	0.340	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power: 11.16 V
Data logger External Power: 10.95 V
Data logger Memory Used: 30%
Data logger Clock: 4:55 PM MST
Laptop Clock: 4:55 PM MST
Dessicant: NEW
Data logger: 410 45 0406
PT: 101183
Power:

Notes: Water Temp. 13.6 C
new external battery installed, voltage 12.35 V



Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E
NE-24-91-19-W4

Personnel & Equipment

Measurement Made By: SM/JSL
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: October 14, 2008
Start Time: 8:30 AM MDT
End Time: 8:40 AM MDT

Level Readings and Measurements

Bench Mark Reading: ASCM Marker
Water Level Reading: 1.260
Top of Ice Level Reading: 2.318
Transducer Reading & Est. El.: 0.206
Other: Rebar on LB 0.972

Setup 1

El: 242.081
El: 241.023
El: 240.817
El: 242.369

Setup 2

El: 242.081
El: 241.024
El: 240.818
El: 242.368

Average

241.024
240.818
242.369

Weather Conditions:

rain

River Conditions:

open, low

Measurement Data

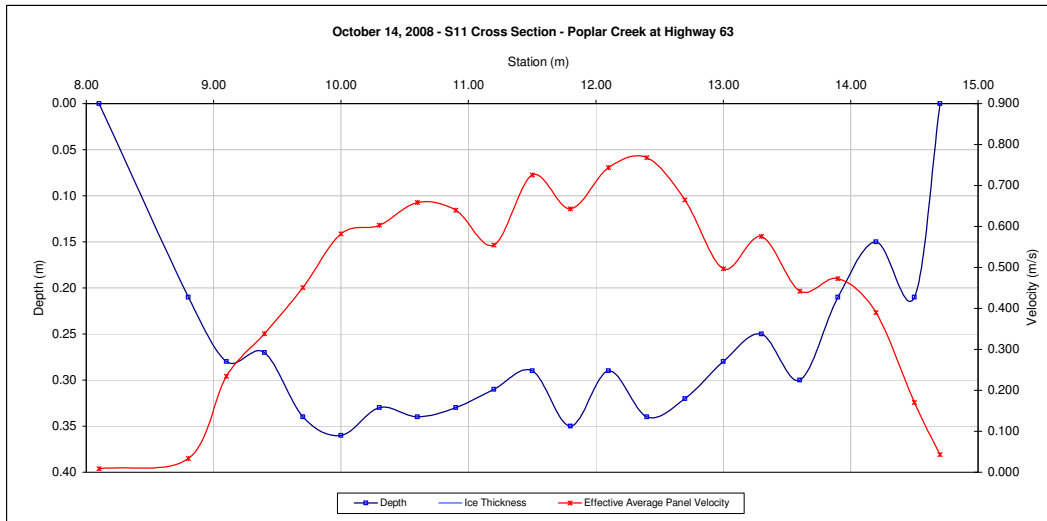
Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	8.10	0.00				1.00	1	8.10	8.45	0.008	0.008	0.05	0.02	0.000	0%
	8.80	0.21			0.034	1.00	2	8.45	8.95	0.034	0.034	0.21	0.11	0.004	0%
	9.10	0.28			0.235	1.00	3	8.95	9.25	0.235	0.235	0.28	0.08	0.020	2%
	9.40	0.27			0.338	1.00	4	9.25	9.55	0.338	0.338	0.27	0.08	0.027	3%
	9.70	0.34			0.451	1.00	5	9.55	9.85	0.451	0.451	0.34	0.10	0.046	5%
	10.00	0.36			0.582	1.00	6	9.85	10.15	0.582	0.582	0.36	0.11	0.063	7%
	10.30	0.33			0.604	1.00	7	10.15	10.45	0.604	0.604	0.33	0.10	0.060	6%
	10.60	0.34			0.658	1.00	8	10.45	10.75	0.658	0.658	0.34	0.10	0.067	7%
	10.90	0.33			0.640	1.00	9	10.75	11.05	0.640	0.640	0.33	0.10	0.063	7%
	11.20	0.31			0.555	1.00	10	11.05	11.35	0.555	0.555	0.31	0.09	0.052	6%
	11.50	0.29			0.725	1.00	11	11.35	11.65	0.725	0.725	0.29	0.09	0.063	7%
	11.80	0.35			0.643	1.00	12	11.65	11.95	0.643	0.643	0.35	0.11	0.068	7%
	12.10	0.29			0.744	1.00	13	11.95	12.25	0.744	0.744	0.29	0.09	0.065	7%
	12.40	0.34			0.768	1.00	14	12.25	12.55	0.768	0.768	0.34	0.10	0.078	9%
	12.70	0.32			0.664	1.00	15	12.55	12.85	0.664	0.664	0.32	0.10	0.064	7%
	13.00	0.28			0.497	1.00	16	12.85	13.15	0.497	0.497	0.28	0.08	0.042	5%
	13.30	0.25			0.576	1.00	17	13.15	13.45	0.576	0.576	0.25	0.07	0.043	5%
	13.60	0.30			0.442	1.00	18	13.45	13.75	0.442	0.442	0.30	0.09	0.040	4%
	13.90	0.21			0.472	1.00	19	13.75	14.05	0.472	0.472	0.21	0.06	0.030	3%
	14.20	0.15			0.390	1.00	20	14.05	14.35	0.390	0.390	0.15	0.04	0.018	2%
LB	14.50	0.21			0.171	1.00	21	14.35	14.60	0.171	0.171	0.21	0.05	0.009	1%
	14.70	0.00				1.00	22	14.60	14.70	0.043	0.043	0.05	0.01	0.000	0%
Total Flow:														0.920	1.000

Total Flow:	0.920	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.78	(m ²)
Top Width:	6.60	(m)
Hydraulic Depth:	0.270	(m)
Mean Velocity:	0.516	(m/s)
Froude Number	0.317	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power: 11.34 V 100%
Data logger External Power: 12.04 77%
Data logger Memory Used: 25%
Data logger Clock: 7:12 AM MST
Laptop Clock: 7:13 AM MST
Dessicant: OK
Data logger: 410 45 0406
PT: 101183
Power:

Notes: Water temp 6.33 C



Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E
NE-24-91-19-W4

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: December 11, 2008
Start Time: 3:30 PM MST
End Time:

Level Readings and Measurements

Bench Mark Reading: ASCM Marker 1.341
Water Level Reading: 2.106
Top of Ice Level Reading: 2.088
Transducer Reading & Est. El.:
Other: Rebar on LB 1.048

Setup 1

El: 242.081
El: 241.316
El: 241.334
El: 242.374

Setup 2

El: 1.34
El: 2.109
El: 2.09
El: 1.049

Average

242.081
241.312
241.331
242.372
241.314
241.333
242.373

Weather Conditions:

partly cloudy, light wind, -16 C
thin ice cover

River Conditions:

Notes: no discharge measurement because ice was too thin
open leads visible 40 m downstream
water level looks really high, possible water release upstream

Hydrometric Measurement / Site Visit Record

S12 - Fort Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Fort Creek
Location: Fort Creek
Site Name: S12
Coordinates & Legal: 6363400 N, 462600 E SW-18-97-10-W4

Time of Measurement

Date of Measurement: May 8, 2008
Start Time: 8:46 AM MDT
End Time: 8:57 AM MDT

Weather Conditions:

clear, calm, 5 C

River Conditions:

open, high stage

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

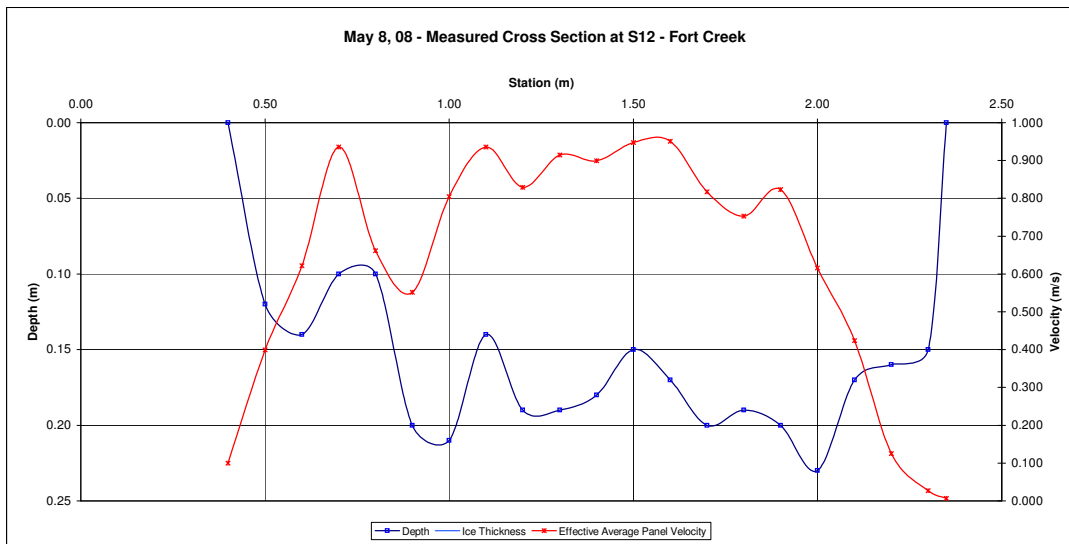
Bench Mark Reading: Rebar on LB 1.229 El: 100.000 1.168 El: 100.000
Water Level Reading: 2.596 El: 98.633 2.534 El: 98.634 98.634
Top of Ice Level Reading: El: El:
Transducer Reading & Est. El.: 0.291 El: 98.342 0.291 El: 98.343 98.342
Other: Top of logger box El: El:

Measurement Data																Percentage of Total
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	0.40	0.00			0.000	1.00	1	0.40	0.45	0.100	0.100	0.03	0.00	0.000	0%	
	0.50	0.12			0.399	1.00	2	0.45	0.55	0.399	0.399	0.12	0.01	0.005	2%	
	0.60	0.14			0.622	1.00	3	0.55	0.65	0.622	0.622	0.14	0.01	0.009	4%	
	0.70	0.10			0.936	1.00	4	0.65	0.75	0.936	0.936	0.10	0.01	0.009	4%	
	0.80	0.10			0.661	1.00	5	0.75	0.85	0.661	0.661	0.10	0.01	0.007	3%	
	0.90	0.20			0.552	1.00	6	0.85	0.95	0.552	0.552	0.20	0.02	0.011	5%	
	1.00	0.21			0.805	1.00	7	0.95	1.05	0.805	0.805	0.21	0.02	0.017	8%	
	1.10	0.14			0.936	1.00	8	1.05	1.15	0.936	0.936	0.14	0.01	0.013	6%	
	1.20	0.19			0.829	1.00	9	1.15	1.25	0.829	0.829	0.19	0.02	0.016	7%	
	1.30	0.19			0.914	1.00	10	1.25	1.35	0.914	0.914	0.19	0.02	0.017	8%	
	1.40	0.18			0.899	1.00	11	1.35	1.45	0.899	0.899	0.18	0.02	0.016	7%	
	1.50	0.15			0.948	1.00	12	1.45	1.55	0.948	0.948	0.15	0.02	0.014	6%	
	1.60	0.17			0.951	1.00	13	1.55	1.65	0.951	0.951	0.17	0.02	0.016	7%	
	1.70	0.20			0.817	1.00	14	1.65	1.75	0.817	0.817	0.20	0.02	0.016	7%	
	1.80	0.19			0.753	1.00	15	1.75	1.85	0.753	0.753	0.19	0.02	0.014	6%	
	1.90	0.20			0.823	1.00	16	1.85	1.95	0.823	0.823	0.20	0.02	0.016	7%	
	2.00	0.23			0.616	1.00	17	1.95	2.05	0.616	0.616	0.23	0.02	0.014	6%	
	2.10	0.17			0.424	1.00	18	2.05	2.15	0.424	0.424	0.17	0.02	0.007	3%	
	2.20	0.16			0.125	1.00	19	2.15	2.25	0.125	0.125	0.16	0.02	0.002	1%	
	2.30	0.15			0.027	1.00	20	2.25	2.33	0.027	0.027	0.15	0.01	0.000	0%	
RB	2.35	0.00			0.000	1.00	21	2.33	2.35	0.007	0.007	0.04	0.00	0.000	0%	
Total Flow:													0.221	1.000		

Total Flow:	0.221	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.32	(m ²)
Top Width:	1.95	(m)
Hydraulic Depth:	0.163	(m)
Mean Velocity:	0.696	(m/s)
Froude Number	0.551	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34	100%
Data logger External Power:	12.04	77%
Data logger Memory Used:		0%
Data logger Clock:	May 08, 2008 08:04	MST
Laptop Clock:	May 08, 2008 08:04	MST
Dessicant:	New	
Data logger:	Ultra Logger RX-1 s/n 703013	
PT:	Keller 8363K 5 psi s/n 0604001-5941	
Power:	Lakewood battery	

Notes: check levels as level had to be fixed on site
ice in upstream culvert
station installed
Manual water temp 4 C



Hydrometric Measurement / Site Visit Record

S12 - Fort Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Fort Creek
Location: Fort Creek
Site Name: S12
Coordinates & Legal: 6363400 N, 462600 E
SW-18-97-10-W4

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: LM Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: June 23, 2008
Start Time: 12:10 PM MDT
End Time: 12:25 PM MDT

Level Readings and Measurements

Bench Mark Reading: Rebar on LB 0.802
Water Level Reading: 2.224
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.240
Other: Top of logger box

Setup 1

El: 100.000
El: 98.578
El:
El: 98.338
El:

Setup 2

El: 100.000
El: 98.574
El:
El: 98.334
El:

Average

98.576
98.574
98.336

Weather Conditions:

overcast

River Conditions:

open, dirty

LB

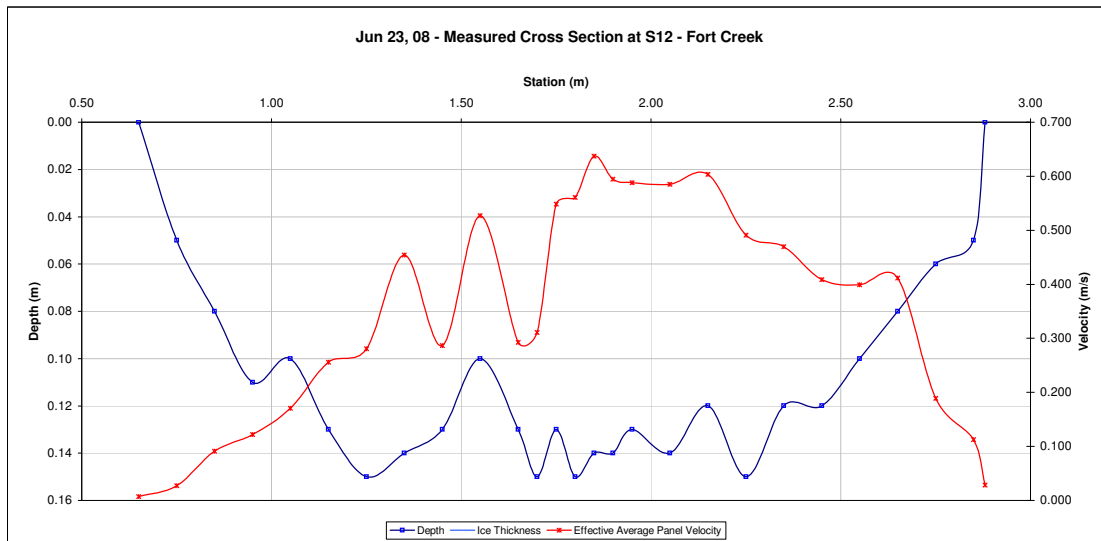
RB

Measured Data						Measurement Data										Calculated Data					Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge							
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)							
0.65	0.00					1.00	1	0.65	0.70	0.007	0.007	0.01	0.00	0.000	0%						
0.75	0.05				0.027	1.00	2	0.70	0.80	0.027	0.027	0.05	0.01	0.000	0%						
0.85	0.08				0.091	1.00	3	0.80	0.90	0.091	0.091	0.08	0.01	0.001	1%						
0.95	0.11				0.122	1.00	4	0.90	1.00	0.122	0.122	0.11	0.01	0.001	1%						
1.05	0.10				0.171	1.00	5	1.00	1.10	0.171	0.171	0.10	0.01	0.002	2%						
1.15	0.13				0.256	1.00	6	1.10	1.20	0.256	0.256	0.13	0.01	0.003	3%						
1.25	0.15				0.280	1.00	7	1.20	1.30	0.280	0.280	0.15	0.02	0.004	4%						
1.35	0.14				0.454	1.00	8	1.30	1.40	0.454	0.454	0.14	0.01	0.006	7%						
1.45	0.13				0.287	1.00	9	1.40	1.50	0.287	0.287	0.13	0.01	0.004	4%						
1.55	0.10				0.527	1.00	10	1.50	1.60	0.527	0.527	0.10	0.01	0.005	5%						
1.65	0.13				0.293	1.00	11	1.60	1.68	0.293	0.293	0.13	0.01	0.003	3%						
1.70	0.15				0.311	1.00	12	1.68	1.73	0.311	0.311	0.15	0.01	0.002	2%						
1.75	0.13				0.549	1.00	13	1.73	1.78	0.549	0.549	0.13	0.01	0.004	4%						
1.80	0.15				0.561	1.00	14	1.78	1.83	0.561	0.561	0.15	0.01	0.004	4%						
1.85	0.14				0.637	1.00	15	1.83	1.88	0.637	0.637	0.14	0.01	0.004	5%						
1.90	0.14				0.594	1.00	16	1.88	1.93	0.594	0.594	0.14	0.01	0.004	4%						
1.95	0.13				0.588	1.00	17	1.93	2.00	0.588	0.588	0.13	0.01	0.006	6%						
2.05	0.14				0.585	1.00	18	2.00	2.10	0.585	0.585	0.14	0.01	0.008	9%						
2.15	0.12				0.604	1.00	19	2.10	2.20	0.604	0.604	0.12	0.01	0.007	8%						
2.25	0.15				0.491	1.00	20	2.20	2.30	0.491	0.491	0.15	0.01	0.007	8%						
2.35	0.12				0.469	1.00	21	2.30	2.40	0.469	0.469	0.12	0.01	0.006	6%						
2.45	0.12				0.408	1.00	22	2.40	2.50	0.408	0.408	0.12	0.01	0.005	5%						
2.55	0.10				0.399	1.00	23	2.50	2.60	0.399	0.399	0.10	0.01	0.004	4%						
2.65	0.08				0.411	1.00	24	2.60	2.70	0.411	0.411	0.08	0.01	0.003	3%						
2.75	0.06				0.189	1.00	25	2.70	2.80	0.189	0.189	0.06	0.01	0.001	1%						
2.85	0.05				0.113	1.00	26	2.80	2.87	0.113	0.113	0.05	0.00	0.000	0%						
2.88	0.00					1.00	27	2.87	2.88	0.028	0.028	0.01	0.00	0.000	0%						
Total Flow:														0.096	1.000						

Total Flow:	0.096	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.25	(m ²)
Top Width:	2.23	(m)
Hydraulic Depth:	0.111	(m)
Mean Velocity:	0.390	(m/s)
Froude Number	0.374	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	11.34	100%
Data logger External Power:	12.29	79%
Data logger Memory Used:	23091	75%
Data logger Clock:	11:04 AM	MST
Laptop Clock:	11:04 AM	MST
Dessicant:	change ASAP	
Data logger:	Ultra Logger RX-1 s/n 703013	
PT:	Keller 8363K 5 psi s/n 0604001-5941	
Power:		

Notes: water temp. 14.5 C



Hydrometric Measurement / Site Visit Record

S12 - Fort Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Fort Creek
Location: Fort Creek
Site Name: S12
Coordinates & Legal: 6363400 N, 462600 E
SW-18-97-10-W4

Personnel & Equipment

Measurement Made By: LM/SM
Data Entry By: DW Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: August 6, 2008
Start Time: 5:50 PM MDT
End Time: 5:55 PM MDT

Level Readings and Measurements

Bench Mark Reading: Rebar on LB 0.742
Water Level Reading: 2.150
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.246
Other: Top of logger box

Setup 1

El.: 100.000
El.: 98.592
El.:
El.: 98.346
El.:

Setup 2

El.: 0.722
El.: 2.13
El.:
El.: 0.246
El.:

Average

100.000
98.592
98.592
98.346
98.346

Weather Conditions: sunny
River Conditions: open

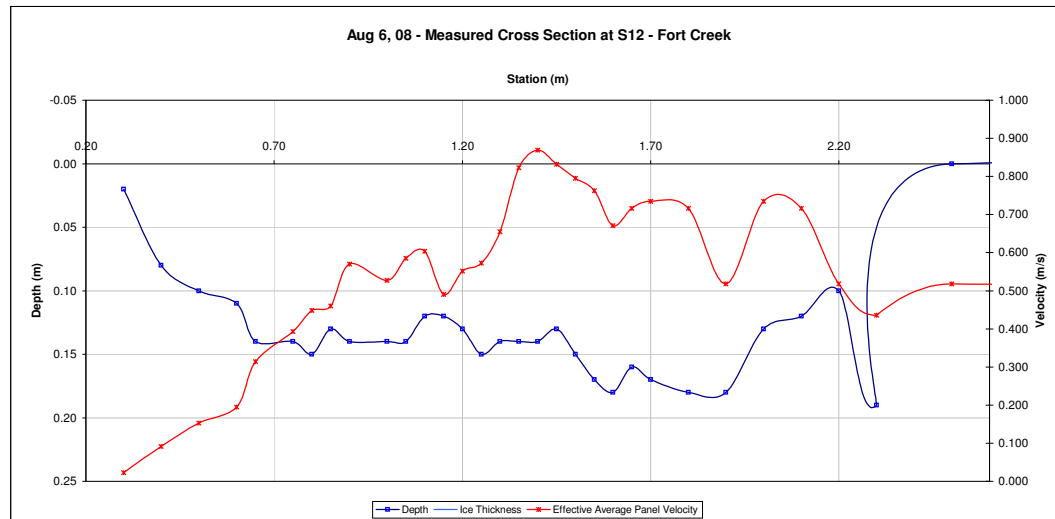
Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at	Panel Ends at	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
LB	0.30	0.00				1.00	1	0.30	0.35	0.023	0.023	0.02	0.00	0.000	0%
	0.40	0.08			0.091	1.00	2	0.35	0.45	0.091	0.091	0.08	0.01	0.001	0%
	0.50	0.10			0.152	1.00	3	0.45	0.55	0.152	0.152	0.10	0.01	0.002	1%
	0.60	0.11			0.195	1.00	4	0.55	0.63	0.195	0.195	0.11	0.01	0.002	1%
	0.65	0.14			0.314	1.00	5	0.63	0.70	0.314	0.314	0.14	0.01	0.003	2%
	0.75	0.14			0.393	1.00	6	0.70	0.78	0.393	0.393	0.14	0.01	0.004	3%
	0.80	0.15			0.448	1.00	7	0.78	0.83	0.448	0.448	0.15	0.01	0.003	2%
	0.85	0.13			0.460	1.00	8	0.83	0.88	0.460	0.460	0.13	0.01	0.003	2%
	0.90	0.14			0.570	1.00	9	0.88	0.95	0.570	0.570	0.14	0.01	0.006	4%
	1.00	0.14			0.527	1.00	10	0.95	1.03	0.527	0.527	0.14	0.01	0.006	3%
	1.05	0.14			0.585	1.00	11	1.03	1.08	0.585	0.585	0.14	0.01	0.004	3%
	1.10	0.12			0.604	1.00	12	1.08	1.13	0.604	0.604	0.12	0.01	0.004	2%
	1.15	0.12			0.491	1.00	13	1.13	1.18	0.491	0.491	0.12	0.01	0.003	2%
	1.20	0.13			0.552	1.00	14	1.18	1.23	0.552	0.552	0.13	0.01	0.004	2%
	1.25	0.15			0.573	1.00	15	1.23	1.28	0.573	0.573	0.15	0.01	0.004	3%
	1.30	0.14			0.655	1.00	16	1.28	1.33	0.655	0.655	0.14	0.01	0.005	3%
	1.35	0.14			0.823	1.00	17	1.33	1.38	0.823	0.823	0.14	0.01	0.006	4%
	1.40	0.14			0.869	1.00	18	1.38	1.43	0.869	0.869	0.14	0.01	0.006	4%
	1.45	0.13			0.832	1.00	19	1.43	1.48	0.832	0.832	0.13	0.01	0.005	3%
	1.50	0.15			0.796	1.00	20	1.48	1.53	0.796	0.796	0.15	0.01	0.006	4%
	1.55	0.17			0.762	1.00	21	1.53	1.58	0.762	0.762	0.17	0.01	0.006	4%
	1.60	0.18			0.671	1.00	22	1.58	1.63	0.671	0.671	0.18	0.01	0.006	4%
	1.65	0.16			0.716	1.00	23	1.63	1.68	0.716	0.716	0.16	0.01	0.006	4%
	1.70	0.17			0.735	1.00	24	1.68	1.75	0.735	0.735	0.17	0.01	0.009	6%
	1.80	0.18			0.716	1.00	25	1.75	1.85	0.716	0.716	0.18	0.02	0.013	8%
	1.90	0.18			0.518	1.00	26	1.85	1.95	0.518	0.518	0.18	0.02	0.009	6%
	2.00	0.13			0.735	1.00	27	1.95	2.05	0.735	0.735	0.13	0.01	0.010	6%
	2.10	0.12			0.716	1.00	28	2.05	2.15	0.716	0.716	0.12	0.01	0.009	5%
	2.20	0.10			0.518	1.00	29	2.15	2.25	0.518	0.518	0.10	0.01	0.005	3%
	2.30	0.19			0.436	1.00	30	2.25	2.40	0.436	0.436	0.19	0.03	0.012	8%
RB	2.50	0.00			0.518	1.00	31	2.40	2.50	0.518	0.518	0.00	0.00	0.000	0%
						1.00	32	2.50	0.00	0.130	0.130	0.00	0.00	0.000	0%
Total Flow:														0.161	1.000

Total Flow:	0.161	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	0.29	(m ²)
Top Width:	2.20	(m)
Hydraulic Depth:	0.131	(m)
Mean Velocity:	0.557	(m/s)
Froude Number	0.491	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power: 11.34 V 100%
Data logger External Power: 12.65 V 81%
Data logger Memory Used: 55% used
Data logger Clock: 4:40 PM MST
Laptop Clock: 4:40 PM MST
Dessicant: new
Data logger: Ultra Logger RX-1 s/n 703013
PT: Keller 8363K 5 psi s/n 0604001-5941
Power:

Notes:



Hydrometric Measurement / Site Visit Record

S12 - Fort Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Fort Creek
Location: Fort Creek
Site Name: S12
Coordinates & Legal: 6363400 N, 462600 E
SW-18-97-10-W4

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: September 14, 2008
Start Time: 4:28 PM MDT
End Time: 4:35 PM MDT

Level Readings and Measurements

Bench Mark Reading: Rebar on LB 0.720
Water Level Reading: 2.149
Top of Ice Level Reading: 0.226
Transducer Reading & Est. EL.: 0.226
Other: Top of logger box

Setup 1

EL: 100.000
EL: 98.571
EL: 98.345

Setup 2

0.701
2.13
0.226
EL: 100.000
EL: 98.571
EL: 98.345

Average

98.571
98.571
98.345

Weather Conditions:

cloudy, 12 C

River Conditions:

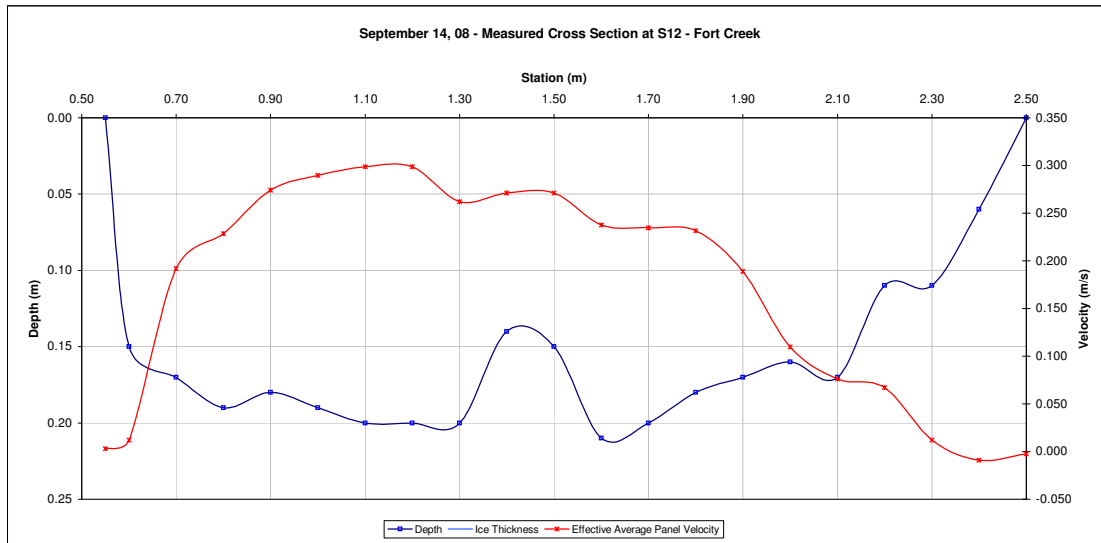
open

		Measurement Data														
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
RB	0.55	0.00				1.00	1	0.55	0.58	0.003	0.003	0.04	0.00	0.000	0%	
	0.60	0.15			0.012	1.00	2	0.58	0.65	0.012	0.012	0.15	0.01	0.000	0%	
	0.70	0.17			0.192	1.00	3	0.65	0.75	0.192	0.192	0.17	0.02	0.003	5%	
	0.80	0.19			0.229	1.00	4	0.75	0.85	0.229	0.229	0.19	0.02	0.004	7%	
	0.90	0.18			0.274	1.00	5	0.85	0.95	0.274	0.274	0.18	0.02	0.005	8%	
	1.00	0.19			0.290	1.00	6	0.95	1.05	0.290	0.290	0.19	0.02	0.006	9%	
	1.10	0.20			0.299	1.00	7	1.05	1.15	0.299	0.299	0.20	0.02	0.006	9%	
	1.20	0.20			0.299	1.00	8	1.15	1.25	0.299	0.299	0.20	0.02	0.006	9%	
	1.30	0.20			0.262	1.00	9	1.25	1.35	0.262	0.262	0.20	0.02	0.005	8%	
	1.40	0.14			0.271	1.00	10	1.35	1.45	0.271	0.271	0.14	0.01	0.004	6%	
	1.50	0.15			0.271	1.00	11	1.45	1.55	0.271	0.271	0.15	0.02	0.004	6%	
	1.60	0.21			0.238	1.00	12	1.55	1.65	0.238	0.238	0.21	0.02	0.005	8%	
	1.70	0.20			0.235	1.00	13	1.65	1.75	0.235	0.235	0.20	0.02	0.005	7%	
	1.80	0.18			0.232	1.00	14	1.75	1.85	0.232	0.232	0.18	0.02	0.004	6%	
	1.90	0.17			0.189	1.00	15	1.85	1.95	0.189	0.189	0.17	0.02	0.003	5%	
	2.00	0.16			0.110	1.00	16	1.95	2.05	0.110	0.110	0.16	0.02	0.002	3%	
	2.10	0.17			0.076	1.00	17	2.05	2.15	0.076	0.076	0.17	0.02	0.001	2%	
	2.20	0.11			0.067	1.00	18	2.15	2.25	0.067	0.067	0.11	0.01	0.001	1%	
	2.30	0.11			0.012	1.00	19	2.25	2.35	0.012	0.012	0.11	0.01	0.000	0%	
	LB	2.40	0.06			-0.009	1.00	20	2.35	2.45	-0.009	-0.009	0.06	0.01	0.000	0%
		2.50	0.00				1.00	21	2.45	2.50	-0.002	-0.002	0.02	0.00	0.000	0%
Total Flow:														0.064	1.000	

Total Flow:	0.064	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.31	(m ²)
Top Width:	1.95	(m)
Hydraulic Depth:	0.160	(m)
Mean Velocity:	0.206	(m/s)
Froude Number	0.164	
Photographs taken looking at:		

Data logger Notes:	
Data logger Internal Power:	11.34 V 100%
Data logger External Power:	12.17 V 78%
Data logger Memory Used:	75%
Data logger Clock:	3:25 PM MST
Laptop Clock:	3:25 PM MST
Dessicant:	NEW
Data logger:	Ultra Logger RX-1 s/n 703013
PT:	Keller 8363K 5 psi s/n 0604001-5941
Power:	

Notes: clocks reset, data cleared



Hydrometric Measurement / Site Visit Record

S12 - Fort Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Fort Creek
Location: Fort Creek
Site Name: S12
Coordinates & Legal: 6363400 N, 462600 E
SW-18-97-10-W4

Personnel & Equipment

Measurement Made By: SM/JSL
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: October 14, 2008
Start Time: 4:54 PM MDT
End Time: 5:05 PM MDT

Level Readings and Measurements

Bench Mark Reading: Rebar on LB 0.610
Water Level Reading: 1.943
Top of Ice Level Reading: 0.330
Transducer Reading & Est. El.: 0.330
Other: Top of logger box

Setup 1

El: 100.000
El: 98.667
El: 98.337

Setup 2

El: 100.000
El: 98.668
El: 98.338

Average

98.668
98.338

Weather Conditions:

partly cloudy, 6 C

River Conditions:

open (looks higher stage)

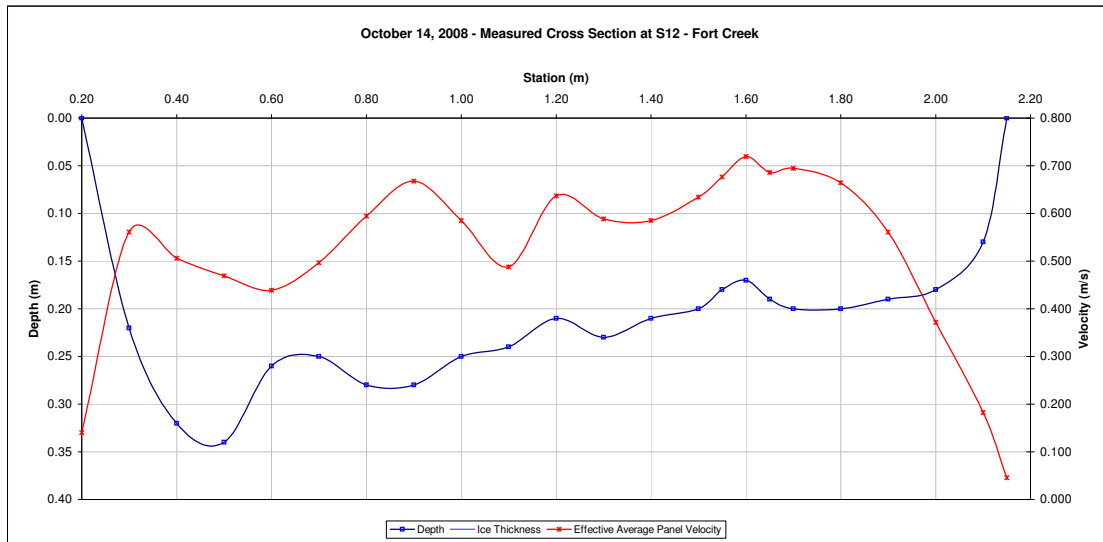
		Measurement Data															
Measured Data						Calculated Data											
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)			
RB	0.20	0.00				1.00	1	0.20	0.25	0.140	0.140	0.06	0.00	0.000	0%		
	0.30	0.22			0.561	1.00	2	0.25	0.35	0.561	0.561	0.22	0.02	0.012	5%		
	0.40	0.32			0.506	1.00	3	0.35	0.45	0.506	0.506	0.32	0.03	0.016	7%		
	0.50	0.34			0.469	1.00	4	0.45	0.55	0.469	0.469	0.34	0.03	0.016	7%		
	0.60	0.26			0.439	1.00	5	0.55	0.65	0.439	0.439	0.26	0.03	0.011	5%		
	0.70	0.25			0.497	1.00	6	0.65	0.75	0.497	0.497	0.25	0.03	0.012	5%		
	0.80	0.28			0.594	1.00	7	0.75	0.85	0.594	0.594	0.28	0.03	0.017	7%		
	0.90	0.28			0.668	1.00	8	0.85	0.95	0.668	0.668	0.28	0.03	0.019	8%		
	1.00	0.25			0.585	1.00	9	0.95	1.05	0.585	0.585	0.25	0.03	0.015	6%		
	1.10	0.24			0.488	1.00	10	1.05	1.15	0.488	0.488	0.24	0.02	0.012	5%		
	1.20	0.21			0.637	1.00	11	1.15	1.25	0.637	0.637	0.21	0.02	0.013	6%		
	1.30	0.23			0.588	1.00	12	1.25	1.35	0.588	0.588	0.23	0.02	0.014	6%		
	1.40	0.21			0.585	1.00	13	1.35	1.45	0.585	0.585	0.21	0.02	0.012	5%		
	1.50	0.20			0.634	1.00	14	1.45	1.53	0.634	0.634	0.20	0.02	0.010	4%		
	1.55	0.18			0.677	1.00	15	1.53	1.58	0.677	0.677	0.18	0.01	0.006	3%		
	1.60	0.17			0.719	1.00	16	1.58	1.63	0.719	0.719	0.17	0.01	0.006	3%		
	1.65	0.19			0.686	1.00	17	1.63	1.68	0.686	0.686	0.19	0.01	0.007	3%		
	1.70	0.20			0.695	1.00	18	1.68	1.75	0.695	0.695	0.20	0.02	0.010	4%		
	1.80	0.20			0.664	1.00	19	1.75	1.85	0.664	0.664	0.20	0.02	0.013	6%		
	1.90	0.19			0.561	1.00	20	1.85	1.95	0.561	0.561	0.19	0.02	0.011	4%		
	2.00	0.18			0.372	1.00	21	1.95	2.05	0.372	0.372	0.18	0.02	0.007	3%		
	LB	2.10	0.13			0.183	1.00	22	2.05	2.13	0.183	0.183	0.13	0.01	0.002	1%	
		2.15	0.00				1.00	23	2.13	2.15	0.046	0.046	0.03	0.00	0.000	0%	
Total Flow:														0.241	1.000		

Total Flow:	0.241	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	0.44	(m ²)
Top Width:	1.95	(m)
Hydraulic Depth:	0.224	(m)
Mean Velocity:	0.552	(m/s)
Froude Number	0.372	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power: 11.34 V 100%
Data logger External Power: 11.8 V 76%
Data logger Memory Used: 20%
Data logger Clock: 3:49 PM MST
Laptop Clock: 3:50 PM MST
Dessicant: good
Data logger: Ultra Logger RX-1 s/n 703013
PT: Keller 8363K 5 psi s/n 0604001-5941
Power:

Notes: Station removed for winter



Hydrometric Measurement / Site Visit Record

S14A - Eils River at CNRL Bridge



Measurement Location

River/Stream: Eils River
Location: Eils River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: January 10, 2008
Start Time: 2:00 PM MST
End Time: 2:30 PM MST

Weather Conditions:

Overcast, -18 C

River Conditions:

Ice Cover

Personnel & Equipment

Measurement Made By: JMS/JS/JV
Data Entry By: SMS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: 2.420
Water Level Reading: 4.321
Top of Ice Level Reading: 4.318
Transducer Reading & Est. El.: 0.957
Other: top of logger box 0.662

Setup No. 1

El: 100.000
El: 98.099
El: 98.102
El: 97.142
El: 101.758

Setup No. 2

2.288
4.183
4.181
0.957
0.528

Average

El: 100.000
El: 98.105
El: 98.107
El: 97.148
El: 101.759

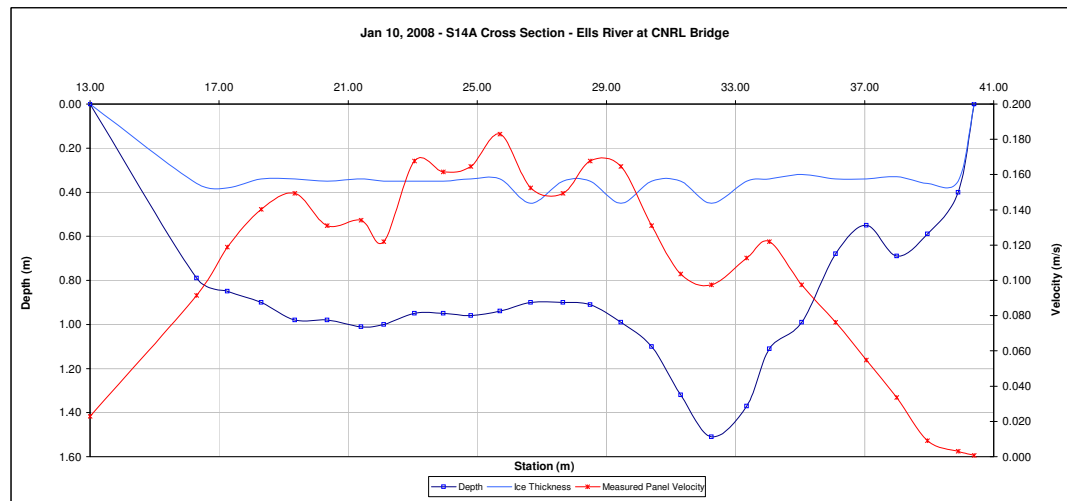
Measurement Data

Measured Data						Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
LB	13.00	0.00	0.00			0.000	0.90	1	13.00	14.65	0.023	0.021	0.11	0.18	0.004	0%
	16.30	0.79	0.36			0.091	0.90	2	14.65	16.78	0.091	0.082	0.43	0.91	0.075	5%
	17.25	0.85	0.38			0.119	0.90	3	16.78	17.78	0.119	0.107	0.47	0.47	0.050	3%
	18.30	0.90	0.34			0.140	0.90	4	17.78	18.83	0.140	0.126	0.56	0.59	0.074	5%
	19.35	0.98	0.34			0.149	0.90	5	18.83	19.85	0.149	0.134	0.64	0.66	0.088	5%
	20.35	0.98	0.35			0.131	0.90	6	19.85	20.88	0.131	0.118	0.63	0.65	0.076	5%
	21.40	1.01	0.34			0.134	0.90	7	20.88	21.75	0.134	0.121	0.67	0.59	0.071	4%
	22.10	1.00	0.35			0.122	0.90	8	21.75	22.58	0.122	0.110	0.65	0.54	0.059	4%
	23.05	0.95	0.35			0.168	0.90	9	22.58	23.50	0.168	0.151	0.60	0.55	0.084	5%
	23.95	0.95	0.35			0.162	0.90	10	23.50	24.38	0.162	0.145	0.60	0.53	0.076	5%
	24.80	0.96	0.34			0.165	0.90	11	24.38	25.25	0.165	0.148	0.62	0.54	0.080	5%
	25.70	0.94	0.34			0.183	0.90	12	25.25	26.18	0.183	0.165	0.60	0.55	0.091	6%
	26.65	0.90	0.45			0.152	0.90	13	26.18	27.15	0.152	0.137	0.45	0.44	0.060	4%
	27.65	0.90	0.35			0.149	0.90	14	27.15	28.08	0.149	0.134	0.55	0.51	0.068	4%
	28.50	0.91	0.35			0.168	0.90	15	28.08	28.98	0.168	0.151	0.56	0.50	0.076	5%
	29.45	0.99	0.45			0.165	0.90	16	28.98	29.93	0.165	0.148	0.54	0.51	0.076	5%
	30.40	1.10	0.35			0.131	0.90	17	29.93	30.85	0.131	0.118	0.75	0.69	0.082	5%
	31.30	1.32	0.35			0.104	0.90	18	30.85	31.78	0.104	0.093	0.97	0.90	0.084	5%
	32.25	1.51	0.45			0.098	0.90	19	31.78	32.80	0.098	0.088	1.06	1.09	0.095	6%
	33.35	1.37	0.35			0.113	0.90	20	32.80	33.70	0.113	0.101	1.02	0.92	0.093	6%
	34.05	1.11	0.34			0.122	0.90	21	33.70	34.55	0.122	0.110	0.77	0.65	0.072	4%
	35.05	0.99	0.32			0.098	0.90	22	34.55	35.58	0.098	0.088	0.67	0.69	0.060	4%
	36.10	0.68	0.34			0.076	0.90	23	35.58	36.58	0.076	0.069	0.34	0.34	0.023	1%
	37.05	0.55	0.34			0.055	0.90	24	36.58	37.53	0.055	0.049	0.21	0.20	0.010	1%
	38.00	0.69	0.33			0.034	0.90	25	37.53	38.48	0.034	0.030	0.36	0.34	0.010	1%
	38.95	0.59	0.36			0.009	0.90	26	38.48	39.43	0.009	0.008	0.23	0.22	0.002	0%
	39.90	0.40	0.35			0.003	0.90	27	39.43	40.15	0.003	0.003	0.05	0.04	0.000	0%
RB	40.40	0.00	0.00			0.000	0.90	28	40.15	40.40	0.001	0.001	0.01	0.00	0.000	0%
Total Flow:															1.641	1.000

Total Flow:	1.641	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	14.79	(m ²)
Top Width:	27.40	(m)
Hydraulic Depth:	0.540	(m)
Mean Velocity:	0.111	(m/s)
Froude Number	0.048	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	
Data logger Internal Power:	0.00
Data logger External Power:	0.00
Data logger Memory Used:	4%
Data logger Clock:	Jan 10, 2008 01:24 PM
Laptop Clock:	Jan 10, 2008 03:14 PM
Dessicant:	Good
Data logger:	1797
PT:	39666
Power:	Battery

Notes: TD reading = 0.957259
Volt meter reading 12.48 V on external battery.
Water Temp = 0.180676 C



Hydrometric Measurement / Site Visit Record

S14A - Eils River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Eils River
Location: Eils River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: February 16, 2008
Start Time: 4:20 PM MST
End Time: 4:50 PM MST

Weather Conditions:

Overcast, -9 C

River Conditions:

Ice Cover

Personnel & Equipment

Measurement Made By: SMS/JS/JVR
Data Entry By: SMS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar 2.049
Water Level Reading: 4.146
Top of Ice Level Reading: 4.185
Transducer Reading & Est. El.: 0.765
Other: top of logger box 0.317

Setup No. 1

El: 100.000
El: 97.903
El: 97.864
El: 97.138
El: 101.732

Setup No. 2

1.994
4.084
4.119
0.765
0.257

Average

El: 100.000
El: 97.910
El: 97.875
El: 97.145
El: 101.735

Measurement Data

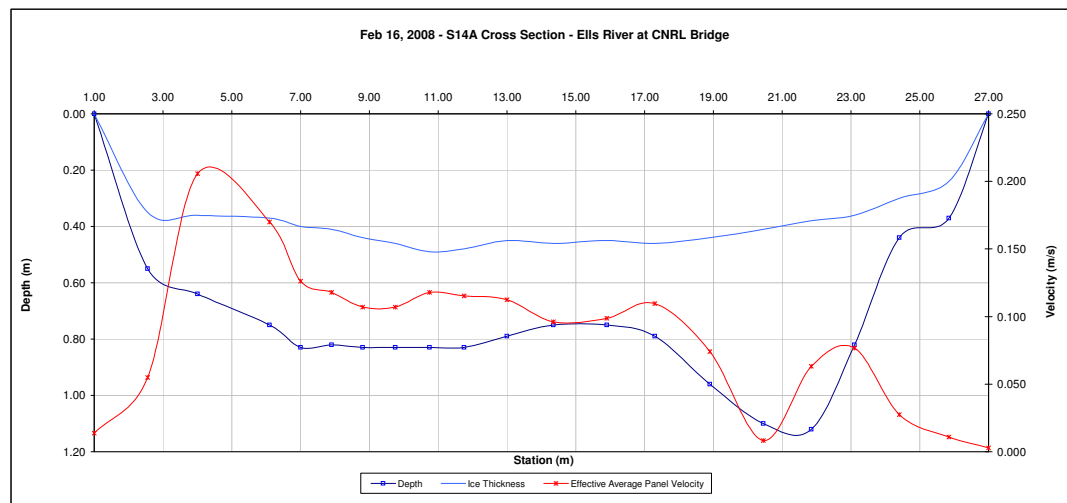
Measured Data				Calculated Data											
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percentage of Total
LB	1.00	0.00	0.00		0.000	0.90	1	1.00	1.78	0.015	0.014	0.05	0.04	0.001	0%
	2.55	0.55	0.35		0.061	0.90	2	1.78	3.28	0.061	0.055	0.20	0.30	0.016	2%
	4.00	0.64	0.36		0.229	0.90	3	3.28	5.05	0.229	0.206	0.28	0.50	0.102	12%
	6.10	0.75	0.37		0.189	0.90	4	5.05	6.55	0.189	0.170	0.38	0.57	0.097	12%
	7.00	0.83	0.40		0.140	0.90	5	6.55	7.45	0.140	0.126	0.43	0.39	0.049	6%
	7.90	0.82	0.41		0.131	0.90	6	7.45	8.35	0.131	0.118	0.41	0.37	0.044	5%
	8.80	0.83	0.44		0.119	0.90	7	8.35	9.28	0.119	0.107	0.39	0.36	0.039	5%
	9.75	0.83	0.46		0.119	0.90	8	9.28	10.25	0.119	0.107	0.37	0.36	0.039	5%
	10.75	0.83	0.49		0.131	0.90	9	10.25	11.25	0.131	0.118	0.34	0.34	0.040	5%
	11.75	0.83	0.48		0.128	0.90	10	11.25	12.38	0.128	0.115	0.35	0.39	0.045	5%
	13.00	0.79	0.45		0.125	0.90	11	12.38	13.68	0.125	0.112	0.34	0.44	0.050	6%
	14.35	0.75	0.46		0.107	0.90	12	13.68	15.13	0.107	0.096	0.29	0.42	0.040	5%
	15.90	0.75	0.45		0.110	0.90	13	15.13	16.60	0.110	0.099	0.30	0.44	0.044	5%
	17.30	0.79	0.46		0.122	0.90	14	16.60	18.10	0.122	0.110	0.33	0.50	0.054	6%
	18.90	0.96	0.44		0.082	0.90	15	18.10	19.68	0.082	0.074	0.52	0.82	0.061	7%
	20.45	1.10	0.41		0.009	0.90	16	19.68	21.15	0.009	0.008	0.69	1.02	0.008	1%
	21.85	1.12	0.38		0.070	0.90	17	21.15	22.48	0.070	0.063	0.74	0.98	0.062	7%
RB	23.10	0.82	0.36		0.085	0.90	18	22.48	23.75	0.085	0.077	0.46	0.59	0.045	5%
	24.40	0.44	0.30		0.030	0.90	19	23.75	25.13	0.030	0.027	0.14	0.19	0.005	1%
	25.85	0.37	0.24		0.012	0.90	20	25.13	26.43	0.012	0.011	0.13	0.17	0.002	0%
	27.00	0.00	0.00		0.000	0.90	21	26.43	27.00	0.003	0.003	0.03	0.02	0.000	0%
Total Flow:														0.842	1.000

Total Flow:	0.842	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	9.20	(m ²)
Top Width:	26.00	(m)
Hydraulic Depth:	0.354	(m)
Mean Velocity:	0.092	(m/s)
Froude Number	0.049	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power: 0.00
Data logger External Power: 0.00
Data logger Memory Used: 4%
Data logger Clock: 4:00 PM MST
Laptop Clock: 4:00 PM MST
Dessicant: Good
Data logger: 1797
PT: 39666
Power: Battery

Notes: Logger reading "date not set", appears readings were not taken since Jan 10th 2008.
Clock synced with tablet.
Thermistor = 0.154419 C



Hydrometric Measurement / Site Visit Record

S14A - Ells River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Ells River
Location: Ells River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: March 13, 2008
Start Time: 5:00 PM MDT
End Time: 5:31 PM MDT

Weather Conditions:

Air Temp = 0.197864 °C

River Conditions:

Ice Cover

Personnel & Equipment

Measurement Made By: SM/JS/JVR
Data Entry By: LMM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar 2.431
Water Level Reading: 4.415
Top of Ice Level Reading: 4.375
Transducer Reading & Est. El.: 0.876
Other: top of logger pole 0.518

Setup No. 1

El: 100.000
El: 98.016
El: 98.056
El: 97.140
El: 101.913

Setup No. 2

2.365
4.362
4.308
0.876
0.449
El: 100.000
El: 98.003
El: 98.057
El: 97.127
El: 101.916

Average

98.010
97.133
101.915

Measurement Data

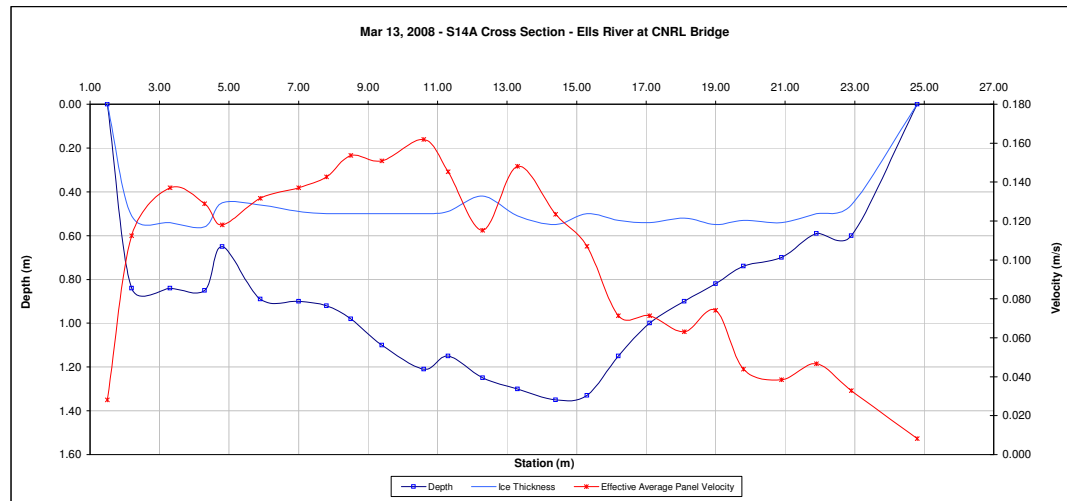
	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	1.50	0.00	0.00			0.000	0.90	1	1.50	1.85	0.031	0.028	0.08	0.03	0.001	0%
	2.20	0.84	0.51			0.125	0.90	2	1.85	2.75	0.125	0.112	0.33	0.30	0.033	3%
	3.30	0.84	0.54			0.152	0.90	3	2.75	3.80	0.152	0.137	0.30	0.32	0.043	4%
	4.30	0.85	0.56			0.143	0.90	4	3.80	4.55	0.143	0.129	0.29	0.22	0.028	2%
	4.80	0.65	0.45			0.131	0.90	5	4.55	5.35	0.131	0.118	0.20	0.16	0.019	2%
	5.90	0.89	0.46			0.146	0.90	6	5.35	6.45	0.146	0.132	0.43	0.47	0.062	5%
	7.00	0.90	0.49			0.152	0.90	7	6.45	7.40	0.152	0.137	0.41	0.39	0.053	5%
	7.80	0.92	0.50			0.158	0.90	8	7.40	8.15	0.158	0.143	0.42	0.32	0.045	4%
	8.50	0.98	0.50			0.171	0.90	9	8.15	8.95	0.171	0.154	0.48	0.38	0.059	5%
	9.40	1.10	0.50			0.168	0.90	10	8.95	10.00	0.168	0.151	0.60	0.63	0.095	8%
	10.60	1.21	0.50			0.180	0.90	11	10.00	10.95	0.180	0.162	0.71	0.67	0.109	9%
	11.30	1.15	0.49			0.162	0.90	12	10.95	11.80	0.162	0.145	0.66	0.56	0.082	7%
	12.30	1.25	0.42			0.128	0.90	13	11.80	12.80	0.128	0.115	0.83	0.83	0.096	8%
	13.30	1.30	0.51			0.165	0.90	14	12.80	13.85	0.165	0.148	0.79	0.83	0.123	11%
	14.40	1.35	0.55			0.137	0.90	15	13.85	14.85	0.137	0.123	0.80	0.80	0.099	8%
	15.30	1.33	0.50			0.119	0.90	16	14.85	15.75	0.119	0.107	0.83	0.75	0.080	7%
	16.20	1.15	0.53			0.079	0.90	17	15.75	16.65	0.079	0.071	0.62	0.56	0.040	3%
	17.10	1.00	0.54			0.079	0.90	18	16.65	17.60	0.079	0.071	0.46	0.44	0.031	3%
	18.10	0.90	0.52			0.070	0.90	19	17.60	18.55	0.070	0.063	0.38	0.36	0.023	2%
	19.00	0.82	0.55			0.082	0.90	20	18.55	19.40	0.082	0.074	0.27	0.23	0.017	1%
RB	19.80	0.74	0.53			0.049	0.90	21	19.40	20.35	0.049	0.044	0.21	0.20	0.009	1%
	20.90	0.70	0.54			0.043	0.90	22	20.35	21.40	0.043	0.038	0.16	0.17	0.006	1%
	21.90	0.59	0.50			0.052	0.90	23	21.40	22.40	0.052	0.047	0.09	0.09	0.004	0%
	22.90	0.60	0.46			0.037	0.90	24	22.40	23.85	0.037	0.033	0.14	0.20	0.007	1%
	24.80	0.00	0.00			0.000	0.90	25	23.85	24.80	0.009	0.008	0.04	0.03	0.000	0%
Total Flow:														1.164	100%	

Total Flow:	1.164	(m³/s)
Perceived Measurement Quality:	Fair	
Total Area:	9.93	(m²)
Top Width:	23.30	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.12	(m/s)
Froude Number	0.06	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power: 0.00V
Data logger External Power: 0.00V
Data logger Memory Used: 5% Used
Data logger Clock: 4:02 PM MST
Laptop Clock:
Dessicant:
Data logger: 1797
PT: 39666
Power:

Notes: DATE NOT SET AGAIN. Appears to have lost date setting March 8th, 2008 @ 5:06 AM.
Data downloaded.
Battery reading 7.34V on the voltmeter, Battery not changed.



Hydrometric Measurement / Site Visit Record

S14A - EIs River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: EIs River
Location: EIs River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: March 15, 2008
Start Time: 9:40 AM MDT
End Time:

Weather Conditions:

overcast, heavy snow, -20 C, strong wind

River Conditions:

Ice Cover

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: JS Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar 1.933
Water Level Reading: 3.920
Top of Ice Level Reading: 3.912
Transducer Reading & Est. El.: 0.893
Other: top of logger pole 0.022

Setup No. 1

El: 100.000
El: 98.013
El: 98.021
El: 97.120
El: 101.911

Setup No. 2

2.009 El: 100.000
3.989 El: 98.020
4.071 El: 97.938
0.893 El: 97.127
0.095 El: 101.914

Average

98.017
97.123
101.913

Notes: Batt Changed, Clock Reset & Sync'd to Tablet time

Data logger Notes:

Data logger Internal Power: 12.4V Aux
Data logger External Power: N/A
Data logger Memory Used: 5% Used
Data logger Clock: Clock Not Set
Laptop Clock:
Dessicant: Good
Data logger: 1797
pT: 39666
Power:

Hydrometric Measurement / Site Visit Record

S14A - Eils River at CNRL Bridge



Measurement Location

River/Stream: Eils River
Location: Eils River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: April 6, 2008
Start Time: 11:25 AM MDT
End Time: 11:43 AM MDT

Weather Conditions:

-7°C, Sunny, Light Winds

River Conditions:

Ice Cover

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: JS Checked by: LM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: 2.448
Water Level Reading: 4.338
Top of Ice Level Reading: 4.191
Transducer Reading & Est. El.: 1.008
Other: top of logger box 0.532

Setup No. 1

El: 100.000
El: 98.110
El: 98.257
El: 97.102
El: 101.916

Setup No. 2

2.382
4.272
4.134
1.008
0.471

Average

100.000
98.110
98.248
97.102
101.914

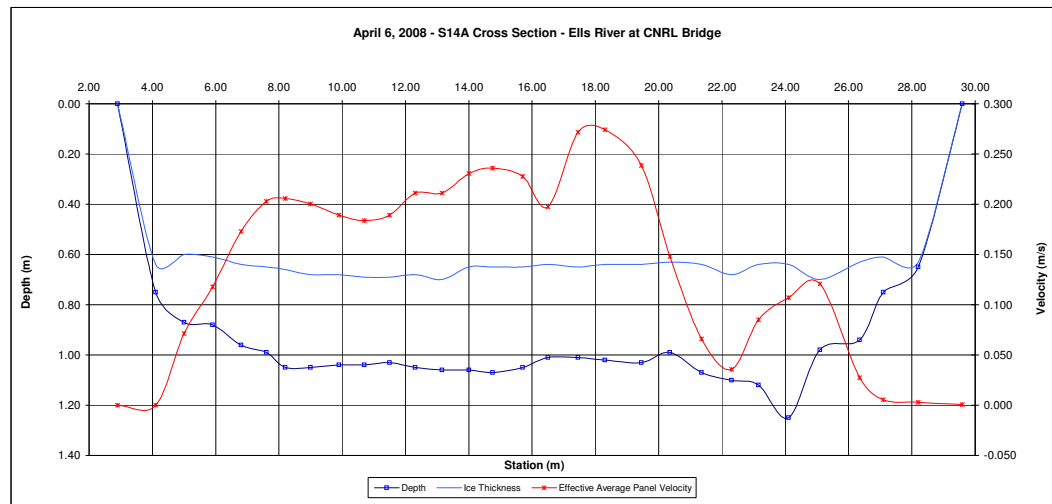
Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
2.90	0.00	0.00			0.000	0.90	1	2.90	3.50	0.000	0.000	0.03	0.02	0.000	0%
4.10	0.75	0.64			0.000	0.90	2	3.50	4.55	0.000	0.000	0.11	0.12	0.000	0%
5.00	0.87	0.60			0.079	0.90	3	4.55	5.45	0.079	0.071	0.27	0.24	0.017	1%
5.90	0.88	0.61			0.131	0.90	4	5.45	6.35	0.131	0.118	0.27	0.24	0.029	2%
6.80	0.96	0.64			0.192	0.90	5	6.35	7.20	0.192	0.173	0.32	0.27	0.047	3%
7.60	0.99	0.65			0.226	0.90	6	7.20	7.90	0.226	0.203	0.34	0.24	0.048	3%
8.20	1.05	0.66			0.229	0.90	7	7.90	8.60	0.229	0.206	0.39	0.27	0.056	4%
9.00	1.05	0.68			0.223	0.90	8	8.60	9.45	0.223	0.200	0.37	0.31	0.063	5%
9.90	1.04	0.68			0.210	0.90	9	9.45	10.30	0.210	0.189	0.36	0.31	0.058	4%
10.70	1.04	0.69			0.204	0.90	10	10.30	11.10	0.204	0.184	0.35	0.28	0.051	4%
11.50	1.03	0.69			0.210	0.90	11	11.10	11.90	0.210	0.189	0.34	0.27	0.051	4%
12.30	1.05	0.68			0.235	0.90	12	11.90	12.73	0.235	0.211	0.37	0.31	0.064	5%
13.15	1.06	0.70			0.235	0.90	13	12.73	13.58	0.235	0.211	0.36	0.31	0.065	5%
14.00	1.06	0.65			0.256	0.90	14	13.58	14.38	0.256	0.230	0.41	0.33	0.076	5%
14.75	1.07	0.65			0.262	0.90	15	14.38	15.23	0.262	0.236	0.42	0.36	0.084	6%
15.70	1.05	0.65			0.253	0.90	16	15.23	16.10	0.253	0.228	0.40	0.35	0.080	6%
16.50	1.01	0.64			0.219	0.90	17	16.10	16.98	0.219	0.198	0.37	0.32	0.064	5%
17.45	1.01	0.65			0.302	0.90	18	16.98	17.88	0.302	0.272	0.36	0.32	0.088	6%
18.30	1.02	0.64			0.305	0.90	19	17.88	18.88	0.305	0.274	0.38	0.38	0.104	8%
19.45	1.03	0.64			0.265	0.90	20	18.88	19.90	0.265	0.239	0.39	0.40	0.095	7%
20.35	0.99	0.63			0.165	0.90	21	19.90	20.85	0.165	0.148	0.36	0.34	0.051	4%
21.35	1.07	0.64			0.073	0.90	22	20.85	21.83	0.073	0.066	0.43	0.42	0.028	2%
22.30	1.10	0.68			0.040	0.90	23	21.83	22.73	0.040	0.036	0.42	0.38	0.013	1%
23.15	1.12	0.64			0.094	0.90	24	22.73	23.63	0.094	0.085	0.48	0.43	0.037	3%
24.10	1.25	0.64			0.119	0.90	25	23.63	24.60	0.119	0.107	0.61	0.59	0.064	5%
25.10	0.98	0.70			0.134	0.90	26	24.60	25.73	0.134	0.121	0.28	0.32	0.038	3%
26.35	0.94	0.63			0.030	0.90	27	25.73	26.73	0.030	0.027	0.31	0.31	0.009	1%
27.10	0.75	0.61			0.006	0.90	28	26.73	27.65	0.006	0.005	0.14	0.13	0.001	0%
28.20	0.65	0.63			0.003	0.90	29	27.65	28.90	0.003	0.003	0.02	0.03	0.000	0%
29.60	0.00	0.00			0.000	0.90	30	28.90	29.60	0.001	0.001	0.01	0.00	0.000	0%
Total Flow:															100%

Total Flow:	1.381	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	8.60	(m ²)
Top Width:	26.70	(m)
Hydraulic Depth:	0.322	(m)
Mean Velocity:	0.161	(m/s)
Froude Number	0.090	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	
Data logger Internal Power:	0.44V
Data logger External Power:	12.84V
Data logger Memory Used:	6%
Data logger Clock:	Not Set
Laptop Clock:	10:17
Dessicant:	0.50
Data logger:	1797
PT:	39666
Power:	Battery

Notes: Clock Reset
Data partial
Water Temp = 0.182615°C



Hydrometric Measurement / Site Visit Record

S14A - Ellis River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Ellis River
 Location: Ellis River at CNRL Bridge
 Site Name: S14A
 Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: May 11, 2008
 Start Time: 3:45 PM MDT
 End Time:

Weather Conditions: overcast, light wind, 8 C
River Conditions: open, high, fast

Personnel & Equipment

Measurement Made By: SS/SM
 Data Entry By: SS Checked by: March Mc Birney Flo-Mate 2000
 Meter Type and No.: s/n 2004521

Level Readings

Bench Mark Reading: rebar 1.922
 Water Level Reading: 3.468
 Top of Ice Level Reading:
 Transducer Reading & Est. El.: 1.156
 Other: top of logger box 0.016

Setup No. 1

El: 100.000
 El: 98.454
 El: 101.922
 El: 97.298
 El: 101.906

Setup No. 2

El: 100.000
 El: 98.452
 El: 101.888
 El: 97.296
 El:

Average

98.453
 97.297
 101.906

Data logger Notes:

Data logger Internal Power: 0.52 V
 Data logger External Power: 12.8 V
 Data logger Memory Used: 0%
 Data logger Clock: 14:44 MST
 Laptop Clock: 14:44 MST
 Dessicant: new

Data logger: 1797
 PT: 14501
 Power: Battery

Notes: td and therm both damaged by ice out
 new td installed and solnist installed
 manual water temp 8.5 C
 clocks synched, mem cleared

Hydrometric Measurement / Site Visit Record

S14A - Eils River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Eils River
Location: Eils River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: May 15, 2008
Start Time: 12:30 PM MDT
End Time: 1:00 PM MDT

Weather Conditions:

overcast, calm, 15 C

River Conditions:

open, high stage

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: 2.247
Water Level Reading: 3.808
Top of Ice Level Reading: 24.00
Transducer Reading & Est. El.: 1.156
Other: top of logger box 0.347

Setup No. 1

El: 100.000
El: 98.439
El: 97.283
El: 101.900

Setup No. 2

El: 2.196
El: 3.753
El: 97.287
El: 101.898

Average

100.000
98.443
97.285
101.899

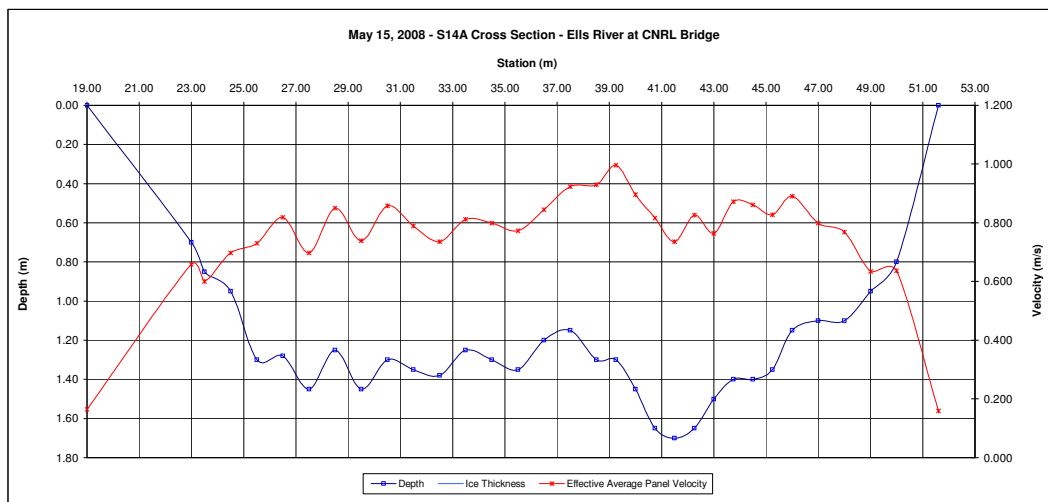
Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
19.00	0.00					1.00	1	19.00	21.00	0.165	0.165	0.18	0.35	0.058	0%
23.00	0.70				0.658	1.00	2	21.00	23.25	0.658	0.658	0.70	1.58	1.037	4%
23.50	0.85				0.600	1.00	3	23.25	24.00	0.600	0.600	0.85	0.64	0.383	1%
24.50	0.95				0.698	1.00	4	24.00	25.00	0.698	0.698	0.95	0.95	0.663	2%
25.50	1.30		0.890	0.570		1.00	5	25.00	26.00	0.730	0.730	1.30	1.30	0.949	3%
26.50	1.28		0.881	0.756		1.00	6	26.00	27.00	0.818	0.818	1.28	1.28	1.048	4%
27.50	1.45		0.991	0.405		1.00	7	27.00	28.00	0.698	0.698	1.45	1.45	1.012	3%
28.50	1.25		1.055	0.646		1.00	8	28.00	29.00	0.850	0.850	1.25	1.25	1.063	4%
29.50	1.45		0.988	0.491		1.00	9	29.00	30.00	0.739	0.739	1.45	1.45	1.072	4%
30.50	1.30		1.006	0.710		1.00	10	30.00	31.00	0.858	0.858	1.30	1.30	1.115	4%
31.50	1.35		0.939	0.640		1.00	11	31.00	32.00	0.789	0.789	1.35	1.35	1.066	4%
32.50	1.38		0.988	0.485		1.00	12	32.00	33.00	0.736	0.736	1.38	1.38	1.016	3%
33.50	1.25		0.893	0.732		1.00	13	33.00	34.00	0.812	0.812	1.25	1.25	1.015	3%
34.50	1.30		0.969	0.628		1.00	14	34.00	35.00	0.799	0.799	1.30	1.30	1.038	4%
35.50	1.35		0.957	0.588		1.00	15	35.00	36.00	0.773	0.773	1.35	1.35	1.043	4%
36.50	1.20		0.978	0.710		1.00	16	36.00	37.00	0.844	0.844	1.20	1.20	1.013	3%
37.50	1.15		1.079	0.768		1.00	17	37.00	38.00	0.924	0.924	1.15	1.15	1.062	4%
38.50	1.30		1.009	0.850		1.00	18	38.00	38.88	0.930	0.930	1.30	1.14	1.057	4%
39.25	1.30		0.991	1.003		1.00	19	38.88	39.63	0.997	0.997	1.30	0.98	0.972	3%
40.00	1.45		0.936	0.856		1.00	20	39.63	40.38	0.896	0.896	1.45	1.09	0.975	3%
40.75	1.65		0.866	0.768		1.00	21	40.38	41.13	0.817	0.817	1.65	1.24	1.011	3%
41.50	1.70		0.920	0.552		1.00	22	41.13	41.88	0.736	0.736	1.70	1.28	0.939	3%
42.25	1.65		0.951	0.701		1.00	23	41.88	42.63	0.826	0.826	1.65	1.24	1.022	4%
43.00	1.50		0.954	0.573		1.00	24	42.63	43.38	0.764	0.764	1.50	1.13	0.859	3%
43.75	1.40		1.003	0.741		1.00	25	43.38	44.13	0.872	0.872	1.40	1.05	0.915	3%
44.50	1.40		0.933	0.789		1.00	26	44.13	44.88	0.861	0.861	1.40	1.05	0.904	3%
45.25	1.35		0.847	0.808		1.00	27	44.88	45.63	0.828	0.828	1.35	1.01	0.838	3%
46.00	1.15		0.951	0.829		1.00	28	45.63	46.50	0.890	0.890	1.15	1.01	0.896	3%
47.00	1.10				0.799	1.00	29	46.50	47.50	0.799	0.799	1.10	1.10	0.878	3%
48.00	1.10				0.768	1.00	30	47.50	48.50	0.768	0.768	1.10	1.10	0.845	3%
49.00	0.95				0.634	1.00	31	48.50	49.50	0.634	0.634	0.95	0.95	0.602	2%
50.00	0.80				0.637	1.00	32	49.50	50.80	0.637	0.637	0.80	1.04	0.663	2%
51.80	0.00					1.00	33	50.80	51.80	0.159	0.159	0.20	0.16	0.025	0%
Total Flow:														29.053	1.000

Total Flow:	29.053	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	37.07	(m ²)
Top Width:	32.60	(m)
Hydraulic Depth:	1.137	(m)
Mean Velocity:	0.784	(m/s)
Froude Number	0.235	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	
Data logger Internal Power:	0.62 V
Data logger External Power:	12.84 V
Data logger Memory Used:	0%
Data logger Clock:	12:31 PM MST
Laptop Clock:	12:32 PM MST
Dessicant:	new
Data logger:	1797
PT:	14501
Power:	Battery

Notes: Solinst: Free memory 39621, battery 100%, LT clock 12:29, DL clock 12:29, SN 1021695
Solinst level: 2.16485 m
Temp 10.262 C



Hydrometric Measurement / Site Visit Record

S14A - Ellis River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Ellis River
Location: Ellis River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: June 25, 2008
Start Time: 10:30 AM MDT
End Time:

Weather Conditions: partly cloudy, 25 C

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked by: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar 2.355
Water Level Reading: 4.000
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.054
Other: top of logger box 0.466

Setup No. 1

El: 100.000
El: 98.355
El: 97.301
El: 101.889

Setup No. 2

2.396 El: 100.000
4.042 El: 98.354
1.054 El: 97.300
0.507 El: 101.889

Average

98.355
97.301
101.889

Data logger Notes:

Data logger Internal Power: 0.69 V
Data logger External Power: 12.75 V
Data logger Memory Used: 2%
Data logger Clock: 10:16 AM MST
Laptop Clock: 10:19 AM MST
Dessicant: good

Data logger: 1797
PT: 14501
Power: Battery

Photographs taken looking at:
Photographs taken.

Notes: Solnist: Free memory 35693, LT clock 10:25, DL clock 10:25, SN 1021695
Solnist level: 2.03945 m
Temp 17.362 C

Hydrometric Measurement / Site Visit Record

S14A - Ells River at CNRL Bridge



Measurement Location

River/Stream: Ells River
Location: Ells River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: June 26, 2008
Start Time: 1:30 PM MDT
End Time: 2:00 PM MDT

Weather Conditions:

sunny 24 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked by: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar 2.428
Water Level Reading: 4.104
Top of Ice Level Reading: 1.256
Transducer Reading & Est. El.: 1.032
Other: top of logger box 0.539

Setup No. 1

El: 100.000
El: 98.324
El: 97.292
El: 101.889

Setup No. 2

2.243
3.911
1.032
0.353

Average

100.000
98.332
97.300
101.890

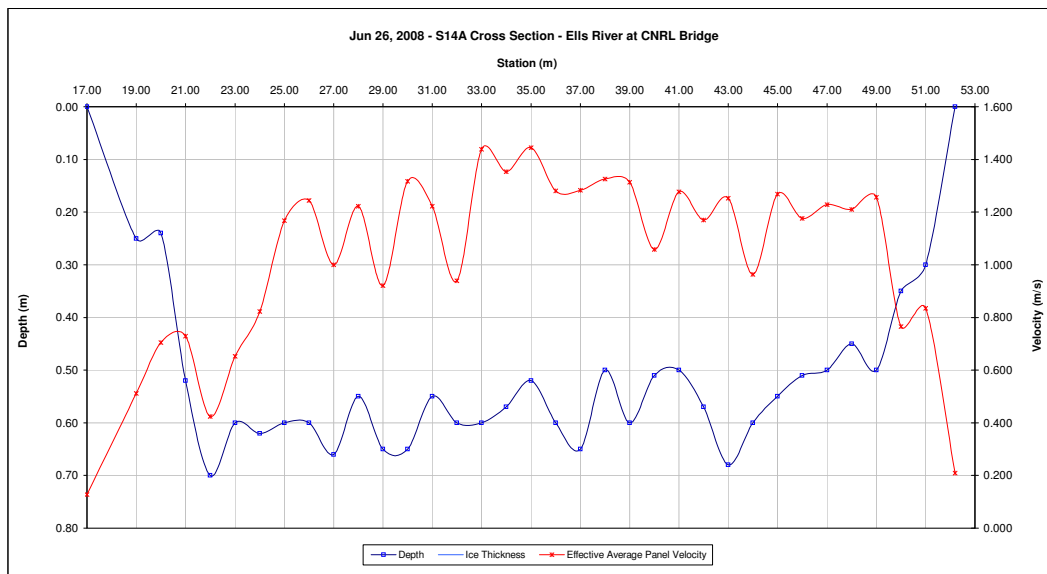
Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
52.20	0.00					1.00	1	52.20	51.60	0.209	0.209	0.08	0.05	0.009	0%
51.00	0.30				0.835	1.00	2	51.60	50.50	0.835	0.835	0.30	0.33	0.276	1%
50.00	0.35				0.765	1.00	3	50.50	49.50	0.765	0.765	0.35	0.35	0.268	1%
49.00	0.50				1.256	1.00	4	49.50	48.50	1.256	1.256	0.50	0.50	0.628	3%
48.00	0.45				1.210	1.00	5	48.50	47.50	1.210	1.210	0.45	0.45	0.545	3%
47.00	0.50				1.228	1.00	6	47.50	46.50	1.228	1.228	0.50	0.50	0.614	3%
46.00	0.51				1.177	1.00	7	46.50	45.50	1.177	1.177	0.51	0.51	0.600	3%
45.00	0.55				1.268	1.00	8	45.50	44.50	1.268	1.268	0.55	0.55	0.697	4%
44.00	0.60				0.963	1.00	9	44.50	43.50	0.963	0.963	0.60	0.60	0.578	3%
43.00	0.68				1.253	1.00	10	43.50	42.50	1.253	1.253	0.68	0.68	0.852	4%
42.00	0.57				1.170	1.00	11	42.50	41.50	1.170	1.170	0.57	0.57	0.667	3%
41.00	0.50				1.277	1.00	12	41.50	40.50	1.277	1.277	0.50	0.50	0.639	3%
40.00	0.51				1.058	1.00	13	40.50	39.50	1.058	1.058	0.51	0.51	0.539	3%
39.00	0.60				1.314	1.00	14	39.50	38.50	1.314	1.314	0.60	0.60	0.788	4%
38.00	0.50				1.326	1.00	15	38.50	37.50	1.326	1.326	0.50	0.50	0.663	3%
37.00	0.65				1.283	1.00	16	37.50	36.50	1.283	1.283	0.65	0.65	0.834	4%
36.00	0.60				1.280	1.00	17	36.50	35.50	1.280	1.280	0.60	0.60	0.768	4%
35.00	0.52				1.445	1.00	18	35.50	34.50	1.445	1.445	0.52	0.52	0.751	4%
34.00	0.57				1.353	1.00	19	34.50	33.50	1.353	1.353	0.57	0.57	0.771	4%
33.00	0.60				1.439	1.00	20	33.50	32.50	1.439	1.439	0.60	0.60	0.863	4%
32.00	0.60				0.939	1.00	21	32.50	31.50	0.939	0.939	0.60	0.60	0.563	3%
31.00	0.55				1.222	1.00	22	31.50	30.50	1.222	1.222	0.55	0.55	0.672	3%
30.00	0.65				1.317	1.00	23	30.50	29.50	1.317	1.317	0.65	0.65	0.856	4%
29.00	0.65				0.920	1.00	24	29.50	28.50	0.920	0.920	0.65	0.65	0.598	3%
28.00	0.55				1.222	1.00	25	28.50	27.50	1.222	1.222	0.55	0.55	0.672	3%
27.00	0.66				1.000	1.00	26	27.50	26.50	1.000	1.000	0.66	0.66	0.660	3%
26.00	0.60				1.244	1.00	27	26.50	25.50	1.244	1.244	0.60	0.60	0.746	4%
25.00	0.60				1.167	1.00	28	25.50	24.50	1.167	1.167	0.60	0.60	0.700	4%
24.00	0.62				0.823	1.00	29	24.50	23.50	0.823	0.823	0.62	0.62	0.510	3%
23.00	0.60				0.652	1.00	30	23.50	22.50	0.652	0.652	0.60	0.60	0.391	2%
22.00	0.70				0.424	1.00	31	22.50	21.50	0.424	0.424	0.70	0.70	0.297	2%
21.00	0.52				0.728	1.00	32	21.50	20.50	0.728	0.728	0.52	0.52	0.379	2%
20.00	0.24				0.704	1.00	33	20.50	19.50	0.704	0.704	0.24	0.24	0.169	1%
19.00	0.25				0.512	1.00	34	19.50	18.00	0.512	0.512	0.25	0.38	0.192	1%
17.00	0.00					1.00	35	18.00	17.00	0.128	0.128	0.06	0.06	0.008	0%
Total Flow:														19.765	1.000

Total Flow:	19.765	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	18.11	(m ²)
Top Width:	35.20	(m)
Hydraulic Depth:	0.515	(m)
Mean Velocity:	1.091	(m/s)
Froude Number	0.486	
Photographs taken looking at:		

Data logger Notes:	
Data logger Internal Power:	0.76 V
Data logger External Power:	12.73 V
Data logger Memory Used:	2% used
Data logger Clock:	12:28 PM MST
Laptop Clock:	1:10 PM MST
Dessicant:	good
Data logger:	1797
PT:	14501
Power:	Battery

Notes:



Hydrometric Measurement / Site Visit Record

S14A - Eils River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Eils River
Location: Eils River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: August 8, 2008
Start Time: 4:33 PM MDT
End Time: 4:50 PM MDT

Weather Conditions:

hot 30 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked by:
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar 2.598
Water Level Reading: 4.470
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.836
Other: top of logger box 0.699

Setup No. 1

El: 100.000
El: 98.128
El:
El: 97.292
El: 101.899

Setup No. 2

2.577
4.45
El: 100.000
El: 98.127
El:
El: 97.291
El: 101.897

Average

98.128
97.292
101.898

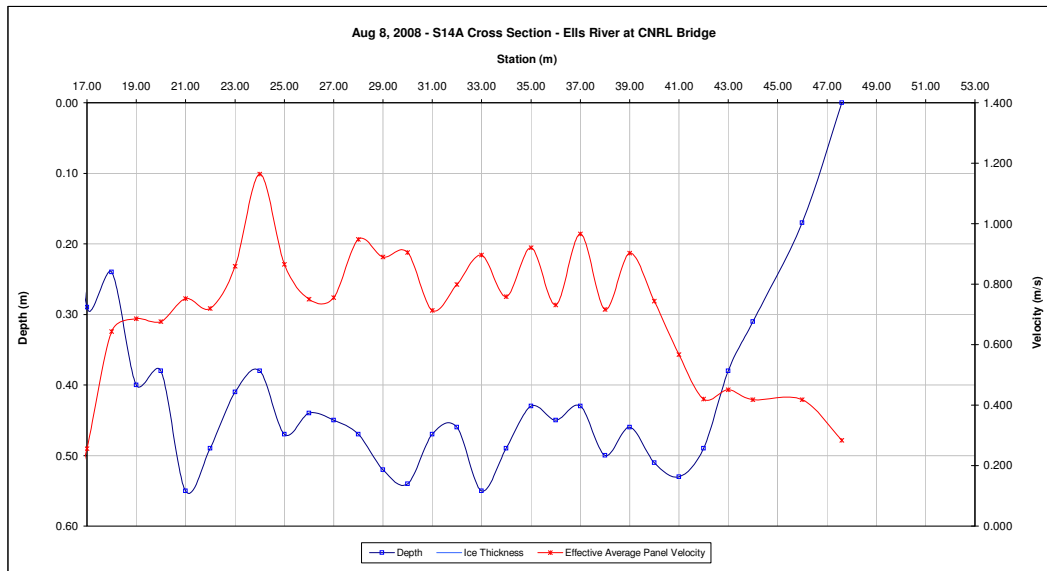
Measurement Data

Measured Data						Calculated Data									
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percentage of Total
LB	16.40	0.00				1.00	1	16.40	16.70	0.064	0.064	0.07	0.02	0.001	0%
	17.00	0.29			0.256	1.00	2	16.70	17.50	0.256	0.256	0.29	0.23	0.059	1%
	18.00	0.24			0.643	1.00	3	17.50	18.50	0.643	0.643	0.24	0.24	0.154	2%
	19.00	0.40			0.686	1.00	4	18.50	19.50	0.686	0.686	0.40	0.40	0.274	3%
	20.00	0.38			0.677	1.00	5	19.50	20.50	0.677	0.677	0.38	0.38	0.257	3%
	21.00	0.55			0.753	1.00	6	20.50	21.50	0.753	0.753	0.55	0.55	0.414	4%
	22.00	0.49			0.719	1.00	7	21.50	22.50	0.719	0.719	0.49	0.49	0.352	4%
	23.00	0.41			0.860	1.00	8	22.50	23.50	0.860	0.860	0.41	0.41	0.352	4%
	24.00	0.38			1.164	1.00	9	23.50	24.50	1.164	1.164	0.38	0.38	0.442	5%
	25.00	0.47			0.866	1.00	10	24.50	25.50	0.866	0.866	0.47	0.47	0.407	4%
	26.00	0.44			0.750	1.00	11	25.50	26.50	0.750	0.750	0.44	0.44	0.330	3%
	27.00	0.45			0.756	1.00	12	26.50	27.50	0.756	0.756	0.45	0.45	0.340	4%
	28.00	0.47			0.948	1.00	13	27.50	28.50	0.948	0.948	0.47	0.47	0.446	5%
	29.00	0.52			0.890	1.00	14	28.50	29.50	0.890	0.890	0.52	0.52	0.463	5%
	30.00	0.54			0.905	1.00	15	29.50	30.50	0.905	0.905	0.54	0.54	0.489	5%
	31.00	0.47			0.713	1.00	16	30.50	31.50	0.713	0.713	0.47	0.47	0.335	3%
	32.00	0.46			0.799	1.00	17	31.50	32.50	0.799	0.799	0.46	0.46	0.367	4%
	33.00	0.55			0.896	1.00	18	32.50	33.50	0.896	0.896	0.55	0.55	0.493	5%
	34.00	0.49			0.759	1.00	19	33.50	34.50	0.759	0.759	0.49	0.49	0.372	4%
	35.00	0.43			0.920	1.00	20	34.50	35.50	0.920	0.920	0.43	0.43	0.396	4%
	36.00	0.45			0.732	1.00	21	35.50	36.50	0.732	0.732	0.45	0.45	0.329	3%
	37.00	0.43			0.966	1.00	22	36.50	37.50	0.966	0.966	0.43	0.43	0.415	4%
	38.00	0.50			0.716	1.00	23	37.50	38.50	0.716	0.716	0.50	0.50	0.358	4%
	39.00	0.46			0.902	1.00	24	38.50	39.50	0.902	0.902	0.46	0.46	0.415	4%
	40.00	0.51			0.744	1.00	25	39.50	40.50	0.744	0.744	0.51	0.51	0.379	4%
	41.00	0.53			0.567	1.00	26	40.50	41.50	0.567	0.567	0.53	0.53	0.300	3%
	42.00	0.49			0.421	1.00	27	41.50	42.50	0.421	0.421	0.49	0.49	0.206	2%
	43.00	0.38			0.451	1.00	28	42.50	43.50	0.451	0.451	0.38	0.38	0.171	2%
	44.00	0.31			0.418	1.00	29	43.50	45.00	0.418	0.418	0.31	0.47	0.194	2%
RB	46.00	0.17			0.418	1.00	30	45.00	46.80	0.418	0.418	0.17	0.31	0.128	1%
	47.60	0.00			0.283	1.00	31	46.80	47.60	0.283	0.283	0.00	0.00	0.000	0%
Total Flow:														9.642	1.000

Total Flow:	9.642	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	12.91	(m ²)
Top Width:	31.20	(m)
Hydraulic Depth:	0.414	(m)
Mean Velocity:	0.747	(m/s)
Froude Number	0.371	
Photographs taken looking at:		
Photos taken		

Data logger Notes:
Data logger Internal Power: 1.29 V
Data logger External Power: 12.7 V
Data logger Memory Used: 3% used
Data logger Clock: 3:15 PM MST
Laptop Clock: 3:18 PM MST
Dessicant: good
Data logger: 1797
PT: 14501
Power: Battery

Notes:



Hydrometric Measurement / Site Visit Record

S14A - Eils River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Eils River
Location: Eils River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: September 10, 2008
Start Time: 2:12 PM MDT
End Time: 2:30 PM MDT

Weather Conditions:

partly cloudy, 15C

River Conditions:

open, low

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: 2.242
Water Level Reading: 4.248
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.709
Other: bubbler left post 0.353

Setup No. 1

El: 100.000
El: 97.994
El:
El: 97.285
El: 101.889

Setup No. 2

2.23 El: 100.000
4.24 El: 97.990
El:
0.709 El: 97.281
0.338 El: 101.892

Average

97.992
97.283
101.891

Measurement Data

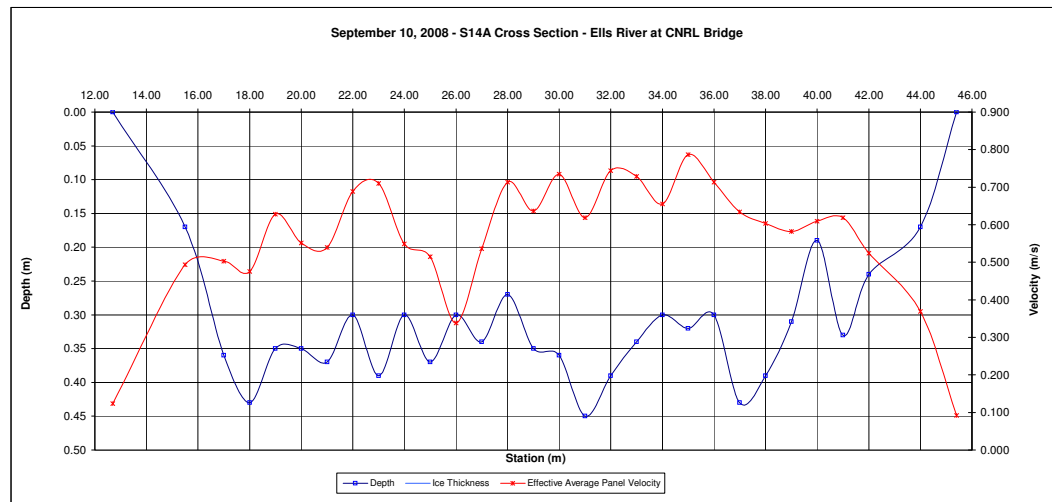
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
45.40	0.00					1.00	1	45.40	44.70	0.092	0.092	0.04	0.03	0.003	0%
44.00	0.17				0.369	1.00	2	44.70	43.00	0.369	0.369	0.17	0.29	0.107	2%
42.00	0.24				0.524	1.00	3	43.00	41.50	0.524	0.524	0.24	0.36	0.189	3%
41.00	0.33				0.619	1.00	4	41.50	40.50	0.619	0.619	0.33	0.33	0.204	4%
40.00	0.19				0.610	1.00	5	40.50	39.50	0.610	0.610	0.19	0.19	0.116	2%
39.00	0.31				0.582	1.00	6	39.50	38.50	0.582	0.582	0.31	0.31	0.180	3%
38.00	0.39				0.604	1.00	7	38.50	37.50	0.604	0.604	0.39	0.39	0.235	4%
37.00	0.43				0.634	1.00	8	37.50	36.50	0.634	0.634	0.43	0.43	0.273	5%
36.00	0.30				0.713	1.00	9	36.50	35.50	0.713	0.713	0.30	0.30	0.214	4%
35.00	0.32				0.786	1.00	10	35.50	34.50	0.786	0.786	0.32	0.32	0.252	4%
34.00	0.30				0.655	1.00	11	34.50	33.50	0.655	0.655	0.30	0.30	0.197	3%
33.00	0.34				0.728	1.00	12	33.50	32.50	0.728	0.728	0.34	0.34	0.248	4%
32.00	0.39				0.744	1.00	13	32.50	31.50	0.744	0.744	0.39	0.39	0.290	5%
31.00	0.45				0.619	1.00	14	31.50	30.50	0.619	0.619	0.45	0.45	0.278	5%
30.00	0.36				0.735	1.00	15	30.50	29.50	0.735	0.735	0.36	0.36	0.264	5%
29.00	0.35				0.637	1.00	16	29.50	28.50	0.637	0.637	0.35	0.35	0.223	4%
28.00	0.27				0.713	1.00	17	28.50	27.50	0.713	0.713	0.27	0.27	0.193	3%
27.00	0.34				0.536	1.00	18	27.50	26.50	0.536	0.536	0.34	0.34	0.182	3%
26.00	0.30				0.338	1.00	19	26.50	25.50	0.338	0.338	0.30	0.30	0.101	2%
25.00	0.37				0.515	1.00	20	25.50	24.50	0.515	0.515	0.37	0.37	0.191	3%
24.00	0.30				0.549	1.00	21	24.50	23.50	0.549	0.549	0.30	0.30	0.165	3%
23.00	0.39				0.710	1.00	22	23.50	22.50	0.710	0.710	0.39	0.39	0.277	5%
22.00	0.30				0.689	1.00	23	22.50	21.50	0.689	0.689	0.30	0.30	0.207	4%
21.00	0.37				0.539	1.00	24	21.50	20.50	0.539	0.539	0.37	0.37	0.200	3%
20.00	0.35				0.552	1.00	25	20.50	19.50	0.552	0.552	0.35	0.35	0.193	3%
19.00	0.35				0.628	1.00	26	19.50	18.50	0.628	0.628	0.35	0.35	0.220	4%
18.00	0.43				0.475	1.00	27	18.50	17.50	0.475	0.475	0.43	0.43	0.204	4%
17.00	0.36				0.503	1.00	28	17.50	16.25	0.503	0.503	0.36	0.45	0.226	4%
15.50	0.17				0.494	1.00	29	16.25	14.10	0.494	0.494	0.17	0.37	0.180	3%
12.70	0.00					1.00	30	14.10	12.70	0.123	0.123	0.04	0.06	0.007	0%
Total Flow:															1.000

Total Flow:	5.819	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	9.76	(m ²)
Top Width:	32.70	(m)
Hydraulic Depth:	0.299	(m)
Mean Velocity:	0.595	(m/s)
Froude Number	0.347	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power: 0.56 V
Data logger External Power: 12.55 V
Data logger Memory Used: 4%
Data logger Clock: 12:55 PM MST
Laptop Clock: 1:00 PM MST
Dessicant: half used
Data logger: 1797
PT: 14501
Power: Battery

Notes: dolphin data good
solinst DL 13:47 LT 13:04 battery 100% mem 28290 free, offset 0m, SN# 1021695, altitude 500 m, level 1.744 m, temp 10.884 C



Hydrometric Measurement / Site Visit Record

S14A - Eils River at CNRL Bridge



Measurement Location

River/Stream: Eils River
Location: Eils River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: October 15, 2008
Start Time: 12:30 PM MDT
End Time: 12:50 PM MDT

Weather Conditions:

sunny, 5 C

River Conditions:

open, low

Personnel & Equipment

Measurement Made By: SSUSL
Data Entry By: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: 2.510
Water Level Reading: 4.524
Top of Ice Level Reading: 0.609
Other: bubbler left post 0.619

Setup No. 1

El: 100.000
El: 97.986
El: 97.377
El: 101.891

Setup No. 2

2.18
4.198
0.609
0.29

Average

100.000
97.982
97.375
101.891

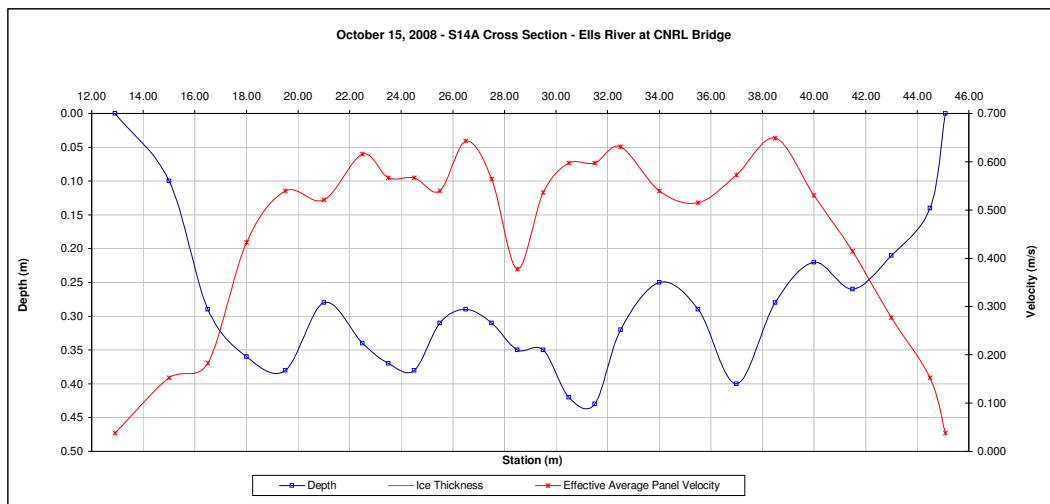
Measurement Data

Measured Data						Calculated Data									
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percentage of Total
12.90	0.00					1.00	1	12.90	13.95	0.038	0.038	0.03	0.03	0.001	0%
15.00	0.10				0.152	1.00	2	13.95	15.75	0.152	0.152	0.10	0.18	0.027	1%
16.50	0.29				0.183	1.00	3	15.75	17.25	0.183	0.183	0.29	0.44	0.080	2%
18.00	0.36				0.433	1.00	4	17.25	18.75	0.433	0.433	0.36	0.54	0.234	5%
19.50	0.38				0.539	1.00	5	18.75	20.25	0.539	0.539	0.38	0.57	0.308	7%
21.00	0.28				0.521	1.00	6	20.25	21.75	0.521	0.521	0.28	0.42	0.219	5%
22.50	0.34				0.616	1.00	7	21.75	23.00	0.616	0.616	0.34	0.43	0.262	6%
23.50	0.37				0.567	1.00	8	23.00	24.00	0.567	0.567	0.37	0.37	0.210	5%
24.50	0.38				0.567	1.00	9	24.00	25.00	0.567	0.567	0.38	0.38	0.215	5%
25.50	0.31				0.539	1.00	10	25.00	26.00	0.539	0.539	0.31	0.31	0.167	4%
26.50	0.29				0.643	1.00	11	26.00	27.00	0.643	0.643	0.29	0.29	0.187	4%
27.50	0.31				0.564	1.00	12	27.00	28.00	0.564	0.564	0.31	0.31	0.175	4%
28.50	0.35				0.378	1.00	13	28.00	29.00	0.378	0.378	0.35	0.35	0.132	3%
29.50	0.35				0.536	1.00	14	29.00	30.00	0.536	0.536	0.35	0.35	0.188	4%
30.50	0.42				0.597	1.00	15	30.00	31.00	0.597	0.597	0.42	0.42	0.251	5%
31.50	0.43				0.597	1.00	16	31.00	32.00	0.597	0.597	0.43	0.43	0.257	6%
32.50	0.32				0.631	1.00	17	32.00	33.25	0.631	0.631	0.32	0.40	0.252	5%
34.00	0.25				0.539	1.00	18	33.25	34.75	0.539	0.539	0.25	0.38	0.202	4%
35.50	0.29				0.515	1.00	19	34.75	36.25	0.515	0.515	0.29	0.44	0.224	5%
37.00	0.40				0.573	1.00	20	36.25	37.75	0.573	0.573	0.40	0.60	0.344	7%
38.50	0.28				0.649	1.00	21	37.75	39.25	0.649	0.649	0.28	0.42	0.273	6%
40.00	0.22				0.530	1.00	22	39.25	40.75	0.530	0.530	0.22	0.33	0.175	4%
41.50	0.26				0.415	1.00	23	40.75	42.25	0.415	0.415	0.26	0.39	0.162	3%
43.00	0.21				0.277	1.00	24	42.25	43.75	0.277	0.277	0.21	0.32	0.087	2%
44.50	0.14				0.152	1.00	25	43.75	44.80	0.152	0.152	0.14	0.15	0.022	0%
45.10	0.00					1.00	26	44.80	45.10	0.038	0.038	0.04	0.01	0.000	0%
Total Flow:															4.653
															1.000

Total Flow:	4.653	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	9.23	(m ²)
Top Width:	32.20	(m)
Hydraulic Depth:	0.287	(m)
Mean Velocity:	0.504	(m/s)
Froude Number	0.301	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:	
Data logger Internal Power:	0.48 V
Data logger External Power:	12.44 V
Data logger Memory Used:	5%
Data logger Clock:	11:22 AM MST
Laptop Clock:	11:29 AM MST
Dessicant:	NEW
Data logger:	1797
PT:	14501
Power:	Battery

Notes: Solinst: SN 1021695 Level = 1.653 m
Battery 100% Temp = 3.829 C
DL Clock 11:39 MST
LT Clock 11:38 MST



Hydrometric Measurement / Site Visit Record

S14A - Eils River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Eils River
Location: Eils River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: December 12, 2008
Start Time: 3:15 PM MST
End Time: 3:30 PM MST

Weather Conditions:

scattered cloud, calm, -22 C
ice-cover

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar 2.046
Water Level Reading: 3.921
Top of Ice Level Reading: 3.925
Transducer Reading & Est. El.: 0.773
Other: bubbler left post 0.155

Setup No. 1

El: 100.000
El: 98.125
El: 98.121
El: 97.352
El: 101.891

Setup No. 2

2.028
3.899
3.908
0.773
0.138

Average

100.000
98.129
98.120
97.356
101.890

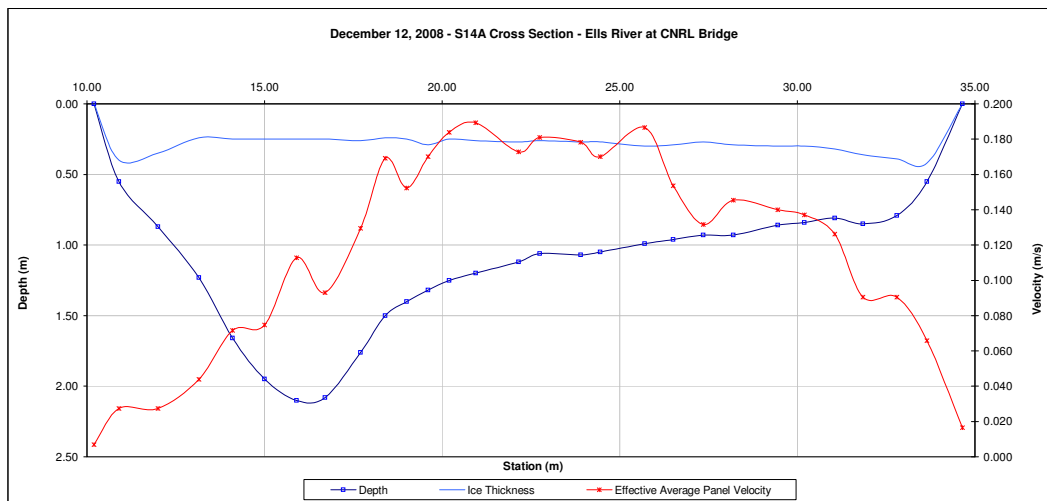
Measurement Data

Measured Data						Calculated Data									
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percentage of Total
34.65	0.00	0.00				0.90	1	34.65	34.15	0.018	0.016	0.03	0.02	0.000	0%
33.65	0.55	0.42			0.073	0.90	2	34.15	33.23	0.073	0.066	0.13	0.12	0.008	0%
32.80	0.79	0.39			0.101	0.90	3	33.23	32.33	0.101	0.091	0.40	0.36	0.033	1%
31.85	0.85	0.36			0.101	0.90	4	32.33	31.45	0.101	0.091	0.49	0.43	0.039	2%
31.05	0.81	0.32			0.140	0.90	5	31.45	30.63	0.140	0.126	0.49	0.40	0.051	2%
30.20	0.84	0.30			0.152	0.90	6	30.63	29.83	0.152	0.137	0.54	0.43	0.059	2%
29.45	0.86	0.30			0.155	0.90	7	29.83	28.83	0.155	0.140	0.56	0.56	0.078	3%
28.20	0.93	0.29			0.162	0.90	8	28.83	27.78	0.162	0.145	0.64	0.67	0.098	4%
27.35	0.93	0.27			0.146	0.90	9	27.78	26.93	0.146	0.132	0.66	0.56	0.074	3%
26.50	0.96	0.29			0.171	0.90	10	26.93	26.10	0.171	0.154	0.67	0.55	0.085	3%
25.70	0.99	0.30			0.207	0.90	11	26.10	25.08	0.207	0.187	0.69	0.71	0.132	5%
24.45	1.05	0.27			0.189	0.90	12	25.08	24.18	0.189	0.170	0.78	0.70	0.119	5%
23.90	1.07	0.27			0.198	0.90	13	24.18	23.33	0.198	0.178	0.80	0.68	0.121	5%
22.75	1.06	0.26			0.201	0.90	14	23.33	22.45	0.201	0.181	0.80	0.70	0.127	5%
22.15	1.12	0.27			0.192	0.90	15	22.45	21.55	0.192	0.173	0.85	0.77	0.132	5%
20.95	1.20	0.26			0.210	0.90	16	21.55	20.58	0.210	0.189	0.94	0.92	0.173	7%
20.20	1.25	0.25			0.204	0.90	17	20.58	19.90	0.204	0.184	1.00	0.68	0.124	5%
19.60	1.32	0.29			0.189	0.90	18	19.90	19.30	0.189	0.170	1.03	0.62	0.105	4%
19.00	1.40	0.25	0.189	0.116		1.00	19	19.30	18.70	0.152	0.152	1.15	0.69	0.105	4%
18.40	1.50	0.24	0.174	0.165		1.00	20	18.70	18.05	0.169	0.169	1.26	0.82	0.139	5%
17.70	1.76	0.26	0.149	0.110		1.00	21	18.05	17.20	0.130	0.130	1.50	1.28	0.165	6%
16.70	2.08	0.25	0.134	0.052		1.00	22	17.20	16.30	0.093	0.093	1.83	1.65	0.153	6%
15.90	2.10	0.25	0.143	0.082		1.00	23	16.30	15.45	0.113	0.113	1.85	1.57	0.177	7%
15.00	1.95	0.25	0.113	0.037		1.00	24	15.45	14.55	0.075	0.075	1.70	1.53	0.114	4%
14.10	1.66	0.25	0.076	0.067		1.00	25	14.55	13.63	0.072	0.072	1.41	1.30	0.093	4%
13.15	1.23	0.24			0.049	0.90	26	13.63	12.58	0.049	0.044	0.99	1.04	0.046	2%
12.00	0.87	0.35			0.030	0.90	27	12.58	11.45	0.030	0.027	0.52	0.59	0.016	1%
10.90	0.55	0.40			0.030	0.90	28	11.45	10.55	0.030	0.027	0.15	0.14	0.004	0%
10.20	0.00	0.00				0.90	29	10.55	10.20	0.008	0.007	0.04	0.01	0.000	0%
Total Flow:														2.571	1.000

Total Flow:	2.571	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	20.48	(m ²)
Top Width:	24.45	(m)
Hydraulic Depth:	0.838	(m)
Mean Velocity:	0.126	(m/s)
Froude Number	0.044	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	site 1797
Data logger Internal Power:	0.4 V
Data logger External Power:	12.24 V
Data logger Memory Used:	7%
Data logger Clock:	1:59 PM MST
Laptop Clock:	2:10 PM MST
Dessicant:	new
Data logger:	1797
PT:	14501
Power:	Battery

Notes: Solinst data: 1.83 m depth, 0.499 C water temp, SN 1021695, LT 14:14, DL 14:14
free memory 19358, battery 100%



Hydrometric Measurement / Site Visit Record

S15A - Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River
Site Name: S15A
Coordinates & Legal: 6353391 N, 458395 E

Time of Measurement

Date of Measurement: May 11, 2008
Start Time: 11:45 AM MDT
End Time: 12:00 PM MDT

Weather Conditions:

clear, calm, 12 C

River Conditions:

high, open, turbulent

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in stump 1.339
Water Level Reading: 2.419
Top of Ice Level Reading: 0.934
Transducer Reading & Calc'd El: 0.438
Other: nail in tree

Setup No. 1

El: 100.000 1.301
El: 98.920 2.381
El: 97.986 0.934
El: 100.901 0.397

Setup No. 2

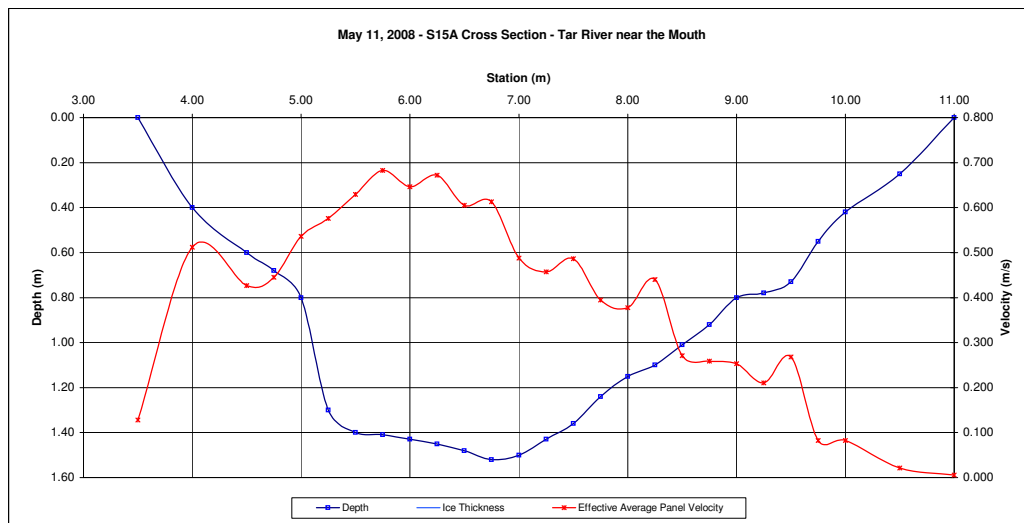
El: 100.000 1.301
El: 98.920 2.381
El: 97.986 0.934
El: 100.904 0.397

Measurement Data																Percentage of Total
Measured Data							Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
RB	3.50	0.00				1.00	1	3.50	3.75	0.128	0.128	0.10	0.03	0.003	0%	
	4.00	0.40			0.51	1.00	2	3.75	4.25	0.512	0.512	0.40	0.20	0.102	3%	
	4.50	0.60			0.43	1.00	3	4.25	4.63	0.427	0.427	0.60	0.23	0.096	3%	
	4.75	0.68			0.45	1.00	4	4.63	4.88	0.445	0.445	0.68	0.17	0.076	2%	
	5.00	0.80			0.54	1.00	5	4.88	5.13	0.536	0.536	0.80	0.20	0.107	3%	
	5.25	1.30	0.65	0.50		1.00	6	5.13	5.38	0.576	0.576	1.30	0.33	0.187	6%	
	5.50	1.40	0.63	0.62		1.00	7	5.38	5.63	0.629	0.629	1.40	0.35	0.220	7%	
	5.75	1.41	0.65	0.72		1.00	8	5.63	5.88	0.683	0.683	1.41	0.35	0.241	8%	
	6.00	1.43	0.63	0.66		1.00	9	5.88	6.13	0.646	0.646	1.43	0.36	0.231	7%	
	6.25	1.45	0.62	0.73		1.00	10	6.13	6.38	0.672	0.672	1.45	0.36	0.244	8%	
	6.50	1.48	0.55	0.66		1.00	11	6.38	6.63	0.605	0.605	1.48	0.37	0.224	7%	
	6.75	1.52	0.54	0.68		1.00	12	6.63	6.88	0.613	0.613	1.52	0.38	0.233	7%	
	7.00	1.50	0.54	0.43		1.00	13	6.88	7.13	0.488	0.488	1.50	0.38	0.183	6%	
	7.25	1.43	0.50	0.41		1.00	14	7.13	7.38	0.457	0.457	1.43	0.36	0.163	5%	
	7.50	1.36	0.51	0.47		1.00	15	7.38	7.63	0.486	0.486	1.36	0.34	0.165	5%	
	7.75	1.24	0.48	0.31		1.00	16	7.63	7.88	0.395	0.395	1.24	0.31	0.122	4%	
	8.00	1.15	0.42	0.33		1.00	17	7.88	8.13	0.378	0.378	1.15	0.29	0.109	3%	
	8.25	1.10	0.45	0.43		1.00	18	8.13	8.38	0.440	0.440	1.10	0.28	0.121	4%	
	8.50	1.01			0.27	1.00	19	8.38	8.63	0.271	0.271	1.01	0.25	0.068	2%	
	8.75	0.92			0.26	1.00	20	8.63	8.88	0.259	0.259	0.92	0.23	0.060	2%	
	9.00	0.80			0.25	1.00	21	8.88	9.13	0.253	0.253	0.80	0.20	0.051	2%	
9.25	0.78			0.21	1.00	22	9.13	9.38	0.210	0.210	0.78	0.20	0.041	1%		
9.50	0.73			0.27	1.00	23	9.38	9.63	0.268	0.268	0.73	0.18	0.049	2%		
9.75	0.55			0.08	1.00	24	9.63	9.88	0.082	0.082	0.55	0.14	0.011	0%		
10.00	0.42			0.08	1.00	25	9.88	10.25	0.082	0.082	0.42	0.16	0.013	0%		
10.50	0.25			0.02	1.00	26	10.25	10.75	0.021	0.021	0.25	0.13	0.003	0%		
11.00	0.00				1.00	27	10.75	11.00	0.005	0.005	0.06	0.02	0.000	0%		
Total Flow:														3.123	1.000	

Total Flow:	3.123	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	6.76	(m ²)
Top Width:	7.50	(m)
Hydraulic Depth:	0.901	(m)
Mean Velocity:	0.462	(m/s)
Froude Number	0.155	
Photographs taken looking at:		
Upstream, downstream, across		

Notes: TD and Thermistor installed

Data logger Notes:	
Data logger Internal Power:	4.65 V
Data logger External Power:	12.7 V
Data logger Memory Used:	0% used
Data logger Clock:	11:17 MST
Laptop Clock:	11:17 MST
Dessicant:	good
Data logger:	Optimum DD-128 #0204100608
PT:	Keller 3psi #0101356
Power:	Solar panel and internal battery



Hydrometric Measurement / Site Visit Record

S15A - Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River
Site Name: S15A
Coordinates & Legal: 6353391 N, 458395 E

Time of Measurement

Date of Measurement: June 27, 2008
Start Time: 4:46 PM MDT
End Time: 5:00 PM MDT

Weather Conditions:

hot 30 C
River Conditions: open

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in stump 1.728
Water Level Reading: 3.390
Top of Ice Level Reading: 0.446
Transducer Reading & Calc'd El: 0.811
Other: nail in tree

Setup No. 1

El: 100.000 1.704
El: 98.338 3.374
El: 97.892 0.446
El: 100.917 0.795

Setup No. 2

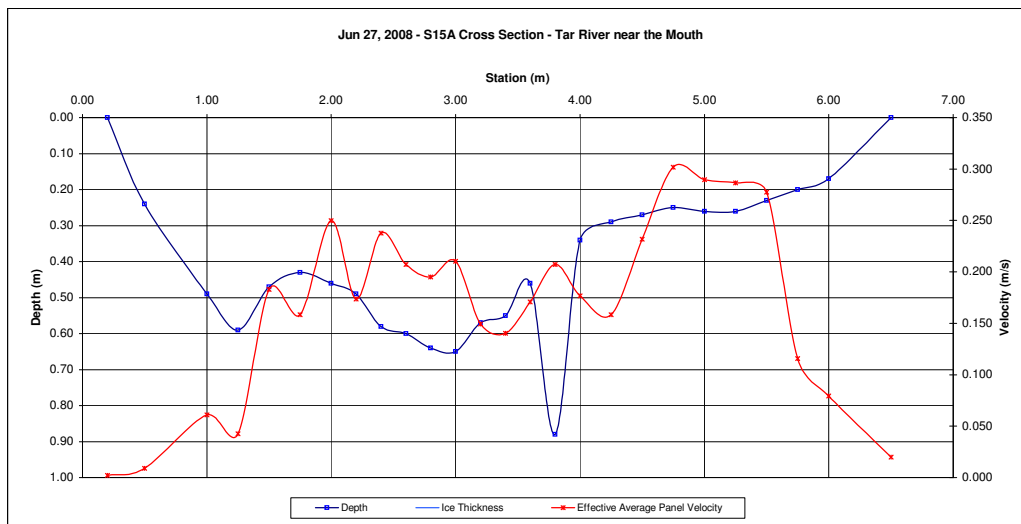
El: 100.000
El: 98.330 98.334
El: 97.884 97.888
El: 100.909 100.913

Measured Data										Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
0.20	0.00					1.00	1	0.20	0.35	0.002	0.002	0.06	0.01	0.000	0%				
0.50	0.24				0.01	1.00	2	0.35	0.75	0.009	0.009	0.24	0.10	0.001	0%				
1.00	0.49				0.06	1.00	3	0.75	1.13	0.061	0.061	0.49	0.18	0.011	3%				
1.25	0.59				0.04	1.00	4	1.13	1.38	0.043	0.043	0.59	0.15	0.006	2%				
1.50	0.47				0.18	1.00	5	1.38	1.63	0.183	0.183	0.47	0.12	0.021	5%				
1.75	0.43				0.16	1.00	6	1.63	1.88	0.158	0.158	0.43	0.11	0.017	4%				
2.00	0.46				0.25	1.00	7	1.88	2.10	0.250	0.250	0.46	0.10	0.026	6%				
2.20	0.49				0.17	1.00	8	2.10	2.30	0.174	0.174	0.49	0.10	0.017	4%				
2.40	0.58				0.24	1.00	9	2.30	2.50	0.238	0.238	0.58	0.12	0.028	7%				
2.60	0.60				0.21	1.00	10	2.50	2.70	0.207	0.207	0.60	0.12	0.025	6%				
2.80	0.64				0.20	1.00	11	2.70	2.90	0.195	0.195	0.64	0.13	0.025	6%				
3.00	0.65				0.21	1.00	12	2.90	3.10	0.210	0.210	0.65	0.13	0.027	7%				
3.20	0.57				0.15	1.00	13	3.10	3.30	0.149	0.149	0.57	0.11	0.017	4%				
3.40	0.55				0.14	1.00	14	3.30	3.50	0.140	0.140	0.55	0.11	0.015	4%				
3.60	0.46				0.17	1.00	15	3.50	3.70	0.171	0.171	0.46	0.09	0.016	4%				
3.80	0.88				0.21	1.00	16	3.70	3.90	0.207	0.207	0.88	0.18	0.036	9%				
4.00	0.34				0.18	1.00	17	3.90	4.13	0.177	0.177	0.34	0.08	0.014	3%				
4.25	0.29				0.16	1.00	18	4.13	4.38	0.158	0.158	0.29	0.07	0.011	3%				
4.50	0.27				0.23	1.00	19	4.38	4.63	0.232	0.232	0.27	0.07	0.016	4%				
4.75	0.25				0.30	1.00	20	4.63	4.88	0.302	0.302	0.25	0.06	0.019	5%				
5.00	0.26				0.29	1.00	21	4.88	5.13	0.290	0.290	0.26	0.07	0.019	5%				
5.25	0.26				0.29	1.00	22	5.13	5.38	0.287	0.287	0.26	0.07	0.019	5%				
5.50	0.23				0.28	1.00	23	5.38	5.63	0.277	0.277	0.23	0.06	0.016	4%				
5.75	0.20				0.12	1.00	24	5.63	5.88	0.116	0.116	0.20	0.05	0.006	1%				
6.00	0.17				0.08	1.00	25	5.88	6.25	0.079	0.079	0.17	0.06	0.005	1%				
6.50	0.00					1.00	26	6.25	6.50	0.020	0.020	0.04	0.01	0.000	0%				
Total Flow:															0.413	1.000			

Total Flow:	0.413	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	2.44	(m ²)
Top Width:	6.30	(m)
Hydraulic Depth:	0.387	(m)
Mean Velocity:	0.169	(m/s)
Froude Number	0.087	
Photographs taken looking at:		
Photos taken		

Notes: Data good

Data logger Notes:		
Data logger Internal Power:	4.7 V	
Data logger External Power:	14.32 V	
Data logger Memory Used:	6% used	
Data logger Clock:	3:39 PM	MST
Laptop Clock:	3:40 PM	MST
Dessicant:	good	
Data logger:	Optimum DD-128 #0204100608	
PT:	Keller 3psi #0101356	
Power:	Solar panel and internal battery	



Hydrometric Measurement / Site Visit Record

S15A - Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River
Site Name: S15A
Coordinates & Legal: 6353391 N, 458395 E

Time of Measurement

Date of Measurement: August 8, 2008
Start Time: 1:05 PM MDT
End Time: 1:30 PM MDT

Weather Conditions:

hot
River Conditions: low stage

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: DW Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in stump 1.425
Water Level Reading: 3.233
Top of Ice Level Reading: 0.313
Transducer Reading & Calc'd El: 0.511
Other: nail in tree

Setup No. 1

El: 100.000 1.375
El: 98.192 3.180
El: 97.879 0.313
El: 100.914 0.465

Setup No. 2

El: 100.000
El: 98.195
El: 97.882
El: 100.912

LB

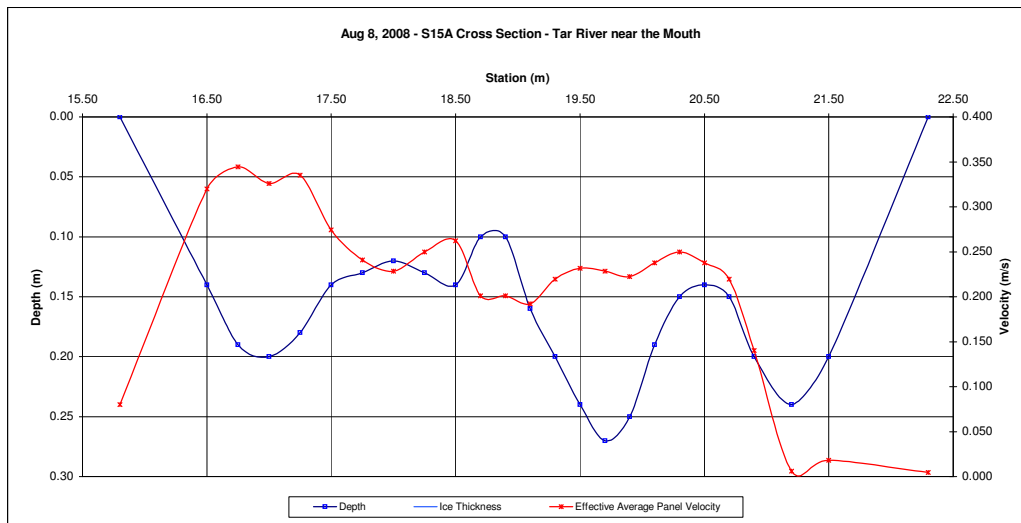
RB

Measured Data						Measurement Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
15.80	0.00					1.00	1	15.80	16.15	0.080	0.080	0.04	0.01	0.001	0%	
16.50	0.14				0.32	1.00	2	16.15	16.63	0.320	0.320	0.14	0.07	0.021	10%	
16.75	0.19				0.34	1.00	3	16.63	16.88	0.344	0.344	0.19	0.05	0.016	8%	
17.00	0.20				0.33	1.00	4	16.88	17.13	0.326	0.326	0.20	0.05	0.016	8%	
17.25	0.18				0.34	1.00	5	17.13	17.38	0.335	0.335	0.18	0.05	0.015	7%	
17.50	0.14				0.27	1.00	6	17.38	17.63	0.274	0.274	0.14	0.04	0.010	5%	
17.75	0.13				0.24	1.00	7	17.63	17.88	0.241	0.241	0.13	0.03	0.008	4%	
18.00	0.12				0.23	1.00	8	17.88	18.13	0.229	0.229	0.12	0.03	0.007	3%	
18.25	0.13				0.25	1.00	9	18.13	18.38	0.250	0.250	0.13	0.03	0.008	4%	
18.50	0.14				0.26	1.00	10	18.38	18.60	0.262	0.262	0.14	0.03	0.008	4%	
18.70	0.10				0.20	1.00	11	18.60	18.80	0.201	0.201	0.10	0.02	0.004	2%	
18.90	0.10				0.20	1.00	12	18.80	19.00	0.201	0.201	0.10	0.02	0.004	2%	
19.10	0.16				0.19	1.00	13	19.00	19.20	0.192	0.192	0.16	0.03	0.006	3%	
19.30	0.20				0.22	1.00	14	19.20	19.40	0.219	0.219	0.20	0.04	0.009	4%	
19.50	0.24				0.23	1.00	15	19.40	19.60	0.232	0.232	0.24	0.05	0.011	5%	
19.70	0.27				0.23	1.00	16	19.60	19.80	0.229	0.229	0.27	0.05	0.012	6%	
19.90	0.25				0.22	1.00	17	19.80	20.00	0.223	0.223	0.25	0.05	0.011	5%	
20.10	0.19				0.24	1.00	18	20.00	20.20	0.238	0.238	0.19	0.04	0.009	4%	
20.30	0.15				0.25	1.00	19	20.20	20.40	0.250	0.250	0.15	0.03	0.007	4%	
20.50	0.14				0.24	1.00	20	20.40	20.60	0.238	0.238	0.14	0.03	0.007	3%	
20.70	0.15				0.22	1.00	21	20.60	20.80	0.219	0.219	0.15	0.03	0.007	3%	
20.90	0.20				0.14	1.00	22	20.80	21.05	0.140	0.140	0.20	0.05	0.007	3%	
21.20	0.24				0.01	1.00	23	21.05	21.35	0.006	0.006	0.24	0.07	0.000	0%	
21.50	0.20				0.02	1.00	24	21.35	21.90	0.018	0.018	0.20	0.11	0.002	1%	
22.30	0.00					1.00	25	21.90	22.30	0.005	0.005	0.05	0.02	0.000	0%	
Total Flow:														0.208	1.000	

Total Flow:	0.208	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.02	(m ²)
Top Width:	6.50	(m)
Hydraulic Depth:	0.158	(m)
Mean Velocity:	0.203	(m/s)
Froude Number	0.163	
Photographs taken looking at:		
Photos taken		

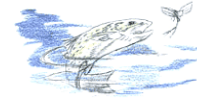
Notes: Water temp. 16.923 C
Site# 608
TSS

Data logger Notes:		
Data logger Internal Power:	4.72 V	
Data logger External Power:	14.35 V	
Data logger Memory Used:	11% used	
Data logger Clock:	12:55 PM	MST
Laptop Clock:	12:58 PM	MST
Dessicant:	ok	
Data logger:		
PT:	101354	
Power:		



Hydrometric Measurement / Site Visit Record

S15A - Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River
Site Name: S15A
Coordinates & Legal: 6353391 N, 458395 E

Time of Measurement

Date of Measurement: September 10, 2008
Start Time: 3:40 PM MDT
End Time: 3:55 PM MDT

Weather Conditions:

20 C, partly cloudy

River Conditions:

low and muddy

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Nail in stump 1.575
Water Level Reading: 3.449
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.241
Other: nail in tree 0.660

Setup No. 1

El: 100.000
El: 98.126
El: 97.885
El: 100.915

Setup No. 2

El: 100.000
El: 98.131
El: 97.890
El: 100.911

LB

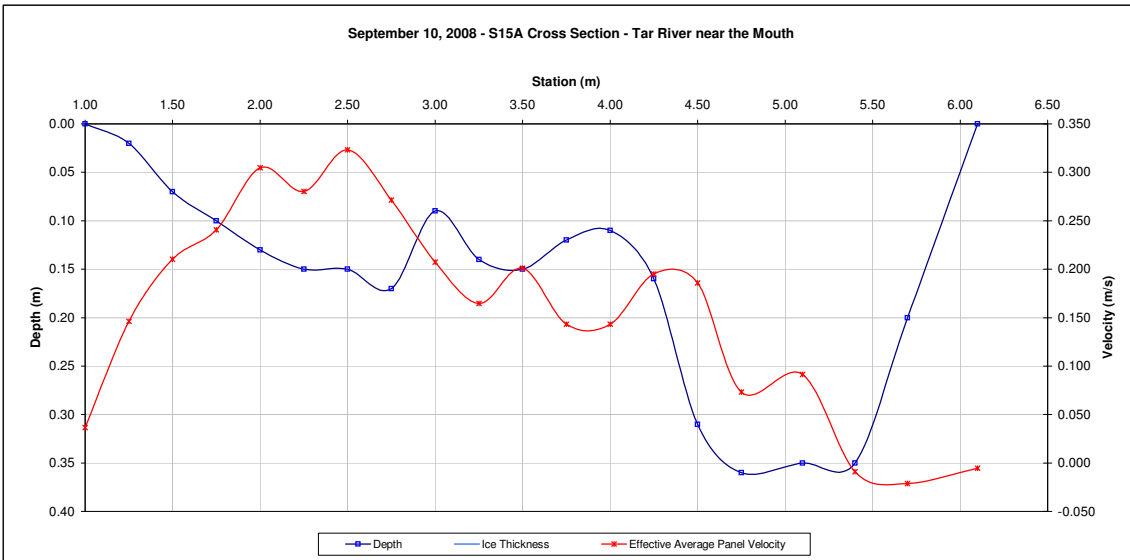
RB

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
1.00	0.00					1.00	1	1.00	1.13	0.037	0.037	0.01	0.00	0.000	0%
1.25	0.02				0.15	1.00	2	1.13	1.38	0.146	0.146	0.02	0.01	0.001	1%
1.50	0.07				0.21	1.00	3	1.38	1.63	0.210	0.210	0.07	0.02	0.004	3%
1.75	0.10				0.24	1.00	4	1.63	1.88	0.241	0.241	0.10	0.03	0.006	5%
2.00	0.13				0.30	1.00	5	1.88	2.13	0.305	0.305	0.13	0.03	0.010	8%
2.25	0.15				0.28	1.00	6	2.13	2.38	0.280	0.280	0.15	0.04	0.011	9%
2.50	0.15				0.32	1.00	7	2.38	2.63	0.323	0.323	0.15	0.04	0.012	10%
2.75	0.17				0.27	1.00	8	2.63	2.88	0.271	0.271	0.17	0.04	0.012	10%
3.00	0.09				0.21	1.00	9	2.88	3.13	0.207	0.207	0.09	0.02	0.005	4%
3.25	0.14				0.16	1.00	10	3.13	3.38	0.165	0.165	0.14	0.04	0.006	5%
3.50	0.15				0.20	1.00	11	3.38	3.63	0.201	0.201	0.15	0.04	0.008	6%
3.75	0.12				0.14	1.00	12	3.63	3.88	0.143	0.143	0.12	0.03	0.004	4%
4.00	0.11				0.14	1.00	13	3.88	4.13	0.143	0.143	0.11	0.03	0.004	3%
4.25	0.16				0.20	1.00	14	4.13	4.38	0.195	0.195	0.16	0.04	0.008	7%
4.50	0.31				0.19	1.00	15	4.38	4.63	0.186	0.186	0.31	0.08	0.014	12%
4.75	0.36				0.07	1.00	16	4.63	4.93	0.073	0.073	0.36	0.11	0.008	7%
5.10	0.35				0.09	1.00	17	4.93	5.25	0.091	0.091	0.35	0.11	0.010	9%
5.40	0.35				-0.01	1.00	18	5.25	5.55	-0.009	-0.009	0.35	0.11	-0.001	-1%
5.70	0.20				-0.02	1.00	19	5.55	5.90	-0.021	-0.021	0.20	0.07	-0.001	-1%
6.10	0.00					1.00	20	5.90	6.10	-0.005	-0.005	0.05	0.01	0.000	0%
Total Flow:												0.119		1.000	

Total Flow:	0.119	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.87	(m ²)
Top Width:	5.10	(m)
Hydraulic Depth:	0.172	(m)
Mean Velocity:	0.136	(m/s)
Froude Number	0.105	
Photographs taken looking at:		
Photos taken		

Data logger Notes:		
Data logger Internal Power:	4.69 V	
Data logger External Power:	14.3 V	
Data logger Memory Used:	14%	used
Data logger Clock:	2:29 PM	MST
Laptop Clock:	2:30 PM	MST
Dessicant:	NEW	
Data logger:	19822817212	
PT:	101356	
Power:		

Notes: Water temp. 10.8 C (Manual Temp 12 C)
Site# 608
Offset 4.8-6.1 logs and debris present
TD looks like it is buried under mud, but left in position
data downloaded is good



Hydrometric Measurement / Site Visit Record

S15A - Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River
Site Name: S15A
Coordinates & Legal: 6353391 N, 458395 E

Time of Measurement

Date of Measurement: October 15, 2008
Start Time: 2:10 PM MDT
End Time: 2:20 PM MDT

Weather Conditions:

clear, 5C

River Conditions:

very low stage

Personnel & Equipment

Measurement Made By: SM/JSL
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Nail in stump 1.609
Water Level Reading: 3.495
Top of Ice Level Reading: 0.225
Transducer Reading & Calc'd E 0.690
Other: nail in tree 0.690

Setup No. 1

El: 100.000
El: 98.114
El: 97.889
El: 100.919

Setup No. 2

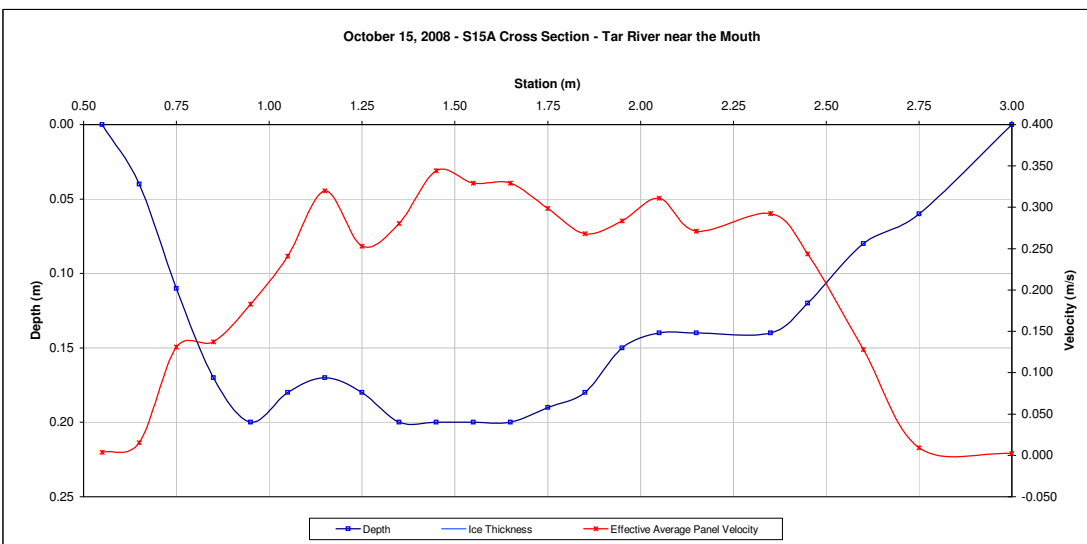
El: 100.000
El: 98.118
El: 97.893
El: 100.919

		Measurement Data															
Measured Data						Calculated Data											
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)			
RB	0.55	0.00				1.00	1	0.55	0.60	0.004	0.004	0.01	0.00	0.000	0%		
	0.65	0.04			0.02	1.00	2	0.60	0.70	0.015	0.015	0.04	0.00	0.000	0%		
	0.75	0.11			0.13	1.00	3	0.70	0.80	0.131	0.131	0.11	0.01	0.001	2%		
	0.85	0.17			0.14	1.00	4	0.80	0.90	0.137	0.137	0.17	0.02	0.002	3%		
	0.95	0.20			0.18	1.00	5	0.90	1.00	0.183	0.183	0.20	0.02	0.004	4%		
	1.05	0.18			0.24	1.00	6	1.00	1.10	0.241	0.241	0.18	0.02	0.004	5%		
	1.15	0.17			0.32	1.00	7	1.10	1.20	0.320	0.320	0.17	0.02	0.005	6%		
	1.25	0.18			0.25	1.00	8	1.20	1.30	0.253	0.253	0.18	0.02	0.005	5%		
	1.35	0.20			0.28	1.00	9	1.30	1.40	0.280	0.280	0.20	0.02	0.006	7%		
	1.45	0.20			0.34	1.00	10	1.40	1.50	0.344	0.344	0.20	0.02	0.007	8%		
	1.55	0.20			0.33	1.00	11	1.50	1.60	0.329	0.329	0.20	0.02	0.007	8%		
	1.65	0.20			0.33	1.00	12	1.60	1.70	0.329	0.329	0.20	0.02	0.007	8%		
	1.75	0.19			0.30	1.00	13	1.70	1.80	0.299	0.299	0.19	0.02	0.006	7%		
	1.85	0.18			0.27	1.00	14	1.80	1.90	0.268	0.268	0.18	0.02	0.005	6%		
	1.95	0.15			0.28	1.00	15	1.90	2.00	0.283	0.283	0.15	0.02	0.004	5%		
	2.05	0.14			0.31	1.00	16	2.00	2.10	0.311	0.311	0.14	0.01	0.004	5%		
	2.15	0.14			0.27	1.00	17	2.10	2.25	0.271	0.271	0.14	0.02	0.006	7%		
	2.35	0.14			0.29	1.00	18	2.25	2.40	0.293	0.293	0.14	0.02	0.006	7%		
	2.45	0.12			0.24	1.00	19	2.40	2.53	0.244	0.244	0.12	0.02	0.004	4%		
	2.60	0.08			0.13	1.00	20	2.53	2.68	0.128	0.128	0.08	0.01	0.002	2%		
	2.75	0.06			0.01	1.00	21	2.68	2.88	0.009	0.009	0.06	0.01	0.000	0%		
	LB	3.00	0.00				1.00	22	2.88	3.00	0.002	0.002	0.02	0.00	0.000	0%	
												Total Flow:		0.084	1.000		

Total Flow:	0.084	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	0.33	(m ²)
Top Width:	2.45	(m)
Hydraulic Depth:	0.136	(m)
Mean Velocity:	0.250	(m/s)
Froude Number	0.216	
Photographs taken looking at:		
Photos taken		

Notes: Water temp. 4.69 C
Site# 608
Station removed

Data logger Notes:	
Data logger Internal Power:	4.67 V
Data logger External Power:	14.8 V
Data logger Memory Used:	19% used
Data logger Clock:	1:08 PM MST
Laptop Clock:	1:09 PM MST
Dessicant:	good
Data logger:	19822817212
PT:	101356
Power:	



Hydrometric Measurement / Site Visit Record

S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River Upland Tributary
Site Name: S18A
Coordinates & Legal:

Time of Measurement

Date of Measurement: May 7, 2008
Start Time: 4:13 PM MDT
End Time: 4:23 PM MDT

Weather Conditions:

clear, calm, 10 C
River Conditions: flowing full, slight backwater

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked:
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in Tree 0.681
Water Level Reading: 1.900
Top of Ice Level Reading:
Transducer Reading & Calc'd E 0.400
Other:

Setup No. 1

El: 100.000 0.695
El: 98.781 1.918
El: 98.381 0.400

Setup No. 2

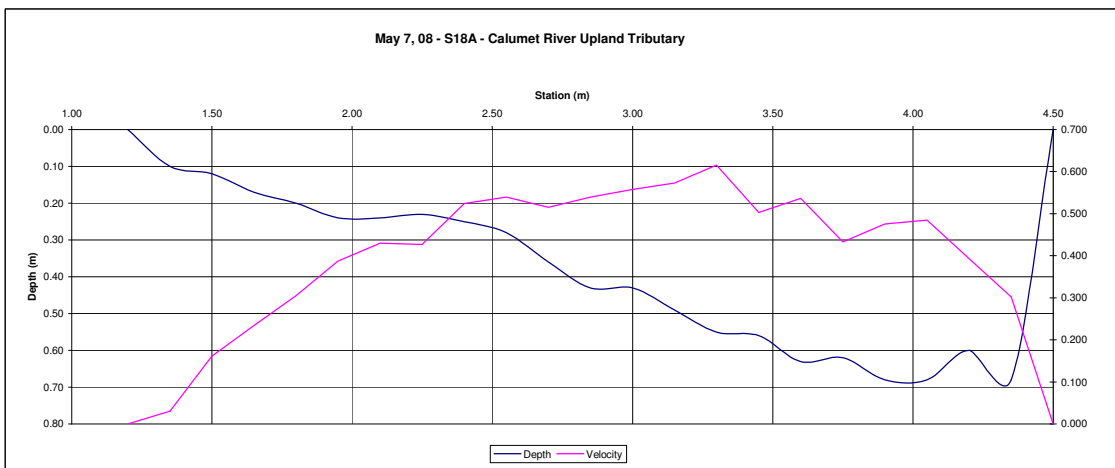
El: 100.000
El: 98.777 98.779
El: 98.377 98.379
El:

Measurement Data																
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	1.20	0.00			0.000	1.00	1	1.20	1.28	0.008	0.008	0.03	0.00	0.000	0%	
	1.35	0.10			0.030	1.00	2	1.28	1.43	0.030	0.030	0.10	0.02	0.000	0%	
	1.50	0.12			0.162	1.00	3	1.43	1.58	0.162	0.162	0.12	0.02	0.003	0%	
	1.65	0.17			0.235	1.00	4	1.58	1.73	0.235	0.235	0.17	0.03	0.006	1%	
	1.80	0.20			0.305	1.00	5	1.73	1.88	0.305	0.305	0.20	0.03	0.009	2%	
	1.95	0.24			0.387	1.00	6	1.88	2.03	0.387	0.387	0.24	0.04	0.014	2%	
	2.10	0.24			0.430	1.00	7	2.03	2.18	0.430	0.430	0.24	0.04	0.015	3%	
	2.25	0.23			0.427	1.00	8	2.18	2.33	0.427	0.427	0.23	0.03	0.015	2%	
	2.40	0.25			0.524	1.00	9	2.33	2.48	0.524	0.524	0.25	0.04	0.020	3%	
	2.55	0.28			0.539	1.00	10	2.48	2.63	0.539	0.539	0.28	0.04	0.023	4%	
	2.70	0.36			0.515	1.00	11	2.63	2.78	0.515	0.515	0.36	0.05	0.028	5%	
	2.85	0.43			0.539	1.00	12	2.78	2.93	0.539	0.539	0.43	0.06	0.035	6%	
	3.00	0.43			0.558	1.00	13	2.93	3.08	0.558	0.558	0.43	0.06	0.036	6%	
	3.15	0.49			0.573	1.00	14	3.08	3.23	0.573	0.573	0.49	0.07	0.042	7%	
	3.30	0.55			0.616	1.00	15	3.23	3.38	0.616	0.616	0.55	0.08	0.051	9%	
	3.45	0.56			0.503	1.00	16	3.38	3.53	0.503	0.503	0.56	0.08	0.042	7%	
	3.60	0.63			0.536	1.00	17	3.53	3.68	0.536	0.536	0.63	0.09	0.051	9%	
	3.75	0.62			0.433	1.00	18	3.68	3.83	0.433	0.433	0.62	0.09	0.040	7%	
	3.90	0.68			0.475	1.00	19	3.83	3.98	0.475	0.475	0.68	0.10	0.048	8%	
	4.05	0.68			0.485	1.00	20	3.98	4.13	0.485	0.485	0.68	0.10	0.049	8%	
	4.20	0.60			0.393	1.00	21	4.13	4.28	0.393	0.393	0.60	0.09	0.035	6%	
	4.35	0.68			0.302	1.00	22	4.28	4.43	0.302	0.302	0.68	0.10	0.031	5%	
	4.50	0.00			0.000	1.00	23	4.50	4.50	0.075	0.075	0.17	0.00	0.000	0%	
LB																
													Total:	0.594	1.000	

Total Flow:	0.594	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	1.28	(m ²)
Top Width:	3.30	(m)
Hydraulic Depth:	0.369	(m)
Mean Velocity:	0.463	(m/s)
Froude Number	0.237	
Photographs taken looking at: upstream, downstream, across		

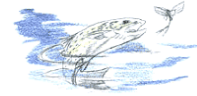
Notes: TD installed 602738
m = 1.4047754
b = -0.0585944

Data logger Notes:	Database 1803
Data logger Internal Power:	0.47
Data logger External Power:	12.27
Data logger Memory Used:	0%
Data logger Clock:	May 07, 2008 15:39 MST
Laptop Clock:	May 07, 2008 15:39 MST
Bessicant:	NEW
Data logger:	Optimum 1803
PT:	62738
Power:	Battery



Hydrometric Measurement / Site Visit Record

S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River Upland Tributary
Site Name: S18A
Coordinates & Legal:

Time of Measurement

Date of Measurement: June 28, 2008
Start Time: 10:20 AM MDT
End Time: 10:30 AM MDT

Weather Conditions:

partly cloudy, 20 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: LM Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in Tree: 0.823
Water Level Reading: 2.101
Top of Ice Level Reading:
Transducer Reading & Calc'd El.:
Other:

Setup No. 1

El: 100.000
El: 98.722
El:
El:
El:

Setup No. 2

El: 100.000
El: 98.723
El:
El:
El:

98.723

LB

LB

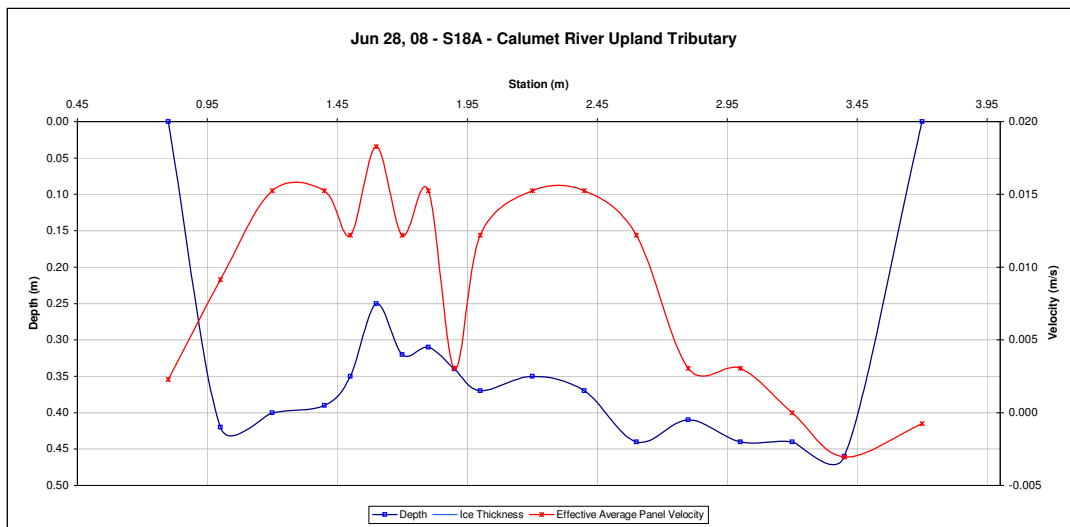
Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.80	0.00					1.00	1	0.80	0.90	0.002	0.002	0.11	0.01	0.000		
1.00	0.42				0.009	1.00	2	0.90	1.10	0.009	0.009	0.42	0.08	0.001		
1.20	0.40				0.015	1.00	3	1.10	1.30	0.015	0.015	0.40	0.08	0.001		
1.40	0.39				0.015	1.00	4	1.30	1.45	0.015	0.015	0.39	0.06	0.001		
1.50	0.35				0.012	1.00	5	1.45	1.55	0.012	0.012	0.35	0.04	0.000		
1.60	0.25				0.018	1.00	6	1.55	1.65	0.018	0.018	0.25	0.03	0.000		
1.70	0.32				0.012	1.00	7	1.65	1.75	0.012	0.012	0.32	0.03	0.000		
1.80	0.31				0.015	1.00	8	1.75	1.85	0.015	0.015	0.31	0.03	0.000		
1.90	0.34				0.003	1.00	9	1.85	1.95	0.003	0.003	0.34	0.03	0.000		
2.00	0.37				0.012	1.00	10	1.95	2.10	0.012	0.012	0.37	0.06	0.001		
2.20	0.35				0.015	1.00	11	2.10	2.30	0.015	0.015	0.35	0.07	0.001		
2.40	0.37				0.015	1.00	12	2.30	2.50	0.015	0.015	0.37	0.07	0.001		
2.60	0.44				0.012	1.00	13	2.50	2.70	0.012	0.012	0.44	0.09	0.001		
2.80	0.41				0.003	1.00	14	2.70	2.90	0.003	0.003	0.41	0.08	0.000		
3.00	0.44				0.003	1.00	15	2.90	3.10	0.003	0.003	0.44	0.09	0.000		
3.20	0.44				0.000	1.00	16	3.10	3.30	0.000	0.000	0.44	0.09	0.000		
3.40	0.46				-0.003	1.00	17	3.30	3.55	-0.003	-0.003	0.46	0.12	0.000		
3.70	0.00					1.00	18	3.55	3.70	-0.001	-0.001	0.12	0.02	0.000		
													Total:	0.009	1.000	

Total Flow:	0.009	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.07	(m ²)
Top Width:	2.90	(m)
Hydraulic Depth:	0.368	(m)
Mean Velocity:	0.008	(m/s)
Froude Number	0.004	
Photographs taken looking at:		

Data logger Notes:	
Data logger Internal Power:	1.33 V
Data logger External Power:	1.266 V
Data logger Memory Used:	
Data logger Clock:	
Laptop Clock:	
Dessicant:	
Data logger:	
PT:	7031305
Power:	

Notes: m = 1.4047754
b = -0.0585944
logger box upside down filled with water
new logger SN = 0304300770

Solinst installed



Hydrometric Measurement / Site Visit Record

S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River Upland Tributary
Site Name: S18A
Coordinates & Legal:

Time of Measurement

Date of Measurement: August 7, 2008
Start Time: 9:10 AM MDT
End Time: 9:20 AM MDT

Weather Conditions:

sunny

River Conditions:

open

Personnel & Equipment

Measurement Made By: LM/SM
Data Entry By: DW Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in Tree: 0.799
Water Level Reading: 1.983
Top of Ice Level Reading:
Transducer Reading & Calc'd El.:
Other:

Setup No. 1

El: 100.000
El: 98.816
El:
El:
El:

Setup No. 2

El: 100.000
El: 98.796
El:
El:
El:

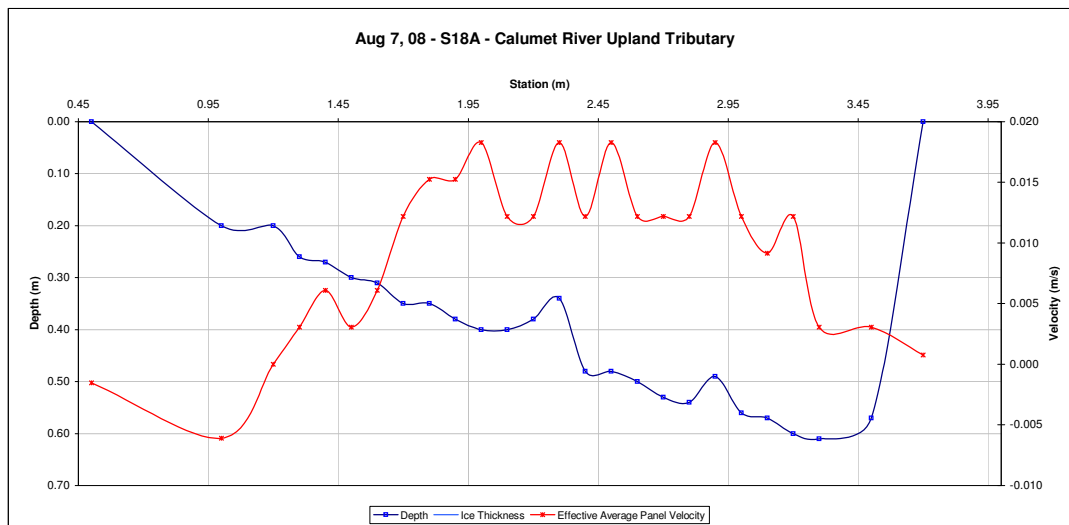
98.806

	Measured Data						Measurement Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective	Panel Effective Depth	Panel Area	Panel Discharge		
												Average Panel Velocity					
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	0.50	0.00					1.00	1	0.50	0.75	-0.002	-0.002	0.05	0.01	0.000	0%	
	1.00	0.20				-0.006	1.00	2	0.75	1.10	-0.006	-0.006	0.20	0.07	0.000	-4%	
	1.20	0.20				0.000	1.00	3	1.10	1.25	0.000	0.000	0.20	0.03	0.000	0%	
	1.30	0.26				0.003	1.00	4	1.25	1.35	0.003	0.003	0.26	0.03	0.000	1%	
	1.40	0.27				0.006	1.00	5	1.35	1.45	0.006	0.006	0.27	0.03	0.000	2%	
	1.50	0.30				0.003	1.00	6	1.45	1.55	0.003	0.003	0.30	0.03	0.000	1%	
	1.60	0.31				0.006	1.00	7	1.55	1.65	0.006	0.006	0.31	0.03	0.000	2%	
	1.70	0.35				0.012	1.00	8	1.65	1.75	0.012	0.012	0.35	0.04	0.000	4%	
	1.80	0.35				0.015	1.00	9	1.75	1.85	0.015	0.015	0.35	0.04	0.001	5%	
	1.90	0.38				0.015	1.00	10	1.85	1.95	0.015	0.015	0.38	0.04	0.001	5%	
	2.00	0.40				0.018	1.00	11	1.95	2.05	0.018	0.018	0.40	0.04	0.001	7%	
	2.10	0.40				0.012	1.00	12	2.05	2.15	0.012	0.012	0.40	0.04	0.000	5%	
	2.20	0.38				0.012	1.00	13	2.15	2.25	0.012	0.012	0.38	0.04	0.000	4%	
	2.30	0.34				0.018	1.00	14	2.25	2.35	0.018	0.018	0.34	0.03	0.001	6%	
	2.40	0.48				0.012	1.00	15	2.35	2.45	0.012	0.012	0.48	0.05	0.001	5%	
	2.50	0.48				0.018	1.00	16	2.45	2.55	0.018	0.018	0.48	0.05	0.001	8%	
	2.60	0.50				0.012	1.00	17	2.55	2.65	0.012	0.012	0.50	0.05	0.001	6%	
	2.70	0.53				0.012	1.00	18	2.65	2.75	0.012	0.012	0.53	0.05	0.001	6%	
	2.80	0.54				0.012	1.00	19	2.75	2.85	0.012	0.012	0.54	0.05	0.001	6%	
	2.90	0.49				0.018	1.00	20	2.85	2.95	0.018	0.018	0.49	0.05	0.001	8%	
3.00	0.56				0.012	1.00	21	2.95	3.05	0.012	0.012	0.56	0.06	0.001	6%		
3.10	0.57				0.009	1.00	22	3.05	3.15	0.009	0.009	0.57	0.06	0.001	5%		
3.20	0.60				0.012	1.00	23	3.15	3.25	0.012	0.012	0.60	0.06	0.001	7%		
3.30	0.61				0.003	1.00	24	3.25	3.40	0.003	0.003	0.61	0.09	0.000	3%		
3.50	0.57				0.003	1.00	25	3.40	3.60	0.003	0.003	0.57	0.11	0.000	3%		
3.70	0.00					1.00	26	3.60	3.70	0.001	0.001	0.14	0.01	0.000	0%		
LB	Total: 0.011 1.000																

Total Flow:	0.011	(m³/s)
Perceived Measurement Quality:	Fair	
Total Area:	1.18	(m²)
Top Width:	3.20	(m)
Hydraulic Depth:	0.369	(m)
Mean Velocity:	0.009	(m/s)
Froude Number	0.005	
Photographs taken looking at:		

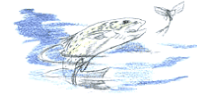
Data logger Notes:
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes: Water temp. 15.6 C



Hydrometric Measurement / Site Visit Record

S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River Upland Tributary
Site Name: S18A
Coordinates & Legal:

Time of Measurement

Date of Measurement: September 12, 2008
Start Time: 1:15 PM MDT
End Time: 1:25 PM MDT

Weather Conditions:

partly cloudy, 16 C

River Conditions:

open, slow moving

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked:
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Nail in Tree: 0.863
Water Level Reading: 2.032
Top of Ice Level Reading:
Transducer Reading & Calc'd El.:
Other:

Setup No. 1

El: 100.000
El: 98.831
El: 98.831
El: 98.831
El: 98.831

Setup No. 2

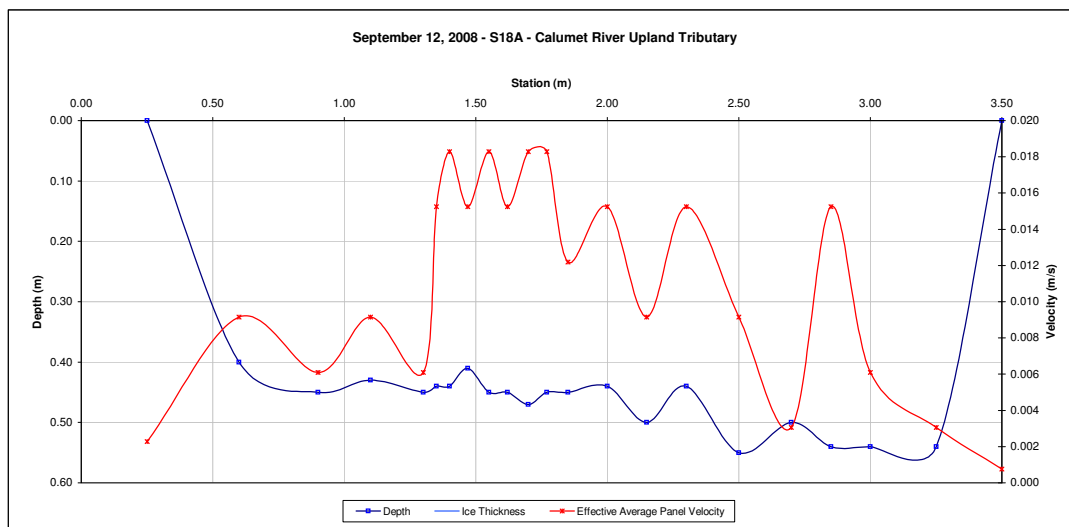
El: 100.000
El: 98.830
El: 98.830
El: 98.831
El: 98.831

	Measured Data						Calculated Data										Percentage of Total
			Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
	Station (m)	Depth (m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	0.25	0.00					1.00	1	0.25	0.43	0.002	0.002	0.10	0.02	0.000	0%	
	0.60	0.40				0.009	1.00	2	0.43	0.75	0.009	0.009	0.40	0.13	0.001	9%	
	0.90	0.45				0.006	1.00	3	0.75	1.00	0.006	0.006	0.45	0.11	0.001	5%	
	1.10	0.43				0.009	1.00	4	1.00	1.20	0.009	0.009	0.43	0.09	0.001	6%	
	1.30	0.45				0.006	1.00	5	1.20	1.33	0.006	0.006	0.45	0.06	0.000	2%	
	1.35	0.44				0.015	1.00	6	1.33	1.38	0.015	0.015	0.44	0.02	0.000	2%	
	1.40	0.44				0.018	1.00	7	1.38	1.44	0.018	0.018	0.44	0.03	0.000	3%	
	1.47	0.41				0.015	1.00	8	1.44	1.51	0.015	0.015	0.41	0.03	0.000	3%	
	1.55	0.45				0.018	1.00	9	1.51	1.59	0.018	0.018	0.45	0.03	0.001	4%	
	1.62	0.45				0.015	1.00	10	1.59	1.66	0.015	0.015	0.45	0.03	0.001	4%	
	1.70	0.47				0.018	1.00	11	1.66	1.74	0.018	0.018	0.47	0.04	0.001	5%	
	1.77	0.45				0.018	1.00	12	1.74	1.81	0.018	0.018	0.45	0.03	0.001	4%	
	1.85	0.45				0.012	1.00	13	1.81	1.93	0.012	0.012	0.45	0.05	0.001	5%	
	2.00	0.44				0.015	1.00	14	1.93	2.08	0.015	0.015	0.44	0.07	0.001	7%	
	2.15	0.50				0.009	1.00	15	2.08	2.23	0.009	0.009	0.50	0.07	0.001	5%	
	2.30	0.44				0.015	1.00	16	2.23	2.40	0.015	0.015	0.44	0.08	0.001	8%	
	2.50	0.55				0.009	1.00	17	2.40	2.60	0.009	0.009	0.55	0.11	0.001	7%	
	2.70	0.50				0.003	1.00	18	2.60	2.78	0.003	0.003	0.50	0.09	0.000	2%	
	2.85	0.54				0.015	1.00	19	2.78	2.93	0.015	0.015	0.54	0.08	0.001	9%	
	3.00	0.54				0.006	1.00	20	2.93	3.13	0.006	0.006	0.54	0.11	0.001	5%	
	3.25	0.54				0.003	1.00	21	3.13	3.38	0.003	0.003	0.54	0.14	0.000	3%	
	RB	3.50	0.00					1.00	22	3.38	3.50	0.001	0.001	0.14	0.02	0.000	0%
														Total:	0.014		1.000

Total Flow:	0.014	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	1.43	(m ²)
Top Width:	3.25	(m)
Hydraulic Depth:	0.439	(m)
Mean Velocity:	0.010	(m/s)
Froude Number	0.005	
Photographs taken looking at:		

Data logger Notes:	
Data logger Internal Power:	SOLNIST
Data logger External Power:	
Data logger Memory Used:	
Data logger Clock:	
Laptop Clock:	
Dessicant:	
Data logger:	
PT:	
Power:	

Notes: Solnist installed so no data logger information



Hydrometric Measurement / Site Visit Record

S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River Upland Tributary
Site Name: S18A
Coordinates & Legal:

Time of Measurement

Date of Measurement: October 20, 2008
Start Time: 11:35 AM MDT
End Time: 11:50 AM MDT

Weather Conditions:

Over cast
River Conditions: Back Water , Very High

Personnel & Equipment

Measurement Made By: SM/AM
Data Entry By: LS Checked:
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in Tree 0.081
Water Level Reading: 1.930
Top of Ice Level Reading:
Transducer Reading & Calc'd El:
Other:

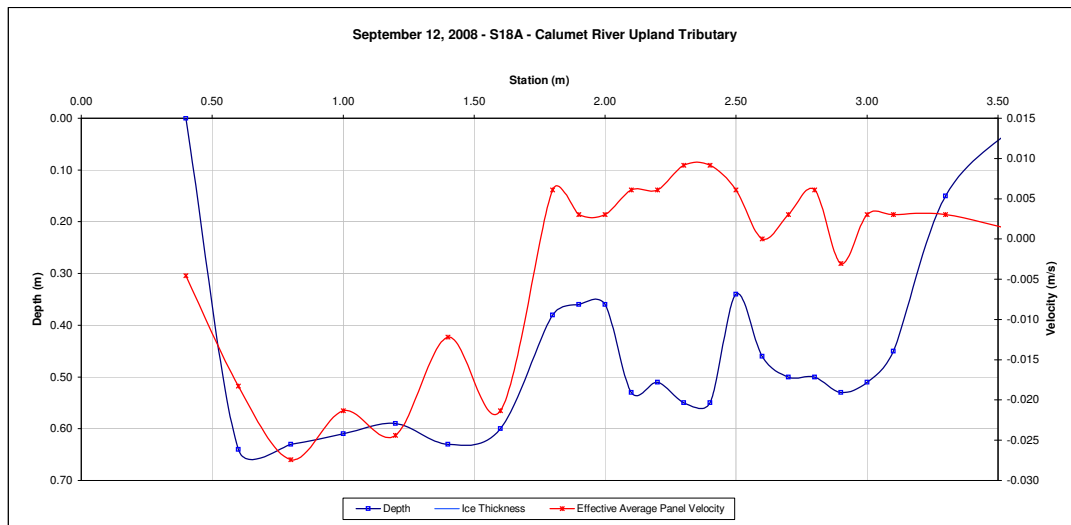
Setup No. 1
El: 100.000
El: 98.151
El:
El:
Setup No. 2
El: 100.000
El: 98.166
El:
El:
98.158

		Measured Data						Measurement Data									
						Calculated Data											
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	0.40	0.00					1.00	1	0.40	0.50	-0.005	-0.005	0.16	0.02	0.000	1%	
	0.60	0.64				-0.018	1.00	2	0.50	0.70	-0.018	-0.018	0.64	0.13	-0.002	19%	
	0.80	0.63				-0.027	1.00	3	0.70	0.90	-0.027	-0.027	0.63	0.13	-0.003	28%	
	1.00	0.61				-0.021	1.00	4	0.90	1.10	-0.021	-0.021	0.61	0.12	-0.003	21%	
	1.20	0.59				-0.024	1.00	5	1.10	1.30	-0.024	-0.024	0.59	0.12	-0.003	23%	
	1.40	0.63				-0.012	1.00	6	1.30	1.50	-0.012	-0.012	0.63	0.13	-0.002	13%	
	1.60	0.60				-0.021	1.00	7	1.50	1.70	-0.021	-0.021	0.60	0.12	-0.003	21%	
	1.80	0.38				0.006	1.00	8	1.70	1.85	0.006	0.006	0.38	0.06	0.000	-3%	
	1.90	0.36				0.003	1.00	9	1.85	1.95	0.003	0.003	0.36	0.04	0.000	-1%	
	2.00	0.36				0.003	1.00	10	1.95	2.05	0.003	0.003	0.36	0.04	0.000	-1%	
	2.10	0.53				0.006	1.00	11	2.05	2.15	0.006	0.006	0.53	0.05	0.000	-3%	
	2.20	0.51				0.006	1.00	12	2.15	2.25	0.006	0.006	0.51	0.05	0.000	-3%	
	2.30	0.55				0.009	1.00	13	2.25	2.35	0.009	0.009	0.55	0.05	0.001	-4%	
	2.40	0.55				0.009	1.00	14	2.35	2.45	0.009	0.009	0.55	0.06	0.001	-4%	
	2.50	0.34				0.006	1.00	15	2.45	2.55	0.006	0.006	0.34	0.03	0.000	-2%	
	2.60	0.46				0.000	1.00	16	2.55	2.65	0.000	0.000	0.46	0.05	0.000	0%	
	2.70	0.50				0.003	1.00	17	2.65	2.75	0.003	0.003	0.50	0.05	0.000	-1%	
	2.80	0.50				0.006	1.00	18	2.75	2.85	0.006	0.006	0.50	0.05	0.000	-2%	
	2.90	0.53				-0.003	1.00	19	2.85	2.95	-0.003	-0.003	0.53	0.05	0.000	1%	
	3.00	0.51				0.003	1.00	20	2.95	3.05	0.003	0.003	0.51	0.05	0.000	-1%	
LB	3.10	0.45				0.003	1.00	21	3.05	3.20	0.003	0.003	0.45	0.07	0.000	-2%	
	3.30	0.15				0.003	1.00	22	3.20	3.45	0.003	0.003	0.15	0.04	0.000	-1%	
	3.60	0.00					1.00	23	3.45	3.60	0.001	0.001	0.00	0.00	0.000	0%	
															Total: -0.012	1.000	

Total Flow:	-0.012	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	1.49	(m ²)
Top Width:	3.20	(m)
Hydraulic Depth:	0.465	(m)
Mean Velocity:	-0.008	(m/s)
Froude Number	-0.004	
Photographs taken looking at:		

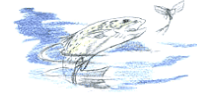
Data logger Notes:	
Data logger Internal Power:	SOLNIST
Data logger External Power:	
Data logger Memory Used:	
Data logger Clock:	
Laptop Clock:	
Dessicant:	
Data logger:	
PT:	
Power:	

Notes: Solnist removed



Hydrometric Measurement / Site Visit Record

S19 - Tar River Lowland Tributary near the mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River Lowland Tributary near the mouth
Site Name: S19
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Time of Measurement

Date of Measurement: January 10, 2008
Start Time: 5:30 PM
End Time:

Weather Conditions: Snowing, -20 C

River Conditions:

Personnel & Equipment

Measurement Made By: JMS/JS/SV
Data Entry By: SMS
Meter Type and No.: checked SM

Level Readings

Bench Mark Reading:
Water Level Reading:
Top of Ice Level Reading:
Transducer Reading & Est. El.:
Other:

Setup No. 1

El: 100.000
El: 100.000
El: 100.000
El: 100.000
El: 100.000

Setup No. 2

El: 100.000
El: 100.000
El: 100.000
El: 100.000
El: 100.000

Average

100.000
100.000
100.000
100.000
100.000

Data logger Notes:
Data logger Internal Power: 4.47
Data logger External Power: 12.76
Data logger Memory Used: 18%
Data logger Clock: 17:25
Laptop Clock: 17:29
Dessicant: Good

Data logger: 0104170271
PT: N/A
Power: 12V 20A battery and solar panel

Notes: RG tips 939. Ignore all tips from today @ roughly 17:24

Hydrometric Measurement / Site Visit Record

S19 - Tar River Lowland Tributary near the mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River Lowland Tributary near the mouth
Site Name: S19
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Time of Measurement

Date of Measurement: February 17, 2008
Start Time: 4:30 PM
End Time:

Weather Conditions:

Snowing, -15 C

River Conditions:

Personnel & Equipment

Measurement Made By: js sms checked SM
Data Entry By: sm
Meter Type and No.:

Level Readings

Bench Mark Reading:
Water Level Reading:
Top of Ice Level Reading:
Transducer Reading & Est. El.:
Other:

Setup No. 1

El: 100.000
El: 100.000
El: 100.000
El: 100.000
El: 100.000

Setup No. 2

El: 100.000
El: 100.000
El: 100.000
El: 100.000
El: 100.000

Average

100.000
100.000
100.000
100.000
100.000

Data logger Notes:

Data logger Internal Power: 4.47
Data logger External Power: 13.32
Data logger Memory Used: 21%
Data logger Clock: 16:22
Laptop Clock: 16:30
Dessicant: Good

Data logger: 0104170271

PT: N/A

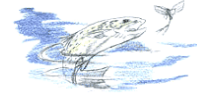
Power: 12V 20A battery and solar panel

Notes:

RG tips 980. Ignore all tips from today @ roughly 16:24
alcohol antifreeze mix added, baby oil topped up

Hydrometric Measurement / Site Visit Record

S19 - Tar River Lowland Tributary near the mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River Lowland Tributary near the mouth
Site Name: S19
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Time of Measurement

Date of Measurement: March 13, 2008
Start Time:
End Time:

Weather Conditions:

River Conditions:

Personnel & Equipment

Measurement Made By: JS/SM/SV
Data Entry By: LM
Meter Type and No.:

checked SM

Level Readings

Bench Mark Reading:
Water Level Reading:
Top of Ice Level Reading:
Transducer Reading & Est. El.:
Other:

Setup No. 1

El: 100.000
El: 100.000
El: 100.000
El: 100.000
El: 100.000
El: 100.000

Setup No. 2

El: 100.000
El: 100.000
El: 100.000
El: 100.000
El: 100.000
El: 100.000

Average

100.000
100.000
100.000
100.000
100.000
100.000

Data logger Notes:
Data logger Internal Power: 4.53
Data logger External Power: 14.35
Data logger Memory Used: 23%
Data logger Clock: 13:40
Laptop Clock: 14:00

Dessicant:

Data logger:

PT:

Power:

Notes: PRG calibrated - added 200 mL 40 tips.
Ignore after 1214 - 1261.

Hydrometric Measurement / Site Visit Record

S19 - Tar River Lowland Tributary near the mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River Lowland Tributary near the mouth
Site Name: S19
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Time of Measurement

Date of Measurement: April 6, 2008
Start Time: 9:00 AM MDT
End Time:

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: LM Checked: SS
Meter Type and No.:

Weather Conditions: -10 C, sunny, light wind

River Conditions:

Data logger Notes:		
Data logger Internal Power:	4.48V	
Data logger External Power:	14.09V	
Data logger Memory Used:	25%	
Data logger Clock:	08:39 AM	MDT
Laptop Clock:	09:00 AM	MDT
Dessicant:		
Data logger:	#0271	
PT:		
Power:		

Notes: data good.
RG Count: 1296

Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Lowland Tar River
 Location: Lowland Tar River
 Site Name: S19
 Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Time of Measurement

Date of Measurement: May 11, 2008
 Start Time: 8:48 AM MDT
 End Time: 8:55 AM MDT

Weather Conditions:

partly cloudy, calm, 5 C
 River Conditions: high, some ice cover

Personnel & Equipment

Measurement Made By: SS/SM
 Data Entry By: SS Checked: sm
 Meter Type and No.: Marsh McBirney FloMate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: NEW Nail ir 1.147
 Water Level Reading: 1.726
 Top of Ice Level Reading:
 Transducer Reading & Calc'd E 0.562
 Other: top logger box 0.215

Setup No. 1

El: 101.630
 El: 101.051
 El: 100.489
 El: 102.562

Setup No. 2

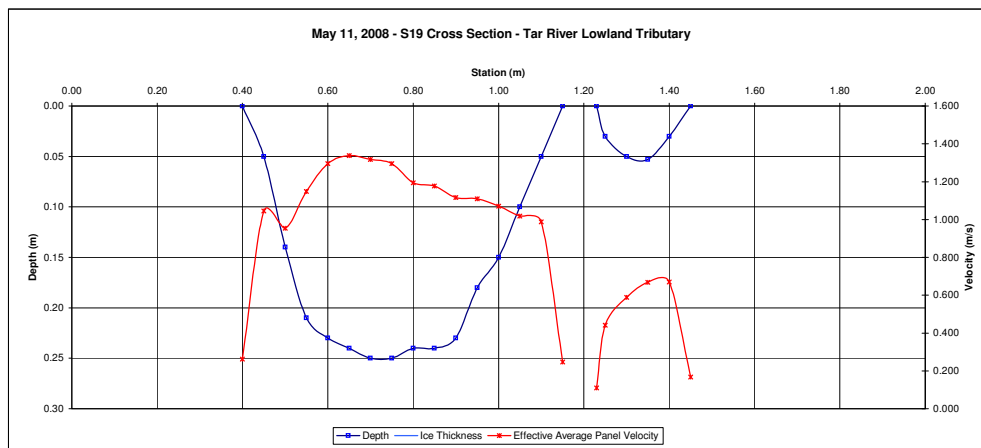
El: 101.630
 El: 101.056
 El: 100.494
 El: 102.564

Measurement Data																
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	0.40	0.00				1.00	1	0.40	0.43	0.261	0.261	0.01	0.00	0.000	0%	
	0.45	0.05			1.045	1.00	2	0.43	0.48	1.045	1.045	0.05	0.00	0.003	2%	
	0.50	0.14			0.954	1.00	3	0.48	0.53	0.954	0.954	0.14	0.01	0.007	4%	
	0.55	0.21			1.149	1.00	4	0.53	0.58	1.149	1.149	0.21	0.01	0.012	8%	
	0.60	0.23			1.295	1.00	5	0.58	0.63	1.295	1.295	0.23	0.01	0.015	10%	
	0.65	0.24			1.338	1.00	6	0.63	0.68	1.338	1.338	0.24	0.01	0.016	10%	
	0.70	0.25			1.317	1.00	7	0.68	0.73	1.317	1.317	0.25	0.01	0.016	11%	
	0.75	0.25			1.295	1.00	8	0.73	0.78	1.295	1.295	0.25	0.01	0.016	10%	
	0.80	0.24			1.195	1.00	9	0.78	0.83	1.195	1.195	0.24	0.01	0.014	9%	
	0.85	0.24			1.177	1.00	10	0.83	0.88	1.177	1.177	0.24	0.01	0.014	9%	
	0.90	0.23			1.116	1.00	11	0.88	0.93	1.116	1.116	0.23	0.01	0.013	8%	
	0.95	0.18			1.109	1.00	12	0.93	0.98	1.109	1.109	0.18	0.01	0.010	6%	
	1.00	0.15			1.070	1.00	13	0.98	1.03	1.070	1.070	0.15	0.01	0.008	5%	
	1.05	0.10			1.018	1.00	14	1.03	1.08	1.018	1.018	0.10	0.01	0.005	3%	
	1.10	0.05			0.988	1.00	15	1.08	1.13	0.988	0.988	0.05	0.00	0.002	2%	
	1.15	0.00				1.00	16	1.13	1.15	0.247	0.247	0.01	0.00	0.000	0%	
RB	1.23	0.00				1.00	17	1.23	1.24	0.110	0.110	0.01	0.00	0.000	0%	
	1.25	0.03			0.442	1.00	18	1.24	1.28	0.442	0.442	0.03	0.00	0.000	0%	
	1.30	0.05			0.588	1.00	19	1.28	1.33	0.588	0.588	0.05	0.00	0.001	1%	
	1.35	0.05			0.668	1.00	20	1.33	1.38	0.668	0.668	0.05	0.00	0.002	1%	
	1.40	0.03			0.671	1.00	21	1.38	1.43	0.671	0.671	0.03	0.00	0.001	1%	
LB	1.45	0.00				1.00	22	1.43	1.45	0.168	0.168	0.01	0.00	0.000	0%	
Total Flow:													0.157	1.000		

Total Flow:	0.157	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.14	(m ²)
Top Width:	0.97	(m)
Hydraulic Depth:	0.141	(m)
Mean Velocity:	1.147	(m/s)
Froude Number	0.976	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:	
Data logger Internal Power:	4.53 V
Data logger External Power:	13.24 V
Data logger Memory Used:	27.0%
Data logger Clock:	7:10 MST
Laptop Clock:	7:21 MST
Dessicant:	good
Data logger:	271
PT:	0101352
Power:	

Notes: discharge taken at culvert outlets (2 of them) see pics
 near critical flow at outlet
 removed snow gauge
 manual water temp 4 C
 TBRG test start 1509
 500 mL added
 end 1581
 0.217 mm per tip???



Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Lowland Tar River
Location: Lowland Tar River
Site Name: S19
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Time of Measurement

Date of Measurement: June 27, 2008
Start Time: 6:00 PM MDT
End Time: 6:10 PM MDT

Weather Conditions:

26 sunny

River Conditions:

open water

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: JMS Checked: sm
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: NEW Nail in 1.113
Water Level Reading: 1.725
Top of Ice Level Reading:
Transducer Reading & Calc'd E 0.447
Other: top logger box

Setup No. 1

El: 101.630
El: 101.018
El: 100.571
El:

Setup No. 2

El: 101.630
El: 101.015
El: 100.568
El:

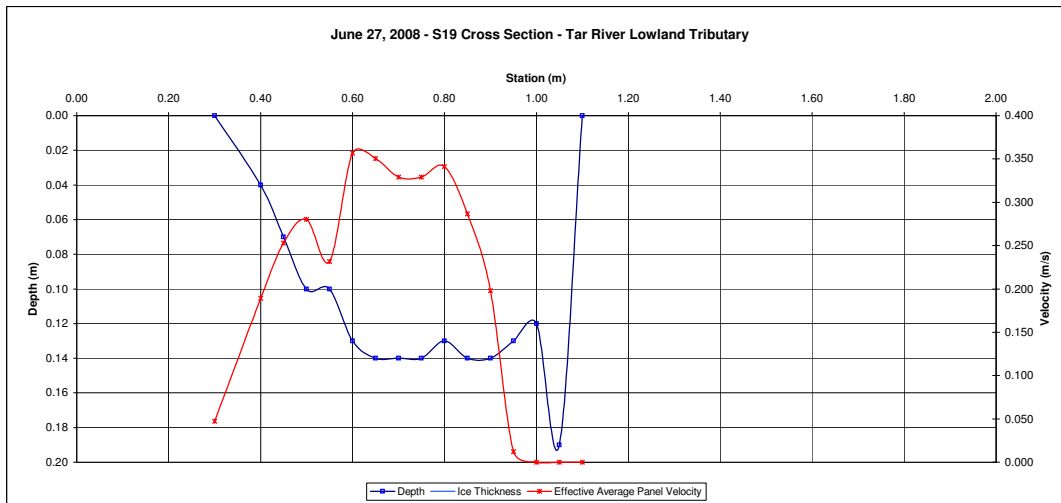
101.017
100.570

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
LB	0.30	0.00				1.00	1	0.30	0.35	0.047	0.047	0.01	0.00	0.000	0%
	0.40	0.04			0.189	1.00	2	0.35	0.43	0.189	0.189	0.04	0.00	0.001	3%
	0.45	0.07			0.253	1.00	3	0.43	0.48	0.253	0.253	0.07	0.00	0.001	5%
	0.50	0.10			0.280	1.00	4	0.48	0.53	0.280	0.280	0.10	0.01	0.001	7%
	0.55	0.10			0.232	1.00	5	0.53	0.58	0.232	0.232	0.10	0.00	0.001	6%
	0.60	0.13			0.357	1.00	6	0.58	0.63	0.357	0.357	0.13	0.01	0.002	12%
	0.65	0.14			0.351	1.00	7	0.63	0.68	0.351	0.351	0.14	0.01	0.002	13%
	0.70	0.14			0.329	1.00	8	0.68	0.73	0.329	0.329	0.14	0.01	0.002	12%
	0.75	0.14			0.329	1.00	9	0.73	0.78	0.329	0.329	0.13	0.01	0.002	11%
	0.80	0.13			0.341	1.00	10	0.78	0.83	0.341	0.341	0.14	0.01	0.002	13%
	0.85	0.14			0.287	1.00	11	0.83	0.88	0.287	0.287	0.14	0.01	0.002	11%
	0.90	0.14			0.198	1.00	12	0.88	0.93	0.198	0.198	0.13	0.01	0.001	7%
	0.95	0.13			0.012	1.00	13	0.93	0.98	0.012	0.012	0.12	0.01	0.000	0%
	1.00	0.12			0.000	1.00	14	0.98	1.03	0.000	0.000	0.19	0.01	0.000	0%
	1.05	0.19			0.000	1.00	15	1.03	1.08	0.000	0.000	0.00	0.00	0.000	0%
RB	1.10	0.00				1.00	16	1.08	1.10	0.000	0.000	0.00	0.00	0.000	0%
Total Flow:														0.019	1.000

Total Flow:	0.019	(m ³ /s)
Perceived Measurement Quality:	good	
Total Area:	0.08	(m ²)
Top Width:	0.80	(m)
Hydraulic Depth:	0.100	(m)
Mean Velocity:		(m/s)
Froude Number	0.238	
Photographs taken looking at:	0.240	
Upstream, downstream, across		

Data logger Notes:	
Data logger Internal Power:	4.65 V
Data logger External Power:	13.62 V
Data logger Memory Used:	
Data logger Clock:	16:19 MST
Laptop Clock:	16:29 MST
Dessicant:	good
Data logger:	
PT:	
Power:	

Notes: discharge taken at culvert outlets (2 of them) see pics
TBRG Count 1747
Discharge also calculated using culvert hydraulics. Q = 0.03 (m3/s).



Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Lowland Tar River
Location: Lowland Tar River
Site Name: S19
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Time of Measurement

Date of Measurement: August 8, 2008
Start Time: 3:21 PM MDT
End Time: 3:25 PM MDT

Weather Conditions:

Hot
River Conditions: open, back water from beaver dam

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: DW Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: NEW Nail in 0.934
Water Level Reading: 1.556
Top of Ice Level Reading:
Transducer Reading & Calc'd E 0.443
Other: top logger box

Setup No. 1

El: 101.630
El: 101.008
El: 100.565
El:

Setup No. 2

El: 101.630
El: 101.014
El: 100.571
El:

101.011
100.568

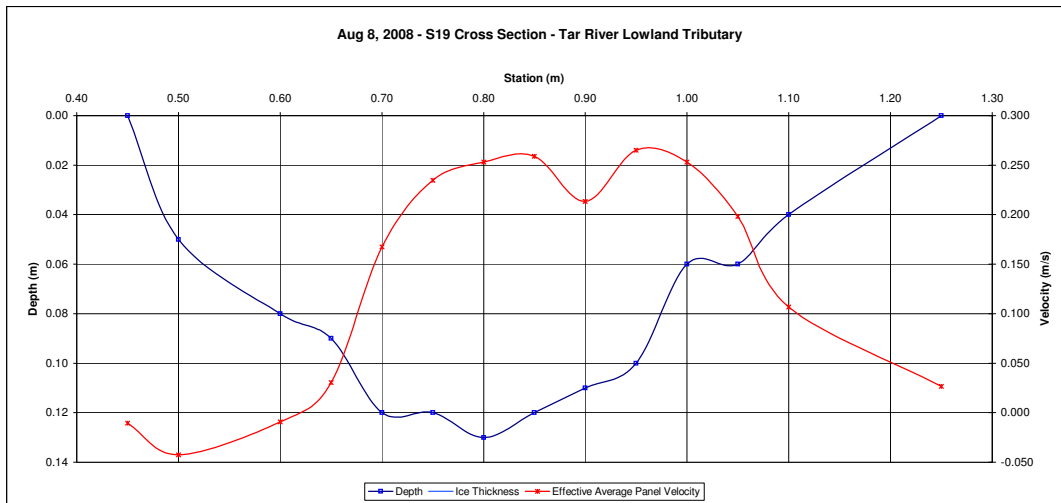
Measurement Data

	Measured Data					Calculated Data									Percentage of Total	
	Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m ²)		Panel Discharge (m ³ /s)
RB	0.45	0.00					1.00	1	0.45	0.48	-0.011	-0.011	0.01	0.00	0.000	0%
	0.50	0.05				-0.043	1.00	2	0.48	0.55	-0.043	-0.043	0.05	0.00	0.000	-2%
	0.60	0.08				-0.009	1.00	3	0.55	0.63	-0.009	-0.009	0.08	0.01	0.000	-1%
	0.65	0.09				0.030	1.00	4	0.63	0.68	0.030	0.030	0.09	0.00	0.000	1%
	0.70	0.12				0.168	1.00	5	0.68	0.73	0.168	0.168	0.12	0.01	0.001	10%
	0.75	0.12				0.235	1.00	6	0.73	0.78	0.235	0.235	0.12	0.01	0.001	14%
	0.80	0.13				0.253	1.00	7	0.78	0.83	0.253	0.253	0.13	0.01	0.002	17%
	0.85	0.12				0.259	1.00	8	0.83	0.88	0.259	0.259	0.12	0.01	0.002	16%
	0.90	0.11				0.213	1.00	9	0.88	0.93	0.213	0.213	0.11	0.01	0.001	12%
	0.95	0.10				0.265	1.00	10	0.93	0.98	0.265	0.265	0.10	0.00	0.001	13%
	1.00	0.06				0.253	1.00	11	0.98	1.03	0.253	0.253	0.06	0.00	0.001	8%
	1.05	0.06				0.198	1.00	12	1.03	1.08	0.198	0.198	0.06	0.00	0.001	6%
LB	1.10	0.04				0.107	1.00	13	1.08	1.18	0.107	0.107	0.04	0.00	0.000	4%
	1.25	0.00					1.00	14	1.18	1.25	0.027	0.027	0.01	0.00	0.000	0%
Total Flow:															0.010	1.000

Total Flow:	0.010	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.06	(m ²)
Top Width:	0.80	(m)
Hydraulic Depth:	0.075	(m)
Mean Velocity:	0.163	(m/s)
Froude Number	0.190	
Photographs taken looking at:		

Data logger Notes:	
Data logger Internal Power:	4.69 V
Data logger External Power:	13.45 V
Data logger Memory Used:	37.0%
Data logger Clock:	1:34 PM MST
Laptop Clock:	1:44 PM MST
Dessicant:	good
Data logger:	170271
PT:	101352
Power:	

Notes: TBRG wire broken therefore no data
Ignore tips from today
Water temp. 20.6 C
Site # 271
TBRG 1747/1756



Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Lowland Tar River
 Location: Lowland Tar River
 Site Name: S19
 Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Time of Measurement

Date of Measurement: September 10, 2008
 Start Time: 4:15 PM MDT
 End Time: 4:20 PM MDT

Weather Conditions:

partly cloudy, 20 C

River Conditions:

open, low flow, beaver activity

Personnel & Equipment

Measurement Made By: SM/SS
 Data Entry By: SS Checked: sm
 Meter Type and No.: Marsh McBirney FloMate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: NEW Nail in 0.967
 Water Level Reading: 1.575
 Top of Ice Level Reading:
 Transducer Reading & Calc'd E 0.454
 Other: top logger box

Setup No. 1

El: 101.630
 El: 101.022
 El: 100.568
 El:

Setup No. 2

El: 101.630
 El: 101.020
 El: 100.566
 El:

101.021
 100.567

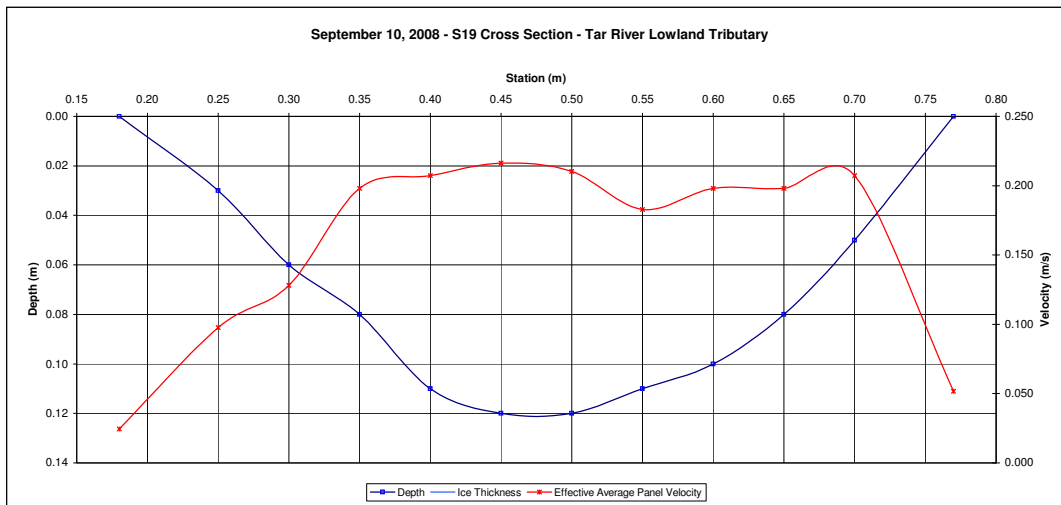
Measurement Data

Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	0.77	0.00				1.00	1	0.77	0.74	0.052	0.052	0.01	0.00	0.000	0%
	0.70	0.05			0.207	1.00	2	0.74	0.68	0.207	0.207	0.05	0.00	0.001	7%
	0.65	0.08			0.198	1.00	3	0.68	0.63	0.198	0.198	0.08	0.00	0.001	9%
	0.60	0.10			0.198	1.00	4	0.63	0.58	0.198	0.198	0.10	0.01	0.001	12%
	0.55	0.11			0.183	1.00	5	0.58	0.53	0.183	0.183	0.11	0.01	0.001	12%
	0.50	0.12			0.210	1.00	6	0.53	0.48	0.210	0.210	0.12	0.01	0.001	15%
	0.45	0.12			0.216	1.00	7	0.48	0.43	0.216	0.216	0.12	0.01	0.001	15%
	0.40	0.11			0.207	1.00	8	0.43	0.38	0.207	0.207	0.11	0.01	0.001	13%
	0.35	0.08			0.198	1.00	9	0.38	0.33	0.198	0.198	0.08	0.00	0.001	9%
	0.30	0.06			0.128	1.00	10	0.33	0.28	0.128	0.128	0.06	0.00	0.000	5%
	0.25	0.03			0.098	1.00	11	0.28	0.22	0.098	0.098	0.03	0.00	0.000	2%
	0.18	0.00				1.00	12	0.22	0.18	0.024	0.024	0.01	0.00	0.000	0%
LB															
												Total Flow:		0.008	1.000

Total Flow:	0.008	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.04	(m ²)
Top Width:	0.59	(m)
Hydraulic Depth:	0.075	(m)
Mean Velocity:	0.191	(m/s)
Froude Number	0.222	
Photographs taken looking at:		

Data logger Notes:		
Data logger Internal Power:	4.68 V	
Data logger External Power:	13.84 V	
Data logger Memory Used:	41%	
Data logger Clock:	3:08 PM	MST
Laptop Clock:	3:18 PM	MST
Dessicant:	good	
Data logger:	170271	
PT:	101352	
Power:		

Notes: Beaver dam activity
 TBRG Count 2250
 Flow only through one culvert, not two



Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Lowland Tar River
Location: Lowland Tar River
Site Name: S19
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Time of Measurement

Date of Measurement: October 15, 2008
Start Time: 3:45 PM MDT
End Time: 3:50 PM MDT

Weather Conditions:

clear, 8C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/JSL
Data Entry By: SS Checked: sm
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: NEW Nail in 1.057
Water Level Reading: 1.662
Top of Ice Level Reading:
Transducer Reading & Calc'd E 0.454
Other: top logger box

Setup No. 1

El: 101.630
El: 101.025
El: 100.571
El:

Setup No. 2

El: 101.630
El: 101.023
El: 100.569
El:

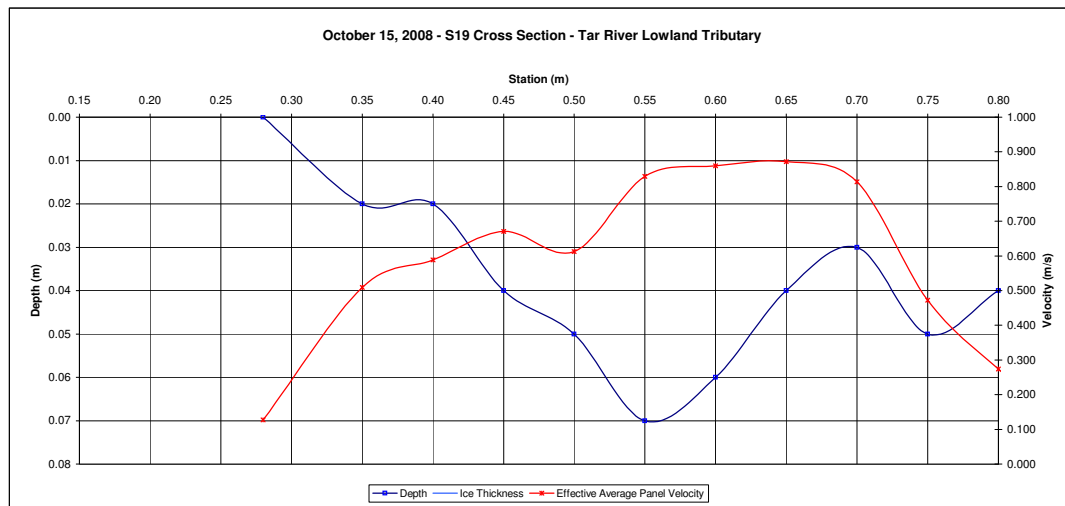
101.024
100.570

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
0.28	0.00					1.00	1	0.28	0.32	0.127	0.127	0.01	0.00	0.000	0%
0.35	0.02				0.509	1.00	2	0.32	0.38	0.509	0.509	0.02	0.00	0.001	4%
0.40	0.02				0.588	1.00	3	0.38	0.43	0.588	0.588	0.02	0.00	0.001	4%
0.45	0.04				0.671	1.00	4	0.43	0.48	0.671	0.671	0.04	0.00	0.001	9%
0.50	0.05				0.613	1.00	5	0.48	0.53	0.613	0.613	0.05	0.00	0.002	11%
0.55	0.07				0.829	1.00	6	0.53	0.58	0.829	0.829	0.07	0.00	0.003	20%
0.60	0.06				0.860	1.00	7	0.58	0.63	0.860	0.860	0.06	0.00	0.003	18%
0.65	0.04				0.872	1.00	8	0.63	0.68	0.872	0.872	0.04	0.00	0.002	12%
0.70	0.03				0.814	1.00	9	0.68	0.73	0.814	0.814	0.03	0.00	0.001	8%
0.75	0.05				0.472	1.00	10	0.73	0.78	0.472	0.472	0.05	0.00	0.001	8%
0.80	0.04				0.274	1.00	11	0.78	0.83	0.274	0.274	0.04	0.00	0.001	4%
0.85	0.03				0.113	1.00	12	0.83	0.90	0.113	0.113	0.03	0.00	0.000	2%
0.94	0.00				0.000	1.00	12	0.90	0.94	0.028	0.028	0.01	0.00	0.000	0%
Total Flow:														0.015	1.000

Total Flow:	0.015	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.02	(m ²)
Top Width:	0.66	(m)
Hydraulic Depth:	0.036	(m)
Mean Velocity:	0.610	(m/s)
Froude Number	1.025	
Photographs taken looking at:		

Data logger Notes:	
Data logger Internal Power:	4.58 V
Data logger External Power:	14.09 V
Data logger Memory Used:	45%
Data logger Clock:	1:46 PM MST
Laptop Clock:	1:56 PM MST
Dessicant:	NEW
Data logger:	170271
PT:	101352
Power:	

Notes: TD removed for winter
TBRG snow gauge adaptor installed count 2435
memory cleared, clocks reset
NOTE: JSL moved debris when taking flow measurement, and thus backwater conditions could have been changed causing a decrease in water level



Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Lowland Tar River
Location: Lowland Tar River
Site Name: S19
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Time of Measurement

Date of Measurement: December 13, 2008
Start Time: 12:15 PM MST
End Time:

Weather Conditions: clear, calm, -31 C
River Conditions: ice cover

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: sm
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: NEW Nail in tree
Water Level Reading:
Top of Ice Level Reading:
Transducer Reading & Calc'd El.:
Other: top logger box

Setup No. 1

El: 101.630
El:
El:
El:
El:

Setup No. 2

El: 101.630
El:
El:
El:
El:

Data logger Notes:

Data logger Internal Power: 4.4 V
Data logger External Power: 15.1 V
Data logger Memory Used: 4%
Data logger Clock: 12:03 PM MST
Laptop Clock: 12:14 PM MST

Dessicant:

Data logger: 170271
PT:
Power:

Notes: antifreeze/alcohol solution topped up, ignore tips around this time
TBRG solution was slushy upon arrival
TBRG count 2470

Hydrometric Measurement / Site Visit Record

S20 - Upland Muskeg River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Upland Muskeg River
Location: Upland Muskeg River
Site Name: S20
Coordinates & Legal: 6354787 N, 492178 E SE-19-96-7-W4

Time of Measurement

Date of Measurement: May 10, 2008
Start Time: 4:40 PM MDT
End Time: 4:55 PM MDT

Weather Conditions:

part cloud, 13 C
River Conditions: open, high

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rebar on LB 1.753
Water Level Reading: 2.640
Top of Ice Level Reading: 1.282
Transducer Reading & Calc'd E 1.282
Other: T-post on LB near DL 0.588

Setup No. 1

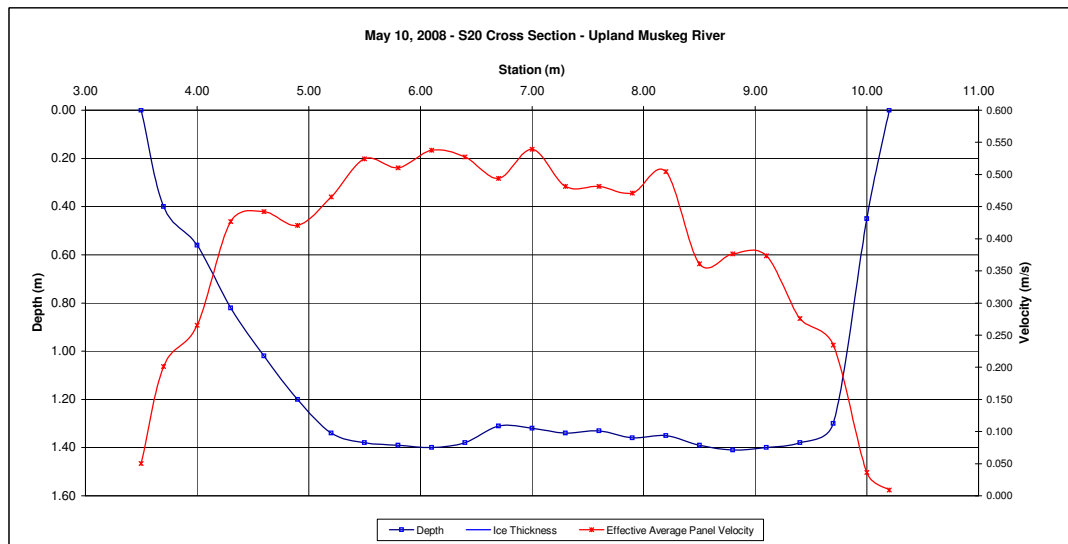
El: 50.000 1.740 El: 50.000
El: 49.113 2.630 El: 49.110 49.112
El: 47.831 1.282 El: 47.828 47.829
El: 51.165 0.572 El: 51.168 51.167

Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
RB 3.50	0.00					1.00	1	3.50	3.60	0.050	0.050	0.10	0.01	0.001	0%				
3.70	0.40				0.201	1.00	2	3.60	3.85	0.201	0.201	0.40	0.10	0.020	1%				
4.00	0.56				0.265	1.00	3	3.85	4.15	0.265	0.265	0.56	0.17	0.045	1%				
4.30	0.82				0.427	1.00	4	4.15	4.45	0.427	0.427	0.82	0.25	0.105	3%				
4.60	1.02				0.442	1.00	5	4.45	4.75	0.442	0.442	1.02	0.31	0.135	4%				
4.90	1.20		0.436	0.405		1.00	6	4.75	5.05	0.421	0.421	1.20	0.36	0.151	4%				
5.20	1.34		0.475	0.454		1.00	7	5.05	5.35	0.465	0.465	1.34	0.40	0.187	6%				
5.50	1.38		0.521	0.527		1.00	8	5.35	5.65	0.524	0.524	1.38	0.41	0.217	6%				
5.80	1.39		0.506	0.515		1.00	9	5.65	5.95	0.511	0.511	1.39	0.42	0.213	6%				
6.10	1.40		0.506	0.570		1.00	10	5.95	6.25	0.538	0.538	1.40	0.42	0.226	7%				
6.40	1.38		0.527	0.527		1.00	11	6.25	6.55	0.527	0.527	1.38	0.41	0.218	6%				
6.70	1.31		0.503	0.485		1.00	12	6.55	6.85	0.494	0.494	1.31	0.39	0.194	6%				
7.00	1.32		0.561	0.518		1.00	13	6.85	7.15	0.539	0.539	1.32	0.40	0.214	6%				
7.30	1.34		0.509	0.454		1.00	14	7.15	7.45	0.482	0.482	1.34	0.40	0.194	6%				
7.60	1.33		0.421	0.543		1.00	15	7.45	7.75	0.482	0.482	1.33	0.40	0.192	6%				
7.90	1.36		0.442	0.500		1.00	16	7.75	8.05	0.471	0.471	1.36	0.41	0.192	6%				
8.20	1.35		0.454	0.555		1.00	17	8.05	8.35	0.504	0.504	1.35	0.40	0.204	6%				
8.50	1.39		0.341	0.381		1.00	18	8.35	8.65	0.361	0.361	1.39	0.42	0.151	4%				
8.80	1.41		0.408	0.344		1.00	19	8.65	8.95	0.376	0.376	1.41	0.42	0.159	5%				
9.10	1.40		0.366	0.381		1.00	20	8.95	9.25	0.373	0.373	1.40	0.42	0.157	5%				
9.40	1.38		0.305	0.247		1.00	21	9.25	9.55	0.276	0.276	1.38	0.41	0.114	3%				
9.70	1.30		0.302	0.168		1.00	22	9.55	9.85	0.235	0.235	1.30	0.39	0.092	3%				
10.00	0.45				0.037	1.00	23	9.85	10.10	0.037	0.037	0.45	0.11	0.004	0%				
LB 10.20	0.00					1.00	24	10.10	10.20	0.009	0.009	0.11	0.01	0.000	0%				
Total Flow:															3.384	1.000			

Total Flow:	3.384	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	7.85	(m ²)
Top Width:	6.70	(m)
Hydraulic Depth:	1.171	(m)
Mean Velocity:	0.431	(m/s)
Froude Number	0.127	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:	Database # 277
Data logger Internal Power:	4.57 V
Data logger External Power:	13.54 V
Data logger Memory Used:	31%
Data logger Clock:	3:24 PM MST
Laptop Clock:	3:26 PM MST
Dessicant:	new
Data logger:	Optimum DD-128 #109050402
PT:	Keller 5 psi #104638
Power:	Solar panel and internal battery

Notes: solar panel pointing wrong way
beaver dam downstream of cross section, possibly affecting water level



Hydrometric Measurement / Site Visit Record

S20 - Upland Muskeg River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Upland Muskeg River
Location: Upland Muskeg River
Site Name: S20
Coordinates & Legal: 6354787 N, 492178 E SE-19-96-7-W4

Time of Measurement

Date of Measurement: June 30, 2008
Start Time: 9:30 AM MDT
End Time: 9:46 AM MDT

Weather Conditions:

River Conditions: sunny, 25 C

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: LM Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: IR by logger 2.325
Water Level Reading: 3.771
Top of Ice Level Reading: 0.740
Transducer Reading & Calc'd El: 1.159
Other: Rebar far away

Setup No. 1

El: 50.000
El: 48.554
El: 47.814
El: 51.166

Setup No. 2

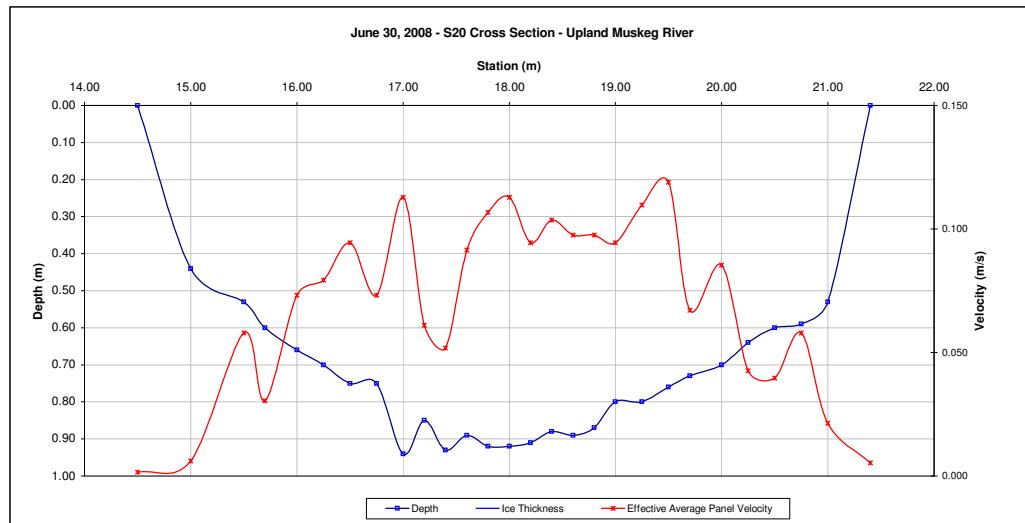
El: 2.290
El: 3.732
El: 0.740
El: 1.120

		Measurement Data														
Measured Data							Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
LB	21.40	0.00				1.00	1	21.40	21.20	0.005	0.005	0.13	0.03	0.000	0%	
	21.00	0.53			0.021	1.00	2	21.20	20.88	0.021	0.021	0.53	0.17	0.004	1%	
	20.75	0.59			0.058	1.00	3	20.88	20.63	0.058	0.058	0.59	0.15	0.009	2%	
	20.50	0.60			0.040	1.00	4	20.63	20.38	0.040	0.040	0.60	0.15	0.006	2%	
	20.25	0.64			0.043	1.00	5	20.38	20.13	0.043	0.043	0.64	0.16	0.007	2%	
	20.00	0.70			0.085	1.00	6	20.13	19.85	0.085	0.085	0.70	0.19	0.016	5%	
	19.70	0.73			0.067	1.00	7	19.85	19.60	0.067	0.067	0.73	0.18	0.012	3%	
	19.50	0.76			0.119	1.00	8	19.60	19.38	0.119	0.119	0.76	0.17	0.020	6%	
	19.25	0.80			0.110	1.00	9	19.38	19.13	0.110	0.110	0.80	0.20	0.022	6%	
	19.00	0.80			0.094	1.00	10	19.13	18.90	0.094	0.094	0.80	0.18	0.017	5%	
	18.80	0.87			0.098	1.00	11	18.90	18.70	0.098	0.098	0.87	0.17	0.017	5%	
	18.60	0.89			0.098	1.00	12	18.70	18.50	0.098	0.098	0.89	0.18	0.017	5%	
	18.40	0.88			0.104	1.00	13	18.50	18.30	0.104	0.104	0.88	0.18	0.018	5%	
	18.20	0.91			0.094	1.00	14	18.30	18.10	0.094	0.094	0.91	0.18	0.017	5%	
	18.00	0.92			0.113	1.00	15	18.10	17.90	0.113	0.113	0.92	0.18	0.021	6%	
	17.80	0.92			0.107	1.00	16	17.90	17.70	0.107	0.107	0.92	0.18	0.020	5%	
	17.60	0.89			0.091	1.00	17	17.70	17.50	0.091	0.091	0.89	0.18	0.016	5%	
	17.40	0.93			0.052	1.00	18	17.50	17.30	0.052	0.052	0.93	0.19	0.010	3%	
	17.20	0.85			0.061	1.00	19	17.30	17.10	0.061	0.061	0.85	0.17	0.010	3%	
	17.00	0.94			0.113	1.00	20	17.10	16.88	0.113	0.113	0.94	0.21	0.024	7%	
	16.75	0.75			0.073	1.00	21	16.88	16.63	0.073	0.073	0.75	0.19	0.014	4%	
	16.50	0.75			0.094	1.00	22	16.63	16.38	0.094	0.094	0.75	0.19	0.018	5%	
	16.25	0.70			0.079	1.00	23	16.38	16.13	0.079	0.079	0.70	0.18	0.014	4%	
	16.00	0.66			0.073	1.00	24	16.13	15.85	0.073	0.073	0.66	0.18	0.013	4%	
	15.70	0.60			0.030	1.00	25	15.85	15.60	0.030	0.030	0.60	0.15	0.005	1%	
	15.50	0.53			0.058	1.00	26	15.60	15.25	0.058	0.058	0.53	0.19	0.011	3%	
	15.00	0.44			0.006	1.00	27	15.25	14.75	0.006	0.006	0.44	0.22	0.001	0%	
	14.50	0.00				1.00	28	14.75	14.50	0.002	0.002	0.11	0.03	0.000	0%	
Total Flow:														0.359	1.000	

Total Flow:	0.359	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	4.72	(m ²)
Top Width:	6.90	(m)
Hydraulic Depth:	0.684	(m)
Mean Velocity:	0.076	(m/s)
Froude Number	0.029	
Photographs taken looking at:		

Data logger Notes:	Database # 277
Data logger Internal Power:	4.57 V
Data logger External Power:	14.07 V
Data logger Memory Used:	35%
Data logger Clock:	8:26 AM MST
Laptop Clock:	8:27 AM MST
Dessicant:	
Data logger:	
PT:	Keller 5 psi #104638
Power:	

Notes: Site = 277



Hydrometric Measurement / Site Visit Record

S20 - Upland Muskeg River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Upland Muskeg River
Location: Upland Muskeg River
Site Name: S20
Coordinates & Legal: 6354787 N, 492178 E SE-19-96-7-W4

Time of Measurement

Date of Measurement: August 6, 2008
Start Time: 1:00 PM MDT
End Time: 1:15 PM MDT

Weather Conditions:

sunny

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/LM
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: IR by logger 1.972
Water Level Reading: 3.154
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 1.001
Other: Rebar far away 0.803

Setup No. 1

El: 50.000
El: 48.818
El: 47.817
El: 51.169

Setup No. 2

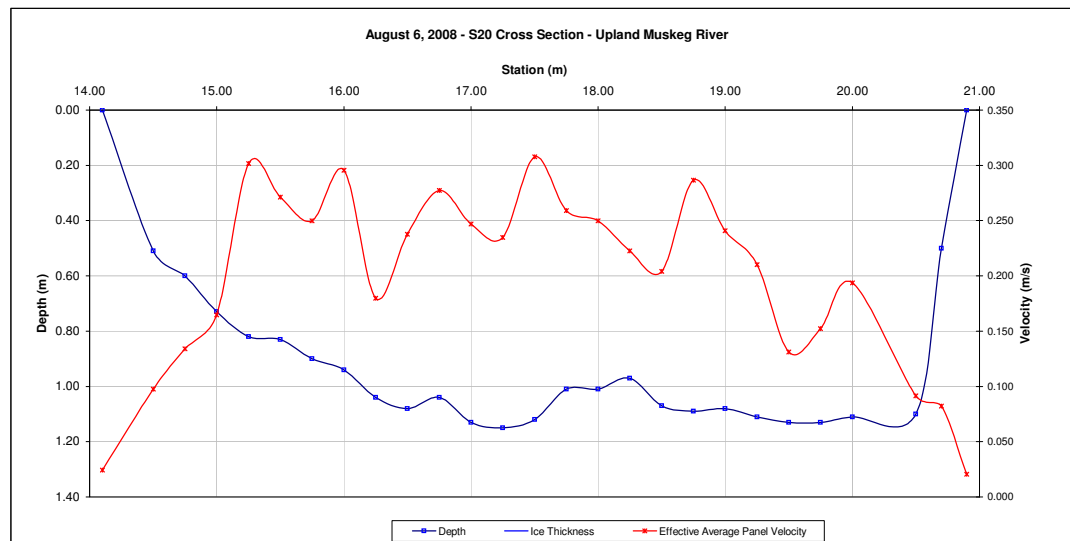
El: 50.000
El: 48.817
El: 47.816
El: 51.168

Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
LB 20.90	0.00					1.00	1	20.90	20.80	0.021	0.021	0.13	0.01	0.000	0%				
20.70	0.50				0.082	1.00	2	20.80	20.60	0.082	0.082	0.50	0.10	0.008	1%				
20.50	1.10				0.091	1.00	3	20.60	20.25	0.091	0.091	1.10	0.39	0.035	3%				
20.00	1.11		0.140	0.247		1.00	4	20.25	19.88	0.194	0.194	1.11	0.42	0.081	6%				
19.75	1.13		0.213	0.091		1.00	5	19.88	19.63	0.152	0.152	1.13	0.28	0.043	3%				
19.50	1.13		0.229	0.034		1.00	6	19.63	19.38	0.131	0.131	1.13	0.28	0.037	3%				
19.25	1.11		0.296	0.125		1.00	7	19.38	19.13	0.210	0.210	1.11	0.28	0.058	4%				
19.00	1.08				0.241	1.00	8	19.13	18.88	0.241	0.241	1.08	0.27	0.065	5%				
18.75	1.09				0.287	1.00	9	18.88	18.63	0.287	0.287	1.09	0.27	0.078	6%				
18.50	1.07				0.204	1.00	10	18.63	18.38	0.204	0.204	1.07	0.27	0.055	4%				
18.25	0.97				0.223	1.00	11	18.38	18.13	0.223	0.223	0.97	0.24	0.054	4%				
18.00	1.01				0.250	1.00	12	18.13	17.88	0.250	0.250	1.01	0.25	0.063	5%				
17.75	1.01				0.259	1.00	13	17.88	17.63	0.259	0.259	1.01	0.25	0.065	5%				
17.50	1.12		0.293	0.323		1.00	14	17.63	17.38	0.308	0.308	1.12	0.28	0.086	6%				
17.25	1.15		0.253	0.216		1.00	15	17.38	17.13	0.235	0.235	1.15	0.29	0.067	5%				
17.00	1.13		0.247	0.247		1.00	16	17.13	16.88	0.247	0.247	1.13	0.28	0.070	5%				
16.75	1.04				0.277	1.00	17	16.88	16.63	0.277	0.277	1.04	0.26	0.072	5%				
16.50	1.08				0.238	1.00	18	16.63	16.38	0.238	0.238	1.08	0.27	0.064	5%				
16.25	1.04				0.180	1.00	19	16.38	16.13	0.180	0.180	1.04	0.26	0.047	3%				
16.00	0.94				0.296	1.00	20	16.13	15.88	0.296	0.296	0.94	0.24	0.069	5%				
15.75	0.90				0.250	1.00	21	15.88	15.63	0.250	0.250	0.90	0.23	0.056	4%				
15.50	0.83				0.271	1.00	22	15.63	15.38	0.271	0.271	0.83	0.21	0.056	4%				
15.25	0.82				0.302	1.00	23	15.38	15.13	0.302	0.302	0.82	0.21	0.062	5%				
15.00	0.73				0.165	1.00	24	15.13	14.88	0.165	0.165	0.73	0.18	0.030	2%				
14.75	0.60				0.134	1.00	25	14.88	14.63	0.134	0.134	0.60	0.15	0.020	1%				
14.50	0.51				0.098	1.00	26	14.63	14.30	0.098	0.098	0.51	0.17	0.016	1%				
RB 14.10	0.00					1.00	27	14.30	14.10	0.024	0.024	0.13	0.03	0.001	0%				
														Total Flow:	1.360				
															1.000				

Total Flow:	1.360	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	6.35	(m ²)
Top Width:	6.80	(m)
Hydraulic Depth:	0.934	(m)
Mean Velocity:	0.214	(m/s)
Froude Number	0.071	
Photographs taken looking at:		

Data logger Notes:	Database # 277
Data logger Internal Power:	4.58 V
Data logger External Power:	13.95 V
Data logger Memory Used:	38% used
Data logger Clock:	11:49 AM MST
Laptop Clock:	11:50 AM MST
Dessicant:	50%
Data logger:	2281725
PT:	Keller 5 psi #104638
Power:	

Notes: Site = 277



Hydrometric Measurement / Site Visit Record

S20 - Upland Muskeg River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Upland Muskeg River
Location: Upland Muskeg River
Site Name: S20
Coordinates & Legal: 6354787 N, 492178 E SE-19-96-7-W4

Time of Measurement

Date of Measurement: September 10, 2008
Start Time: 9:42 AM MDT
End Time: 9:50 AM MDT

Weather Conditions:

partly cloudy, 10 C

River Conditions:

open, low

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rebar on LB 2.201
Water Level Reading: 3.908
Top of Ice Level Reading: 0.462
Transducer Reading & Calc'd El: 0.462
Other: T-post on LB near DL 1.025

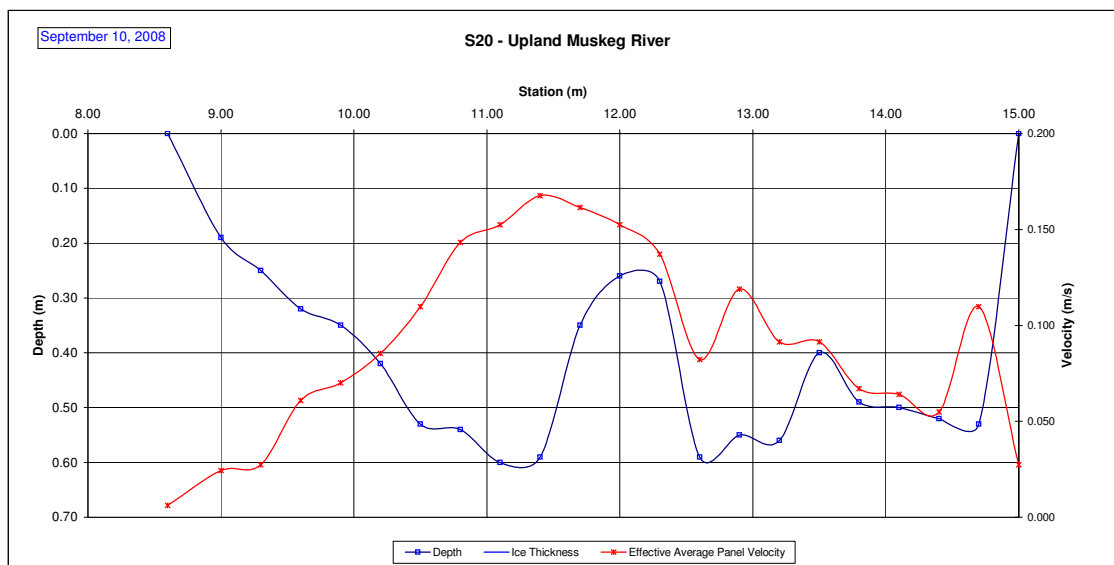
Setup No. 1	Setup No. 2
El: 50.000	El: 50.000
El: 48.293	El: 48.292 48.293
El: 47.831	El: 47.830 47.830
El: 51.176	El: 51.172 51.174

	Measurement Data															Percenta ge of Total
	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB																
	15.00	0.00					1.00	1	15.00	14.85	0.027	0.027	0.13	0.02	0.001	0%
	14.70	0.53				0.110	1.00	2	14.85	14.55	0.110	0.110	0.53	0.16	0.017	6%
	14.40	0.52				0.055	1.00	3	14.55	14.25	0.055	0.055	0.52	0.16	0.009	3%
	14.10	0.50				0.064	1.00	4	14.25	13.95	0.064	0.064	0.50	0.15	0.010	4%
	13.80	0.49				0.067	1.00	5	13.95	13.65	0.067	0.067	0.49	0.15	0.010	4%
	13.50	0.40				0.091	1.00	6	13.65	13.35	0.091	0.091	0.40	0.12	0.011	4%
	13.20	0.56				0.091	1.00	7	13.35	13.05	0.091	0.091	0.56	0.17	0.015	6%
	12.90	0.55				0.119	1.00	8	13.05	12.75	0.119	0.119	0.55	0.17	0.020	7%
	12.60	0.59				0.082	1.00	9	12.75	12.45	0.082	0.082	0.59	0.18	0.015	5%
	12.30	0.27				0.137	1.00	10	12.45	12.15	0.137	0.137	0.27	0.08	0.011	4%
	12.00	0.26				0.152	1.00	11	12.15	11.85	0.152	0.152	0.26	0.08	0.012	4%
	11.70	0.35				0.162	1.00	12	11.85	11.55	0.162	0.162	0.35	0.11	0.017	6%
	11.40	0.59				0.168	1.00	13	11.55	11.25	0.168	0.168	0.59	0.18	0.030	11%
	11.10	0.60				0.152	1.00	14	11.25	10.95	0.152	0.152	0.60	0.18	0.027	10%
	10.80	0.54				0.143	1.00	15	10.95	10.65	0.143	0.143	0.54	0.16	0.023	9%
	10.50	0.53				0.110	1.00	16	10.65	10.35	0.110	0.110	0.53	0.16	0.017	6%
	10.20	0.42				0.085	1.00	17	10.35	10.05	0.085	0.085	0.42	0.13	0.011	4%
	9.90	0.35				0.070	1.00	18	10.05	9.75	0.070	0.070	0.35	0.11	0.007	3%
	9.60	0.32				0.061	1.00	19	9.75	9.45	0.061	0.061	0.32	0.10	0.006	2%
	9.30	0.25				0.027	1.00	20	9.45	9.15	0.027	0.027	0.25	0.07	0.002	1%
9.00	0.19				0.024	1.00	21	9.15	8.80	0.024	0.024	0.19	0.07	0.002	1%	
RB	8.60	0.00					1.00	22	8.80	8.60	0.006	0.006	0.05	0.01	0.000	0%
													Total Flow:		0.272	1.000

Total Flow:	0.272	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.68	(m ²)
Top Width:	6.40	(m)
Hydraulic Depth:	0.419	(m)
Mean Velocity:	0.101	(m/s)
Froude Number	0.050	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:	Database # 277
Data logger Internal Power:	4.51 V
Data logger External Power:	14.67 V
Data logger Memory Used:	41%
Data logger Clock:	8:33 AM MST
Laptop Clock:	8:30 AM MST
Dessicant:	half used
Data logger:	Optimum DD-128 #109050402
PT:	Keller 5 psi #104638
Power:	Solar panel and internal battery

Notes:
Data looks good
Weeds near left bank up to 1/3 depth
water is lower than expected



Hydrometric Measurement / Site Visit Record

S20 - Upland Muskeg River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Upland Muskeg River
 Location: Upland Muskeg River
 Site Name: S20
 Coordinates & Legal: 6354787 N, 492178 E SE-19-96-7-W4

Time of Measurement

Date of Measurement: October 23, 2008
 Start Time: 9:55 AM MDT
 End Time: 10:05 AM MDT

Weather Conditions:

partly cloudy, 3 C

River Conditions:

Yellow

Personnel & Equipment

Measurement Made By: SM/AM
 Data Entry By: LS Checked: SM
 Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Rebar on LB 1.780
 Water Level Reading: 3.467
 Top of Ice Level Reading: 0.484
 Transducer Reading & Calc'd El: 0.614
 Other: T-post on LB near DL 0.614

Setup No. 1

El: 50.000
 El: 48.313
 El: 47.829
 El: 51.166

Setup No. 2

El: 1.765
 El: 3.459
 El: 0.484
 El: 0.600

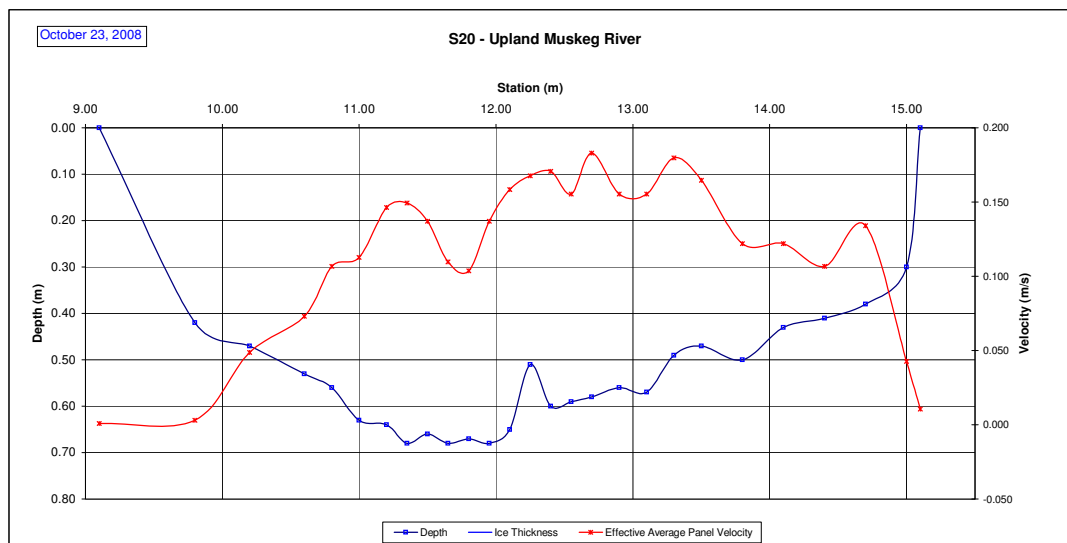
Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
LB 9.10	0.00					1.00	1	9.10	9.45	0.001	0.001	0.11	0.04	0.000	0%				
9.80	0.42				0.003	1.00	2	9.45	10.00	0.003	0.003	0.42	0.23	0.001	0%				
10.20	0.47				0.049	1.00	3	10.00	10.40	0.049	0.049	0.47	0.19	0.009	3%				
10.60	0.53				0.073	1.00	4	10.40	10.70	0.073	0.073	0.53	0.16	0.012	3%				
10.80	0.56				0.107	1.00	5	10.70	10.90	0.107	0.107	0.56	0.11	0.012	3%				
11.00	0.63				0.113	1.00	6	10.90	11.10	0.113	0.113	0.63	0.13	0.014	4%				
11.20	0.64				0.146	1.00	7	11.10	11.28	0.146	0.146	0.64	0.11	0.016	5%				
11.35	0.68				0.149	1.00	8	11.28	11.43	0.149	0.149	0.68	0.10	0.015	4%				
11.50	0.66				0.137	1.00	9	11.43	11.58	0.137	0.137	0.66	0.10	0.014	4%				
11.65	0.68				0.110	1.00	10	11.58	11.73	0.110	0.110	0.68	0.10	0.011	3%				
11.80	0.67				0.104	1.00	11	11.73	11.88	0.104	0.104	0.67	0.10	0.010	3%				
11.95	0.68				0.137	1.00	12	11.88	12.03	0.137	0.137	0.68	0.10	0.014	4%				
12.10	0.65				0.158	1.00	13	12.03	12.18	0.158	0.158	0.65	0.10	0.015	5%				
12.25	0.51				0.168	1.00	14	12.18	12.33	0.168	0.168	0.51	0.08	0.013	4%				
12.40	0.60				0.171	1.00	15	12.33	12.48	0.171	0.171	0.60	0.09	0.015	4%				
12.55	0.59				0.155	1.00	16	12.48	12.63	0.155	0.155	0.59	0.09	0.014	4%				
12.70	0.58				0.183	1.00	17	12.63	12.80	0.183	0.183	0.58	0.10	0.019	5%				
12.90	0.56				0.155	1.00	18	12.80	13.00	0.155	0.155	0.56	0.11	0.017	5%				
13.10	0.57				0.155	1.00	19	13.00	13.20	0.155	0.155	0.57	0.11	0.018	5%				
13.30	0.49				0.180	1.00	20	13.20	13.40	0.180	0.180	0.49	0.10	0.018	5%				
13.50	0.47				0.165	1.00	21	13.40	13.65	0.165	0.165	0.47	0.12	0.019	6%				
13.80	0.50				0.122	1.00	22	13.65	13.95	0.122	0.122	0.50	0.15	0.018	5%				
14.10	0.43				0.122	1.00	23	13.95	14.25	0.122	0.122	0.43	0.13	0.016	5%				
14.40	0.41				0.107	1.00	24	14.25	14.55	0.107	0.107	0.41	0.12	0.013	4%				
14.70	0.38				0.134	1.00	25	14.55	14.85	0.134	0.134	0.38	0.11	0.015	4%				
15.00	0.30				0.043	1.00	26	14.85	15.05	0.043	0.043	0.30	0.06	0.003	1%				
RB 15.10	0.00					1.00	27	15.05	15.10	0.011	0.011	0.08	0.00	0.000	0%				
														Total Flow:	0.342	1.000			

Total Flow:	0.342	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.95	(m ²)
Top Width:	6.00	(m)
Hydraulic Depth:	0.491	(m)
Mean Velocity:	0.116	(m/s)
Froude Number	0.053	
Photographs taken looking at:		
Upstream, downstream, across		

Notes:

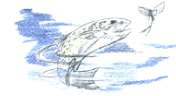
Memory cleared
 Clock Reset
 Sample rate changed to 1 hour

Data logger Notes:	Database # 277
Data logger Internal Power:	4.5 V
Data logger External Power:	13.64 V
Data logger Memory Used:	44%
Data logger Clock:	8:36 AM MST
Laptop Clock:	8:38 AM MST
Dessicant:	New
Data logger:	Optimum DD-128 #109050402
PT:	Keller 5 psi #104638
Power:	Solar panel and internal battery



Hydrometric Measurement / Site Visit Record

S22 - Muskeg Creek near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg Creek
Location: Muskeg Creek near the Mouth
Site Name: S22
Coordinates & Legal: 6348856 N, 481036 E SE-36-95-9-W4
Time of Measurement
Date of Measurement: May 10, 2008
Start Time: 2:46 PM MDT
End Time: 3:10 PM MDT

Weather Conditions: sunny, part cloud, 8 C
River Conditions: open, high

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: sm
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: t post 0.358 El: 306.476
Water Level Reading: 2.270 El: 304.564
Top of Ice Level Reading: El: 304.564
Transducer Reading & Calc'd El.: 0.874 El: 303.690
Other: Nail in tree on RB 1.600 El: 305.234

Setup No. 1

El: 306.476
El: 304.564
El: 304.564
El: 303.690
El: 305.234

Setup No. 2

El: 306.476
El: 304.564
El: 304.564
El: 303.690
El: 305.234

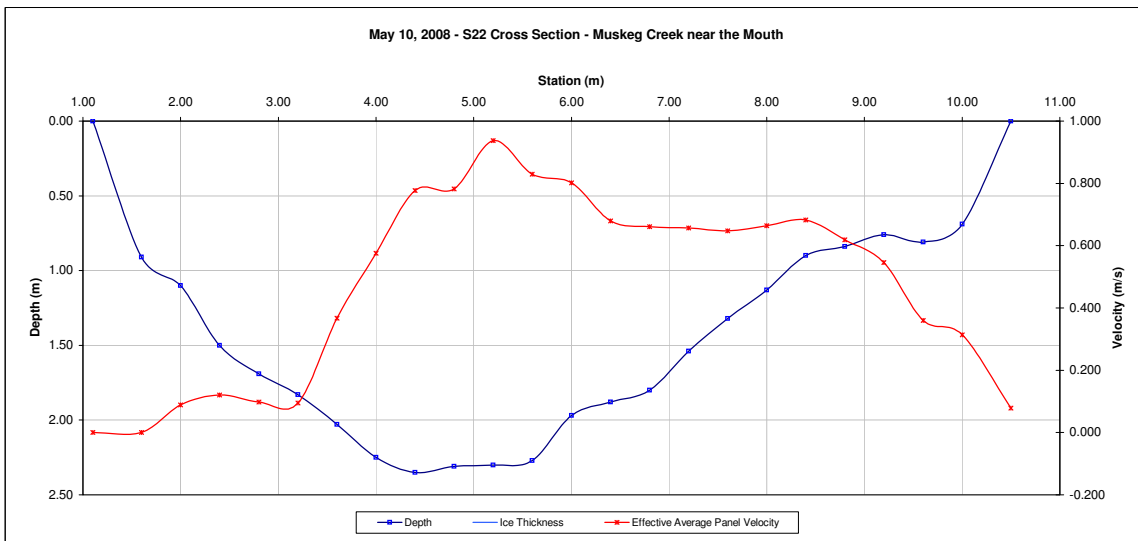
Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
LB 1.10	0.00					1.00	1	1.10	1.35	0.000	0.000	0.23	0.06	0.000	0.0%
1.60	0.91				0.000	1.00	2	1.35	1.80	0.000	0.000	0.91	0.41	0.000	0.0%
2.00	1.10				0.088	1.00	3	1.80	2.20	0.088	0.088	1.10	0.44	0.039	0.5%
2.40	1.50		0.326	-0.085		1.00	4	2.20	2.60	0.120	0.120	1.50	0.60	0.072	0.9%
2.80	1.69		0.277	-0.082		1.00	5	2.60	3.00	0.098	0.098	1.69	0.68	0.066	0.9%
3.20	1.83		0.329	-0.140		1.00	6	3.00	3.40	0.094	0.094	1.83	0.73	0.069	0.9%
3.60	2.03		0.576	0.158		1.00	7	3.40	3.80	0.367	0.367	2.03	0.81	0.298	3.9%
4.00	2.25		0.698	0.454		1.00	8	3.80	4.20	0.576	0.576	2.25	0.90	0.518	6.8%
4.40	2.35		1.052	0.503		1.00	9	4.20	4.60	0.777	0.777	2.35	0.94	0.731	9.6%
4.80	2.31		0.878	0.686		1.00	10	4.60	5.00	0.782	0.782	2.31	0.92	0.722	9.5%
5.20	2.30		1.039	0.835		1.00	11	5.00	5.40	0.937	0.937	2.30	0.92	0.862	11.3%
5.60	2.27		0.957	0.701		1.00	12	5.40	5.80	0.829	0.829	2.27	0.91	0.753	9.9%
6.00	1.97		0.924	0.680		1.00	13	5.80	6.20	0.802	0.802	1.97	0.79	0.632	8.3%
6.40	1.88		0.899	0.460		1.00	14	6.20	6.60	0.680	0.680	1.88	0.75	0.511	6.7%
6.80	1.80		0.972	0.351		1.00	15	6.60	7.00	0.661	0.661	1.80	0.72	0.476	6.2%
7.20	1.54		0.969	0.344		1.00	16	7.00	7.40	0.657	0.657	1.54	0.62	0.405	5.3%
7.60	1.32		1.006	0.290		1.00	17	7.40	7.80	0.648	0.648	1.32	0.53	0.342	4.5%
8.00	1.13				0.664	1.00	18	7.80	8.20	0.664	0.664	1.13	0.45	0.300	3.9%
8.40	0.90				0.683	1.00	19	8.20	8.60	0.683	0.683	0.90	0.36	0.246	3.2%
8.80	0.84				0.619	1.00	20	8.60	9.00	0.619	0.619	0.84	0.34	0.208	2.7%
9.20	0.76				0.546	1.00	21	9.00	9.40	0.546	0.546	0.76	0.30	0.166	2.2%
9.60	0.81				0.360	1.00	22	9.40	9.80	0.360	0.360	0.81	0.32	0.117	1.5%
10.00	0.69				0.314	1.00	23	9.80	10.25	0.314	0.314	0.69	0.31	0.097	1.3%
RB 10.50	0.00					1.00	24	10.25	10.50	0.078	0.078	0.17	0.04	0.003	0%
Total														7.634	1.000

Total Flow:	7.634	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	13.85	(m ²)
Top Width:	9.40	(m)
Hydraulic Depth:	1.474	(m)
Mean Velocity:	0.551	(m/s)
Froude Number	0.145	
Photographs taken looking at: Upstream, downstream, across.		

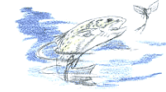
Notes: installed TD
manual water temp 8 C

Data logger Notes:	Database # 602
Data logger Internal Power:	4.68 V
Data logger External Power:	13.15 V
Data logger Memory Used:	0%
Data logger Clock:	14:25 MST
Laptop Clock:	14:25 MST
Dessicant:	
Data logger:	0204100602
PT:	101353
Power:	Battery & Solar panel



Hydrometric Measurement / Site Visit Record

S22 - Muskeg Creek near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg Creek
Location: Muskeg Creek near the Mouth
Site Name: S22
Coordinates & Legal: 6348856 N, 481036 E SE-36-95-9-W4

Time of Measurement

Date of Measurement: June 30, 2008
Start Time: 8:30 AM MDT
End Time: 8:50 AM MDT

Weather Conditions:

sunny, 23 C

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: 1 post 0.418
Water Level Reading: 3.382
Top of Ice Level Reading:
Transducer Reading & Calc'd EL: 0.159
Other: Nail in tree on RB 1.671

Setup No. 1

El: 306.476 0.400
El: 303.512 3.364
El: 303.512
El: 303.353 0.159
El: 305.223 1.652

Setup No. 2

El: 306.476
El: 303.512
El:
El: 303.353
El: 305.224

Average

303.512
303.353
305.224

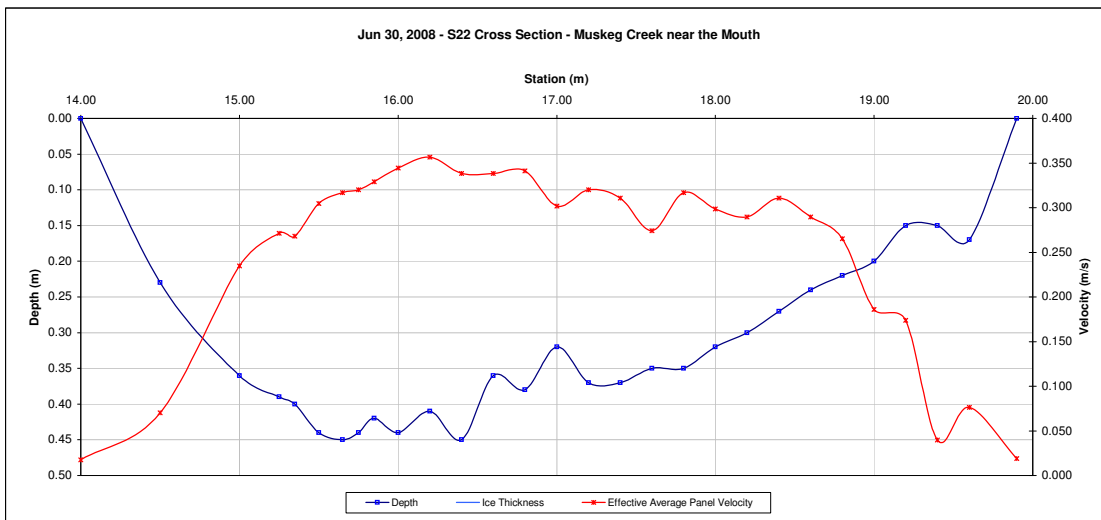
Measured Data						Measurement Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
14.00	0.00					1.00	1	14.00	14.25	0.018	0.018	0.06	0.01	0.000	0.1%	
14.50	0.23				0.070	1.00	2	14.25	14.75	0.070	0.070	0.23	0.12	0.008	1.7%	
15.00	0.36				0.235	1.00	3	14.75	15.13	0.235	0.235	0.36	0.14	0.032	6.6%	
15.25	0.39				0.271	1.00	4	15.13	15.30	0.271	0.271	0.39	0.07	0.019	3.8%	
15.35	0.40				0.268	1.00	5	15.30	15.43	0.268	0.268	0.40	0.05	0.013	2.8%	
15.50	0.44				0.305	1.00	6	15.43	15.58	0.305	0.305	0.44	0.07	0.020	4.2%	
15.65	0.45				0.317	1.00	7	15.58	15.70	0.317	0.317	0.45	0.06	0.018	3.7%	
15.75	0.44				0.320	1.00	8	15.70	15.80	0.320	0.320	0.44	0.04	0.014	2.9%	
15.85	0.42				0.329	1.00	9	15.80	15.93	0.329	0.329	0.42	0.05	0.017	3.6%	
16.00	0.44				0.344	1.00	10	15.93	16.10	0.344	0.344	0.44	0.08	0.027	5.5%	
16.20	0.41				0.357	1.00	11	16.10	16.30	0.357	0.357	0.41	0.08	0.029	6.1%	
16.40	0.45				0.338	1.00	12	16.30	16.50	0.338	0.338	0.45	0.09	0.030	6.3%	
16.60	0.36				0.338	1.00	13	16.50	16.70	0.338	0.338	0.36	0.07	0.024	5.1%	
16.80	0.38				0.341	1.00	14	16.70	16.90	0.341	0.341	0.38	0.08	0.026	5.4%	
17.00	0.32				0.302	1.00	15	16.90	17.10	0.302	0.302	0.32	0.06	0.019	4.0%	
17.20	0.37				0.320	1.00	16	17.10	17.30	0.320	0.320	0.37	0.07	0.024	4.9%	
17.40	0.37				0.311	1.00	17	17.30	17.50	0.311	0.311	0.37	0.07	0.023	4.8%	
17.60	0.35				0.274	1.00	18	17.50	17.70	0.274	0.274	0.35	0.07	0.019	4.0%	
17.80	0.35				0.317	1.00	19	17.70	17.90	0.317	0.317	0.35	0.07	0.022	4.6%	
18.00	0.32				0.299	1.00	20	17.90	18.10	0.299	0.299	0.32	0.06	0.019	4.0%	
18.20	0.30				0.290	1.00	21	18.10	18.30	0.290	0.290	0.30	0.06	0.017	3.6%	
18.40	0.27				0.311	1.00	22	18.30	18.50	0.311	0.311	0.27	0.05	0.017	3.5%	
18.60	0.24				0.290	1.00	23	18.50	18.70	0.290	0.290	0.24	0.05	0.014	2.9%	
18.80	0.22				0.265	1.00	24	18.70	18.90	0.265	0.265	0.22	0.04	0.012	2.4%	
19.00	0.20				0.186	1.00	25	18.90	19.10	0.186	0.186	0.20	0.04	0.007	1.5%	
19.20	0.15				0.174	1.00	26	19.10	19.30	0.174	0.174	0.15	0.03	0.005	1.1%	
19.40	0.15				0.040	1.00	27	19.30	19.50	0.040	0.040	0.15	0.03	0.001	0.2%	
19.60	0.17				0.076	1.00	28	19.50	19.75	0.076	0.076	0.17	0.04	0.003	0.7%	
19.90	0.00					1.00	29	19.75	19.90	0.019	0.019	0.04	0.01	0.000	0.0%	
Total														0.481	1.000	

Total Flow:	0.481	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	1.77	(m ²)
Top Width:	5.90	(m)
Hydraulic Depth:	0.300	(m)
Mean Velocity:	0.272	(m/s)
Froude Number	0.159	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power: 4.76 V
Data logger External Power: 13.62 V
Data logger Memory Used: 4%
Data logger Clock: 7:09 AM MST
Laptop Clock: 7:09 AM MST
Dessicant:
Data logger: 0204100602
PT: 101353
Power: Battery & Solar panel

Notes: TD out of water upon arrival
TD MOVED



Hydrometric Measurement / Site Visit Record

S22 - Muskeg Creek near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg Creek
Location: Muskeg Creek near the Mouth
Site Name: S22
Coordinates & Legal: 6348856 N, 481036 E SE-36-95-9-W4

Time of Measurement

Date of Measurement: August 6, 2008
Start Time: 3:20 PM MDT
End Time: 3:30 PM MDT

Weather Conditions:

River Conditions: clear, 26C
open

Personnel & Equipment

Measurement Made By: LM / SM
Data Entry By: LM Checked: sm
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: 1 post 0.237
Water Level Reading: 3.298
Top of Ice Level Reading:
Transducer Reading & Calc'd EL: 0.028
Other: Nail in tree on RB

Setup No. 1

El: 306.476
El: 303.415
El: 303.387

Setup No. 2

El: 306.476
El: 303.416
El: 303.388

Average

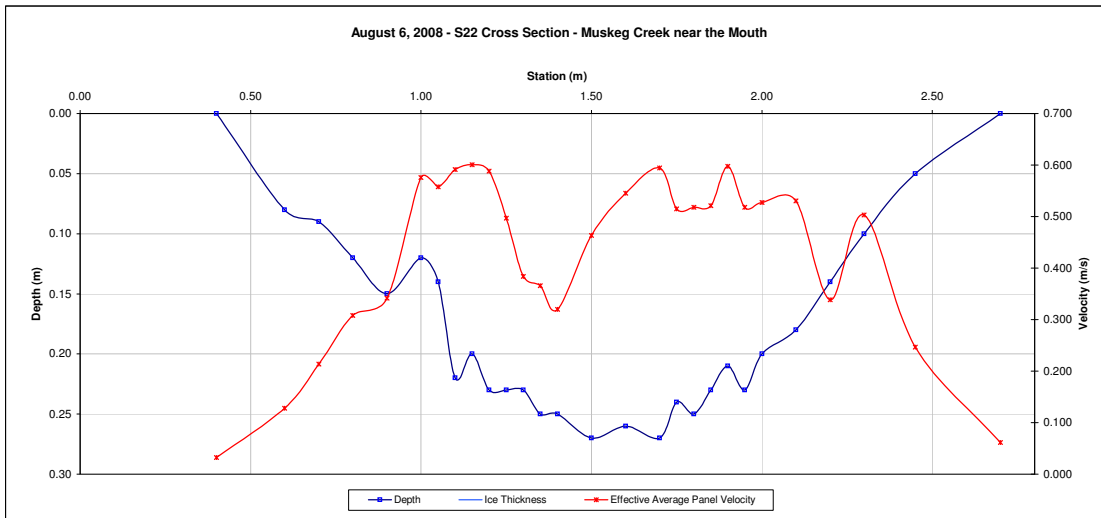
303.416
303.387

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.40	0.00					1.00	1	0.40	0.50	0.032	0.032	0.02	0.00	0.000	0.0%	
0.60	0.08				0.128	1.00	2	0.50	0.65	0.128	0.128	0.08	0.01	0.002	0.9%	
0.70	0.09				0.213	1.00	3	0.65	0.75	0.213	0.213	0.09	0.01	0.002	1.2%	
0.80	0.12				0.308	1.00	4	0.75	0.85	0.308	0.308	0.12	0.01	0.004	2.3%	
0.90	0.15				0.341	1.00	5	0.85	0.95	0.341	0.341	0.15	0.02	0.005	3.2%	
1.00	0.12				0.576	1.00	6	0.95	1.03	0.576	0.576	0.12	0.01	0.005	3.2%	
1.05	0.14				0.558	1.00	7	1.03	1.08	0.558	0.558	0.14	0.01	0.004	2.4%	
1.10	0.22				0.591	1.00	8	1.08	1.13	0.591	0.591	0.22	0.01	0.007	4.0%	
1.15	0.20				0.600	1.00	9	1.13	1.18	0.600	0.600	0.20	0.01	0.006	3.7%	
1.20	0.23				0.588	1.00	10	1.18	1.23	0.588	0.588	0.23	0.01	0.007	4.2%	
1.25	0.23				0.497	1.00	11	1.23	1.28	0.497	0.497	0.23	0.01	0.006	3.5%	
1.30	0.23				0.384	1.00	12	1.28	1.33	0.384	0.384	0.23	0.01	0.004	2.7%	
1.35	0.25				0.366	1.00	13	1.33	1.38	0.366	0.366	0.25	0.01	0.005	2.8%	
1.40	0.25				0.320	1.00	14	1.38	1.45	0.320	0.320	0.25	0.02	0.006	3.7%	
1.50	0.27				0.463	1.00	15	1.45	1.55	0.463	0.463	0.27	0.03	0.013	7.7%	
1.60	0.26				0.546	1.00	16	1.55	1.65	0.546	0.546	0.26	0.03	0.014	8.8%	
1.70	0.27				0.594	1.00	17	1.65	1.73	0.594	0.594	0.27	0.02	0.012	7.4%	
1.75	0.24				0.515	1.00	18	1.73	1.78	0.515	0.515	0.24	0.01	0.006	3.8%	
1.80	0.25				0.518	1.00	19	1.78	1.83	0.518	0.518	0.25	0.01	0.006	4.0%	
1.85	0.23				0.521	1.00	20	1.83	1.88	0.521	0.521	0.23	0.01	0.006	3.7%	
1.90	0.21				0.597	1.00	21	1.88	1.93	0.597	0.597	0.21	0.01	0.006	3.9%	
1.95	0.23				0.518	1.00	22	1.93	1.98	0.518	0.518	0.23	0.01	0.006	3.7%	
2.00	0.20				0.527	1.00	23	1.98	2.05	0.527	0.527	0.20	0.01	0.008	4.9%	
2.10	0.18				0.530	1.00	24	2.05	2.15	0.530	0.530	0.18	0.02	0.010	5.9%	
2.20	0.14				0.338	1.00	25	2.15	2.25	0.338	0.338	0.14	0.01	0.005	2.9%	
2.30	0.10				0.503	1.00	26	2.25	2.38	0.503	0.503	0.10	0.01	0.006	3.9%	
2.45	0.05				0.247	1.00	27	2.38	2.58	0.247	0.247	0.05	0.01	0.002	1.5%	
2.70	0.00				0.000	1.00	28	2.58	2.70	0.062	0.062	0.01	0.00	0.000	0.1%	
Total														0.162	1.000	

Total Flow:	0.162	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.36	(m ²)
Top Width:	2.30	(m)
Hydraulic Depth:	0.154	(m)
Mean Velocity:	0.456	(m/s)
Froude Number	0.371	
Photographs taken looking at:		

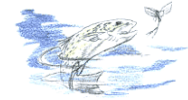
Data logger Notes:	
Data logger Internal Power:	4.77 V
Data logger External Power:	13.17 V
Data logger Memory Used:	7%
Data logger Clock:	2:00 PM MST
Laptop Clock:	2:01 PM MST
Dessicant:	NEW
Data logger:	0204100602
PT:	101353
Power:	Battery & Solar panel

Notes: Check S20 - file labeled wrong
S22 - August 6, 2008 should be S20 (TAKEN CARE OF)
cte 602



Hydrometric Measurement / Site Visit Record

S22 - Muskeg Creek near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg Creek
Location: Muskeg Creek near the Mouth
Site Name: S22
Coordinates & Legal: 6348856 N, 481036 E SE-36-95-9-W4

Time of Measurement

Date of Measurement: September 11, 2008
Start Time: 7:00 PM MDT
End Time: 7:20 PM MDT

Weather Conditions:

cloudy, 10 C
River Conditions: open

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: sm
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: 1 post 0.313
Water Level Reading: 3.241
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 0.062
Other: Nail in tree on RB 1.567

Setup No. 1

El: 306.476
El: 303.548
El:
El: 303.486
El: 305.222

Setup No. 2

El: 306.476
El: 303.545
El:
El: 303.483
El: 305.225

Average

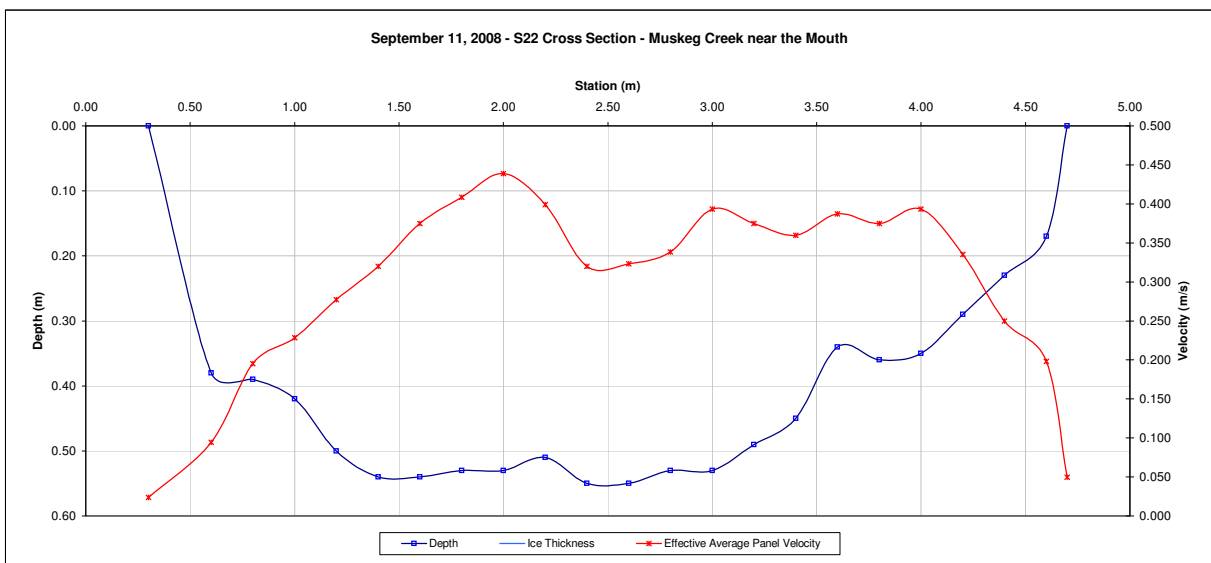
303.547
303.485
305.224

Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
LB	0.30	0.00				1.00	1	0.30	0.45	0.024	0.024	0.10	0.01	0.000	0.1%				
	0.60	0.38			0.094	1.00	2	0.45	0.70	0.094	0.094	0.38	0.10	0.009	1.5%				
	0.80	0.39			0.195	1.00	3	0.70	0.90	0.195	0.195	0.39	0.08	0.015	2.5%				
	1.00	0.42			0.229	1.00	4	0.90	1.10	0.229	0.229	0.42	0.08	0.019	3.1%				
	1.20	0.50			0.277	1.00	5	1.10	1.30	0.277	0.277	0.50	0.10	0.028	4.5%				
	1.40	0.54			0.320	1.00	6	1.30	1.50	0.320	0.320	0.54	0.11	0.035	5.7%				
	1.60	0.54			0.375	1.00	7	1.50	1.70	0.375	0.375	0.54	0.11	0.040	6.6%				
	1.80	0.53			0.408	1.00	8	1.70	1.90	0.408	0.408	0.53	0.11	0.043	7.1%				
	2.00	0.53			0.439	1.00	9	1.90	2.10	0.439	0.439	0.53	0.11	0.047	7.6%				
	2.20	0.51			0.399	1.00	10	2.10	2.30	0.399	0.399	0.51	0.10	0.041	6.7%				
	2.40	0.55			0.320	1.00	11	2.30	2.50	0.320	0.320	0.55	0.11	0.035	5.8%				
	2.60	0.55			0.323	1.00	12	2.50	2.70	0.323	0.323	0.55	0.11	0.036	5.8%				
	2.80	0.53			0.338	1.00	13	2.70	2.90	0.338	0.338	0.53	0.11	0.036	5.9%				
	3.00	0.53			0.393	1.00	14	2.90	3.10	0.393	0.393	0.53	0.11	0.042	6.8%				
	3.20	0.49			0.375	1.00	15	3.10	3.30	0.375	0.375	0.49	0.10	0.037	6.0%				
	3.40	0.45			0.360	1.00	16	3.30	3.50	0.360	0.360	0.45	0.09	0.032	5.3%				
	3.60	0.34			0.387	1.00	17	3.50	3.70	0.387	0.387	0.34	0.07	0.026	4.3%				
	3.80	0.36			0.375	1.00	18	3.70	3.90	0.375	0.375	0.36	0.07	0.027	4.4%				
	4.00	0.35			0.393	1.00	19	3.90	4.10	0.393	0.393	0.35	0.07	0.028	4.5%				
	4.20	0.29			0.335	1.00	20	4.10	4.30	0.335	0.335	0.29	0.06	0.019	3.2%				
	4.40	0.23			0.250	1.00	21	4.30	4.50	0.250	0.250	0.23	0.05	0.011	1.9%				
RB	4.60	0.17			0.198	1.00	22	4.50	4.65	0.198	0.198	0.17	0.03	0.005	0.8%				
	4.70	0.00				1.00	23	4.65	4.70	0.050	0.050	0.04	0.00	0.000	0.0%				
																Total		0.611	1.000

Total Flow:	0.611	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.86	(m ²)
Top Width:	4.40	(m)
Hydraulic Depth:	0.423	(m)
Mean Velocity:	0.328	(m/s)
Froude Number	0.161	
Photographs taken looking at:		

Data logger Notes:		
Data logger Internal Power:	4.6 V	
Data logger External Power:	12.98 V	
Data logger Memory Used:	10%	
Data logger Clock:	6:10 PM	MST
Laptop Clock:	6:27 PM	MST
Dessicant:	good	
Data logger:	100607	
PT:	101353	
Power:	Battery & Solar panel	

Notes: TD might have been flipped over on cinderblock



Hydrometric Measurement / Site Visit Record

S22 - Muskeg Creek near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg Creek
Location: Muskeg Creek near the Mouth
Site Name: S22
Coordinates & Legal: 6348856 N, 481036 E SE-36-95-9-W4

Time of Measurement

Date of Measurement: October 23, 2008
Start Time: 3:28 PM MDT
End Time: 3:41 PM MDT

Weather Conditions:

Partly cloudy
River Conditions: Higher than previous

Personnel & Equipment

Measurement Made By: SM/AM
Data Entry By: LS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: 1 post 0.365
Water Level Reading: 3.169
Top of Ice Level Reading:
Transducer Reading & Calc'd EL: 0.213
Other: Nail in tree on RB 1.614

Setup No. 1

El: 306.476
El: 303.672
El: 303.459
El: 305.227

Setup No. 2

El: 306.476
El: 303.672
El: 303.459
El: 305.228

Average 303.672

303.459

305.228

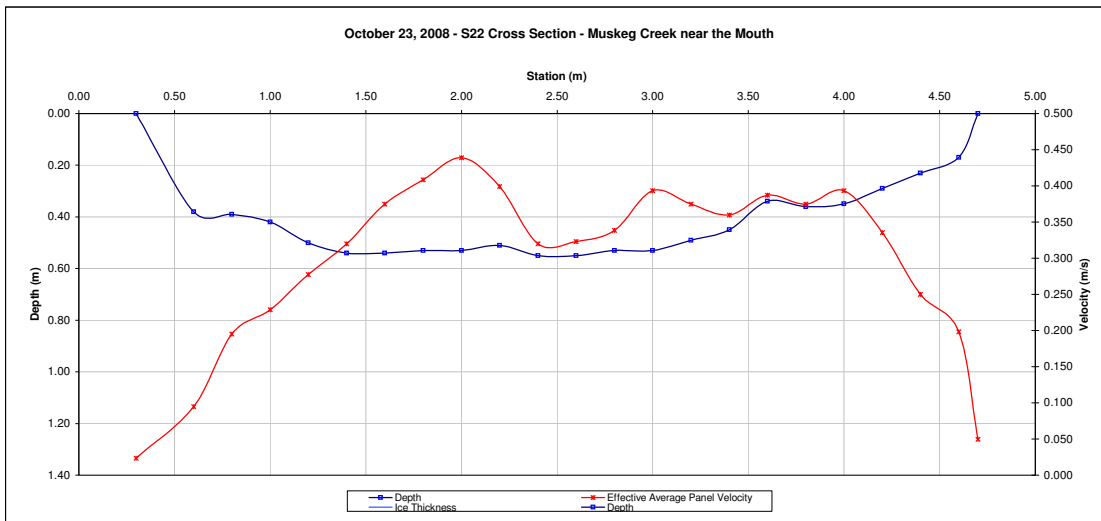
Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
8.90	0.00					1.00	1	8.90	9.20	0.174	0.174	0.05	0.01	0.002	0.2%	
9.50	0.18				0.698	1.00	2	9.20	9.60	0.698	0.698	0.18	0.07	0.050	3.8%	
9.70	0.25				0.844	1.00	3	9.60	9.80	0.844	0.844	0.25	0.05	0.042	3.2%	
9.90	0.26				0.613	1.00	4	9.80	10.00	0.613	0.613	0.26	0.05	0.032	2.4%	
10.10	0.30				0.960	1.00	5	10.00	10.20	0.960	0.960	0.30	0.06	0.058	4.4%	
10.30	0.33				1.125	1.00	6	10.20	10.40	1.125	1.125	0.33	0.07	0.074	5.6%	
10.50	0.38				1.042	1.00	7	10.40	10.60	1.042	1.042	0.38	0.08	0.079	6.0%	
10.70	0.40				1.177	1.00	8	10.60	10.80	1.177	1.177	0.40	0.08	0.094	7.1%	
10.90	0.38				1.146	1.00	9	10.80	11.00	1.146	1.146	0.38	0.08	0.087	6.6%	
11.10	0.55				0.686	1.00	10	11.00	11.15	0.686	0.686	0.55	0.08	0.057	4.3%	
11.20	0.50				0.323	1.00	11	11.15	11.30	0.323	0.323	0.50	0.08	0.024	1.8%	
11.40	0.55				0.503	1.00	12	11.30	11.50	0.503	0.503	0.55	0.11	0.055	4.2%	
11.60	0.47				0.713	1.00	13	11.50	11.65	0.713	0.713	0.47	0.07	0.050	3.8%	
11.70	0.49				0.878	1.00	14	11.65	11.75	0.878	0.878	0.49	0.05	0.043	3.3%	
11.80	0.52				0.863	1.00	15	11.75	11.85	0.863	0.863	0.52	0.05	0.045	3.4%	
11.90	0.53				0.890	1.00	16	11.85	11.95	0.890	0.890	0.53	0.05	0.047	3.6%	
12.00	0.55				0.796	1.00	17	11.95	12.05	0.796	0.796	0.55	0.06	0.044	3.3%	
12.10	0.53				0.585	1.00	18	12.05	12.20	0.585	0.585	0.53	0.08	0.047	3.5%	
12.30	0.56				0.768	1.00	19	12.20	12.40	0.768	0.768	0.56	0.11	0.086	6.5%	
12.50	0.51				0.728	1.00	20	12.40	12.60	0.728	0.728	0.51	0.10	0.074	5.6%	
12.70	0.50				0.466	1.00	21	12.60	12.80	0.466	0.466	0.50	0.10	0.047	3.5%	
12.90	0.45				0.347	1.00	22	12.80	13.00	0.347	0.347	0.45	0.09	0.031	2.4%	
13.10	0.40				0.445	1.00	23	13.00	13.25	0.445	0.445	0.40	0.10	0.045	3.4%	
13.40	0.33				0.390	1.00	24	13.25	13.65	0.390	0.390	0.33	0.13	0.051	3.9%	
13.90	0.30				0.259	1.00	25	13.65	14.20	0.259	0.259	0.30	0.17	0.043	3.2%	
14.50	0.30				0.055	1.00	26	14.20	14.75	0.055	0.055	0.30	0.17	0.009	0.7%	
15.00	0.20				0.003	1.00	27	14.75	15.15	0.003	0.003	0.20	0.08	0.000	0.0%	
15.30	0.00					1.00	28	15.15	15.30	0.001	0.001	0.05	0.01	0.000	0.0%	
Total														1.317	1.000	

Total Flow:	1.317	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.23	(m ²)
Top Width:	6.40	(m)
Hydraulic Depth:	0.348	(m)
Mean Velocity:	0.592	(m/s)
Froude Number	0.320	
Photographs taken looking at:		

Notes: Station removed , Clock Reset

Data logger Notes:	
Data logger Internal Power:	4.73 V
Data logger External Power:	13.7 V
Data logger Memory Used:	14%
Data logger Clock:	6:10 PM MST
Laptop Clock:	6:27 PM MST
Dessicant:	good
Data logger:	100607
PT:	101353
Power:	Battery & Solar panel



Hydrometric Measurement / Site Visit Record

Athabasca River - S24



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River
 Location: S24
 Site Name: Athabasca River
 Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

Time of Measurement

Date of Measurement: January 14, 2008
 Start Time: 9:15 AM MST
 End Time: 9:20 AM

Weather Conditions:

-3 sunny

River Conditions:

Ice

Personnel & Equipment

Measurement Made By: SM, JS
 Data Entry By: JMS
 Meter Type and No.: March Mc Birney Flo-Mate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: Nail in Tree 0.354
 Water Level Reading: 5.169
 Top of Ice Level Reading: 5.142
 Transducer Reading & Est. El.: 2.440
 Other: T-post 0.097

Setup No. 1

El: 231.096
 El: 226.281
 El: 226.308
 El: 223.841
 El: 231.353

Setup No. 2

0.433
 El: 231.096
 El: 226.261
 El: 226.309
 El: 223.821
 El: 231.357

Average

226.271
 223.831

Data logger Notes:		Database #278
Data logger Internal Power:	4.67 V	
Data logger External Power:	12.28 V	
Data logger Memory Used:	33%	
Data logger Clock:	9:15	MST
Laptop Clock:	9:20	MST
Dessicant:	10%	
Data logger:	104170278 Optimum DD128	
PT:	14528 Keller	
Power:	Battery and Solar Panel	

Notes: Data Downloaded

S24 - Athabasca River below Edymundson Creek



Measurement Location

River/Stream:	Athabasca River below Edmundson Creek
Location:	Athabasca River below Edmundson Creek
Site Name:	S24
Coordinates & Legal:	466313 E, 6372760 N NE-9-98-10-W4

Time of Measurement

Time of Measurement

Date of Measurement: January 16, 2008
Start Time: 10:15 AM MST
End Time: 2:02 PM MST

Weather Conditions:

+5° C, scattered cloud, light wind

River Conditions:

Open. Very low stage

Personnel & Equipment

Measurement Made By:

Measurement Made By: sm/jw
Data Entry By: sm Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Level Readings

Bench Mark Reading: nail in tree

Water Level Reading:

Top of Ice Level Reading:

Transducer Reading & Calc'd Fl.:

Other: T-post

Setup No. 1

El: 231.096

El: 231.096

El: 231.096

El: 231.096
El: 231.096

El: 231.096

Setup No. 2

El: 231.096

El: 231.096

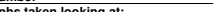
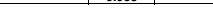
El: 231.096

El: 231.096
El: 231.096

El: 231.096
El: 231.096

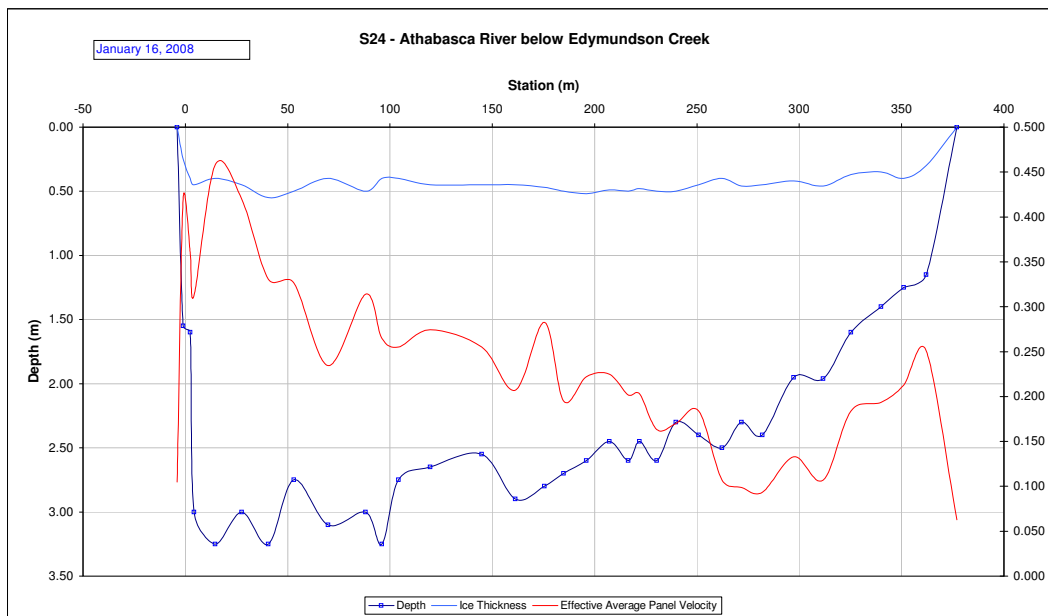
LB

Total Flow:	185.12	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	756.85	(m ²)
Top Width:	381.00	(m)
Hydraulic Depth:	1.986	(m)
Mean Velocity:	0.245	(m/s)
Froude Number	0.055	

Photographs taken looking at:



Notes:

Data logger Notes:	Database #278	
Data logger Internal Power:	4.74 V	
Data logger External Power:	14.25 V	
Data logger Memory Used:	20%	
Data logger Clock:	Oct 23, 2007 11:12	MST
Laptop Clock:	Oct 23, 2007 11:13	MST
Dessicant:	100% good	
Data logger:	Optimum DD-128 #104170278	
PT:	s/n 14528	
Power:	Battery and Solar Panel	



Hydrometric Measurement / Site Visit Record

S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River below Edmundson Creek
Location: Athabasca River below Edmundson Creek
Site Name: S24
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

Time of Measurement

Date of Measurement: February 18, 2008
Start Time: 12:45 PM MST
End Time: 2:20 PM MST

Weather Conditions:

River Conditions:

Partly cloudy, calm, -7 C
Ice Cover

Personnel & Equipment

Measurement Made By: SMS/JS
Data Entry By: SMS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Checked: SM
s/n 2004521

Level Readings

Bench Mark Reading: nail in tree
Water Level Reading:
Top of Ice Level Reading:
Transducer Reading & Calc'd El.:
Other: T-post

Setup No. 1

El: 231.096
El: 226.096
El: 226.082
El: 223.866
El: 231.370

Setup No. 2

El: 231.096
El: 226.097
El: 226.079
El: 223.867
El: 231.357

LB

Measured Data						Measurement Data		Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
0.00	0.00	0.00				1.0	1	0.0	3.8	-0.002	-0.002	0.315	1.2	-0.002	0%	
7.60	1.67	0.41	-0.015	0.003		1.0	2	3.8	10.7	-0.006	-0.006	1.260	8.6	-0.053	0%	
13.70	1.71	0.51	0.021	0.018		1.0	3	10.7	17.8	0.020	0.020	1.200	8.6	0.170	0%	
21.90	1.70	0.44	0.110	0.091		1.0	4	17.8	26.8	0.101	0.101	1.260	11.3	1.137	1%	
31.65	1.64	0.50	0.198	0.311		1.0	5	26.8	36.6	0.255	0.255	1.140	11.2	2.858	2%	
41.60	1.74	0.50	0.375	0.451		1.0	6	36.6	47.2	0.413	0.413	1.240	13.1	5.403	3%	
52.75	2.33	0.50	0.411	0.503		1.0	7	47.2	58.1	0.457	0.457	1.830	19.9	9.099	6%	
63.35	2.75	0.55	0.335	0.488		1.0	8	58.1	67.1	0.411	0.411	2.200	20.0	8.215	5%	
70.90	2.50	0.54	0.424	0.472		1.0	9	67.1	74.8	0.448	0.448	1.960	15.0	6.740	4%	
78.70	2.95	0.51	0.460	0.472		1.0	10	74.8	82.4	0.466	0.466	2.440	18.5	8.648	5%	
86.10	2.76	0.52	0.326	0.451		1.0	11	82.4	89.7	0.389	0.389	2.240	16.4	6.355	4%	
93.30	2.76	0.55	0.381	0.418		1.0	12	89.7	97.2	0.399	0.399	2.210	16.5	6.596	4%	
101.05	2.56	0.52	0.320	0.369		1.0	13	97.2	105.3	0.344	0.344	2.040	16.6	5.726	4%	
109.60	2.64	0.54	0.332	0.378		1.0	14	105.3	114.3	0.355	0.355	2.100	18.7	6.655	4%	
118.90	3.00	0.61	0.216	0.402		1.0	15	114.3	122.8	0.309	0.309	2.390	20.4	6.322	4%	
126.70	2.37	0.62	0.180	0.338		1.0	16	122.8	130.4	0.259	0.259	1.750	13.2	3.423	2%	
134.00	2.40	0.53	0.390	0.424		1.0	17	130.4	137.9	0.407	0.407	1.870	14.0	5.707	4%	
141.70	2.21	0.65	0.335	0.351		1.0	18	137.9	146.0	0.343	0.343	1.560	12.6	4.333	3%	
150.20	2.37	0.65	0.293	0.329		1.0	19	146.0	154.6	0.311	0.311	1.720	14.9	4.626	3%	
159.00	2.35	0.55	0.250	0.226		1.0	20	154.6	163.4	0.238	0.238	1.800	15.8	3.766	2%	
167.80	2.29	0.60	0.287	0.351		1.0	21	163.4	171.5	0.319	0.319	1.690	13.6	4.333	3%	
175.10	2.01	0.65	0.201	0.183		1.0	22	171.5	179.4	0.192	0.192	1.360	10.8	2.076	1%	
183.70	2.23	0.59	0.262	0.314		1.0	23	179.4	187.6	0.288	0.288	1.640	13.4	3.862	2%	
191.45	2.28	0.63	0.290	0.326		1.0	24	187.6	195.2	0.308	0.308	1.650	12.5	3.848	2%	
198.85	2.33	0.67	0.204	0.262		1.0	25	195.2	202.9	0.233	0.233	1.660	12.9	3.000	2%	
206.95	2.24	0.55	0.232	0.232		1.0	26	202.9	210.7	0.232	0.232	1.690	13.2	3.054	2%	
214.45	2.22	0.46	0.219	0.299		1.0	27	210.7	218.8	0.259	0.259	1.760	14.2	3.671	2%	
223.05	2.35	0.56	0.180	0.283		1.0	28	218.8	227.0	0.232	0.232	1.790	14.8	3.431	2%	
231.00	2.27	0.52	0.244	0.280		1.0	29	227.0	234.8	0.262	0.262	1.750	13.6	3.555	2%	
238.55	2.33	0.66	0.201	0.271		1.0	30	234.8	242.7	0.236	0.236	1.670	13.2	3.126	2%	
246.85	2.02	0.52	0.216	0.317		1.0	31	242.7	252.3	0.267	0.267	1.500	14.3	3.820	2%	
257.65	2.25	0.55	0.046	0.287		1.0	32	252.3	262.0	0.166	0.166	1.700	16.5	2.746	2%	
266.30	2.19	0.65	0.119	0.134		1.0	33	262.0	270.3	0.126	0.126	1.540	12.8	1.617	1%	
274.25	2.16	0.50	0.201	0.180		1.0	34	270.3	278.4	0.191	0.191	1.660	13.4	2.554	2%	
282.45	2.01	0.54	0.210	0.226		1.0	35	278.4	286.0	0.218	0.218	1.470	11.3	2.459	2%	
289.60	2.13	0.56	0.152	0.146		1.0	36	286.0	293.9	0.149	0.149	1.570	12.3	1.841	1%	
298.15	2.06	0.50	0.122	0.180		1.0	37	293.9	302.0	0.151	0.151	1.560	12.6	1.901	1%	
305.75	1.99	0.60	0.140	0.174		1.0	38	302.0	309.4	0.157	0.157	1.390	10.4	1.631	1%	
313.10	1.95	0.56	0.162	0.152		1.0	39	309.4	316.7	0.157	0.157	1.390	10.1	1.582	1%	
320.25	1.91	0.61	0.137	0.168		1.0	40	316.7	323.9	0.152	0.152	1.300	9.4	1.431	1%	
327.55	1.76	0.51	0.152	0.165		1.0	41	323.9	331.2	0.158	0.158	1.250	9.1	1.436	1%	
334.75	1.96	0.63	0.128	0.131		1.0	42	331.2	338.6	0.130	0.130	1.330	9.9	1.279	1%	
342.40	1.50	0.40	0.152	0.128		1.0	43	338.6	346.1	0.140	0.140	1.020	7.7	1.076	1%	
349.80	1.50	0.44	0.140	0.162		1.0	44	346.1	353.7	0.151	0.151	1.060	8.0	1.207	1%	
357.50	1.70	0.52	0.067	0.149		1.0	45	353.7	361.0	0.108	0.108	1.180	8.6	0.932	1%	
364.40	1.54	0.49	0.012	0.171		1.0	46	361.0	367.9	0.091	0.091	1.050	7.3	0.670	0%	
371.45	1.16	0.49			0.158	0.9	47	367.9	374.8	0.158	0.143	0.670	4.6	0.657	0%	
378.15	1.25	0.49			0.137	0.9	48	374.8	381.5	0.137	0.123	0.760	5.1	0.629	0%	
384.85	1.04	0.45			0.162	0.9	49	381.5	388.5	0.162	0.145	0.590	4.1	0.600	0%	
392.15	1.06	0.48			0.177	0.9	50	388.5	395.7	0.177	0.159	0.580	4.2	0.664	0%	
399.25	0.99	0.41			0.131	0.9	51	395.7	402.9	0.131	0.118	0.580	4.1	0.489	0%	
406.45	0.79	0.41			0.223	0.9	52	402.9	410.1	0.223	0.200	0.380	2.8	0.552	0%	
413.75	0.99	0.44			0.195	0.9	53	410.1	417.6	0.195	0.176	0.550	4.1	0.724	0%	
421.45	0.78	0.42			0.155	0.9	54	417.6	425.1	0.155	0.140	0.360	2.7	0.375	0%	
428.65	0.38	0.33			0.003	0.9	55	425.1	429.3	0.003	0.003	0.050	0.2	0.001	0%	
430.00	0.00	0.00				0.9	56	429.3	430	0.001	0.001	0.013	0.0	0.000	0%	
Total Flow														162.55	1.00	

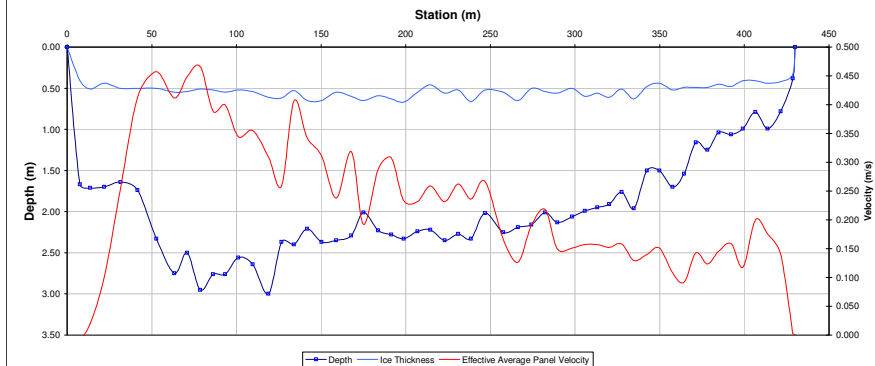
RB

Total Flow:	162.55	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	624.49	(m ²)
Top Width:	430.00	(m)
Hydraulic Depth:	1.452	(m)
Mean Velocity:	0.260	(m/s)
Froude Number	0.069	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:	Database # 278
Data logger Internal Power:	4.64 V
Data logger External Power:	12.63 V
Data logger Memory Used:	36%
Data logger Clock:	Feb 18, 2008 09:52 MST
Laptop Clock:	Feb 18, 2008 10:00 MST
Dessicant:	10% used
Data logger:	Optimum DD-128 #104170278
PT:	s/n 14528
Power:	Battery and Solar Panel

Notes:

S24 - Athabasca River below Edmundson Creek - Feb 18, 08



Hydrometric Measurement / Site Visit Record
S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River below Edmundson Creek
Location: Athabasca River below Edmundson Creek
Site Name: S24
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4
Time of Measurement: March 11, 2008
Date of Measurement: 10:45 AM MDT
Start Time: 11:50 AM MDT
End Time:
Weather Conditions: Overcast, -5 C
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: SMJS
Data Entry By: SMS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521
Checked: LMM
Level Readings:
Bench Mark Reading: 0.371
Water Level Reading: 5.339
Top of Ice Level Reading: 226.128
Transducer Reading & Calc'd El.: 2.263
Other: T-post 0.114

Setup No. 1		Setup No. 2		Average	
El:	231.096	0.347	El:	231.096	
El:	226.128	5.312	El:	226.131	226.130
El:	226.111	5.323	El:	226.120	
El:	223.865	2.263	El:	223.868	223.867
El:	231.353	0.089	El:	231.354	

Measured Data						Measurement Data										Calculated Data						Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge								
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)								
1.70	0.00	0.00				0.9	1	1.7	2.7	0.000	0.000	0.013	0.0	0.000	0%							
3.70	0.40	0.35			0.000	0.9	2	2.7	5.9	0.000	0.000	0.050	0.2	0.000	0%							
8.00	1.80	0.50	-0.021	-0.012		1.0	3	5.9	11.5	-0.017	-0.017	1.300	7.3	-0.123	0%							
15.00	1.75	0.62	0.012	0.015		1.0	4	11.5	18.8	0.014	0.014	1.130	8.2	0.113	0%							
22.60	1.65	0.55			0.018	0.9	5	18.8	26.3	0.018	0.018	1.100	8.3	0.136	0%							
30.00	1.50	0.55			0.101	0.9	6	26.3	33.8	0.101	0.091	0.950	7.1	0.641	0%							
37.50	1.12	0.62			0.134	0.9	7	33.8	41.2	0.134	0.121	0.500	3.7	0.450	0%							
44.90	1.55	0.46			0.235	0.9	8	41.2	48.8	0.235	0.211	1.090	8.3	1.750	1%							
52.70	2.55	0.55	0.241	0.250		1.0	9	48.8	56.6	0.245	0.245	2.000	15.6	3.828	3%							
60.50	2.50	0.50	0.296	0.265		1.0	10	56.6	64.3	0.280	0.280	2.000	15.3	4.290	3%							
68.00	2.75	0.51	0.338	0.332		1.0	11	64.3	72.1	0.335	0.335	2.240	17.5	5.858	4%							
76.10	2.45	0.50	0.357	0.357		1.0	12	72.1	80.3	0.357	0.357	1.860	16.0	5.702	4%							
84.40	3.05	0.58	0.344	0.223		1.0	13	80.3	88.5	0.283	0.283	2.470	20.3	5.741	4%							
92.50	3.10	0.55	0.351	0.320		1.0	14	88.5	96.5	0.335	0.335	2.550	20.4	6.840	5%							
100.40	3.25	0.64	0.354	0.287		1.0	15	96.5	104.3	0.320	0.320	2.610	20.4	6.515	4%							
108.10	2.70	0.58	0.320	0.308		1.0	16	104.3	112.0	0.314	0.314	2.120	16.4	5.158	3%							
115.90	2.72	0.54	0.323	0.235		1.0	17	112.0	119.7	0.279	0.279	2.180	16.7	4.651	3%							
123.40	2.86	0.65	0.299	0.283		1.0	18	119.7	126.9	0.291	0.291	2.210	16.0	4.664	3%							
130.40	2.83	0.61	0.332	0.165		1.0	19	126.9	134.1	0.248	0.248	2.220	15.9	3.943	3%							
137.70	2.85	0.61	0.329	0.204		1.0	20	134.1	141.2	0.267	0.267	2.240	15.9	4.242	3%							
144.60	2.60	0.60	0.238	0.244		1.0	21	141.2	147.6	0.241	0.241	2.000	12.8	3.082	2%							
150.50	2.84	0.75	0.305	0.235		1.0	22	147.6	154.4	0.270	0.270	2.090	14.2	3.834	3%							
158.20	2.45	0.61	0.323	0.277		1.0	23	154.4	161.4	0.300	0.300	1.840	13.0	3.895	3%							
164.60	2.62	0.67	0.268	0.207		1.0	24	161.4	168.6	0.238	0.238	1.950	14.0	3.338	2%							
172.60	2.15	0.56	0.293	0.277		1.0	25	168.6	176.2	0.285	0.285	1.590	12.1	3.444	2%							
179.80	2.35	0.64	0.305	0.223		1.0	26	176.2	183.6	0.264	0.264	1.710	12.7	3.336	2%							
187.40	2.58	0.56	0.290	0.186		1.0	27	183.6	191.0	0.238	0.238	2.020	14.9	3.554	2%							
194.60	2.18	0.62	0.363	0.268		1.0	28	191.0	199.0	0.315	0.315	1.560	12.5	3.937	3%							
203.40	2.20	0.68	0.308	0.283		1.0	29	199.0	207.1	0.296	0.296	1.520	12.2	3.618	2%							
210.70	2.20	0.54	0.296	0.250		1.0	30	207.1	214.8	0.273	0.273	1.660	12.9	3.510	2%							
218.90	2.34	0.54	0.274	0.274		1.0	31	214.8	222.8	0.274	0.274	1.800	14.4	3.950	3%							
226.70	2.30	0.61	0.308	0.256		1.0	32	222.8	230.1	0.282	0.282	1.690	12.3	3.478	2%							
233.50	2.23	0.64	0.271	0.280		1.0	33	230.1	237.2	0.276	0.276	1.590	11.2	3.092	2%							
240.80	2.34	0.59	0.238	0.219		1.0	34	237.2	244.0	0.229	0.229	1.750	11.9	2.720	2%							
247.10	2.20	0.60	0.180	0.192		1.0	35	244.0	249.8	0.186	0.186	1.600	9.3	1.725	1%							
252.40	2.34	0.61	0.274	0.262		1.0	36	249.8	256.5	0.268	0.268	1.730	11.7	3.132	2%							
260.60	2.33	0.64	0.320	0.189		1.0	37	256.5	263.8	0.255	0.255	1.690	12.3	3.118	2%							
266.90	2.26	0.55	0.302	0.262		1.0	38	263.8	270.7	0.282	0.282	1.710	11.9	3.351	2%							
274.50	2.41	0.63	0.280	0.223		1.0	39	270.7	278.0	0.251	0.251	1.780	13.0	3.267	2%							
281.50	2.24	0.64	0.280	0.235		1.0	40	278.0	284.9	0.258	0.258	1.600	11.0	2.843	2%							
288.30	2.22	0.65	0.271	0.232		1.0	41	284.9	291.7	0.251	0.251	1.570	10.6	2.665	2%							
295.00	2.23	0.61	0.238	0.165		1.0	42	291.7	298.9	0.201	0.201	1.620	11.7	2.363	2%							
302.80	2.34	0.64	0.241	0.213		1.0	43	298.9	306.0	0.227	0.227	1.700	12.1	2.741	2%							
309.20	2.28	0.83	0.235	0.152		1.0	44	306.0	312.9	0.194	0.194	1.450	9.9	1.922	1%							
316.50	2.30	0.81	0.128	0.171		1.0	45	312.9	320.0	0.149	0.149	1.490	10.7	1.591	1%							
323.50	2.13	0.88	0.158	0.122		1.0	46	320.0	327.1	0.140	0.140	1.450	10.3	1.443	1%							
330.70	2.20	0.68	0.131	0.128		1.0	47	327.1	334.6	0.130	0.130	1.520	11.3	1.467	1%							
338.40	2.12	0.78	0.125	0.128		1.0	48	334.6	342.1	0.126	0.126	1.340	10.1	1.271	1%							
345.70	1.83	0.72	0.094	0.107		1.0	49	342.1	349.8	0.101	0.101	1.110	8.6	0.865	1%							
353.90	1.74	0.63	0.079	0.091		1.0	50	349.8	358.2	0.085	0.085	1.110	9.3	0.791	1%							
362.40	1.68	0.76	0.085	0.079		1.0	51	358.2	366.2	0.082	0.082	0.920	7.4	0.609	0%							
370.00	1.82	0.65	0.049	0.049		1.0	52	366.2	374.2	0.049	0.049	1.170	9.3	0.452	0%							
378.30	1.68	0.68	0.030	0.030		1.0	53	374.2	382.5	0.030	0.030	1.000	8.4	0.255	0%							
386.70	1.29	0.66			0.085	0.9	54	382.5	390.9	0.085	0.077	0.630	5.3	0.406	0%							
395.10	1.24	0.67			0.052	0.9	55	390.9	399.6	0.052	0.047	0.570	5.0	0.231	0%							
404.10	1.20	0.67			0.018	0.9	56	399.6	409.5	0.018	0.016	0.530	5.2	0.086	0%							
414.80	1.18	0.66			0.006	0.9	57	409.5	420.1	0.006	0.005	0.520	5.5	0.030	0%							
425.30	1.10	0.67			0.088	0.9	58	420.1	430.9	0.088	0.080	0.430	4.7	0.371	0%							
436.50	1.00	0.69			0.216	0.9	59	430.9	441.2	0.216	0.208	0.340	3.9	0.882	0%							
445.90	0.75	0.63			0.128	0.9	60	441.2	447.0	0.128	0.115	0.120	0.7	0.079	0%							
448.00	0.00	0.00				0.9	61	447.0	448.0	0.032	0.029	0.030	0.0	0.001	0%							

Hydrometric Measurement / Site Visit Record

S24 - Athabasca River below Edmondson Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River below Edmondson Creek
Location: Athabasca River below Edmondson Creek
Site Name: S24
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

Time of Measurement

Date of Measurement: April 5, 2008
Start Time: 12:06 PM MDT
End Time: 1:00 PM MDT

Weather Conditions:

River Conditions: Sunny, -20 C, Light Wind
Ice Cover

Personnel & Equipment

Measurement Made By: SM/JJS
Data Entry By: sm
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 0.391
Water Level Reading: 5.200
Top of Ice Level Reading: 5.147
Transducer Reading & Calc'd EL: 2.453
Other: T post 0.133

SM/JJS
sm
Marsh McBirney FloMate 2000
s/n 2004521

Checked: SM

Setup No. 1

Et: 231.096
Et: 226.287
Et: 223.834
Et: 231.354

Setup No. 2

Et: 0.375
Et: 5.181
Et: 2.453
Et: 0.118

Average

Et: 231.096
Et: 226.290
Et: 223.837
Et: 231.353

LB

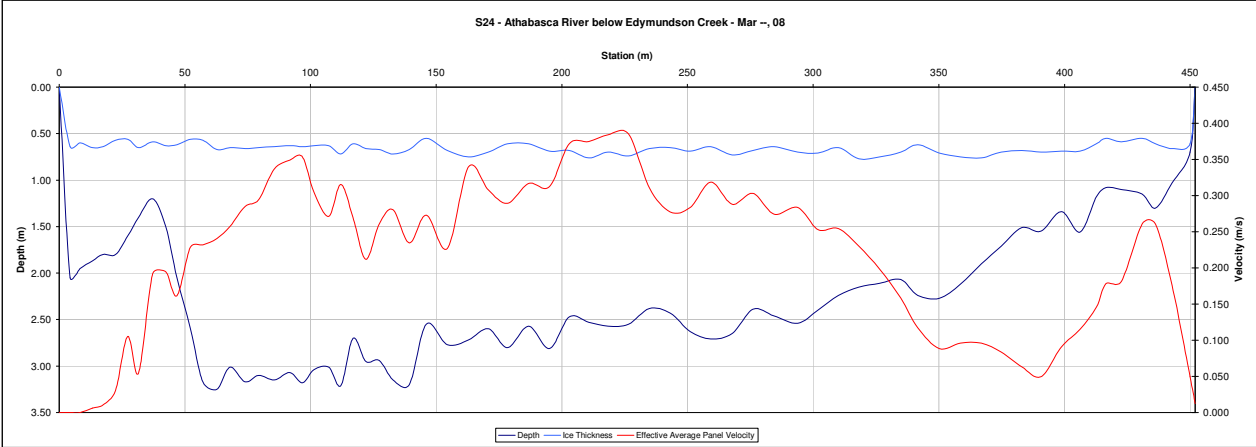
Measured Data							Calculated Data									Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m²)	Panel Discharge (m³/s)		
0.00	0.00	0.00			0	1.0	1	0.0	2.2	0.000	0.000	0.353	0.8	0.000	0%	
4.30	2.05	0.64	0.000	0.000		1.0	2	2.2	6.3	0.000	0.000	1.410	5.9	0.000	0%	
8.30	1.95	0.60	0.000	0.000		1.0	3	6.3	10.8	0.000	0.000	1.350	6.0	0.000	0%	
13.20	1.87	0.65	0.003	0.009		1.0	4	10.8	15.4	0.006	0.006	1.220	5.4	0.004	0%	
17.50	1.80	0.64	0.009	0.012		1.0	5	15.4	20.0	0.011	0.011	1.160	5.3	0.007	0%	
22.40	1.80	0.57	0.030	0.030		1.0	6	20.0	24.9	0.030	0.030	1.230	6.0	0.184	0%	
27.30	1.60	0.56	0.110	0.101		1.0	7	24.9	29.5	0.105	0.105	1.040	4.8	0.503	0%	
31.60	1.40	0.65			0.061	0.9	8	29.5	34.4	0.061	0.055	0.750	3.7	0.204	0%	
37.20	1.20	0.59			0.213	0.9	9	34.4	39.8	0.213	0.192	0.610	3.3	0.633	0%	
42.40	1.50	0.63			0.216	0.9	10	39.8	44.7	0.216	0.195	0.870	4.2	0.822	0%	
46.90	2.05	0.62	0.146	0.177		1.0	11	44.7	49.6	0.162	0.162	1.430	7.0	1.132	1%	
52.20	2.60	0.56	0.265	0.192		1.0	12	49.6	54.7	0.229	0.229	2.040	10.5	2.402	1%	
57.20	3.17	0.57	0.223	0.241		1.0	13	54.7	60.0	0.232	0.232	2.600	13.8	3.192	2%	
62.80	3.25	0.67	0.287	0.186		1.0	14	60.0	65.4	0.241	0.241	2.580	13.4	3.355	2%	
68.00	3.01	0.65	0.268	0.247		1.0	15	65.4	71.0	0.258	0.258	2.360	13.2	3.404	2%	
74.00	3.17	0.66	0.283	0.287		1.0	16	71.0	76.7	0.285	0.285	2.510	14.2	4.042	2%	
78.30	3.10	0.65	0.308	0.280		1.0	17	76.7	82.4	0.284	0.284	2.450	14.1	4.144	2%	
85.50	3.15	0.64	0.357	0.317		1.0	18	82.4	88.7	0.337	0.337	2.510	15.7	5.284	3%	
91.80	3.07	0.63	0.378	0.320		1.0	19	88.7	94.3	0.349	0.349	2.440	13.8	4.811	3%	
96.80	3.18	0.64	0.357	0.351		1.0	20	94.3	99.1	0.354	0.354	2.540	12.1	4.286	2%	
101.30	3.04	0.63	0.293	0.317		1.0	21	99.1	104.3	0.305	0.305	2.410	12.5	3.825	2%	
107.20	3.01	0.63	0.268	0.274		1.0	22	104.3	109.6	0.271	0.271	2.380	12.7	3.454	2%	
112.00	3.21	0.72	0.338	0.293		1.0	23	109.6	114.5	0.315	0.315	2.490	12.1	3.810	2%	
116.90	2.70	0.61	0.290	0.250		1.0	24	114.5	119.5	0.270	0.270	2.090	10.5	2.819	2%	
122.00	2.95	0.66	0.241	0.183		1.0	25	119.5	124.7	0.212	0.212	2.290	11.9	2.523	1%	
127.30	2.94	0.67	0.259	0.262		1.0	26	124.7	130.1	0.261	0.261	2.270	12.3	3.194	2%	
132.80	3.15	0.72	0.287	0.274		1.0	27	130.1	136.1	0.280	0.280	2.430	14.6	4.088	2%	
138.30	3.20	0.67	0.236	0.232		1.0	28	136.1	142.7	0.235	0.235	2.330	16.8	3.949	2%	
146.10	2.55	0.55	0.235	0.311		1.0	29	142.7	150.3	0.273	0.273	2.000	15.2	4.146	2%	
154.50	2.77	0.68	0.247	0.207		1.0	30	150.3	158.7	0.227	0.227	2.090	17.5	3.963	2%	
162.80	2.72	0.75	0.378	0.302		1.0	31	158.7	166.8	0.340	0.340	1.970	16.0	5.423	3%	
170.70	2.60	0.70	0.314	0.302		1.0	32	166.8	174.6	0.308	0.308	1.900	14.8	4.562	2%	
178.40	2.80	0.61	0.293	0.287		1.0	33	174.6	182.6	0.290	0.290	2.190	17.8	5.105	3%	
186.80	2.67	0.61	0.290	0.344		1.0	34	182.6	190.9	0.317	0.317	1.960	16.3	5.157	3%	
195.00	2.81	0.69	0.305	0.320		1.0	35	190.9	199.0	0.312	0.312	2.120	17.2	5.385	3%	
203.00	2.47	0.68	0.375	0.389		1.0	36	199.0	206.9	0.372	0.372	1.790	14.1	5.225	3%	
210.70	2.53	0.76	0.389	0.381		1.0	37	206.9	214.5	0.375	0.375	1.770	13.5	5.076	3%	
218.30	2.57	0.70	0.357	0.411		1.0	38	214.5	222.4	0.384	0.384	1.670	14.8	5.674	3%	
226.50	2.55	0.74	0.375	0.396		1.0	39	222.4	230.7	0.386	0.386	1.810	14.9	5.758	3%	
234.80	2.38	0.66	0.277	0.344		1.0	40	230.7	238.9	0.311	0.311	1.720	14.2	4.412	2%	
243.00	2.43	0.65	0.314	0.241		1.0	41	238.9	247.1	0.277	0.277	1.780	14.5	4.024	2%	
251.10	2.63	0.69	0.293	0.274		1.0	42	247.1	255.2	0.283	0.283	1.940	15.7	4.454	2%	
259.20	2.71	0.64	0.323	0.314		1.0	43	255.2	263.5	0.319	0.319	2.070	17.2	5.472	3%	
267.70	2.65	0.73	0.283	0.283		1.0	44	263.5	271.9	0.288	0.288	1.920	16.1	4.645	3%	
276.00	2.39	0.68	0.308	0.299		1.0	45	271.9	280.2	0.303	0.303	1.710	14.3	4.330	2%	
284.40	2.46	0.64	0.290	0.259		1.0	46	280.2	289.2	0.274	0.274	1.820	16.3	4.468	2%	
293.90	2.54	0.70	0.293	0.274		1.0	47	289.2	297.9	0.283	0.283	1.840	16.1	4.564	3%	
301.90	2.40	0.71	0.259	0.247		1.0	48	297.9	306.0	0.253	0.253	1.690	13.5	3.442	2%	
310.00	2.24	0.65	0.256	0.253		1.0	49	306.0	314.1	0.255	0.255	1.590	13.0	3.288	2%	
318.20	2.15	0.77	0.229	0.232		1.0	50	314.1	322.4	0.230	0.230	1.380	11.4	2.620	1%	
326.50	2.11	0.75	0.192	0.204		1.0	51	322.4	330.7	0.198	0.198	1.360	11.4	2.250	1%	
334.90	2.07	0.70	0.165	0.152		1.0	52	330.7	338.3	0.158	0.158	1.370	10.3	1.639	1%	
341.60	2.24	0.62	0.167	0.128		1.0	53	338.3	345.9	0.117	0.117	1.620	12.3	1.445	1%	
350.10	2.27	0.69	0.091	0.085		1.0	54	345.9	354.4	0.088	0.088	1.560	13.2	1.172	1%	
358.60	2.12	0.75	0.101	0.091		1.0	55	354.4	362.8	0.096	0.096	1.370	11.5	1.105	1%	
366.90	1.90	0.76	0.088	0.104		1.0	56	362.8	370.9	0.096	0.096	1.140	9.3	0.892	0%	
374.90	1.71	0.79	0.085	0.082		1.0	57	370.9	379.0	0.084	0.084	1.010	8.1	0.681	0%	
383.00	1.51	0.68			0.070	0.9	58	379.0	386.7	0.070	0.063	0.830	6.5	0.411	0%	
390.60	1.55	0.70			0.055	0.9	59	386.7	394.7	0.055	0.049	0.850	6.7	0.332	0%	
398.80	1.34	0.69	0.101	0.101		0.9	60	394.7	402.5	0.101	0.091	0.650	5.1	0.459	0%	
406.20	1.56	0.69	0.128	0.128		0.9	61	402.5	409.4	0.128	0.115	0.870	6.0	0.692	0%	
412.60	1.18	0.61	0.162	0.162		0.9	62	409.4	414.6	0.162	0.145	0.570	2.9	0.427	0%	
416.50	1.08	0.55			0.198	0.9	63	414.6	419.6	0.198	0.178	0.530	2.7	0.473	0%	
422.60	1.10	0.58	0.201	0.201		0.9	64	419.6	426.8	0.201	0.181	0.600	3.1	0.665	0%	
430.90	1.15	0.55			0.290	0.9	65	426.8	433.6	0.290	0.261	0.600	4.1	1.063	1%	
436.20	1.30	0.61			0.290	0.9	66	433.6	439.5	0.290	0.261	0.690	4.1	1.070	1%	
442.80	0.93	0.66			0.195	0.9	67	439.5	446.4	0.195	0.176	0.370	2.6	0.448	0%	
450.00	0.70	0.61			0.055	0.9	68	446.4	451.0	0.055	0.049	0.090	0.4	0.020	0%	
452.00	0.00	0.00			0	0.9	69	451.0	452.0	0.014	0.012	0.023	0.0	0.000	0%	
Total Flow														182.55	100%	

RB

Total Flow:	182.55	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	732.28	(m ²)
Top Width:	452.00	(m)
Hydraulic Depth:	1.620	(m)
Mean Velocity:	0.248	(m/s)
Froude Number	0.663	
Photographs taken looking at:		

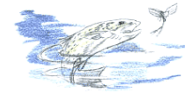
Data logger Notes:	Database # 278
Data logger Internal Power:	4.7 v
Data logger External Power:	14.72 v
Data logger Memory Used:	39%
Data logger Clock:	9:33 AM
Laptop Clock:	9:55 AM
Dessicant:	
Data logger:	Optimum DD-128 #104170278
PT:	s/n 14528
Power:	Battery and Solar Panel

Notes:



Hydrometric Measurement / Site Visit Record

S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River below Edmundson Creek
Location: Athabasca River below Edmundson Creek
Site Name: S24
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4
Time of Measurement: June 27, 2008
Date of Measurement: 10:30 AM MDT
End Time:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 0.504
Water Level Reading: 4.219
Top of Ice Level Reading: 3.729
Transducer Reading & Calc'd El.: 0.245
Other: T-post

Setup No. 1

El: 231.096
El: 227.381
El: 231.600
El: 223.652
El: 231.355

Setup No. 2

El: 231.096
El: 227.384
El: 231.587
El: 223.655
El: 231.352

Average

227.383
231.587
223.654
231.354

Weather Conditions:

Hot, 25 C

River Conditions:

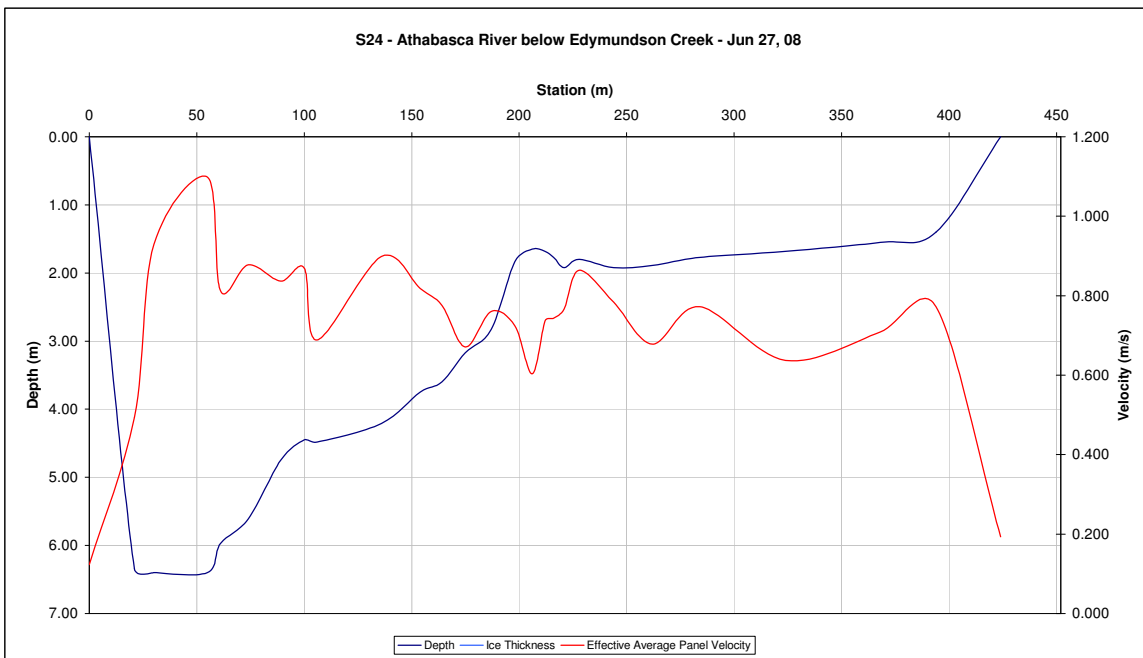
Measurement Data

LB	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
	0.00	0.00				0	1.0	1	0.0	10.5	0.123	0.123	1.585	16.6	2.054	0%
	21.00	6.34		0.585	0.402		1.0	2	10.5	25.5	0.494	0.494	6.340	95.1	46.958	5%
	30.00	6.40		1.113	0.747		1.0	3	25.5	42.5	0.930	0.930	6.400	108.8	101.145	10%
	55.00	6.40		1.405	0.792		1.0	4	42.5	58.0	1.099	1.099	6.400	99.2	109.001	11%
	61.00	5.97		0.991	0.634		1.0	5	58.0	67.5	0.812	0.812	5.970	56.7	46.069	5%
	74.00	5.61		1.103	0.652		1.0	6	67.5	81.5	0.878	0.878	5.610	78.5	68.944	7%
	89.00	4.75		1.116	0.558		1.0	7	81.5	94.5	0.837	0.837	4.750	61.8	51.665	5%
	100.00	4.45		0.991	0.747		1.0	8	94.5	103.0	0.869	0.869	4.450	37.8	32.858	3%
	106.00	4.48		0.866	0.512		1.0	9	103.0	121.0	0.689	0.689	4.480	80.6	55.549	6%
	136.00	4.21		0.911	0.887		1.0	10	121.0	145.0	0.899	0.899	4.210	101.0	90.851	9%
	154.00	3.75		0.985	0.652		1.0	11	145.0	159.0	0.818	0.818	3.750	52.5	42.965	4%
	164.00	3.60		0.869	0.683		1.0	12	159.0	169.5	0.776	0.776	3.600	37.8	29.322	3%
	175.00	3.17		0.747	0.594		1.0	13	169.5	181.0	0.671	0.671	3.170	36.5	24.445	2%
	187.00	2.83		0.869	0.652		1.0	14	181.0	192.5	0.760	0.760	2.830	32.5	24.750	2%
	198.00	1.83		0.863	0.585		1.0	15	192.5	202.0	0.724	0.724	1.830	17.4	12.585	1%
	206.00	1.65		0.814	0.393		1.0	16	202.0	209.0	0.604	0.604	1.650	11.6	6.970	1%
	212.00	1.68		0.802	0.671		1.0	17	209.0	214.0	0.736	0.736	1.680	8.4	6.183	1%
	216.00	1.77		0.954	0.533		1.0	18	214.0	218.5	0.744	0.744	1.770	8.0	5.924	1%
	221.00	1.92		0.963	0.570		1.0	19	218.5	224.5	0.767	0.767	1.920	11.5	8.831	1%
	228.00	1.80		0.954	0.774		1.0	20	224.5	236.0	0.864	0.864	1.800	20.7	17.887	2%
	244.00	1.92		0.814	0.753		1.0	21	236.0	253.0	0.783	0.783	1.920	32.6	25.568	3%
	262.00	1.89		0.744	0.613		1.0	22	253.0	273.0	0.678	0.678	1.890	37.8	25.635	3%
	284.00	1.77		0.777	0.768		1.0	23	273.0	304.0	0.773	0.773	1.770	54.9	42.396	4%
	324.00	1.68		0.707	0.567		1.0	24	304.0	346.0	0.637	0.637	1.680	70.6	44.949	5%
	368.00	1.55		0.750	0.668		1.0	25	346.0	381.0	0.709	0.709	1.550	54.3	38.445	4%
	394.00	1.40		0.856	0.689		1.0	26	381.0	409.0	0.773	0.773	1.400	39.2	30.289	3%
	424.00	0.00		0.000	0.000		1.0	27	409.0	424.0	0.193	0.193	0.350	5.3	1.014	0%
RB														Total Flow	993.25	100%

Total Flow:	993.25	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1267.64	(m ²)
Top Width:	424.00	(m)
Hydraulic Depth:	2.990	(m)
Mean Velocity:	0.784	(m/s)
Froude Number	0.145	
Photographs taken looking at:		
Photos taken		

Data logger Notes:		Database # 278
Data logger Internal Power:	4.78 v	
Data logger External Power:	13.84 v	
Data logger Memory Used:	46%	
Data logger Clock:	10:55 AM	
Laptop Clock:	11:07 AM	
Dessicant:		
Data logger:	Optimum DD-128 #104170278	
PT:	s/n 14528	
Power:	Battery and Solar Panel	

Notes:



Hydrometric Measurement / Site Visit Record

S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River below Edmundson Creek
Location: Athabasca River below Edmundson Creek
Site Name: S24
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4
Time of Measurement
Date of Measurement: August 10, 2008
Start Time: 10:30 AM MDT
End Time:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 0.400
Water Level Reading: 4.630
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 3.273
Other: T-post 0.139

Setup No. 1

El: 231.096
El: 226.866
El: 231.496
El: 223.593
El: 231.357

Setup No. 2

El: 0.392
El: 4.620
El:
El: 3.273
El: 0.130

Average

231.096
226.867
231.488
223.594
231.358

Weather Conditions:

Hot, 25 C

River Conditions:

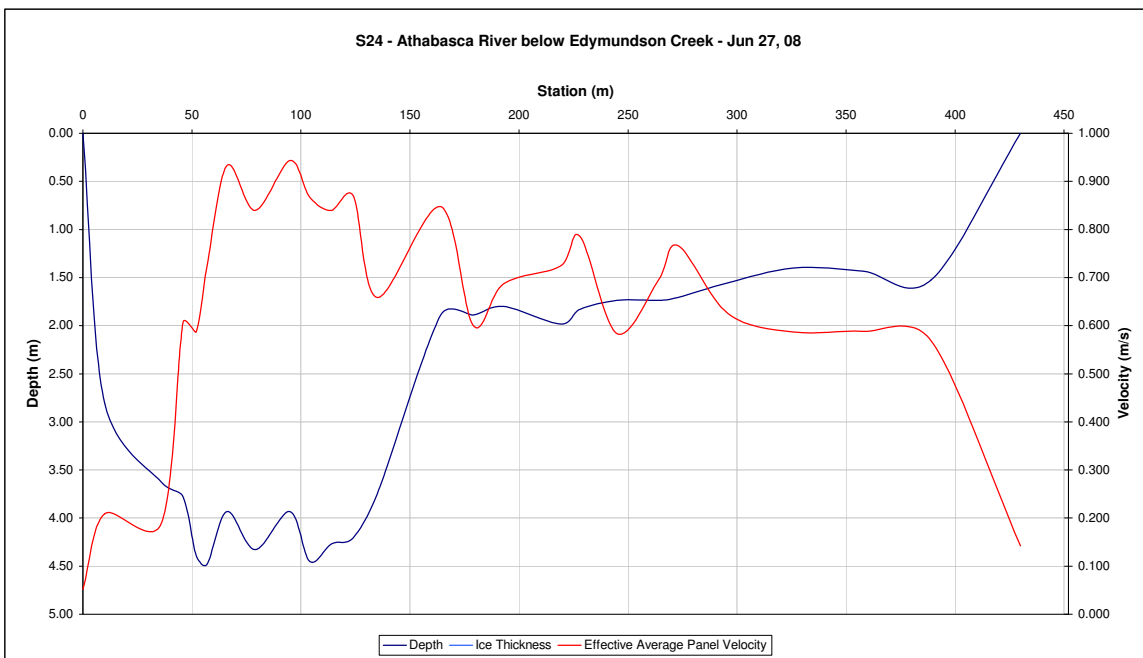
Measurement Data

	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
LB	0.00	0.00				0	1.0	1	0.0	5.0	0.052	0.052	0.701	3.5	0.183	0%
	10.00	2.80		0.283	0.134		1.0	2	5.0	23.0	0.209	0.209	2.804	50.5	10.539	2%
	36.00	3.63		0.067	0.311		1.0	3	23.0	41.0	0.189	0.189	3.627	65.3	12.338	2%
	46.00	3.78		0.747	0.466		1.0	4	41.0	49.0	0.607	0.607	3.780	30.2	18.340	3%
	52.00	4.39		0.652	0.521		1.0	5	49.0	54.5	0.587	0.587	4.389	24.1	14.164	2%
	57.00	4.48		0.796	0.652		1.0	6	54.5	61.5	0.724	0.724	4.481	31.4	22.704	3%
	66.00	3.93		1.015	0.850		1.0	7	61.5	72.5	0.933	0.933	3.932	43.3	40.340	6%
	79.00	4.33		1.015	0.664		1.0	8	72.5	87.0	0.840	0.840	4.328	62.8	52.700	8%
	95.00	3.93		0.988	0.899		1.0	9	87.0	99.5	0.943	0.943	3.932	49.1	46.365	7%
	104.00	4.45		0.948	0.786		1.0	10	99.5	109.0	0.867	0.867	4.450	42.3	36.660	6%
	114.00	4.27		0.939	0.741		1.0	11	109.0	119.0	0.840	0.840	4.267	42.7	35.833	5%
	124.00	4.21		0.902	0.838		1.0	12	119.0	129.5	0.870	0.870	4.206	44.2	38.433	6%
	135.00	3.75		0.826	0.491		1.0	13	129.5	149.5	0.658	0.658	3.749	75.0	49.365	7%
	164.00	1.89		0.887	0.808		1.0	14	149.5	171.5	0.847	0.847	1.890	41.6	35.228	5%
	179.00	1.89		0.805	0.396		1.0	15	171.5	186.0	0.600	0.600	1.890	27.4	16.453	2%
	193.00	1.80		0.805	0.570		1.0	16	186.0	206.0	0.687	0.687	1.798	36.0	24.721	4%
	219.00	1.98		0.887	0.561		1.0	17	206.0	223.5	0.724	0.724	1.981	34.7	25.098	4%
	228.00	1.83		0.841	0.728		1.0	18	223.5	236.5	0.785	0.785	1.829	23.8	18.660	3%
	245.00	1.74		0.613	0.555		1.0	19	236.5	254.5	0.584	0.584	1.737	31.3	18.253	3%
	264.00	1.74		0.728	0.661		1.0	20	254.5	268.5	0.695	0.695	1.737	24.3	16.903	3%
	273.00	1.71		0.832	0.701		1.0	21	268.5	284.5	0.767	0.767	1.707	27.3	20.935	3%
	296.00	1.55		0.664	0.585		1.0	22	284.5	311.0	0.625	0.625	1.554	41.2	25.739	4%
	326.00	1.40		0.680	0.494		1.0	23	311.0	342.0	0.587	0.587	1.402	43.5	25.502	4%
	358.00	1.43		0.677	0.500		1.0	24	342.0	373.5	0.588	0.588	1.433	45.1	26.546	4%
	389.00	1.52		0.692	0.445		1.0	25	373.5	409.5	0.568	0.568	1.524	54.9	31.188	5%
	RB	430.00	0.00		0.000	0.000		1.0	26	409.5	430.0	0.142	0.142	0.381	7.8	1.110
Total Flow														664.30	100%	

Total Flow:	664.30	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	1003.01	(m ²)
Top Width:	430.00	(m)
Hydraulic Depth:	2.333	(m)
Mean Velocity:	0.662	(m/s)
Froude Number	0.138	
Photographs taken looking at:		
Photos taken		

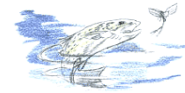
Data logger Notes:	Database # 278
Data logger Internal Power:	4.77 v
Data logger External Power:	13.57 v
Data logger Memory Used:	50%
Data logger Clock:	11:31 AM
Laptop Clock:	11:43 AM
Dessicant:	
Data logger:	Optimum DD-128 #104170278
PT:	s/n 14528
Power:	Battery and Solar Panel

Notes:



Hydrometric Measurement / Site Visit Record

S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River below Edmundson Creek
Location: Athabasca River below Edmundson Creek
Site Name: S24
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

Time of Measurement

Date of Measurement: September 13, 2008
Start Time: 12:30 PM MDT
End Time:

Weather Conditions:

calm cloudy

River Conditions:

Personnel & Equipment

Measurement Made By: sm ss
Data Entry By: sm Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 0.550
Water Level Reading: 5.260
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 2.816
Other: T-post 0.290

Setup No. 1

El: 231.096
El: 226.386
El: 231.646
El: 223.570
El: 231.356

Setup No. 2

0.532
5.238

2.816
0.274

Average

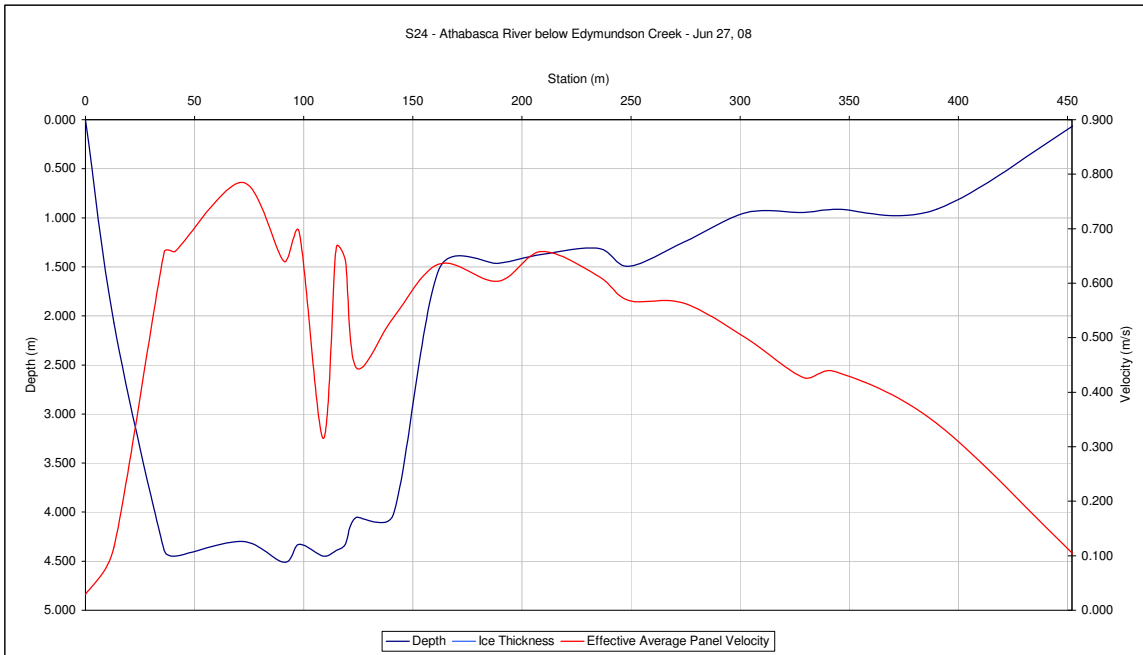
El: 231.096
El: 226.390
El: 231.628
El: 223.574
El: 231.354

Measurement Data																
Measured Data						Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	0.00	0.000				0	1.0	1	0.0	6.5	0.029	0.029	0.518	3.4	0.098	0%
	13.00	2.073		0.134	0.098		1.0	2	6.5	24.5	0.116	0.116	2.073	37.3	4.321	1%
	36.00	4.389		0.738	0.576		1.0	3	24.5	38.5	0.657	0.657	4.389	61.4	40.362	8%
	41.00	4.450		0.728	0.588		1.0	4	38.5	56.5	0.658	0.658	4.450	80.1	52.736	10%
	72.00	4.298		0.728	0.841		1.0	5	56.5	81.5	0.785	0.785	4.298	107.4	84.327	16%
	91.00	4.511		0.701	0.579		1.0	6	81.5	94.5	0.640	0.640	4.511	58.6	37.537	7%
	98.00	4.328		0.744	0.643		1.0	7	94.5	103.5	0.693	0.693	4.328	39.0	27.011	5%
	109.00	4.450		0.347	0.283		1.0	8	103.5	112.0	0.315	0.315	4.450	37.8	11.933	2%
	115.00	4.389		0.738	0.594		1.0	9	112.0	117.0	0.666	0.666	4.389	21.9	14.616	3%
	119.00	4.328		0.674	0.613		1.0	10	117.0	121.5	0.643	0.643	4.328	19.5	12.526	2%
	124.00	4.054		0.503	0.387		1.0	11	121.5	132.5	0.445	0.445	4.054	44.6	19.844	4%
	141.00	4.023		0.698	0.375		1.0	12	132.5	151.5	0.536	0.536	4.023	76.4	41.008	8%
	162.00	1.524		0.710	0.561		1.0	13	151.5	175.5	0.636	0.636	1.524	36.6	23.244	5%
	189.00	1.463		0.637	0.570		1.0	14	175.5	199.0	0.604	0.604	1.463	34.4	20.749	4%
	209.00	1.372		0.664	0.652		1.0	15	199.0	222.0	0.658	0.658	1.372	31.5	20.769	4%
	235.00	1.311		0.619	0.607		1.0	16	222.0	242.0	0.613	0.613	1.311	26.2	16.059	3%
	249.00	1.494		0.604	0.533		1.0	17	242.0	261.5	0.568	0.568	1.494	29.1	16.555	3%
	274.00	1.250		0.576	0.552		1.0	18	261.5	288.5	0.564	0.564	1.250	33.7	19.026	4%
	303.00	0.945		0.512	0.485		1.0	19	288.5	316.0	0.498	0.498	0.945	26.0	12.949	3%
	329.00	0.945		0.448	0.405		1.0	20	316.0	336.5	0.427	0.427	0.945	19.4	8.266	2%
344.00	0.914		0.588	0.287		1.0	21	336.5	367.0	0.437	0.437	0.914	27.9	12.198	2%	
390.00	0.914		0.369	0.317		1.0	22	367.0	423.5	0.343	0.343	0.914	51.7	17.715	3%	
RB	457.00	0		0.000	0.000		1.0	22	423.5	457.0	0.086	0.086	0.229	7.7	0.656	0%
														Total Flow	514.51	100%

Total Flow:	514.51	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	911.69	(m ²)
Top Width:	457.00	(m)
Hydraulic Depth:	1.995	(m)
Mean Velocity:	0.564	(m/s)
Froude Number	0.128	
Photographs taken looking at:		
Photos taken		

Data logger Notes:	Database # 278
Data logger Internal Power:	4.78 v
Data logger External Power:	13.84 v
Data logger Memory Used:	46%
Data logger Clock:	10:55 AM
Laptop Clock:	11:07 AM
Dessicant:	
Data logger:	Optimum DD-128 #104170278
PT:	s/n 14528
Power:	Battery and Solar Panel

Notes:



Hydrometric Measurement / Site Visit Record

S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River below Edmundson Creek
Location: Athabasca River below Edmundson Creek
Site Name: S24
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

Time of Measurement

Date of Measurement: October 14, 2008
Start Time: 11:30 AM MDT
End Time: 12:30 PM

Weather Conditions:

light rain showers

River Conditions:

Personnel & Equipment

Measurement Made By: sm jsl
Data Entry By: sm Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 0.439
Water Level Reading: 5.270
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 2.690
Other: T-post 0.178

Setup No. 1

El: 231.096
El: 226.265
El: 231.535
El: 223.575
El: 231.357

Setup No. 2

0.420
5.250
El: 231.096
El: 226.266
El: 231.516
El: 223.576
El: 231.357

Average

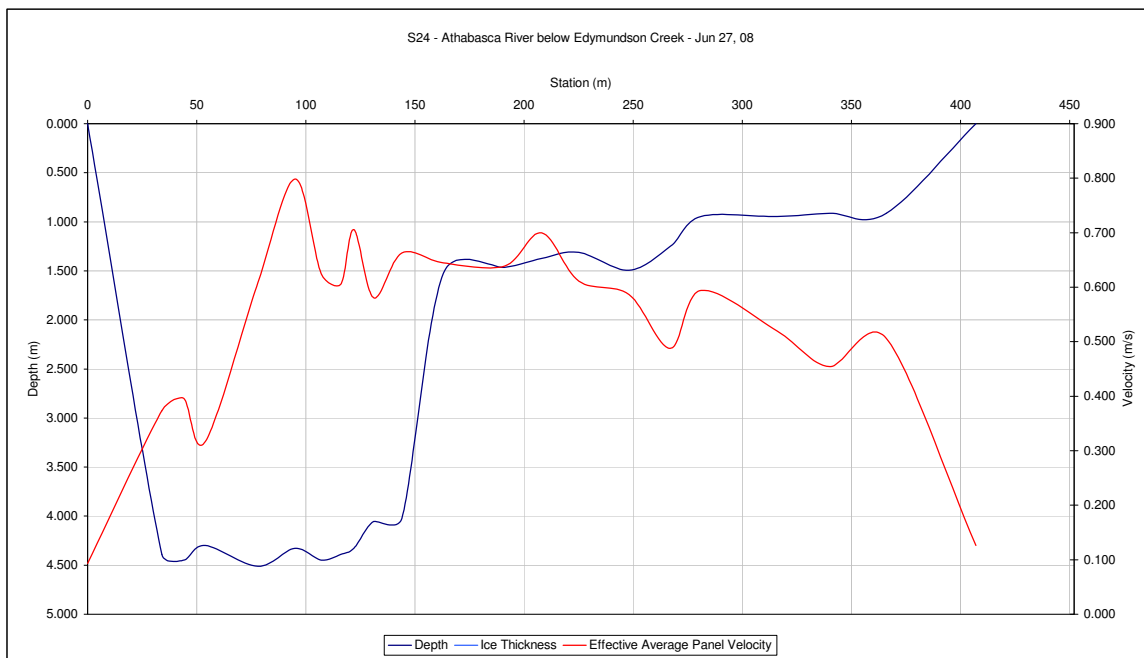
226.266
231.516
223.576
231.357

Measurement Data																
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	0.00	0.000			0	1.0	1	0.0	17.0	0.093	0.093	1.097	18.7	1.741	0%	
	34.00	4.389		0.439	0.308	1.0	2	17.0	39.0	0.373	0.373	4.389	96.6	36.054	7%	
	44.00	4.450		0.448	0.344	1.0	3	39.0	49.0	0.396	0.396	4.450	44.5	17.633	4%	
	54.00	4.298		0.393	0.241	1.0	4	49.0	66.0	0.317	0.317	4.298	73.1	23.160	5%	
	78.00	4.511		0.671	0.546	1.0	5	66.0	86.5	0.608	0.608	4.511	92.5	56.233	12%	
	95.00	4.328		0.774	0.823	1.0	6	86.5	101.0	0.799	0.799	4.328	62.8	50.117	10%	
	107.00	4.450		0.735	0.515	1.0	7	101.0	111.5	0.625	0.625	4.450	46.7	29.196	6%	
	116.00	4.389		0.680	0.530	1.0	8	111.5	119.0	0.605	0.605	4.389	32.9	19.917	4%	
	122.00	4.328		0.695	0.716	1.0	9	119.0	126.5	0.706	0.706	4.328	32.5	22.905	5%	
	131.00	4.054		0.707	0.454	1.0	10	126.5	137.5	0.581	0.581	4.054	44.6	25.892	5%	
	144.00	4.023		0.689	0.637	1.0	11	137.5	153.5	0.663	0.663	4.023	64.4	42.676	9%	
	163.00	1.524		0.613	0.677	1.0	12	153.5	177.0	0.645	0.645	1.524	35.8	23.088	5%	
	191.00	1.463		0.713	0.564	1.0	13	177.0	199.5	0.639	0.639	1.463	32.9	21.020	4%	
	208.00	1.372		0.802	0.597	1.0	14	199.5	216.5	0.700	0.700	1.372	23.3	16.311	3%	
	225.00	1.311		0.768	0.454	1.0	15	216.5	236.5	0.611	0.611	1.311	26.2	16.019	3%	
	248.00	1.494		0.597	0.576	1.0	16	236.5	257.5	0.587	0.587	1.494	31.4	18.402	4%	
	267.00	1.250		0.500	0.475	1.0	17	257.5	274.0	0.488	0.488	1.250	20.6	10.056	2%	
	281.00	0.945		0.573	0.616	1.0	18	274.0	312.3	0.594	0.594	0.945	36.2	21.528	4%	
	316.00	0.945		0.530	0.509	1.0	19	312.3	340.7	0.520	0.520	0.945	26.8	13.913	3%	
	340.00	0.914		0.543	0.366	1.0	20	340.7	371.0	0.454	0.454	0.914	27.7	12.597	3%	
366.00	0.914		0.549	0.463	1.0	21	371.0	386.5	0.506	0.506	0.914	14.2	7.171	1%		
407.00	0		0.000	0.000	1.0	21	386.5	407.0	0.126	0.126	0.229	4.7	0.593	0%		
RB																
													Total Flow	486.22	100%	

Total Flow:	486.22	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	888.92	(m ²)
Top Width:	407.00	(m)
Hydraulic Depth:	2.184	(m)
Mean Velocity:	0.547	(m/s)
Froude Number	0.118	
Photographs taken looking at:		
Photos taken		

Notes: installed new TD SN#14571
m=1.406178
b=0

Data logger Notes:	Database # 278
Data logger Internal Power:	4.72 v
Data logger External Power:	14.34 v
Data logger Memory Used:	2%
Data logger Clock:	11:41 AM
Laptop Clock:	11:53 AM
Dessicant:	
Data logger:	Optimum DD-128 #104170278
PT:	s/n 14528
Power:	Battery and Solar Panel



Hydrometric Measurement / Site Visit Record

S25 - Susan Lake Outlet



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Susan Lake Outlet
Location: Susan Lake Outlet
Site Name: S25
Coordinates & Legal:

Time of Measurement

Date of Measurement: June 27, 2008
Start Time: 1:20 PM MDT
End Time: 1:30 PM MDT

Weather Conditions:

sunny, 25 C

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: T post 0.764 El: 100.000 0.742 El: 100.000
Water Level Reading: 1.805 El: 98.959 1.793 El: 98.949 98.954
Top of Ice Level Reading: El: El: El:
Transducer Reading & Est. El.: 0.267 El: 98.692 0.267 El: 98.682 98.687
Other: NIT on RB 0.766 El: 99.998 0.745 El: 99.997

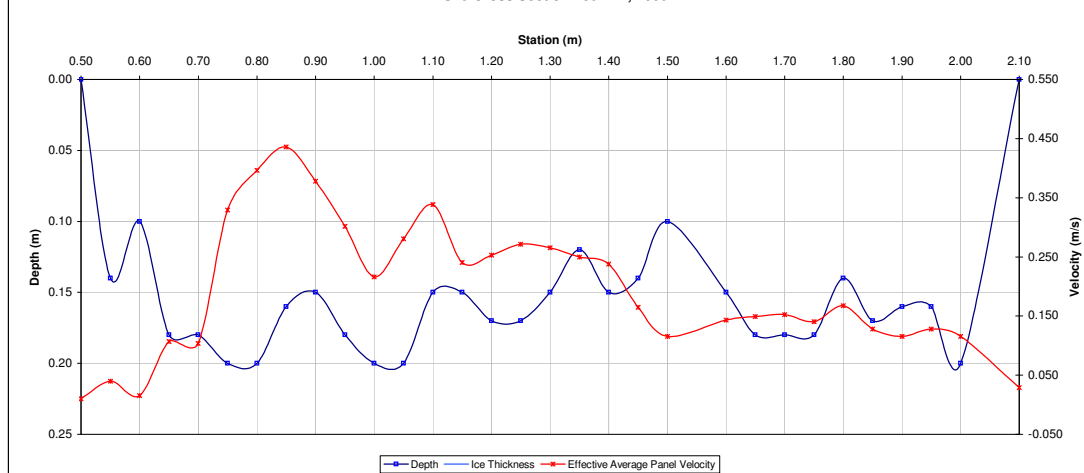
Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
0.50	0.00					1.00	1	0.50	0.53	0.010	0.010	0.04	0.00	0.000	0.0%				
0.55	0.14				0.040	1.00	2	0.53	0.58	0.040	0.040	0.14	0.01	0.000	0.5%				
0.60	0.10				0.015	1.00	3	0.58	0.63	0.015	0.015	0.10	0.01	0.000	0.1%				
0.65	0.18				0.107	1.00	4	0.63	0.68	0.107	0.107	0.18	0.01	0.001	1.9%				
0.70	0.18				0.104	1.00	5	0.68	0.73	0.104	0.104	0.18	0.01	0.001	1.8%				
0.75	0.20				0.329	1.00	6	0.73	0.78	0.329	0.329	0.20	0.01	0.003	6.4%				
0.80	0.20				0.396	1.00	7	0.78	0.83	0.396	0.396	0.20	0.01	0.004	7.7%				
0.85	0.16				0.436	1.00	8	0.83	0.88	0.436	0.436	0.16	0.01	0.003	6.8%				
0.90	0.15				0.378	1.00	9	0.88	0.93	0.378	0.378	0.15	0.01	0.003	5.5%				
0.95	0.18				0.302	1.00	10	0.93	0.98	0.302	0.302	0.18	0.01	0.003	5.3%				
1.00	0.20				0.216	1.00	11	0.98	1.03	0.216	0.216	0.20	0.01	0.002	4.2%				
1.05	0.20				0.280	1.00	12	1.03	1.08	0.280	0.280	0.20	0.01	0.003	5.5%				
1.10	0.15				0.338	1.00	13	1.08	1.13	0.338	0.338	0.15	0.01	0.003	5.0%				
1.15	0.15				0.241	1.00	14	1.13	1.18	0.241	0.241	0.15	0.01	0.002	3.5%				
1.20	0.17				0.253	1.00	15	1.18	1.23	0.253	0.253	0.17	0.01	0.002	4.2%				
1.25	0.17				0.271	1.00	16	1.23	1.28	0.271	0.271	0.17	0.01	0.002	4.5%				
1.30	0.15				0.265	1.00	17	1.28	1.33	0.265	0.265	0.15	0.01	0.002	3.9%				
1.35	0.12				0.250	1.00	18	1.33	1.38	0.250	0.250	0.12	0.01	0.001	2.9%				
1.40	0.15				0.238	1.00	19	1.38	1.43	0.238	0.238	0.15	0.01	0.002	3.5%				
1.45	0.14				0.165	1.00	20	1.43	1.48	0.165	0.165	0.14	0.01	0.001	2.2%				
1.50	0.10				0.116	1.00	21	1.48	1.55	0.116	0.116	0.10	0.01	0.001	1.7%				
1.60	0.15				0.143	1.00	22	1.55	1.63	0.143	0.143	0.15	0.01	0.002	3.1%				
1.65	0.18				0.149	1.00	23	1.63	1.68	0.149	0.149	0.18	0.01	0.001	2.6%				
1.70	0.18				0.152	1.00	24	1.68	1.73	0.152	0.152	0.18	0.01	0.001	2.7%				
1.75	0.18				0.140	1.00	25	1.73	1.78	0.140	0.140	0.18	0.01	0.001	2.5%				
1.80	0.14				0.168	1.00	26	1.78	1.83	0.168	0.168	0.14	0.01	0.001	2.3%				
1.85	0.17				0.128	1.00	27	1.83	1.88	0.128	0.128	0.17	0.01	0.001	2.1%				
1.90	0.16				0.116	1.00	28	1.88	1.93	0.116	0.116	0.16	0.01	0.001	1.8%				
1.95	0.16				0.128	1.00	29	1.93	1.98	0.128	0.128	0.16	0.01	0.001	2.0%				
2.00	0.20				0.116	1.00	30	1.98	2.05	0.116	0.116	0.20	0.01	0.002	3.4%				
2.10	0.00					1.00	31	2.05	2.10	0.029	0.029	0.05	0.00	0.000	0.1%				
Total Flow:															0.051	1.000			

Total Flow:	0.051	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.25	(m ²)
Top Width:	1.60	(m)
Hydraulic Depth:	0.156	(m)
Mean Velocity:	0.205	(m/s)
Froude Number	0.165	
Photographs taken looking at:		
Photos taken		

Notes: rock weir installed to ensure TD does not become perched
will cause WL to increase

Data logger Notes:
Data logger Internal Power: 1.99
Data logger External Power: 12.6
Data logger Memory Used: 0%
Data logger Clock: 12:37 PM MST
Laptop Clock: 12:37 PM MST
Dessicant: good
Data logger: 1303
PT: 39676
Power:

S25 Cross Section - Jun 27, 2008



Hydrometric Measurement / Site Visit Record

S25 - Susan Lake Outlet



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Susan Lake Outlet
Location: Susan Lake Outlet
Site Name: S25
Coordinates & Legal:

Time of Measurement

Date of Measurement: August 10, 2008
Start Time: 1:10 PM MDT
End Time: 1:40 PM MDT

Weather Conditions:

River Conditions: sunny 30 C

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: T post	0.814	El:	100.000	0.765	El:	100.000	
Water Level Reading:	1.867	El:	98.947	1.82	El:	98.945	98.946
Top of Ice Level Reading:		El:			El:		
Transducer Reading & Est. El.:	0.237	El:	98.710	0.237	El:	98.708	98.709
Other: NIT on RB	0.825	El:	99.989	0.775	El:	99.990	99.990

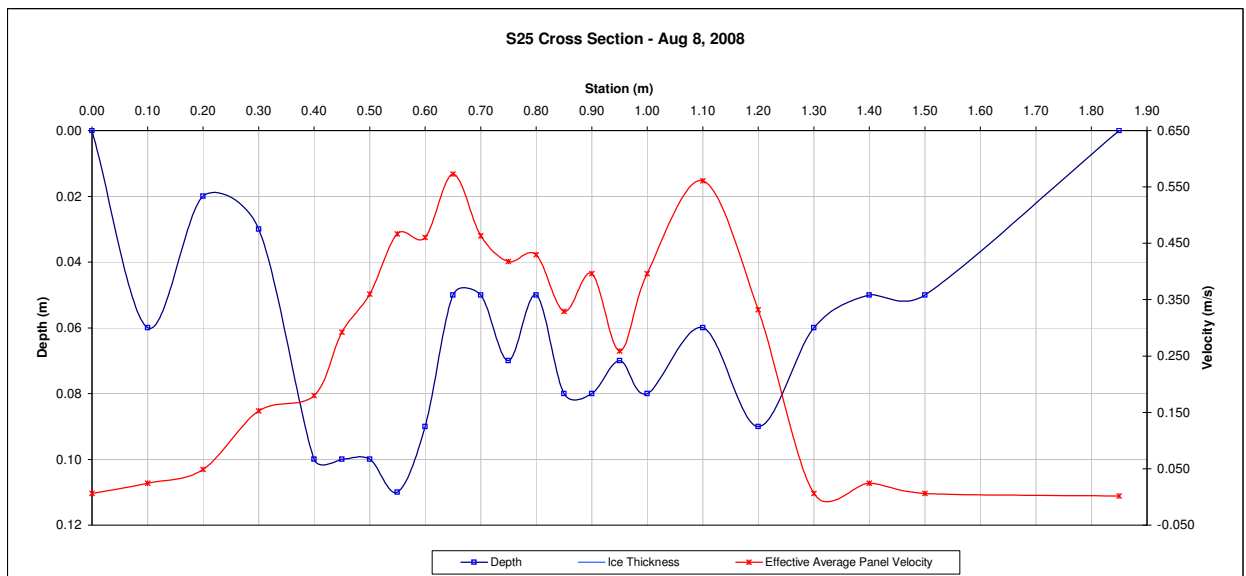
LB

RB

Measured Data						Measurement Data										Percenta ge of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.00	0.00					1.00	1	0.00	0.05	0.006	0.006	0.02	0.00	0.000	0.0%	
0.10	0.06				0.024	1.00	2	0.05	0.15	0.024	0.024	0.06	0.01	0.000	0.5%	
0.20	0.02				0.049	1.00	3	0.15	0.25	0.049	0.049	0.02	0.00	0.000	0.4%	
0.30	0.03				0.152	1.00	4	0.25	0.35	0.152	0.152	0.03	0.00	0.000	1.6%	
0.40	0.10				0.180	1.00	5	0.35	0.43	0.180	0.180	0.10	0.01	0.001	4.8%	
0.45	0.10				0.293	1.00	6	0.43	0.48	0.293	0.293	0.10	0.00	0.001	5.3%	
0.50	0.10				0.360	1.00	7	0.48	0.53	0.360	0.360	0.10	0.01	0.002	6.5%	
0.55	0.11				0.466	1.00	8	0.53	0.58	0.466	0.466	0.11	0.01	0.003	9.2%	
0.60	0.09				0.460	1.00	9	0.58	0.63	0.460	0.460	0.09	0.00	0.002	7.4%	
0.65	0.05				0.573	1.00	10	0.63	0.68	0.573	0.573	0.05	0.00	0.001	5.1%	
0.70	0.05				0.463	1.00	11	0.68	0.73	0.463	0.463	0.05	0.00	0.001	4.2%	
0.75	0.07				0.418	1.00	12	0.73	0.78	0.418	0.418	0.07	0.00	0.001	5.2%	
0.80	0.05				0.430	1.00	13	0.78	0.83	0.430	0.430	0.05	0.00	0.001	3.9%	
0.85	0.08				0.329	1.00	14	0.83	0.88	0.329	0.329	0.08	0.00	0.001	4.7%	
0.90	0.08				0.396	1.00	15	0.88	0.93	0.396	0.396	0.08	0.00	0.002	5.7%	
0.95	0.07				0.259	1.00	16	0.93	0.98	0.259	0.259	0.07	0.00	0.001	3.3%	
1.00	0.08				0.396	1.00	17	0.98	1.05	0.396	0.396	0.08	0.01	0.002	8.5%	
1.10	0.06				0.561	1.00	18	1.05	1.15	0.561	0.561	0.06	0.01	0.003	12.1%	
1.20	0.09				0.332	1.00	19	1.15	1.25	0.332	0.332	0.09	0.01	0.003	10.7%	
1.30	0.06				0.006	1.00	20	1.25	1.35	0.006	0.006	0.06	0.01	0.000	0.1%	
1.40	0.05				0.024	1.00	21	1.35	1.45	0.024	0.024	0.05	0.00	0.000	0.4%	
1.50	0.05				0.006	1.00	22	1.45	1.68	0.006	0.006	0.05	0.01	0.000	0.2%	
1.85	0.00					1.00	23	1.68	1.85	0.002	0.002	0.01	0.00	0.000	0.0%	
Total Flow:														0.028	1.000	

Total Flow:	0.028	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.11	(m ²)
Top Width:	1.85	(m)
Hydraulic Depth:	0.058	(m)
Mean Velocity:	0.260	(m/s)
Froude Number	0.345	
Photographs taken looking at:		
Photos taken		
Notes: see Jon's field book 1 for questions		

Data logger Notes:		
Data logger Internal Power:	12.5 V	
Data logger External Power:		
Data logger Memory Used:	1%	
Data logger Clock:	12:08 PM	MST
Laptop Clock:	12:10 PM	MST
Dessicant:	good	
Data logger:		
PT:	39676	
Power:		



Hydrometric Measurement / Site Visit Record

S25 - Susan Lake Outlet



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Susan Lake Outlet
Location: Susan Lake Outlet
Site Name: S25
Coordinates & Legal:

Time of Measurement

Date of Measurement: September 14, 2008
Start Time: 1:22 PM MDT
End Time: 1:30 PM MDT

Weather Conditions:

cloudy, calm 13 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: T post 1.169 El: 100.000 1.138 El: 100.000
Water Level Reading: 2.211 El: 98.958 2.178 El: 98.960 98.959
Top of Ice Level Reading: El: 98.708 0.250 El: 98.710 98.709
Transducer Reading & Est. El.: 0.250 El: 99.997 1.14 El: 99.998 99.998
Other: NIT on RB

Measurement Data

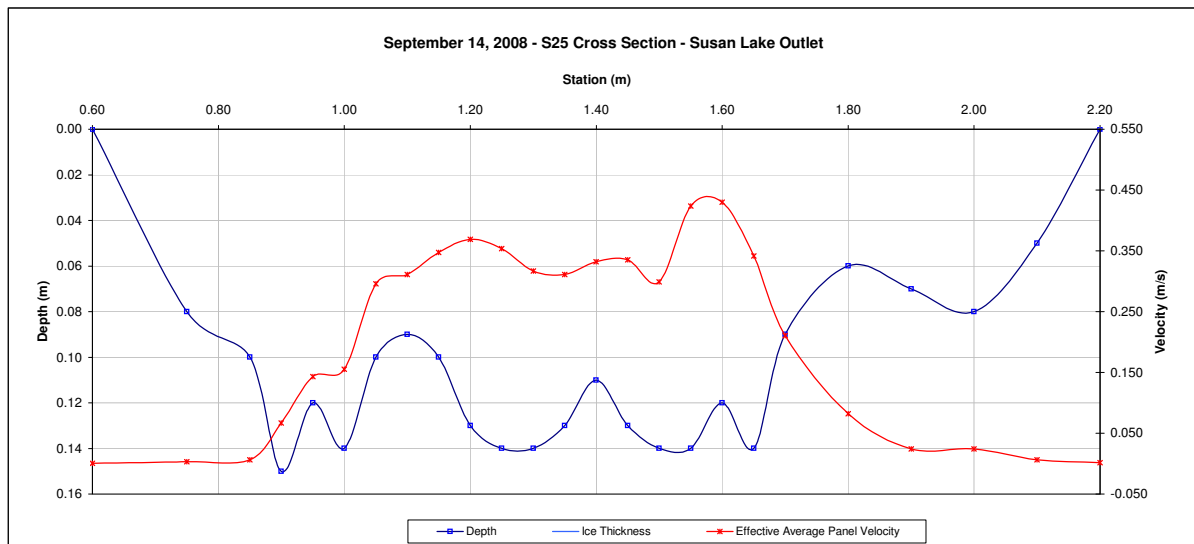
	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	0.60	0.00					1.00	1	0.60	0.68	0.001	0.001	0.02	0.00	0.000	0.0%
	0.75	0.08				0.003	1.00	2	0.68	0.80	0.003	0.003	0.08	0.01	0.000	0.1%
	0.85	0.10				0.006	1.00	3	0.80	0.88	0.006	0.006	0.10	0.01	0.000	0.1%
	0.90	0.15				0.067	1.00	4	0.88	0.93	0.067	0.067	0.15	0.01	0.001	1.5%
	0.95	0.12				0.143	1.00	5	0.93	0.98	0.143	0.143	0.12	0.01	0.001	2.6%
	1.00	0.14				0.155	1.00	6	0.98	1.03	0.155	0.155	0.14	0.01	0.001	3.3%
	1.05	0.10				0.296	1.00	7	1.03	1.08	0.296	0.296	0.10	0.01	0.001	4.5%
	1.10	0.09				0.311	1.00	8	1.08	1.13	0.311	0.311	0.09	0.00	0.001	4.3%
	1.15	0.10				0.347	1.00	9	1.13	1.18	0.347	0.347	0.10	0.00	0.002	5.3%
	1.20	0.13				0.369	1.00	10	1.18	1.23	0.369	0.369	0.13	0.01	0.002	7.4%
	1.25	0.14				0.354	1.00	11	1.23	1.28	0.354	0.354	0.14	0.01	0.002	7.6%
	1.30	0.14				0.317	1.00	12	1.28	1.33	0.317	0.317	0.14	0.01	0.002	6.8%
	1.35	0.13				0.311	1.00	13	1.33	1.38	0.311	0.311	0.13	0.01	0.002	6.2%
	1.40	0.11				0.332	1.00	14	1.38	1.43	0.332	0.332	0.11	0.01	0.002	5.6%
	1.45	0.13				0.335	1.00	15	1.43	1.48	0.335	0.335	0.13	0.01	0.002	6.7%
	1.50	0.14				0.299	1.00	16	1.48	1.53	0.299	0.299	0.14	0.01	0.002	6.4%
	1.55	0.14				0.424	1.00	17	1.53	1.58	0.424	0.424	0.14	0.01	0.003	9.1%
	1.60	0.12				0.430	1.00	18	1.58	1.63	0.430	0.430	0.12	0.01	0.003	7.9%
	1.65	0.14				0.341	1.00	19	1.63	1.68	0.341	0.341	0.14	0.01	0.002	7.3%
	1.70	0.09				0.210	1.00	20	1.68	1.75	0.210	0.210	0.09	0.01	0.001	4.4%
	1.80	0.06				0.082	1.00	21	1.75	1.85	0.082	0.082	0.06	0.01	0.000	1.5%
	1.90	0.07				0.024	1.00	22	1.85	1.95	0.024	0.024	0.07	0.01	0.000	0.5%
	2.00	0.08				0.024	1.00	23	1.95	2.05	0.024	0.024	0.08	0.01	0.000	0.6%
	2.10	0.05				0.006	1.00	24	2.05	2.15	0.006	0.006	0.05	0.01	0.000	0.1%
	RB	2.20	0.00				1.00		25	2.15	2.20	0.002	0.002	0.01	0.00	0.000
Total Flow:															0.033	1.000

Total Flow:	0.033	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.15	(m ²)
Top Width:	1.60	(m)
Hydraulic Depth:	0.096	(m)
Mean Velocity:	0.213	(m/s)
Froude Number	0.219	
Photographs taken looking at:		
Photos taken		

Data logger Notes:
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

MST
MST

Notes:



Hydrometric Measurement / Site Visit Record

S25 - Susan Lake Outlet



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Susan Lake Outlet
Location: Susan Lake Outlet
Site Name: S25
Coordinates & Legal:

Time of Measurement

Date of Measurement: October 14, 2008
Start Time: 2:22 PM MDT
End Time: 2:35 PM MDT

Weather Conditions:

partly cloudy, 6 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: T post 0.734 El: 100.000 0.710 El: 100.000
Water Level Reading: 1.750 El: 98.984 1.731 El: 98.979 98.982
Top of Ice Level Reading: El: 98.710 0.275 El: 98.705 98.707
Transducer Reading & Est. El.: 0.275 El: 99.995 0.714 El: 99.996 99.996
Other: NIT on RB

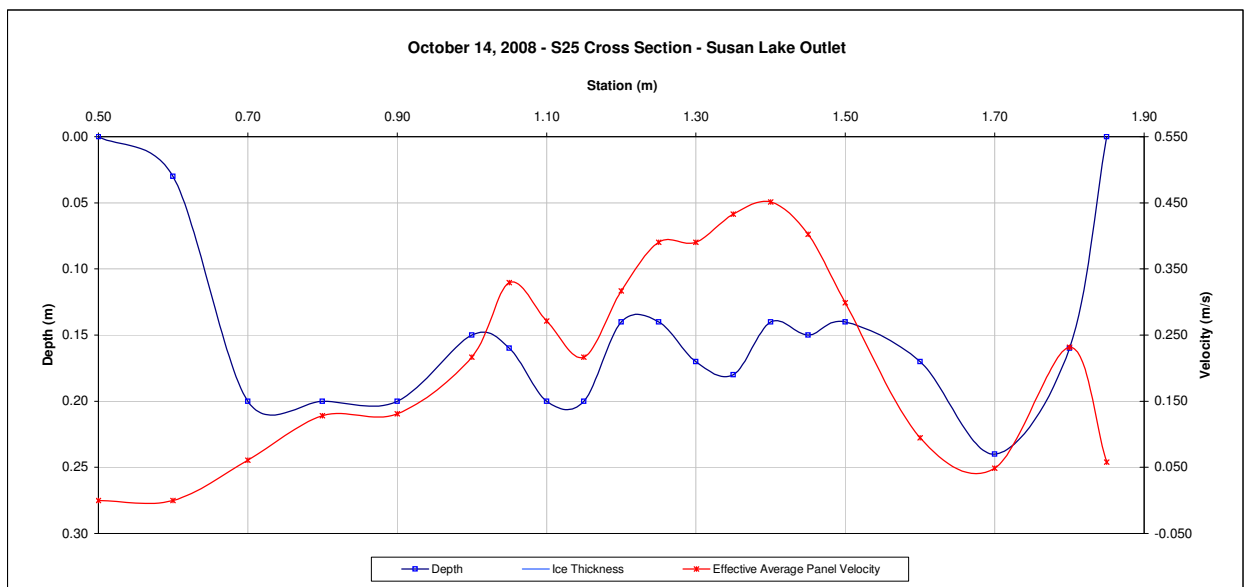
Measured Data						Measurement Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
LB 0.50	0.00					1.00	1	0.50	0.55	0.000	0.000	0.01	0.00	0.000	0.0%
0.60	0.03				0.000	1.00	2	0.55	0.65	0.000	0.000	0.03	0.00	0.000	0.0%
0.70	0.20				0.061	1.00	3	0.65	0.75	0.061	0.061	0.20	0.02	0.001	2.8%
0.80	0.20				0.128	1.00	4	0.75	0.85	0.128	0.128	0.20	0.02	0.003	5.9%
0.90	0.20				0.131	1.00	5	0.85	0.95	0.131	0.131	0.20	0.02	0.003	6.0%
1.00	0.15				0.216	1.00	6	0.95	1.03	0.216	0.216	0.15	0.01	0.002	5.6%
1.05	0.16				0.329	1.00	7	1.03	1.08	0.329	0.329	0.16	0.01	0.003	6.1%
1.10	0.20				0.271	1.00	8	1.08	1.13	0.271	0.271	0.20	0.01	0.003	6.2%
1.15	0.20				0.216	1.00	9	1.13	1.18	0.216	0.216	0.20	0.01	0.002	5.0%
1.20	0.14				0.317	1.00	10	1.18	1.23	0.317	0.317	0.14	0.01	0.002	5.1%
1.25	0.14				0.390	1.00	11	1.23	1.28	0.390	0.390	0.14	0.01	0.003	6.3%
1.30	0.17				0.390	1.00	12	1.28	1.33	0.390	0.390	0.17	0.01	0.003	7.6%
1.35	0.18				0.433	1.00	13	1.33	1.38	0.433	0.433	0.18	0.01	0.004	9.0%
1.40	0.14				0.451	1.00	14	1.38	1.43	0.451	0.451	0.14	0.01	0.003	7.3%
1.45	0.15				0.402	1.00	15	1.43	1.48	0.402	0.402	0.15	0.01	0.003	6.9%
1.50	0.14				0.299	1.00	16	1.48	1.55	0.299	0.299	0.14	0.01	0.003	7.2%
1.60	0.17				0.094	1.00	17	1.55	1.65	0.094	0.094	0.17	0.02	0.002	3.7%
1.70	0.24				0.049	1.00	18	1.65	1.75	0.049	0.049	0.24	0.02	0.001	2.7%
1.80	0.16				0.232	1.00	19	1.75	1.83	0.232	0.232	0.16	0.01	0.003	6.4%
RB 1.85	0.00					1.00	20	1.83	1.85	0.058	0.058	0.04	0.00	0.000	0.1%
Total Flow:														0.043	1.000

Total Flow:	0.043	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.21	(m ²)
Top Width:	1.35	(m)
Hydraulic Depth:	0.158	(m)
Mean Velocity:	0.204	(m/s)
Froude Number	0.164	
Photographs taken looking at:	Photos taken	

Data logger Notes:

Data logger Internal Power: 2.33 V
Data logger External Power: 12.25 V
Data logger Memory Used: 2%
Data logger Clock: 1:08 PM MST
Laptop Clock: 1:15 PM MST
Dessicant: good
Data logger: 1303
PT: 39676
Power:

Notes: Station removed for winter



Hydrometric Measurement / Site Visit Record

S26 - Mackay River WSC



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mackay River
Location: S26
Site Name: Mackay River WSC
Coordinates & Legal: 458031 E, 6341078 N SE-3-95-11-W4

Time of Measurement

Date of Measurement: January 15, 2008
Start Time: 9:14 AM MST
End Time: MST

Weather Conditions:

-15 C, Overcast
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: JMS, JS, SM
Data Entry By: JMS checked sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Paint on Rock 0.781
Water Level Reading: 3.439
Top of Ice Level Reading: 3.447
Transducer Reading & Est. El.:
Other:

Setup No. 1

El: 100.000
El: 97.342
El: 97.334
El: 97.342
El:

Setup No. 2

El: 100.000
El: 97.340
El: 97.357
El: 97.340
El:

Average

97.341
97.357
97.341

Measurement Data

LB	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
	1.90	0.00	0.00			0.000	0.90	1	1.90	2.90	0.032	0.029	0.02	0.02	0.001	0%
	3.90	0.47	0.38			0.128	0.90	2	2.90	4.18	0.128	0.115	0.09	0.11	0.013	2%
	4.45	0.52	0.30			0.131	0.90	3	4.18	4.78	0.131	0.118	0.22	0.13	0.016	2%
	5.10	0.46	0.25			0.201	0.90	4	4.78	5.38	0.201	0.181	0.21	0.13	0.023	3%
	5.65	0.53	0.20			0.259	0.90	5	5.38	5.95	0.259	0.233	0.33	0.19	0.044	6%
	6.25	0.60	0.25			0.280	0.90	6	5.95	6.60	0.280	0.252	0.35	0.23	0.057	8%
	6.95	0.73	0.28			0.338	0.90	7	6.60	7.40	0.338	0.304	0.45	0.36	0.110	14%
	7.85	0.66	0.28			0.378	0.90	8	7.40	8.08	0.378	0.340	0.38	0.26	0.087	11%
	8.30	0.75	0.29			0.296	0.90	9	8.08	8.70	0.296	0.266	0.46	0.29	0.077	10%
	9.10	0.73	0.30			0.213	0.90	10	8.70	9.43	0.213	0.192	0.43	0.31	0.060	8%
	9.75	0.69	0.30			0.189	0.90	11	9.43	10.10	0.189	0.170	0.39	0.26	0.045	6%
	10.45	0.65	0.28			0.192	0.90	12	10.10	10.85	0.192	0.173	0.37	0.28	0.048	6%
	11.25	0.65	0.30			0.226	0.90	13	10.85	11.58	0.226	0.203	0.35	0.25	0.052	7%
	11.90	0.60	0.30			0.174	0.90	14	11.58	12.28	0.174	0.156	0.30	0.21	0.033	4%
	12.65	0.55	0.30			0.219	0.90	15	12.28	13.00	0.219	0.198	0.25	0.18	0.036	5%
	13.35	0.50	0.30			0.216	0.90	16	13.00	13.63	0.216	0.195	0.20	0.13	0.024	3%
	13.90	0.49	0.34			0.165	0.90	17	13.63	14.28	0.165	0.148	0.15	0.10	0.014	2%
	14.65	0.45	0.32			0.085	0.90	18	14.28	14.93	0.085	0.077	0.13	0.08	0.006	1%
	15.20	0.43	0.30			0.125	0.90	19	14.93	15.53	0.125	0.112	0.13	0.08	0.009	1%
	15.85	0.40	0.29			0.070	0.90	20	15.53	16.13	0.070	0.063	0.11	0.07	0.004	1%
	16.40	0.40	0.27			0.024	0.90	21	16.13	16.70	0.024	0.022	0.13	0.07	0.002	0%
	17.00	0.00	0.00			0.000	0.90	22	16.70	17.00	0.006	0.005	0.03	0.01	0.000	0%
RB																
	Total Flow:														0.760	1.000

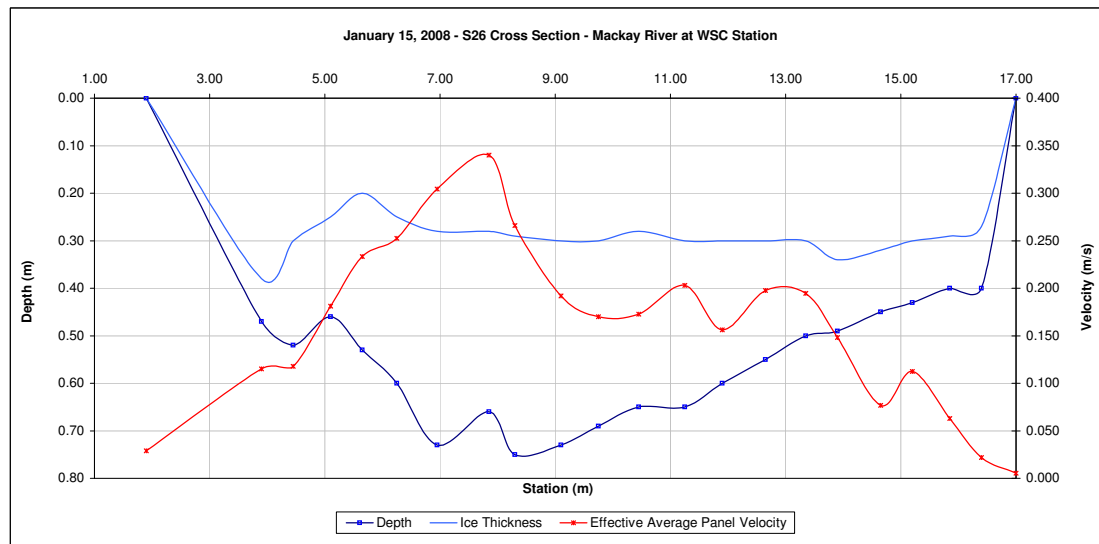
Total Flow:	0.760	(m ³ /s)
Perceived Measurement Quality:	good	
Total Area:	3.75	(m ²)
Top Width:	15.10	(m)
Hydraulic Depth:	0.248	(m)
Mean Velocity:	0.203	(m/s)
Froude Number	0.130	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:

-20 C, overcast. Complete ice cover. 2 layers of ice with slush flow between. Some seepage evident.



Hydrometric Measurement / Site Visit Record

S26 - Mackay River WSC



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mackay River
Location: S26
Site Name: Mackay River WSC
Coordinates & Legal: 458031 E, 6341078 N SE-3-95-11-W4

Time of Measurement

Date of Measurement: February 18, 2008
Start Time: 4:45 PM MST
End Time: 5:02 PM MST

Weather Conditions:

-7 C, Overcast
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: js sms
Data Entry By: sm checked sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

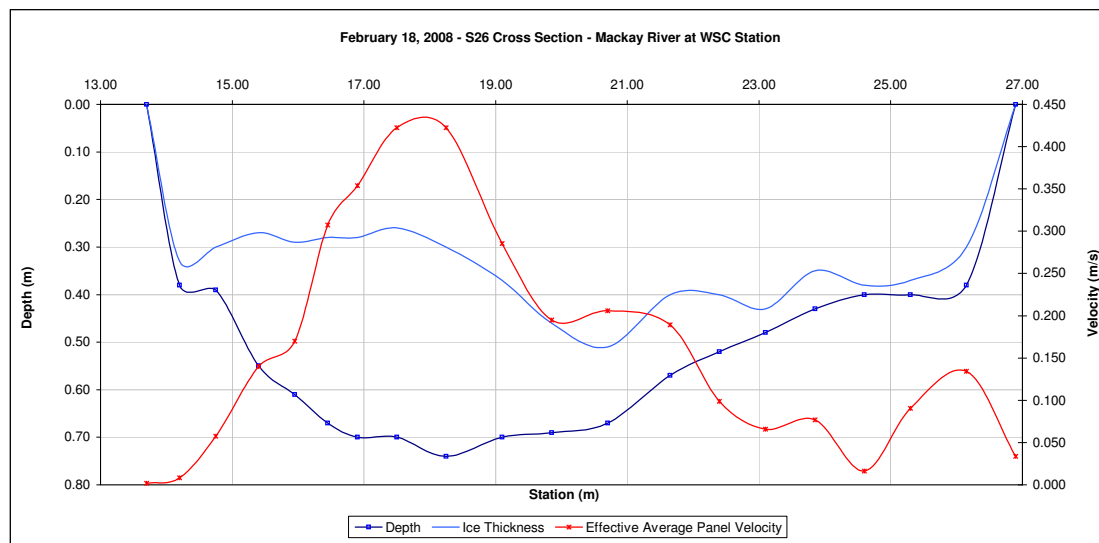
Bench Mark Reading: Paint on Rock 0.740 El: 100.000 0.735 El: 100.000
Water Level Reading: 3.409 El: 97.331 3.402 El: 97.333
Top of Ice Level Reading: 3.400 El: 97.340 3.393 El: 97.342
Transducer Reading & Est. El.: El: 97.331 El: 97.333
Other: El: El: 97.332

		Measurement Data															
Measured Data							Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)			
LB	13.70	0.00	0.00		0.000	0.90	1	13.70	13.95	0.002	0.002	0.01	0.00	0.000	0%		
	14.20	0.38	0.33		0.009	0.90	2	13.95	14.48	0.009	0.008	0.05	0.03	0.000	0%		
	14.75	0.39	0.30		0.064	0.90	3	14.48	15.08	0.064	0.058	0.09	0.05	0.003	0%		
	15.40	0.55	0.27		0.155	0.90	4	15.08	15.68	0.155	0.140	0.28	0.17	0.024	4%		
	15.95	0.61	0.29		0.189	0.90	5	15.68	16.20	0.189	0.170	0.32	0.17	0.029	4%		
	16.45	0.67	0.28		0.341	0.90	6	16.20	16.68	0.341	0.307	0.39	0.19	0.057	9%		
	16.90	0.70	0.28		0.393	0.90	7	16.68	17.20	0.393	0.354	0.42	0.22	0.078	12%		
	17.50	0.70	0.26		0.469	0.90	8	17.20	17.88	0.469	0.422	0.44	0.30	0.125	19%		
	18.25	0.74	0.30		0.469	0.90	9	17.88	18.68	0.469	0.422	0.44	0.35	0.149	23%		
	19.10	0.70	0.37		0.317	0.90	10	18.68	19.48	0.317	0.285	0.33	0.26	0.075	11%		
	19.85	0.69	0.46		0.216	0.90	11	19.48	20.28	0.216	0.195	0.23	0.18	0.036	5%		
	20.70	0.67	0.51		0.229	0.90	12	20.28	21.18	0.229	0.206	0.16	0.14	0.030	4%		
	21.65	0.57	0.40		0.210	0.90	13	21.18	22.03	0.210	0.189	0.17	0.14	0.027	4%		
	22.40	0.52	0.40		0.110	0.90	14	22.03	22.75	0.110	0.099	0.12	0.09	0.009	1%		
	23.10	0.48	0.43		0.073	0.90	15	22.75	23.48	0.073	0.066	0.05	0.04	0.002	0%		
	23.85	0.43	0.35		0.085	0.90	16	23.48	24.23	0.085	0.077	0.08	0.06	0.005	1%		
	24.60	0.40	0.38		0.018	0.90	17	24.23	24.95	0.018	0.016	0.02	0.01	0.000	0%		
	25.30	0.40	0.37		0.101	0.90	18	24.95	25.73	0.101	0.091	0.03	0.02	0.002	0%		
RB	26.15	0.38	0.30		0.149	0.90	19	25.73	26.53	0.149	0.134	0.08	0.06	0.009	1%		
	26.90	0.00	0.00		0.000	0.90	20	26.53	26.90	0.037	0.034	0.02	0.01	0.000	0%		
Total Flow:													0.659	1.000			

Total Flow:	0.659	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	2.50	(m ²)
Top Width:	13.20	(m)
Hydraulic Depth:	0.190	(m)
Mean Velocity:	0.263	(m/s)
Froude Number	0.193	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

S26 - Mackay River WSC



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mackay River
Location: S26
Site Name: Mackay River WSC
Coordinates & Legal: 458031 E, 6341078 N SE-3-95-11-W4

Time of Measurement

Date of Measurement: March 13, 2008
Start Time: 6:32 PM MST
End Time: 6:45 PM MST

Weather Conditions:

River Conditions:

Personnel & Equipment

Measurement Made By: js sms
Data Entry By: Imm sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Paint on Rock 1.015
Water Level Reading: 3.575
Top of Ice Level Reading: 3.457
Transducer Reading & Est. El.:
Other:

Setup No. 1

El: 100.000
El: 97.440
El: 97.558
El:

Setup No. 2

El: 100.000
El: 97.434
El: 97.563
El:

Average

97.437

LB

RB

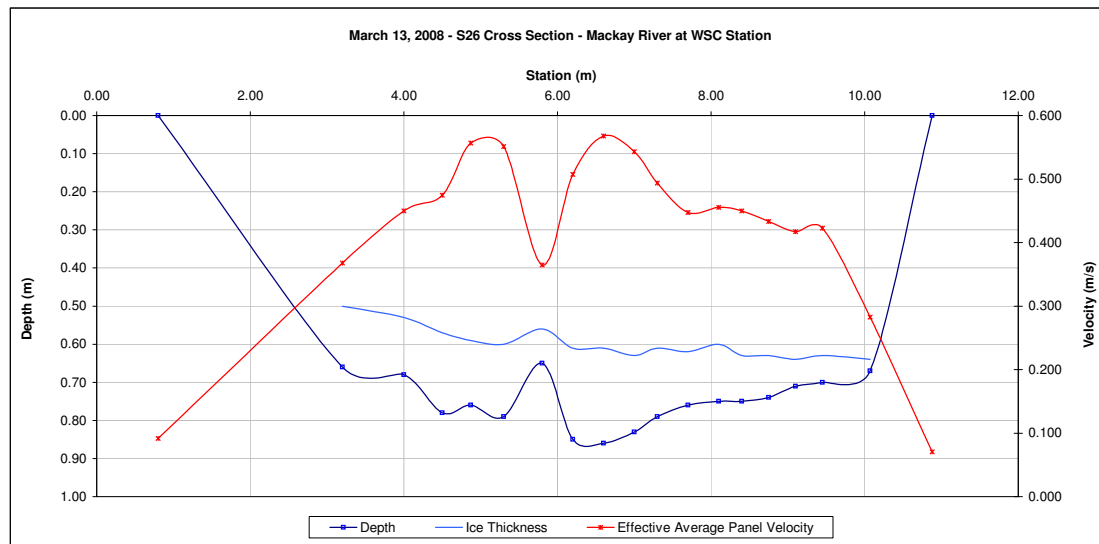
Measured Data							Measurement Data												
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)					
0.80	0.00				0.000	0.90	1	0.80	2.00	0.102	0.092	0.04	0.05	0.004	1%				
3.20	0.66	0.50			0.408	0.90	2	2.00	3.60	0.408	0.368	0.16	0.26	0.094	16%				
4.00	0.68	0.53			0.500	0.90	3	3.60	4.25	0.500	0.450	0.15	0.10	0.044	8%				
4.50	0.78	0.57			0.527	0.90	4	4.25	4.69	0.527	0.475	0.21	0.09	0.043	8%				
4.87	0.76	0.59			0.619	0.90	5	4.69	5.09	0.619	0.557	0.17	0.07	0.038	7%				
5.30	0.79	0.60			0.613	0.90	6	5.09	5.55	0.613	0.551	0.19	0.09	0.049	8%				
5.80	0.65	0.56			0.405	0.90	7	5.55	6.00	0.405	0.365	0.09	0.04	0.015	3%				
6.20	0.85	0.61			0.564	0.90	8	6.00	6.40	0.564	0.507	0.24	0.10	0.049	8%				
6.60	0.86	0.61			0.631	0.90	9	6.40	6.80	0.631	0.568	0.25	0.10	0.057	10%				
7.00	0.83	0.63			0.604	0.90	10	6.80	7.15	0.604	0.543	0.20	0.07	0.038	7%				
7.30	0.79	0.61			0.549	0.90	11	7.15	7.50	0.549	0.494	0.18	0.06	0.031	5%				
7.70	0.76	0.62			0.497	0.90	12	7.50	7.90	0.497	0.447	0.14	0.06	0.025	4%				
8.10	0.75	0.60			0.506	0.90	13	7.90	8.25	0.506	0.455	0.15	0.05	0.024	4%				
8.40	0.75	0.63			0.500	0.90	14	8.25	8.58	0.500	0.450	0.12	0.04	0.018	3%				
8.75	0.74	0.63			0.482	0.90	15	8.58	8.93	0.482	0.433	0.11	0.04	0.017	3%				
9.10	0.71	0.64			0.463	0.90	16	8.93	9.28	0.463	0.417	0.07	0.02	0.010	2%				
9.45	0.70	0.63			0.469	0.90	17	9.28	9.76	0.469	0.422	0.07	0.03	0.014	2%				
10.07	0.67	0.64			0.314	0.90	18	9.76	10.48	0.314	0.283	0.03	0.02	0.006	1%				
10.88	0.00					0.90	19	10.48	11.24	0.078	0.071	0.01	0.01	0.000	0%				
11.60																			
Total Flow:														0.576	1.000				

Total Flow:	0.576	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.29	(m ²)
Top Width:	10.80	(m)
Hydraulic Depth:	0.119	(m)
Mean Velocity:	0.446	(m/s)
Froude Number	0.412	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

S26 - Mackay River WSC



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mackay River
Location: S26
Site Name: Mackay River WSC
Coordinates & Legal: 458031 E, 6341078 N SE-3-95-11-W4

Time of Measurement

Date of Measurement: April 6, 2008
Start Time: 12:30 PM MDT
End Time: 1:00 PM MDT

Weather Conditions:

-5C, Sunny, Light Wind

River Conditions:

Ice Cover

Personnel & Equipment

Measurement Made By: JS SM
Data Entry By: LM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Checked: sm

March Mc Birney Flo-Mate 2000

s/n 2004521

Level Readings

Bench Mark Reading: Paint on Rock 1.017
Water Level Reading: 3.695
Top of Ice Level Reading: 3.591
Transducer Reading & Est. El.:
Other:

Setup No. 1
El: 100.000
El: 97.322
El: 97.426
El:

Setup No. 2
El: 100.000
El: 97.326
El: 97.429
El:

Average

97.324

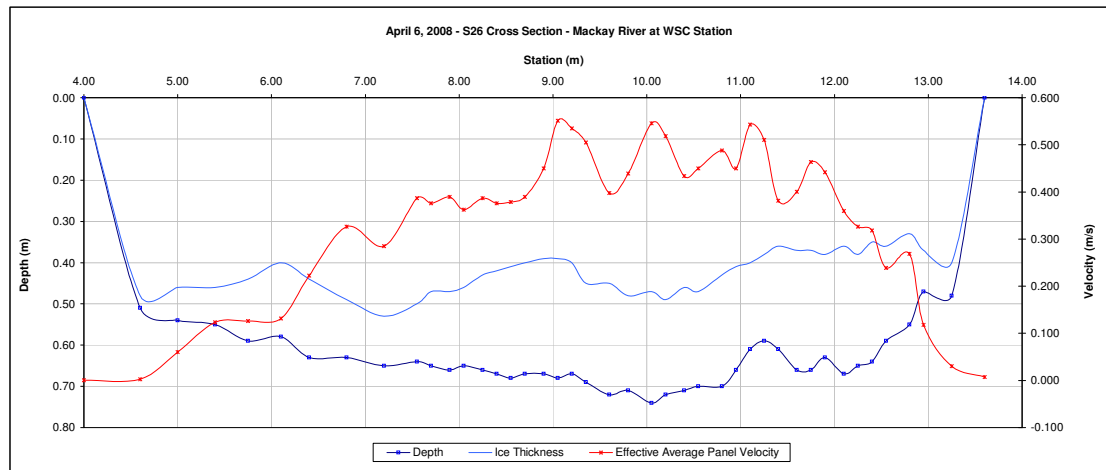
RB

Measured Data						Measurement Data																	Calculated Data						Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at	Panel Ends at	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge															
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)															
4.00	0.00	0			0.000	0.90	1	4.00	4.30	0.001	0.001	0.01	0.00	0.000	0%														
4.60	0.51	0.48			0.003	0.90	2	4.30	4.80	0.003	0.003	0.03	0.02	0.000	0%														
5.00	0.54	0.46			0.067	0.90	3	4.80	5.20	0.067	0.060	0.08	0.03	0.002	0%														
5.40	0.55	0.46			0.137	0.90	4	5.20	5.58	0.137	0.123	0.09	0.03	0.004	1%														
5.75	0.59	0.44			0.140	0.90	5	5.58	5.93	0.140	0.126	0.15	0.05	0.007	1%														
6.10	0.58	0.40			0.146	0.90	6	5.93	6.25	0.146	0.132	0.18	0.06	0.008	1%														
6.40	0.63	0.44			0.247	0.90	7	6.25	6.60	0.247	0.222	0.19	0.07	0.015	2%														
6.80	0.63	0.49			0.363	0.90	8	6.60	7.00	0.363	0.326	0.14	0.06	0.018	3%														
7.20	0.65	0.53			0.317	0.90	9	7.00	7.38	0.317	0.285	0.12	0.05	0.013	2%														
7.55	0.64	0.50			0.430	0.90	10	7.38	7.63	0.430	0.387	0.14	0.04	0.014	2%														
7.70	0.65	0.47			0.418	0.90	11	7.63	7.80	0.418	0.376	0.18	0.03	0.012	2%														
7.90	0.66	0.47			0.433	0.90	12	7.80	7.98	0.433	0.390	0.19	0.03	0.013	2%														
8.05	0.65	0.46			0.402	0.90	13	7.98	8.15	0.402	0.362	0.19	0.03	0.012	2%														
8.25	0.66	0.43			0.430	0.90	14	8.15	8.33	0.430	0.387	0.23	0.04	0.016	2%														
8.40	0.67	0.42			0.418	0.90	15	8.33	8.48	0.418	0.376	0.25	0.04	0.014	2%														
8.55	0.68	0.41			0.421	0.90	16	8.48	8.63	0.421	0.379	0.27	0.04	0.015	2%														
8.70	0.67	0.40			0.433	0.90	17	8.63	8.80	0.433	0.390	0.27	0.05	0.018	3%														
8.90	0.67	0.39			0.500	0.90	18	8.80	8.98	0.500	0.450	0.28	0.05	0.022	3%														
9.05	0.68	0.39			0.613	0.90	19	8.98	9.13	0.613	0.551	0.29	0.04	0.024	4%														
9.20	0.67	0.40			0.594	0.90	20	9.13	9.28	0.594	0.535	0.27	0.04	0.022	3%														
9.35	0.69	0.45			0.561	0.90	21	9.28	9.48	0.561	0.505	0.24	0.05	0.024	4%														
9.60	0.72	0.45			0.442	0.90	22	9.48	9.70	0.442	0.398	0.27	0.06	0.024	4%														
9.8	0.71	0.48			0.488	0.90	23	9.70	9.93	0.488	0.439	0.23	0.05	0.023	4%														
10.05	0.74	0.47			0.607	0.90	24	9.93	10.13	0.607	0.546	0.27	0.05	0.029	5%														
10.20	0.72	0.49			0.576	0.90	25	10.13	10.30	0.576	0.518	0.23	0.04	0.021	3%														
10.4	0.71	0.46			0.482	0.90	26	10.30	10.48	0.482	0.433	0.25	0.04	0.019	3%														
10.55	0.70	0.47			0.500	0.90	27	10.48	10.68	0.500	0.450	0.23	0.05	0.021	3%														
10.8	0.70	0.43			0.543	0.90	28	10.68	10.88	0.543	0.488	0.27	0.05	0.026	4%														
10.95	0.66	0.41			0.500	0.90	29	10.88	11.03	0.500	0.450	0.25	0.04	0.017	3%														
11.10	0.61	0.40			0.604	0.90	30	11.03	11.18	0.604	0.543	0.21	0.03	0.017	3%														
11.25	0.59	0.38			0.567	0.90	31	11.18	11.33	0.567	0.510	0.21	0.03	0.016	3%														
11.40	0.61	0.36			0.424	0.90	32	11.33	11.50	0.424	0.381	0.25	0.04	0.017	3%														
11.60	0.66	0.37			0.445	0.90	33	11.50	11.68	0.445	0.401	0.29	0.05	0.020	3%														
11.75	0.66	0.37			0.515	0.90	34	11.68	11.83	0.515	0.464	0.29	0.04	0.020	3%														
11.90	0.63	0.38			0.491	0.90	35	11.83	12.00	0.491	0.442	0.25	0.04	0.019	3%														
12.10	0.67	0.36			0.399	0.90	36	12.00	12.18	0.399	0.359	0.31	0.05	0.019	3%														
12.25	0.65	0.38			0.363	0.90	37	12.18	12.33	0.363	0.326	0.27	0.04	0.013	2%														
12.40	0.64	0.35			0.354	0.90	38	12.33	12.48	0.354	0.318	0.29	0.04	0.014	2%														
12.55	0.59	0.36			0.265	0.90	39	12.48	12.68	0.265	0.239	0.23	0.05	0.011	2%														
12.80	0.55	0.33			0.299	0.90	40	12.68	12.88	0.299	0.269	0.22	0.04	0.012	2%														
12.95	0.47	0.37			0.131	0.90	41	12.88	13.10	0.131	0.118	0.10	0.02	0.003	0%														
13.25	0.48	0.40			0.034	0.90	42	13.10	13.43	0.034	0.030	0.08	0.03	0.001	0%														
13.60	0.00	0.00			0.000	0.90	43	13.43	13.60	0.008	0.008	0.02	0.00	0.000	0%														
Total Flow:															0.635	1.000													

Total Flow:	0.635	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.75	(m ²)
Top Width:	9.60	(m)
Hydraulic Depth:	0.183	(m)
Mean Velocity:	0.362	(m/s)
Froude Number	0.270	
Photographs taken looking at:	Photographs taken.	

Data logger Notes:	
Data logger Internal Power:	
Data logger External Power:	
Data logger Memory Used:	
Data logger Clock:	
Laptop Clock:	
Dessicant:	
Data logger:	
PT:	
Power:	

Notes:



Hydrometric Measurement / Site Visit Record

S26 - Mackay River WSC



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mackay River
Location: S26
Site Name: Mackay River WSC
Coordinates & Legal: 458031 E, 6341078 N SE-3-95-11-W4

Time of Measurement

Date of Measurement: December 13, 2008
Start Time: 1:55 PM MST
End Time: 2:15 PM MST

Weather Conditions:

clear, calm, -31 C

River Conditions:

ice-cover, thick

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

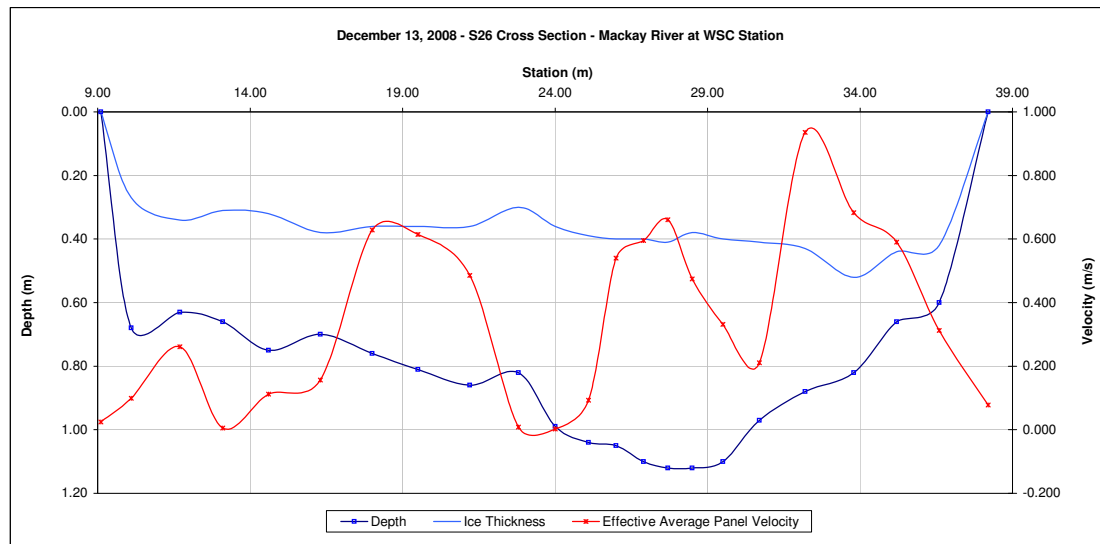
Bench Mark Reading: Paint on Rock 0.739 El: 100.000 0.705 El: 100.000
Water Level Reading: 2.983 El: 97.756 2.945 El: 97.760
Top of Ice Level Reading: 2.962 El: 97.777 2.933 El: 97.772
Transducer Reading & Est. El.: El: 97.772
Other: El: 97.775

Measurement Data

Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
38.20	0.00	0.00				0.90	1	38.20	37.40	0.087	0.078	0.05	0.04	0.003	0%
36.60	0.60	0.42			0.347	0.90	2	37.40	35.90	0.347	0.313	0.18	0.27	0.084	2%
35.20	0.66	0.44			0.655	0.90	3	35.90	34.50	0.655	0.590	0.22	0.31	0.182	4%
33.80	0.82	0.52			0.759	0.90	4	34.50	33.00	0.759	0.683	0.30	0.45	0.307	7%
32.20	0.88	0.43			1.039	0.90	5	33.00	31.45	1.039	0.935	0.45	0.70	0.652	14%
30.70	0.97	0.41			0.235	0.90	6	31.45	30.10	0.235	0.211	0.56	0.76	0.160	3%
29.50	1.10	0.40			0.369	0.90	7	30.10	29.00	0.369	0.332	0.70	0.77	0.256	5%
28.50	1.12	0.38			0.527	0.90	8	29.00	28.10	0.527	0.475	0.74	0.67	0.316	7%
27.70	1.12	0.41			0.735	0.90	9	28.10	27.30	0.735	0.661	0.71	0.57	0.376	8%
26.90	1.10	0.40			0.661	0.90	10	27.30	26.45	0.661	0.595	0.70	0.59	0.354	8%
26.00	1.05	0.40			0.600	0.90	11	26.45	25.55	0.600	0.540	0.65	0.58	0.316	7%
25.10	1.04	0.39			0.104	0.90	12	25.55	24.55	0.104	0.093	0.65	0.65	0.061	1%
24.00	0.99	0.36			0.003	0.90	13	24.55	23.40	0.003	0.003	0.63	0.72	0.002	0%
22.80	0.82	0.30			0.009	0.90	14	23.40	22.00	0.009	0.008	0.52	0.73	0.006	0%
21.20	0.86	0.36			0.539	0.90	15	22.00	20.35	0.539	0.486	0.50	0.82	0.401	9%
19.50	0.81	0.36			0.683	0.90	16	20.35	18.75	0.683	0.614	0.45	0.72	0.442	10%
18.00	0.76	0.36			0.698	0.90	17	18.75	17.15	0.698	0.628	0.40	0.64	0.402	9%
16.30	0.70	0.38			0.174	0.90	18	17.15	15.45	0.174	0.156	0.32	0.54	0.085	2%
14.60	0.75	0.32			0.125	0.90	19	15.45	13.85	0.125	0.112	0.43	0.69	0.077	2%
13.10	0.66	0.31			0.006	0.90	20	13.85	12.40	0.006	0.005	0.35	0.51	0.003	0%
11.70	0.63	0.34			0.290	0.90	21	12.40	10.90	0.290	0.261	0.29	0.44	0.113	2%
10.10	0.68	0.27			0.110	0.90	22	10.90	9.60	0.110	0.099	0.41	0.53	0.053	1%
9.10	0.00	0.00				0.90	23	9.60	9.10	0.027	0.025	0.10	0.05	0.001	0%
Total Flow:														4.652	1.000

Total Flow:	4.652	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	12.75	(m ²)
Top Width:	29.10	(m)
Hydraulic Depth:	0.438	(m)
Mean Velocity:	0.365	(m/s)
Froude Number	0.176	
Photographs taken looking at:		
Photographs taken.		

Notes: slush is present throughout some of the discharge measurement section



Hydrometric Measurement / Site Visit Record
Firebag River near the Mouth - S27



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Firebag River
Location: S27
Site Name: Firebag River near the Mouth
Coordinates & Legal: 63887706 N, 488685 E SE-35-99-8-W4
Time of Measurement: January 16, 2008
Date of Measurement: 12:58 PM MST
Start Time: 1:47 PM MST
End Time: 1:47 PM MST

Personnel & Equipment

Measurement Made By: JS/MS
Data Entry By: March Mc Birney Flo-Mate 2000
Meter Type and No.: s/n 2004521

Level Readings

Bench Mark Reading: 1.038
Water Level Reading: 3.125
Top of Ice Level Reading: 3.092
Transducer Reading & Est. El.: 1.086
Other:

Setup No. 1

El: 96.773
El: 97.686
El: 97.719
El: 96.600

Setup No. 2

El: 1.151
El: 3.221
El: 3.209
El: 1.086

Average

97.773
97.690
97.715
96.604

Weather Conditions:

-26 °C Overcast, Light wind

River Conditions:

Ice Cover with slush on top of ice

Measurement Data

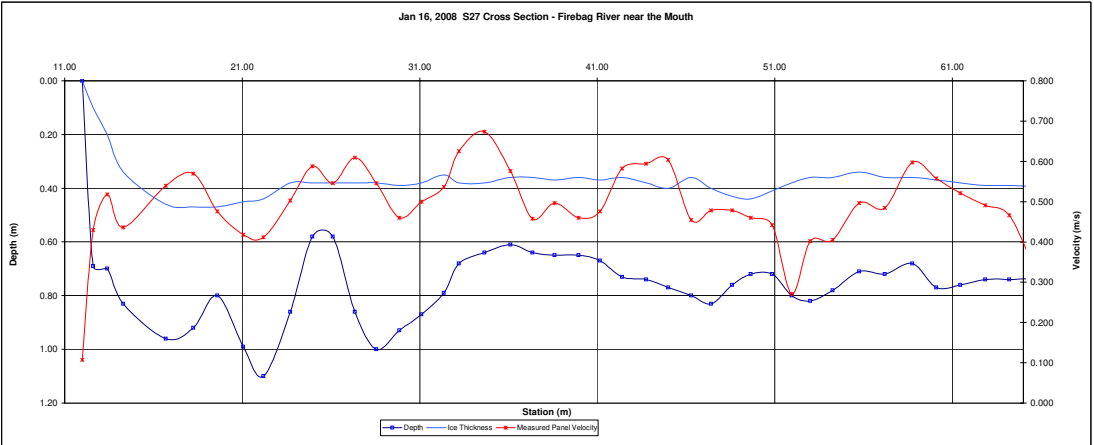
Measured Data						Calculated Data									
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percentage of Total
12.00	0.00	0.00			0.000	0.90	1	12.00	12.30	0.107	0.097	0.15	0.04	0.004	0.0%
12.60	0.69	0.10			0.430	0.90	2	12.30	13.00	0.430	0.387	0.59	0.41	0.160	1.4%
13.40	0.70	0.20			0.518	0.90	3	13.00	13.85	0.518	0.466	0.50	0.43	0.198	1.8%
14.30	0.83	0.34			0.436	0.90	4	13.85	15.50	0.436	0.392	0.49	0.81	0.317	2.8%
16.70	0.96	0.46			0.539	0.90	5	15.50	17.48	0.539	0.486	0.50	0.99	0.479	4.3%
18.25	0.92	0.47			0.570	0.90	6	17.48	18.93	0.570	0.513	0.45	0.65	0.335	3.0%
19.60	0.80	0.47			0.475	0.90	7	18.93	20.33	0.475	0.428	0.33	0.46	0.198	1.8%
21.05	0.99	0.45			0.418	0.90	8	20.33	21.63	0.418	0.376	0.54	0.70	0.264	2.3%
22.20	1.10	0.44			0.411	0.90	9	21.63	22.95	0.411	0.370	0.66	0.87	0.324	2.9%
23.70	0.86	0.38			0.503	0.90	10	22.95	24.33	0.503	0.453	0.48	0.66	0.299	2.7%
24.95	0.58	0.38			0.588	0.90	11	24.33	25.53	0.588	0.529	0.20	0.24	0.127	1.1%
26.10	0.58	0.38			0.546	0.90	12	25.53	26.73	0.546	0.491	0.20	0.24	0.118	1.0%
27.35	0.86	0.39			0.510	0.90	13	26.73	27.95	0.510	0.549	0.48	0.59	0.323	2.9%
28.55	1.00	0.38			0.546	0.90	14	27.95	29.20	0.546	0.491	0.62	0.78	0.381	3.4%
29.85	0.93	0.39			0.460	0.90	15	29.20	30.48	0.460	0.414	0.54	0.69	0.285	2.5%
31.10	0.87	0.38			0.500	0.90	16	30.48	31.73	0.500	0.450	0.49	0.61	0.276	2.5%
32.35	0.79	0.35			0.536	0.90	17	31.73	32.78	0.536	0.483	0.44	0.46	0.223	2.0%
33.20	0.68	0.38			0.626	0.90	18	32.78	33.93	0.626	0.562	0.30	0.34	0.194	1.7%
34.65	0.64	0.38			0.674	0.90	19	33.93	35.38	0.674	0.606	0.26	0.38	0.229	2.0%
36.10	0.61	0.36			0.576	0.90	20	35.38	36.73	0.576	0.518	0.25	0.34	0.175	1.6%
37.35	0.64	0.36			0.457	0.90	21	36.73	37.98	0.457	0.411	0.28	0.35	0.144	1.3%
38.60	0.69	0.37			0.497	0.90	22	37.98	39.28	0.497	0.447	0.28	0.36	0.163	1.4%
39.95	0.65	0.36			0.460	0.90	23	39.28	40.55	0.460	0.414	0.29	0.37	0.153	1.4%
41.15	0.67	0.37			0.475	0.90	24	40.55	41.78	0.475	0.428	0.30	0.37	0.157	1.4%
42.40	0.73	0.36			0.582	0.90	25	41.78	43.08	0.582	0.524	0.37	0.48	0.252	2.2%
43.75	0.74	0.38			0.594	0.90	26	43.08	44.38	0.594	0.535	0.36	0.47	0.250	2.2%
45.00	0.77	0.40			0.604	0.90	27	44.38	45.65	0.604	0.543	0.37	0.47	0.256	2.3%
46.30	0.80	0.36			0.454	0.90	28	45.65	46.85	0.454	0.409	0.44	0.53	0.216	1.9%
47.40	0.83	0.40			0.479	0.90	29	46.85	48.00	0.479	0.431	0.43	0.49	0.213	1.9%
48.60	0.76	0.43			0.479	0.90	30	48.00	49.13	0.479	0.431	0.33	0.37	0.160	1.4%
49.65	0.72	0.44			0.460	0.90	31	49.13	50.25	0.460	0.414	0.28	0.32	0.130	1.2%
50.85	0.72	0.41			0.442	0.90	32	50.25	51.40	0.442	0.398	0.31	0.36	0.142	1.3%
51.95	0.80	0.38			0.271	0.90	33	51.40	52.48	0.271	0.244	0.42	0.45	0.110	1.0%
53.00	0.82	0.36			0.402	0.90	34	52.48	53.63	0.402	0.362	0.46	0.53	0.192	1.7%
54.25	0.78	0.36			0.405	0.90	35	53.63	55.00	0.405	0.365	0.42	0.58	0.211	1.9%
55.75	0.71	0.34			0.497	0.90	36	55.00	56.48	0.497	0.447	0.37	0.55	0.244	2.2%
57.20	0.72	0.36			0.485	0.90	37	56.48	57.98	0.485	0.436	0.36	0.54	0.236	2.1%
58.75	0.68	0.36			0.597	0.90	38	57.98	59.43	0.597	0.538	0.32	0.46	0.249	2.2%
60.10	0.77	0.37			0.558	0.90	39	59.43	60.78	0.558	0.502	0.40	0.54	0.271	2.4%
61.45	0.76	0.38			0.521	0.90	40	60.78	62.15	0.521	0.469	0.38	0.52	0.245	2.2%
62.85	0.74	0.39			0.491	0.90	41	62.15	63.53	0.491	0.442	0.35	0.48	0.213	1.9%
64.20	0.74	0.39			0.466	0.90	42	63.53	65.13	0.466	0.420	0.35	0.56	0.235	2.1%
66.05	0.75	0.40			0.317	0.90	43	65.13	66.93	0.317	0.285	0.35	0.63	0.180	1.6%
67.80	0.87	0.45			0.372	0.90	44	66.93	68.43	0.372	0.335	0.42	0.63	0.211	1.9%
69.05	0.94	0.44			0.552	0.90	45	68.43	69.68	0.552	0.497	0.50	0.63	0.310	2.8%
70.30	0.94	0.50			0.591	0.90	46	69.68	70.95	0.591	0.532	0.44	0.56	0.299	2.7%
71.60	0.92	0.56			0.671	0.90	47	70.95	72.35	0.671	0.604	0.36	0.50	0.304	2.7%
73.10	0.92	0.48			0.622	0.90	48	72.35	73.65	0.622	0.560	0.44	0.57	0.320	2.8%
74.20	0.93	0.40			0.543	0.90	49	73.65	74.65	0.543	0.488	0.53	0.53	0.259	2.3%
75.10	0.00	0.00			0.000	0.90	50	74.65	75.10	0.136	0.122	0.13	0.06	0.007	0.1%
Total Flow: 11.239															100%

Total Flow:	11.239	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	24.96	(m ²)
Top Width:	63.10	(m)
Hydraulic Depth:	0.395	(m)
Mean Velocity:	0.450	(m/s)
Froude Number	0.229	
Photographs taken looking at:		
Photographs taken:	no	

Data logger Notes:	Database #333
Data logger Internal Power:	4.71
Data logger External Power:	12.55
Data logger Memory Used:	0.8%
Data logger Clock:	12:05 MST
Laptop Clock:	12:28 MST
Dessicant:	60% USED
Data logger:	106040333 Optimum DD128
PT:	101348 Keller
Power:	Magnacharge 20V 10A DC Battery

Notes:

Data downloaded, data looks good as of last trip. Change dessicant next trip



Hydrometric Measurement / Site Visit Record

Firebag River near the Mouth - S27



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Firebag River
Location: S27
Site Name: Firebag River near the Mouth
Coordinates & Legal: 63887706 N, 488685 E SE-35-99-8-W4

Time of Measurement

Date of Measurement: February 12, 2008
Start Time: 11:50 AM MST
End Time: 12:20 PM MST

Weather Conditions:

-17 clear

River Conditions:

Ice Cover with slush on top of ice

Personnel & Equipment

Measurement Made By: jvr sm sms checked SM
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Rod in PVC RB 1.554
Water Level Reading: 3.623
Top of Ice Level Reading: 3.583
Transducer Reading & Est. El.: 1.109
Other:

Setup No. 1

El: 99.773
El: 97.704
El: 97.744
El: 96.595
El:

Setup No. 2

El: 1.534
El: 3.607
El: 3.563
El: 1.109
El:

Average

97.702
97.744
96.593

Measurement Data

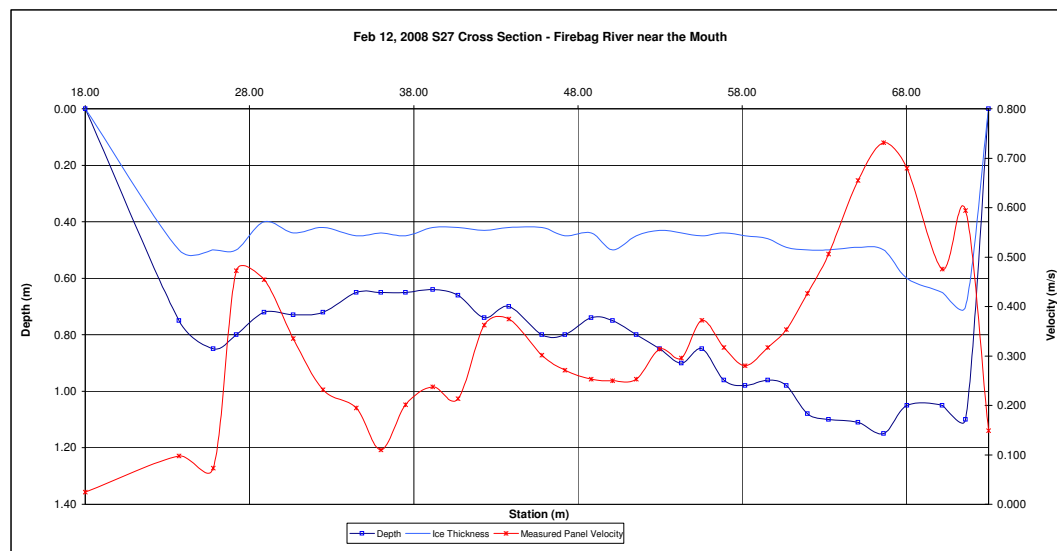
Measured Data						Calculated Data										
			Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
Station	Depth	Ice Thickness	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
(m)	(m)	(m)														
18.00	0.00	0.00			0.000	0.90	1	18.00	20.85	0.024	0.022	0.06	0.18	0.004	0.1%	
23.70	0.75	0.50			0.098	0.90	2	20.85	24.75	0.098	0.088	0.25	0.98	0.086	1.3%	
25.80	0.85	0.50			0.073	0.90	3	24.75	26.50	0.073	0.066	0.35	0.61	0.040	0.6%	
27.20	0.80	0.50			0.472	0.90	4	26.50	28.05	0.472	0.425	0.30	0.46	0.198	3.1%	
28.90	0.72	0.40			0.454	0.90	5	28.05	29.79	0.454	0.409	0.32	0.56	0.227	3.6%	
30.67	0.73	0.44			0.335	0.90	6	29.79	31.58	0.335	0.302	0.29	0.52	0.157	2.5%	
32.48	0.72	0.42			0.232	0.90	7	31.58	33.49	0.232	0.208	0.30	0.57	0.120	1.9%	
34.50	0.65	0.45			0.195	0.90	8	33.49	35.25	0.195	0.176	0.20	0.35	0.062	1.0%	
36.00	0.65	0.45			0.110	0.90	9	35.25	36.75	0.110	0.099	0.21	0.32	0.031	0.5%	
37.50	0.65	0.45			0.201	0.90	10	36.75	38.33	0.201	0.181	0.20	0.32	0.057	0.9%	
39.15	0.64	0.42			0.238	0.90	11	38.33	39.93	0.238	0.214	0.22	0.35	0.075	1.2%	
40.70	0.66	0.42			0.213	0.90	12	39.93	41.50	0.213	0.192	0.24	0.38	0.073	1.1%	
42.30	0.74	0.43			0.363	0.90	13	41.50	43.05	0.363	0.326	0.31	0.48	0.157	2.5%	
43.80	0.70	0.42			0.375	0.90	14	43.05	44.80	0.375	0.337	0.28	0.49	0.165	2.6%	
45.80	0.80	0.42			0.302	0.90	15	44.80	46.50	0.302	0.272	0.38	0.65	0.175	2.8%	
47.20	0.80	0.45			0.271	0.90	16	46.50	48.00	0.271	0.244	0.35	0.53	0.128	2.0%	
48.80	0.74	0.44			0.253	0.90	17	48.00	49.45	0.253	0.228	0.30	0.44	0.099	1.6%	
50.10	0.75	0.50			0.250	0.90	18	49.45	50.83	0.250	0.225	0.25	0.34	0.077	1.2%	
51.55	0.80	0.45			0.253	0.90	19	50.83	52.27	0.253	0.228	0.35	0.50	0.115	1.8%	
52.98	0.85	0.43			0.314	0.90	20	52.27	53.64	0.314	0.283	0.42	0.58	0.163	2.6%	
54.30	0.90	0.44			0.296	0.90	21	53.64	54.93	0.296	0.266	0.46	0.59	0.157	2.5%	
55.55	0.85	0.45			0.372	0.90	22	54.93	56.22	0.372	0.335	0.40	0.52	0.173	2.7%	
56.89	0.96	0.44			0.317	0.90	23	56.22	57.54	0.317	0.285	0.52	0.68	0.195	3.1%	
58.18	0.98	0.45			0.280	0.90	24	57.54	58.87	0.280	0.252	0.53	0.71	0.179	2.8%	
59.56	0.96	0.46			0.317	0.90	25	58.87	60.13	0.317	0.285	0.50	0.63	0.179	2.8%	
60.69	0.98	0.49			0.354	0.90	26	60.13	61.33	0.354	0.318	0.49	0.59	0.188	3.0%	
61.97	1.08	0.50			0.427	0.90	27	61.33	62.62	0.427	0.384	0.58	0.75	0.286	4.5%	
63.26	1.10	0.50			0.506	0.90	28	62.62	64.16	0.506	0.455	0.60	0.93	0.422	6.7%	
65.06	1.11	0.49			0.655	0.90	29	64.16	65.83	0.655	0.590	0.62	1.04	0.611	9.6%	
66.60	1.15	0.50			0.732	0.90	30	65.83	67.32	0.732	0.658	0.65	0.97	0.638	10.0%	
68.04	1.05	0.60			0.680	0.90	31	67.32	69.11	0.680	0.612	0.45	0.80	0.491	7.7%	
70.17	1.05	0.65			0.475	0.90	32	69.11	70.89	0.475	0.428	0.40	0.71	0.305	4.8%	
71.60	1.10	0.70			0.594	0.90	33	70.89	72.30	0.594	0.535	0.40	0.57	0.303	4.8%	
73.00	0.00	0.00			0.000	0.90	34	72.30	73.00	0.149	0.134	0.10	0.07	0.009	0.1%	
Total Flow:														6.345	100%	

Total Flow:	6.345	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	19.14	(m ²)
Top Width:	55.00	(m)
Hydraulic Depth:	0.348	(m)
Mean Velocity:	0.332	(m/s)
Froude Number	0.179	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	Database #333
Data logger Internal Power:	4.61
Data logger External Power:	12.22
Data logger Memory Used:	0.8%
Data logger Clock:	11:05 MST
Laptop Clock:	11:32 MST
Dessicant:	new
Data logger:	106040333 Optimum DD128
PT:	101348 Keller
Power:	Magnacharge 20V 10A DC Battery

Notes:

data downloaded is good
m=0.8622496
b=0.104788



Hydrometric Measurement / Site Visit Record

Firebag River near the Mouth - S27



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Firebag River
Location: S27
Site Name: Firebag River near the Mouth
Coordinates & Legal: 63887706 N, 488685 E SE-35-99-8-W4

Time of Measurement

Date of Measurement: March 9, 2008
Start Time: 9:20 AM MST
End Time: 9:35 AM MST

Weather Conditions:

-7 clear

River Conditions:

Ice Cover with slush on top of ice

Personnel & Equipment

Measurement Made By: jvr sm JS checked SM
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Rod in PVC RB 1.624
Water Level Reading: 3.684
Top of Ice Level Reading: 3.651
Transducer Reading & Est. El.: 1.134
Other:

Setup No. 1

El: 99.773
El: 97.713
El: 97.746
El: 96.579

Setup No. 2

El: 1.609
El: 3.669
El: 3.635
El: 1.134

Average

97.773
97.713
97.747
96.579

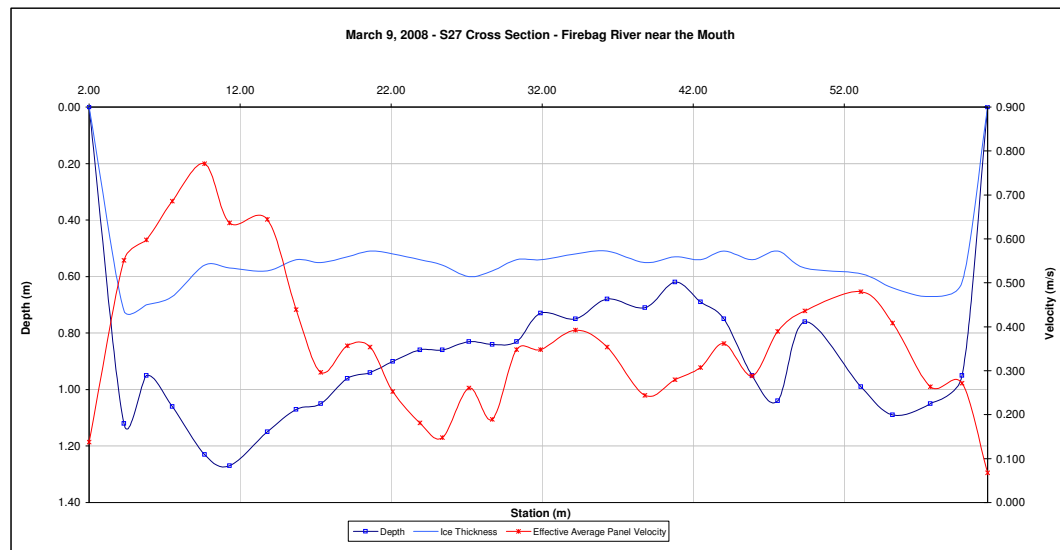
Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
2.00	0.00	0.00			0.000	0.90	1	2.00	3.15	0.153	0.138	0.10	0.12	0.016	0.2%
4.30	1.12	0.72			0.613	0.90	2	3.15	5.05	0.613	0.551	0.40	0.76	0.419	4.8%
5.80	0.95	0.70			0.664	0.90	3	5.05	6.65	0.664	0.598	0.25	0.40	0.239	2.7%
7.50	1.06	0.67			0.762	0.90	4	6.65	8.58	0.762	0.686	0.39	0.75	0.515	5.9%
9.65	1.23	0.56			0.856	0.90	5	8.58	10.48	0.856	0.771	0.67	1.27	0.981	11.3%
11.30	1.27	0.57			0.707	0.90	6	10.48	12.55	0.707	0.636	0.70	1.45	0.924	10.6%
13.80	1.15	0.58			0.716	0.90	7	12.55	14.75	0.716	0.645	0.57	1.25	0.808	9.3%
15.70	1.07	0.54			0.488	0.90	8	14.75	16.53	0.488	0.439	0.53	0.94	0.413	4.7%
17.35	1.05	0.55			0.329	0.90	9	16.53	18.23	0.329	0.296	0.50	0.85	0.252	2.9%
19.10	0.96	0.53			0.396	0.90	10	18.23	19.85	0.396	0.357	0.43	0.70	0.249	2.9%
20.60	0.94	0.51			0.393	0.90	11	19.85	21.35	0.393	0.354	0.43	0.65	0.228	2.6%
22.10	0.90	0.52			0.280	0.90	12	21.35	23.00	0.280	0.252	0.38	0.63	0.158	1.8%
23.90	0.86	0.54			0.201	0.90	13	23.00	24.65	0.201	0.181	0.32	0.53	0.096	1.1%
25.40	0.86	0.56			0.165	0.90	14	24.65	26.28	0.165	0.148	0.30	0.49	0.072	0.8%
27.15	0.83	0.60			0.290	0.90	15	26.28	27.93	0.290	0.261	0.23	0.38	0.099	1.1%
28.70	0.84	0.58			0.210	0.90	16	27.93	29.50	0.210	0.189	0.26	0.41	0.078	0.9%
30.30	0.83	0.54			0.387	0.90	17	29.50	31.10	0.387	0.348	0.29	0.46	0.162	1.9%
31.90	0.73	0.54			0.387	0.90	18	31.10	33.05	0.387	0.348	0.19	0.37	0.129	1.5%
34.20	0.75	0.52			0.436	0.90	19	33.05	35.25	0.436	0.392	0.23	0.51	0.198	2.3%
36.30	0.68	0.51			0.393	0.90	20	35.25	37.55	0.393	0.354	0.17	0.39	0.138	1.6%
38.80	0.71	0.55			0.271	0.90	21	37.55	39.80	0.271	0.244	0.16	0.36	0.088	1.0%
40.80	0.62	0.53			0.311	0.90	22	39.80	41.65	0.311	0.280	0.09	0.17	0.047	0.5%
42.50	0.69	0.54			0.341	0.90	23	41.65	43.28	0.341	0.307	0.15	0.24	0.075	0.9%
44.05	0.75	0.51			0.402	0.90	24	43.28	44.98	0.402	0.362	0.24	0.41	0.148	1.7%
45.90	0.95	0.54			0.320	0.90	25	44.98	46.75	0.320	0.288	0.41	0.73	0.210	2.4%
47.60	1.04	0.51			0.433	0.90	26	46.75	48.50	0.433	0.390	0.53	0.93	0.361	4.1%
49.40	0.76	0.57			0.485	0.90	27	48.50	51.25	0.485	0.436	0.19	0.52	0.228	2.6%
53.10	0.99	0.59			0.533	0.90	28	51.25	54.15	0.533	0.480	0.40	1.16	0.557	6.4%
55.20	1.09	0.64			0.454	0.90	29	54.15	56.45	0.454	0.409	0.45	1.04	0.423	4.9%
57.70	1.05	0.67			0.293	0.90	30	56.45	58.75	0.293	0.263	0.38	0.87	0.230	2.6%
59.80	0.95	0.62			0.302	0.90	31	58.75	60.65	0.302	0.272	0.33	0.63	0.170	2.0%
61.50	0.00	0.00			0.000	0.90	32	60.65	61.50	0.075	0.068	0.08	0.07	0.005	0.1%
Total Flow:														8.716	100%

Total Flow:	8.716	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	20.42	(m ²)
Top Width:	59.50	(m)
Hydraulic Depth:	0.343	(m)
Mean Velocity:	0.427	(m/s)
Froude Number	0.233	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	Database #333
Data logger Internal Power:	4.71
Data logger External Power:	12.55
Data logger Memory Used:	2.0%
Data logger Clock:	07:13 MST
Laptop Clock:	07:52 MST
Dessicant:	good
Data logger:	106040333 Optimum DD128
PT:	101348 Keller
Power:	Magnacharge 20V 10A DC Battery

Notes:
data downloaded is good sample rate & time = 1 hrs., 1.7 sec sensor stabilization



Hydrometric Measurement / Site Visit Record

Firebag River near the Mouth - S27



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Firebag River
Location: S27
Site Name: Firebag River near the Mouth
Coordinates & Legal: 63887706 N, 488685 E SE-35-99-8-W4

Time of Measurement

Date of Measurement: April 2, 2008
Start Time: 12:05 PM MST
End Time: 12:35 PM MST

Weather Conditions:

River Conditions: +2 overcast
Ice Cover

Personnel & Equipment

Measurement Made By: js sm
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

checked SM

Level Readings

Bench Mark Reading: Rod in PVC RE 1.621
Water Level Reading: 3.482
Top of Ice Level Reading: 3.261
Transducer Reading & Est. El.: 1.319
Other:

Setup No. 1

El: 99.773
El: 97.912
El: 98.133
El: 96.593
El:

Setup No. 2

El: 1.454
El: 3.32
El: 3.25
El: 1.319
El:

Average

99.773
97.907
97.977
96.588
96.591

Measurement Data

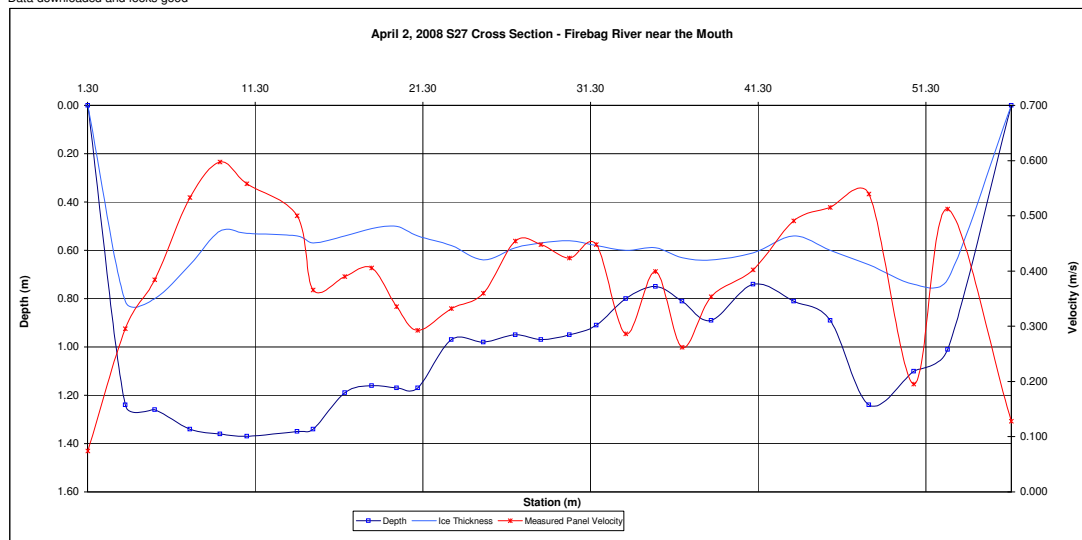
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
1.32	0.00	0.00			0.000	0.90	1	1.32	2.44	0.074	0.067	0.11	0.12	0.008	0%	
3.55	1.24	0.81			0.296	0.90	2	2.44	4.43	0.296	0.266	0.43	0.86	0.228	3%	
5.30	1.26	0.80			0.384	0.90	3	4.43	6.35	0.384	0.346	0.46	0.89	0.306	3%	
7.40	1.34	0.66			0.533	0.90	4	6.35	8.30	0.533	0.480	0.68	1.33	0.637	7%	
9.20	1.36	0.52			0.597	0.90	5	8.30	10.00	0.597	0.538	0.84	1.43	0.768	9%	
10.80	1.37	0.53			0.558	0.90	6	10.00	12.30	0.558	0.502	0.84	1.93	0.970	11%	
13.80	1.35	0.54			0.500	0.90	7	12.30	14.28	0.500	0.450	0.81	1.60	0.720	8%	
14.75	1.34	0.57			0.366	0.90	8	14.28	15.70	0.366	0.329	0.77	1.10	0.361	4%	
16.65	1.19	0.54			0.390	0.90	9	15.70	17.45	0.390	0.351	0.65	1.14	0.399	5%	
18.25	1.16	0.51			0.405	0.90	10	17.45	18.99	0.405	0.365	0.65	1.00	0.365	4%	
19.73	1.17	0.50			0.335	0.90	11	18.99	20.37	0.335	0.302	0.67	0.92	0.278	3%	
21.00	1.17	0.54			0.293	0.90	12	20.37	22.00	0.293	0.263	0.63	1.03	0.271	3%	
23.00	0.97	0.58			0.332	0.90	13	22.00	23.95	0.332	0.299	0.39	0.76	0.227	3%	
24.90	0.98	0.64			0.360	0.90	14	23.95	25.86	0.360	0.324	0.34	0.65	0.210	2%	
26.82	0.95	0.59			0.454	0.90	15	25.86	27.58	0.454	0.409	0.36	0.62	0.253	3%	
28.34	0.97	0.57			0.448	0.90	16	27.58	29.20	0.448	0.403	0.40	0.65	0.260	3%	
30.05	0.95	0.56			0.424	0.90	17	29.20	30.85	0.424	0.381	0.39	0.64	0.245	3%	
31.64	0.91	0.58			0.448	0.90	18	30.85	32.52	0.448	0.403	0.33	0.55	0.223	3%	
33.40	0.80	0.60			0.287	0.90	19	32.52	34.29	0.287	0.258	0.20	0.35	0.091	1%	
35.17	0.75	0.59			0.399	0.90	20	34.29	35.97	0.399	0.359	0.16	0.27	0.097	1%	
36.77	0.81	0.63			0.262	0.90	21	35.97	37.64	0.262	0.236	0.18	0.30	0.071	1%	
38.50	0.89	0.64			0.354	0.90	22	37.64	39.75	0.354	0.318	0.25	0.53	0.168	2%	
41.00	0.74	0.61			0.402	0.90	23	39.75	42.22	0.402	0.362	0.13	0.32	0.116	1%	
43.43	0.81	0.54			0.491	0.90	24	42.22	44.52	0.491	0.442	0.27	0.62	0.274	3%	
45.60	0.89	0.60			0.515	0.90	25	44.52	46.75	0.515	0.464	0.29	0.65	0.300	3%	
47.90	1.24	0.66			0.539	0.90	26	46.75	49.24	0.539	0.486	0.58	1.44	0.700	8%	
50.57	1.10	0.74			0.195	0.90	27	49.24	51.59	0.195	0.176	0.36	0.85	0.149	2%	
52.60	1.01	0.72			0.512	0.90	28	51.59	52.60	0.512	0.461	0.29	0.29	0.136	2%	
56.40	0.00	0.00			0.000	0.90	29	52.60	56.40	0.128	0.115	0.07	0.28	0.032	0%	
Total Flow:															8.864	100%

Total Flow:	8.864	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	23.10	(m ²)
Top Width:	55.08	(m)
Hydraulic Depth:	0.419	(m)
Mean Velocity:	0.384	(m/s)
Froude Number	0.189	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:	Database #333
Data logger Internal Power:	12.52
Data logger External Power:	2.0%
Data logger Memory Used:	10:20
Data logger Clock:	10:59
Laptop Clock:	good
Dessicant:	
Data logger:	106040333 Optimum DD128
PT:	101348 Keller
Power:	Magnacharge 20V 10A DC Battery

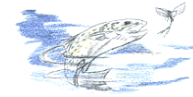
Notes:

Set Sample time to 2 hours for open water season
volt metre reading 12.77V
Data downloaded and looks good



Hydrometric Measurement / Site Visit Record

Firebag River near the Mouth - S27



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Firebag River
Location: S27
Site Name: Firebag River near the Mouth
Coordinates & Legal: 63887706 N, 488685 E SE-35-99-8-W4

Time of Measurement

Date of Measurement: December 11, 2008
Start Time: 9:30 AM MST
End Time: 9:50 AM MST

Weather Conditions:

clear, calm, -29 C
River Conditions: ice-cover, thin in places

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rod in PVC RE 1.321
Water Level Reading: 3.291
Top of Ice Level Reading: 3.261
Transducer Reading & Est. El.: 1.232

Setup No. 1	Setup No. 2	Average
El: 99.773	1.266 El: 99.773	
El: 97.803	3.238 El: 97.801	97.802
El: 97.833	3.207 El: 97.832	97.833
El: 96.571	1.232 El: 96.569	96.570

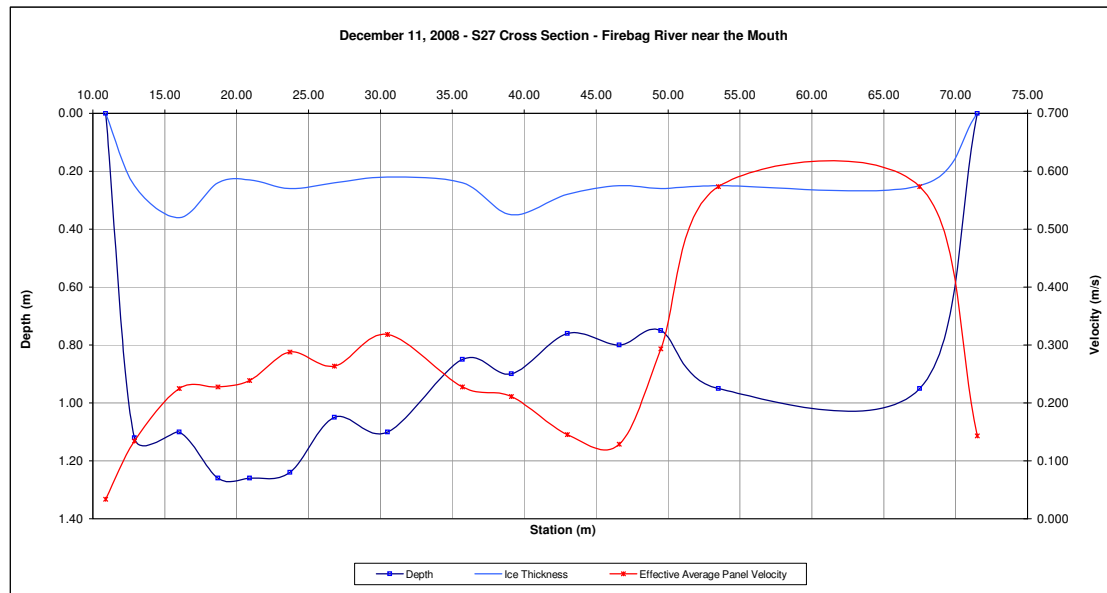
Measurement Data

	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
RB	10.90	0.00	0.00				0.90	1	10.90	11.90	0.037	0.034	0.22	0.22	0.007	0%
	12.90	1.12	0.25			0.149	0.90	2	11.90	14.45	0.149	0.134	0.87	2.22	0.298	2%
	16.00	1.10	0.36			0.250	0.90	3	14.45	17.35	0.250	0.225	0.74	2.15	0.483	3%
	18.70	1.26	0.24			0.253	0.90	4	17.35	19.80	0.253	0.228	1.02	2.50	0.569	4%
	20.90	1.26	0.23			0.265	0.90	5	19.80	22.30	0.265	0.239	1.03	2.58	0.615	4%
	23.70	1.24	0.26			0.320	0.90	6	22.30	25.25	0.320	0.288	0.98	2.89	0.833	6%
	26.80	1.05	0.24			0.293	0.90	7	25.25	28.65	0.293	0.263	0.81	2.75	0.725	5%
	30.50	1.10	0.22			0.354	0.90	8	28.65	33.10	0.354	0.318	0.88	3.92	1.246	9%
	35.70	0.85	0.24			0.253	0.90	9	33.10	37.40	0.253	0.228	0.61	2.62	0.597	4%
	39.10	0.90	0.35			0.235	0.90	10	37.40	41.05	0.235	0.211	0.55	2.01	0.424	3%
	43.00	0.76	0.28			0.162	0.90	11	41.05	44.80	0.162	0.145	0.48	1.80	0.262	2%
	46.60	0.80	0.25			0.143	0.90	12	44.80	48.05	0.143	0.129	0.55	1.79	0.230	2%
	49.50	0.75	0.26			0.326	0.90	13	48.05	51.50	0.326	0.294	0.49	1.69	0.496	4%
	53.50	0.95	0.25			0.637	0.90	14	51.50	60.50	0.637	0.573	0.70	6.30	3.612	26%
	67.50	0.95	0.25			0.637	0.90	15	60.50	69.50	0.637	0.573	0.70	6.30	3.612	26%
LB	71.50	0.00	0.00				0.90	16	69.50	71.50	0.159	0.143	0.18	0.35	0.050	0%
Total Flow:														14.060	100%	

Total Flow:	14.060	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	42.08	(m ²)
Top Width:	60.60	(m)
Hydraulic Depth:	0.694	(m)
Mean Velocity:	0.334	(m/s)
Froude Number	0.128	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:	
Data logger Internal Power:	4.67 V
Data logger External Power:	12.36 V
Data logger Memory Used:	5.0%
Data logger Clock:	08:26 MST
Laptop Clock:	09:01 MST
Dessicant:	NEW
Data logger:	106040333 Optimum DD128
PT:	101348 Keller
Power:	Magnacharge 20V 10A DC Battery

Notes: Ice too thin to walk on near left bank, this is where the flow was the fastest estimated distance to LB and tried to account for non-measurable flow
MMT QUALITY IS POOR because of this reason, hence the large panel discharge percentage near LB



Hydrometric Measurement / Site Visit Record

Christina River near Chard (07CE002) - S29



Measurement Location

River/Stream: Christina River
Location: S29
Site Name: Christina River near Chard (07CE002)
Coordinates & Legal: 6252434 N, 476998 E SE-16-79-6-W4
Time of Measurement: January 8, 2008
Date of Measurement: 12:18 PM MST
Start Time: 1:45 PM MST
End Time: 1:45 PM MST

Personnel & Equipment

Measurement Made By: JS/UMS
Data Entry By: SMS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Tbar in PVC 1.402
Water Level Reading: 5.011
Top of Ice Level Reading: 4.982
Transducer Reading & Est. El.: 5.604
Other: Water level at WSC 5.048

Setup No. 1

El: 99.076
El: 95.467
El: 95.496
El: 89.863
El: 95.430

Setup No. 2

El: 99.076
El: 95.467
El: 95.491
El: 89.863
El: 95.409

Average

95.467
95.494
89.863
95.420

Weather Conditions:

River Conditions: Ice Cover

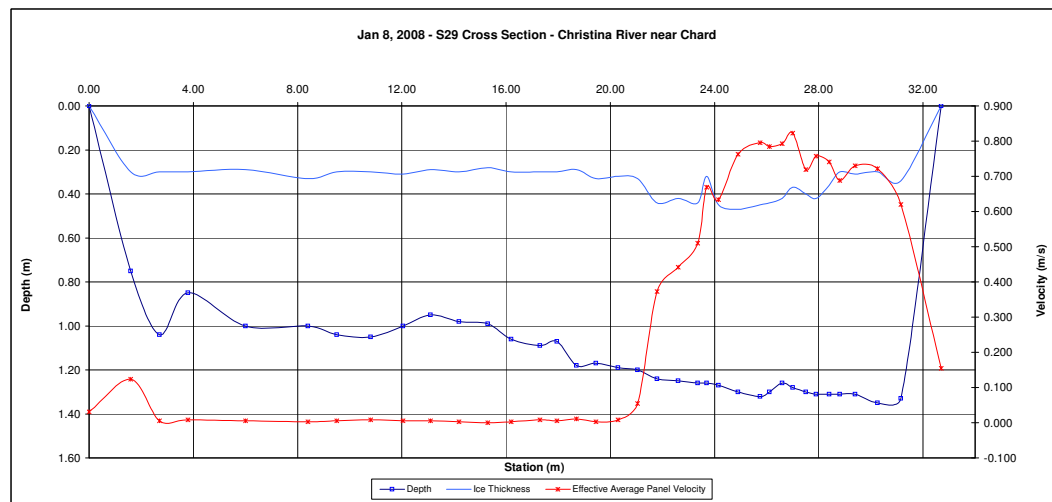
Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
0.00	0.00	0.00				0.90	1	0.00	0.80	0.034	0.031	0.11	0.09	0.003	0%
1.60	0.75	0.30			0.137	0.90	2	0.80	2.15	0.137	0.123	0.45	0.61	0.075	1%
2.70	1.04	0.30			0.006	0.90	3	2.15	3.25	0.006	0.005	0.74	0.81	0.004	0%
3.80	0.85	0.30			0.009	0.90	4	3.25	4.90	0.009	0.008	0.55	0.91	0.007	0%
6.00	1.00	0.29			0.006	0.90	5	4.90	7.20	0.006	0.005	0.71	1.63	0.009	0%
8.40	1.00	0.33			0.003	0.90	6	7.20	8.95	0.003	0.003	0.67	1.17	0.003	0%
9.50	1.04	0.30			0.006	0.90	7	8.95	10.15	0.006	0.005	0.74	0.89	0.005	0%
10.80	1.05	0.30			0.009	0.90	8	10.15	11.43	0.009	0.008	0.75	0.96	0.008	0%
12.05	1.00	0.31			0.006	0.90	9	11.43	12.58	0.006	0.005	0.69	0.79	0.004	0%
13.10	0.95	0.29			0.006	0.90	10	12.58	13.65	0.006	0.005	0.66	0.71	0.004	0%
14.20	0.98	0.30			0.003	0.90	11	13.65	14.75	0.003	0.003	0.68	0.75	0.002	0%
15.30	0.99	0.28			0.000	0.90	12	14.75	15.75	0.000	0.000	0.71	0.71	0.000	0%
16.20	1.06	0.30			0.003	0.90	13	15.75	16.75	0.003	0.003	0.76	0.76	0.002	0%
17.30	1.09	0.30			0.009	0.90	14	16.75	17.63	0.009	0.008	0.79	0.69	0.006	0%
17.95	1.07	0.30			0.006	0.90	15	17.63	18.33	0.006	0.005	0.77	0.54	0.003	0%
18.70	1.18	0.29			0.012	0.90	16	18.33	19.08	0.012	0.011	0.89	0.67	0.007	0%
19.45	1.17	0.33			0.003	0.90	17	19.08	19.88	0.003	0.003	0.84	0.67	0.002	0%
20.30	1.19	0.32			0.009	0.90	18	19.88	20.68	0.009	0.008	0.87	0.70	0.006	0%
21.05	1.20	0.33			0.061	0.90	19	20.68	21.43	0.061	0.055	0.87	0.65	0.036	1%
21.80	1.24	0.44			0.415	0.90	20	21.43	22.20	0.415	0.373	0.80	0.62	0.231	4%
22.60	1.25	0.42			0.491	0.90	21	22.20	22.98	0.491	0.442	0.83	0.64	0.284	4%
23.35	1.26	0.44			0.567	0.90	22	22.98	23.53	0.567	0.510	0.82	0.45	0.230	4%
23.70	1.26	0.32			0.744	0.90	23	23.53	23.93	0.744	0.669	0.94	0.38	0.252	4%
24.15	1.27	0.45			0.704	0.90	24	23.93	24.53	0.704	0.634	0.82	0.49	0.312	5%
24.90	1.30	0.47			0.847	0.90	25	24.53	25.33	0.847	0.763	0.83	0.66	0.506	8%
25.75	1.32	0.45			0.884	0.90	26	25.33	25.93	0.884	0.796	0.87	0.52	0.415	6%
26.10	1.30	0.44			0.872	0.90	27	25.93	26.35	0.872	0.785	0.86	0.37	0.287	4%
26.60	1.26	0.42			0.881	0.90	28	26.35	26.80	0.881	0.793	0.84	0.38	0.300	5%
27.00	1.28	0.37			0.914	0.90	29	26.80	27.25	0.914	0.823	0.91	0.41	0.337	5%
27.50	1.30	0.40			0.799	0.90	30	27.25	27.70	0.799	0.719	0.90	0.40	0.291	4%
27.90	1.31	0.42			0.841	0.90	31	27.70	28.15	0.841	0.757	0.89	0.40	0.303	5%
28.40	1.31	0.36			0.823	0.90	32	28.15	28.60	0.823	0.741	0.95	0.43	0.317	5%
28.80	1.31	0.30			0.765	0.90	33	28.60	29.10	0.765	0.689	1.01	0.51	0.348	5%
29.40	1.31	0.31			0.811	0.90	34	29.10	29.83	0.811	0.730	1.00	0.72	0.529	8%
30.25	1.35	0.30			0.802	0.90	35	29.83	30.70	0.802	0.721	1.05	0.92	0.663	10%
31.15	1.33	0.34			0.689	0.90	36	30.70	31.93	0.689	0.620	0.99	1.21	0.752	11%
32.70	0.00	0.00				0.90	37	31.93	32.70	0.172	0.155	0.00	0.00	0.000	0%
Total Flow:														6.543	1.000

Total Flow:	6.543	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	24.22	(m ²)
Top Width:	32.70	(m)
Hydraulic Depth:	0.741	(m)
Mean Velocity:	0.270	(m/s)
Froude Number	0.100	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes: Slush around 0.6 D on offsets 22.6, 21.8, 21.05, 20.3, therefore mmt taken just below slush. Suggest doing flow mmts further downstream, closer to bridge to avoid similar bad mmts.



Hydrometric Measurement / Site Visit Record

Christina River near Chard (07CE002) - S29



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Christina River
Location: S29
Site Name: Christina River near Chard (07CE002)
Coordinates & Legal: 6252434 N, 476998 E SE-16-79-6-W4

Time of Measurement

Date of Measurement: February 13, 2008
Start Time: 10:30 AM MDT
End Time: 11:20 AM MDT

Weather Conditions:

River Conditions: -20 snowing
Ice Cover light wind

Personnel & Equipment

Measurement Made By: SM/SMS
Data Entry By: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: 94-1 1.409
Water Level Reading: WSC 5.945
Top of Ice Level Reading: 5.953
Transducer Reading & Est. El.: 5.315
Other:

Setup No. 1

El: 99.703
El: 95.167
El: 95.159
El: 89.852
El:

Setup No. 2

El: 99.703
El: 95.165
El: 95.152
El: 89.850
El:

Average

95.166
95.156
89.851

Measurement Data

Measured Data						Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	13.00	0.00	0.00			0	0.90	1	13.00	14.00	0.000	0.000	0.14	0.14	0.000	0%
	15.00	0.90	0.34			0	0.90	2	14.00	15.45	0.000	0.000	0.56	0.81	0.000	0%
	15.90	0.90	0.34			0.003	0.90	3	15.45	16.25	0.003	0.003	0.56	0.45	0.001	0%
	16.60	0.90	0.40			0	0.90	4	16.25	16.95	0.000	0.000	0.50	0.35	0.000	0%
	17.30	0.88	0.45			0.006	0.90	5	16.95	17.60	0.006	0.005	0.43	0.28	0.002	0%
	17.90	0.90	0.45			0.494	0.90	6	17.60	18.15	0.494	0.444	0.45	0.25	0.110	4%
	18.40	0.92	0.42			0.530	0.90	7	18.15	18.75	0.530	0.477	0.50	0.30	0.143	5%
	19.10	0.80	0.45			0.634	0.90	8	18.75	19.50	0.634	0.571	0.35	0.26	0.150	6%
	19.90	0.88	0.46			0.625	0.90	9	19.50	20.15	0.625	0.562	0.42	0.27	0.154	6%
	20.40	0.90	0.50			0.530	0.90	10	20.15	20.60	0.530	0.477	0.40	0.18	0.086	3%
	20.80	0.85	0.47			0.564	0.90	11	20.60	21.23	0.564	0.507	0.38	0.24	0.121	5%
	21.65	0.88	0.50			0.649	0.90	12	21.23	21.88	0.649	0.584	0.38	0.25	0.144	5%
	22.10	0.90	0.55			0.646	0.90	13	21.88	22.30	0.646	0.582	0.35	0.15	0.087	3%
	22.50	0.90	0.55			0.652	0.90	14	22.30	22.70	0.652	0.587	0.35	0.14	0.082	3%
	22.90	0.92	0.53			0.664	0.90	15	22.70	23.13	0.664	0.598	0.39	0.17	0.099	4%
	23.35	0.97	0.50			0.622	0.90	16	23.13	23.58	0.622	0.560	0.47	0.21	0.118	4%
	23.80	0.97	0.50			0.671	0.90	17	23.58	24.08	0.671	0.604	0.47	0.24	0.142	5%
	24.35	0.96	0.53			0.686	0.90	18	24.08	24.58	0.686	0.617	0.43	0.22	0.133	5%
	24.80	0.90	0.50			0.692	0.90	19	24.58	25.05	0.692	0.623	0.40	0.19	0.118	4%
	25.30	0.90	0.55			0.741	0.90	20	25.05	25.55	0.741	0.667	0.35	0.18	0.117	4%
	25.80	0.85	0.56			0.728	0.90	21	25.55	26.08	0.728	0.656	0.29	0.15	0.100	4%
	26.35	0.80	0.56			0.759	0.90	22	26.08	26.63	0.759	0.683	0.24	0.13	0.090	3%
	26.90	0.75	0.53			0.780	0.90	23	26.63	27.05	0.780	0.702	0.22	0.09	0.066	2%
	27.20	0.73	0.48			0.765	0.90	24	27.05	27.40	0.765	0.689	0.25	0.09	0.060	2%
	27.60	0.70	0.30			0.753	0.90	25	27.40	27.85	0.753	0.678	0.40	0.18	0.122	5%
	28.10	0.65	0.15			0.744	0.90	26	27.85	29.05	0.744	0.669	0.50	0.60	0.402	15%
	LB	30.00	0.00	0.00			0	0.90	27	29.05	30.00	0.186	0.167	0.13	0.12	0.020
Total Flow:															2.665	1.000

Total Flow:	2.665	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	6.62	(m ²)
Top Width:	17.00	(m)
Hydraulic Depth:	0.390	(m)
Mean Velocity:	0.402	(m/s)
Froude Number	0.206	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power:

Data logger External Power:

Data logger Memory Used:

Data logger Clock:

Laptop Clock:

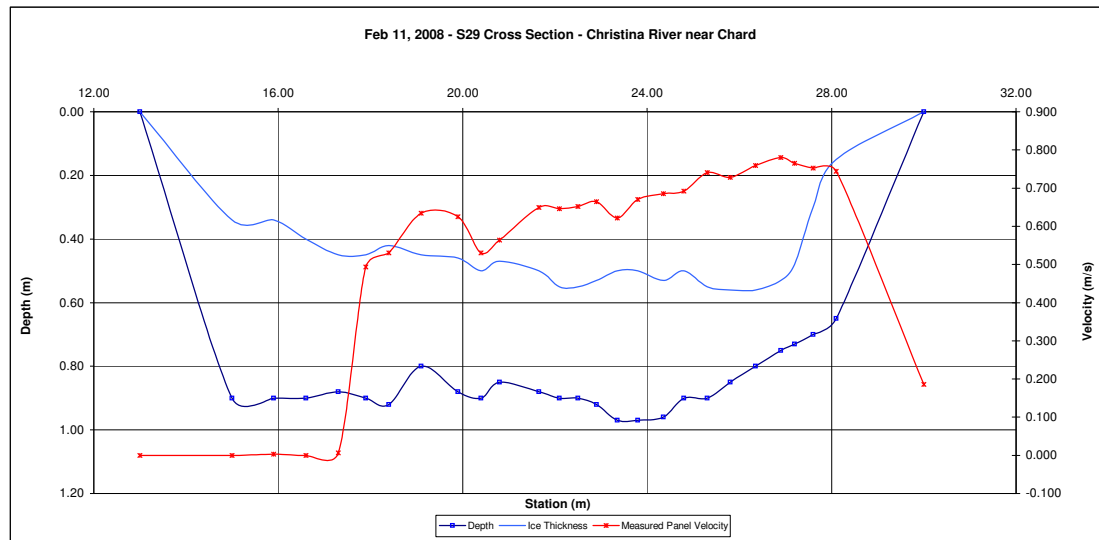
Dessicant:

Data logger:

PT:

Power:

Notes: flow velocity negligible



Hydrometric Measurement / Site Visit Record

Christina River near Chard (07CE002) - S29



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Christina River
Location: S29
Site Name: Christina River near Chard (07CE002)
Coordinates & Legal: 6252434 N, 476998 E SE-16-79-6-W4

Time of Measurement

Date of Measurement: March 12, 2008
Start Time: 9:05 AM MDT
End Time: 9:30 AM MDT

Weather Conditions:

River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: js jvr sm Checked by: LM
Data Entry By: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: t-post 1.459
Water Level Reading: 5.174
Top of Ice Level Reading: 5.165
Transducer Reading & Est. El.: 5.510
Other: Water level at WSC 94-1
Other: nail in tree 0.938

Setup No. 1

El: 99.076
El: 95.361
El: 95.370
El: 89.851
El: 100.535

Setup No. 2

1.4 El: 99.076
5.109 El: 95.367
5.088 El: 95.388
5.510 El: 89.857
El: 100.476

Average

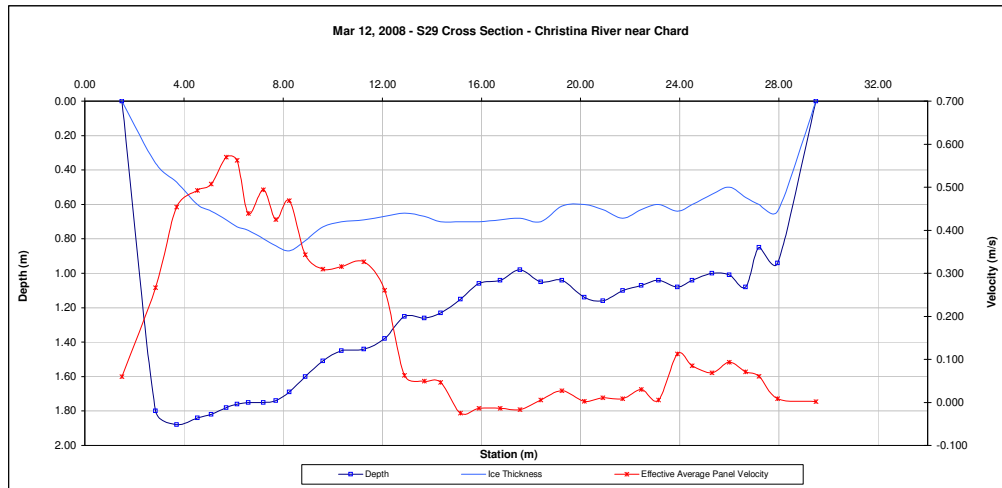
95.364
95.388
89.854
100.506
99.599

		Measured Data					Measurement Data					Calculated Data					Percentage of Total
		Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
		(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
RB		1.50	0.00	0.00	0.000	0.000		0.90	1	1.50	2.18	0.067	0.060	0.36	0.24	0.015	0%
		2.85	1.80	0.36	0.296	0.238		1.00	2	2.18	3.28	0.267	0.267	1.44	1.58	0.422	10%
		3.70	1.88	0.47	0.445	0.463		1.00	3	3.28	4.13	0.454	0.454	1.41	1.20	0.544	12%
		4.55	1.84	0.60	0.512	0.472		1.00	4	4.13	4.83	0.492	0.492	1.24	0.87	0.427	10%
		5.10	1.82	0.64	0.536	0.479		1.00	5	4.83	5.40	0.507	0.507	1.18	0.68	0.344	8%
		5.70	1.78	0.69	0.594	0.546		1.00	6	5.40	5.93	0.570	0.570	1.09	0.57	0.326	7%
		6.15	1.76	0.73			0.625	0.90	7	5.93	6.38	0.625	0.562	1.03	0.46	0.261	6%
		6.60	1.75	0.75			0.488	0.90	8	6.38	6.90	0.488	0.439	1.00	0.53	0.230	5%
		7.20	1.75	0.80			0.549	0.90	9	6.90	7.45	0.549	0.494	0.95	0.52	0.258	6%
		7.70	1.74	0.84			0.472	0.90	10	7.45	7.98	0.472	0.425	0.90	0.47	0.201	5%
		8.25	1.69	0.87			0.521	0.90	11	7.98	8.58	0.521	0.469	0.82	0.49	0.231	5%
		8.90	1.60	0.81			0.381	0.90	12	8.58	9.25	0.381	0.343	0.79	0.53	0.183	4%
		9.60	1.51	0.73			0.344	0.90	13	9.25	9.98	0.344	0.310	0.78	0.57	0.175	4%
		10.35	1.45	0.70			0.351	0.90	14	9.98	10.80	0.351	0.315	0.75	0.62	0.195	4%
		11.25	1.44	0.69			0.363	0.90	15	10.80	11.68	0.363	0.326	0.75	0.66	0.214	5%
		12.10	1.38	0.67			0.290	0.90	16	11.68	12.50	0.290	0.261	0.71	0.59	0.153	3%
		12.90	1.25	0.65			0.070	0.90	17	12.50	13.30	0.070	0.063	0.60	0.48	0.030	1%
		13.70	1.26	0.67			0.055	0.90	18	13.30	14.03	0.055	0.049	0.59	0.43	0.021	0%
		14.35	1.23	0.70			0.052	0.90	19	14.03	14.75	0.052	0.047	0.53	0.38	0.018	0%
		15.15	1.15	0.70			-0.027	0.90	20	14.75	15.53	-0.027	-0.025	0.45	0.35	-0.009	0%
		15.90	1.06	0.70			-0.015	0.90	21	15.53	16.33	-0.015	-0.014	0.36	0.29	-0.004	0%
		16.75	1.04	0.69			-0.015	0.90	22	16.33	17.15	-0.015	-0.014	0.35	0.29	-0.004	0%
		17.55	0.98	0.68			-0.018	0.90	23	17.15	17.98	-0.018	-0.016	0.30	0.25	-0.004	0%
		18.40	1.05	0.70			0.006	0.90	24	17.98	18.83	0.006	0.005	0.35	0.30	0.002	0%
		19.25	1.04	0.61			0.030	0.90	25	18.83	19.70	0.030	0.027	0.43	0.38	0.010	0%
		20.15	1.14	0.60			0.003	0.90	26	19.70	20.53	0.003	0.003	0.54	0.45	0.001	0%
		20.90	1.16	0.63			0.012	0.90	27	20.53	21.30	0.012	0.011	0.53	0.41	0.005	0%
		21.70	1.10	0.68			0.009	0.90	28	21.30	22.08	0.009	0.008	0.42	0.33	0.003	0%
		22.45	1.07	0.63			0.034	0.90	29	22.08	22.80	0.034	0.030	0.44	0.32	0.010	0%
		23.15	1.04	0.60			0.006	0.90	30	22.80	23.53	0.006	0.005	0.44	0.32	0.002	0%
		23.90	1.08	0.64			0.125	0.90	31	23.53	24.20	0.125	0.112	0.44	0.30	0.033	1%
		24.50	1.04	0.60			0.094	0.90	32	24.20	24.90	0.094	0.085	0.44	0.31	0.026	1%
		25.30	1.00	0.54			0.076	0.90	33	24.90	25.65	0.076	0.069	0.46	0.35	0.024	1%
		26.00	1.01	0.50			0.104	0.90	34	25.65	26.33	0.104	0.093	0.51	0.34	0.032	1%
		26.65	1.08	0.56			0.079	0.90	35	26.33	26.93	0.079	0.071	0.52	0.31	0.022	1%
		27.20	0.85	0.60			0.067	0.90	36	26.93	27.58	0.067	0.060	0.25	0.16	0.010	0%
LB		27.95	0.94	0.64			0.009	0.90	37	27.58	28.73	0.009	0.008	0.30	0.35	0.003	0%
		29.50	0.00	0.00			0.000	0.90	33	28.73	29.50	0.002	0.002	0.08	0.06	0.000	0%
Total Flow:																4.411	1.000

Total Flow:	4.411	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	17.71	(m ²)
Top Width:	28.00	(m)
Hydraulic Depth:	0.632	(m)
Mean Velocity:	0.249	(m/s)
Froude Number	0.100	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

Christina River near Chard (07CE002) - S29



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Christina River
Location: S29
Site Name: Christina River near Chard (07CE002)
Coordinates & Legal: 6252434 N, 476998 E SE-16-79-6-W4

Time of Measurement

Date of Measurement: March 31, 2008
Start Time: 12:55 PM MDT
End Time: 1:30 PM MDT

Weather Conditions:

windy -5 sunny

River Conditions:

Ice Cover

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: 1-post	1.607	El: 99.076	1.454
Water Level Reading:	5.393	El: 95.290	5.232
Top of Ice Level Reading:	5.309	El: 95.374	5.184
Transducer Reading & Est. El.:	5.298	El: 89.992	5.298
Other: Water level at WSC		El: 100.683	
Other: 94-1			
Other: nail in tree	1.086	99.597	0.937
			99.593
			99.595

		Measurement Data														
Measured Data							Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
LB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)		(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
	2.20	0.00	0.00			0.000	0.90	1	2.20	3.23	0.090	0.081	0.30	0.31	0.025	1%
	4.25	1.69	0.49	0.363	0.354		1.00	2	3.23	4.75	0.358	0.358	1.20	1.83	0.655	18%
	5.25	1.60	0.51			0.418	0.90	3	4.75	5.63	0.418	0.376	1.09	0.95	0.358	10%
	6.00	1.55	0.54			0.451	0.90	4	5.63	6.40	0.451	0.406	1.01	0.78	0.318	9%
	6.80	1.55	0.53			0.509	0.90	5	6.40	7.15	0.509	0.458	1.02	0.77	0.350	10%
	7.50	1.50	0.55			0.543	0.90	6	7.15	7.90	0.543	0.488	0.95	0.71	0.348	9%
	8.30	1.35	0.54			0.485	0.90	7	7.90	8.70	0.485	0.436	0.81	0.65	0.283	8%
	9.10	1.35	0.60			0.506	0.90	8	8.70	9.45	0.506	0.455	0.75	0.56	0.256	7%
	9.80	1.27	0.63			0.393	0.90	9	9.45	10.15	0.393	0.354	0.64	0.45	0.159	4%
	10.50	1.15	0.60			0.393	0.90	10	10.15	11.00	0.393	0.354	0.55	0.47	0.165	4%
	11.50	1.05	0.61			0.411	0.90	11	11.00	12.05	0.411	0.370	0.44	0.46	0.171	5%
	12.60	0.95	0.59			0.357	0.90	12	12.05	13.15	0.357	0.321	0.36	0.40	0.127	3%
	13.70	0.90	0.50			0.207	0.90	13	13.15	14.30	0.207	0.187	0.40	0.46	0.086	2%
	14.90	0.82	0.50			0.210	0.90	14	14.30	15.43	0.210	0.189	0.32	0.36	0.068	2%
	15.95	0.77	0.50			0.180	0.90	15	15.43	16.48	0.180	0.162	0.27	0.28	0.046	1%
	17.00	0.85	0.52			0.229	0.90	16	16.48	17.50	0.229	0.206	0.33	0.34	0.070	2%
	18.00	0.80	0.52			0.195	0.90	17	17.50	18.45	0.195	0.176	0.28	0.27	0.047	1%
	18.90	0.75	0.50			0.143	0.90	18	18.45	19.53	0.143	0.129	0.25	0.27	0.035	1%
	20.15	0.68	0.56			0.137	0.90	19	19.53	20.85	0.137	0.123	0.12	0.16	0.020	1%
	21.55	0.70	0.60			0.067	0.90	20	20.85	22.38	0.067	0.060	0.10	0.15	0.009	0%
	23.20	0.68	0.60			0.003	0.90	21	22.38	24.15	0.003	0.003	0.08	0.14	0.000	0%
	25.10	0.88	0.59			0.177	0.90	22	24.15	26.05	0.177	0.159	0.29	0.55	0.088	2%
27.00	0.00	0.00			0.000	0.90	23	26.05	27.00	0.044	0.040	0.07	0.07	0.003	0%	
RB																
	Total Flow:													3.686	100%	

Total Flow:	3.686	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	11.39	(m ²)
Top Width:	24.80	(m)
Hydraulic Depth:	0.459	(m)
Mean Velocity:	0.324	(m/s)
Froude Number	0.153	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power:

Data logger External Power:

Data logger Memory Used:

Data logger Clock:

Laptop Clock:

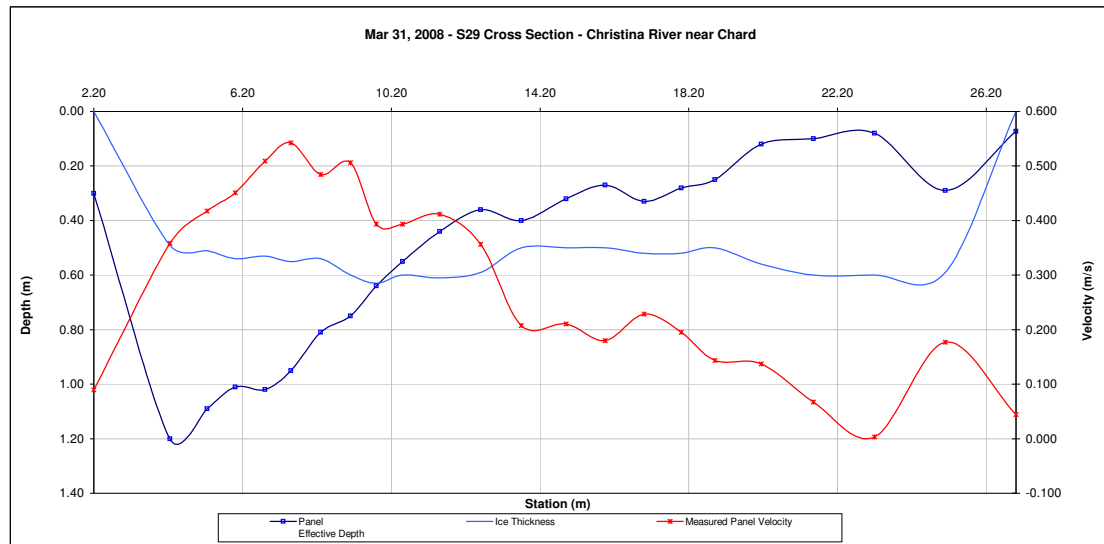
Dessicant:

Data logger:

PT:

Power:

Notes:



Hydrometric Measurement / Site Visit Record

Christina River near Chard (07CE002) - S29



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Christina River
Location: S29
Site Name: Christina River near Chard (07CE002)
Coordinates & Legal: 6252434 N, 476998 E SE-16-79-6-W4

Time of Measurement

Date of Measurement: December 8, 2008
Start Time: 1:30 PM MST
End Time: 2:00 PM MST

Weather Conditions:

cloudy, light snow, -18 C
River Conditions: ice cover, ice jam at station

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked:
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: WSC 94-1 1.438
Water Level Reading: 4.479
Top of Ice Level Reading: 4.449
Transducer Reading & Est. El.: 6.768
Other: nail in bridge 4.291

Setup No. 1

El: 99.703
El: 96.662
El: 96.692
El: 89.894
El: 96.850

Setup No. 2

El: 99.703
El: 96.648
El: 96.689
El: 89.880
El: 96.845

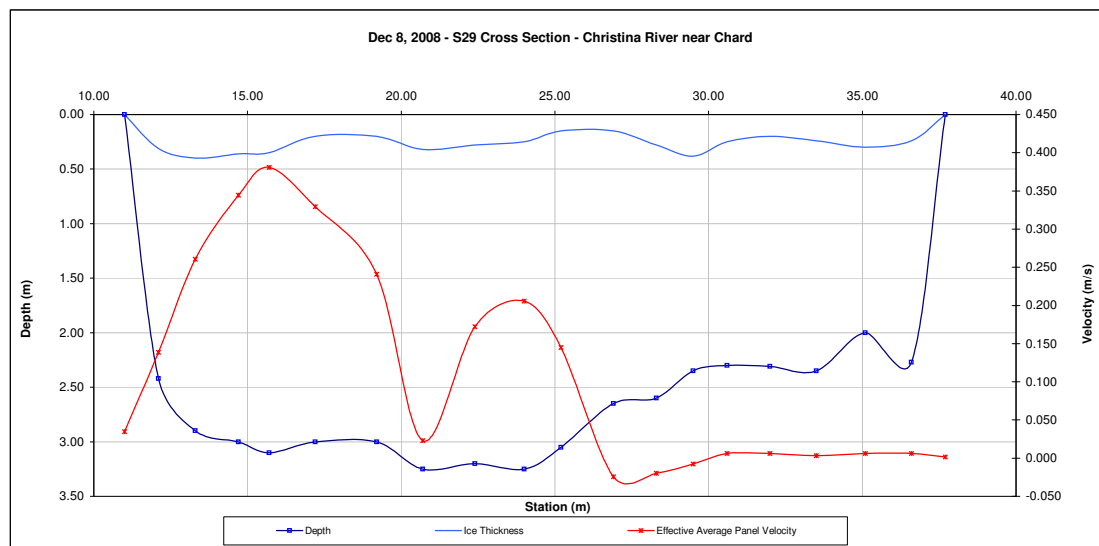
Average

96.655
96.691
89.887
96.848

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
11.00	0.00	0.00				1.00	1	11.00	11.55	0.035	0.035	0.53	0.29	0.010	0%
12.10	2.42	0.31	0.009	0.268		1.00	2	11.55	12.70	0.139	0.139	2.11	2.43	0.337	4%
13.30	2.90	0.40	-0.015	0.536		1.00	3	12.70	14.00	0.261	0.261	2.50	3.25	0.847	10%
14.70	3.00	0.36	0.003	0.686		1.00	4	14.00	15.20	0.344	0.344	2.64	3.17	1.091	13%
15.70	3.10	0.35	0.000	0.762		1.00	5	15.20	16.45	0.381	0.381	2.75	3.44	1.310	15%
17.20	3.00	0.20	0.003	0.655		1.00	6	16.45	18.20	0.329	0.329	2.80	4.90	1.613	19%
19.20	3.00	0.20	-0.015	0.497		1.00	7	18.20	19.95	0.241	0.241	2.80	4.90	1.180	14%
20.70	3.25	0.32	0.003	0.043		1.00	8	19.95	21.55	0.023	0.023	2.93	4.69	0.107	1%
22.40	3.20	0.28	0.012	0.332		1.00	9	21.55	23.20	0.172	0.172	2.92	4.82	0.830	10%
24.00	3.25	0.25	-0.003	0.415		1.00	10	23.20	24.60	0.206	0.206	3.00	4.20	0.864	10%
25.20	3.05	0.15	-0.006	0.296		1.00	11	24.60	26.05	0.145	0.145	2.90	4.20	0.609	7%
26.90	2.65	0.15	-0.018	-0.030		1.00	12	26.05	27.60	-0.024	-0.024	2.50	3.88	-0.094	-1%
28.30	2.60	0.28	-0.024	-0.015		1.00	13	27.60	28.90	-0.020	-0.020	2.32	3.02	-0.060	-1%
29.50	2.35	0.38	-0.015	0.000		1.00	14	28.90	30.05	-0.008	-0.008	1.97	2.27	-0.017	0%
30.60	2.30	0.25	0.006	0.006		1.00	15	30.05	31.30	0.006	0.006	2.05	2.56	0.016	0%
32.00	2.31	0.20	0.009	0.003		1.00	16	31.30	32.75	0.006	0.006	2.11	3.06	0.019	0%
33.50	2.35	0.24	0.000	0.006		1.00	17	32.75	34.30	0.003	0.003	2.11	3.27	0.010	0%
35.10	2.00	0.30	0.003	0.009		1.00	18	34.30	35.85	0.006	0.006	1.70	2.64	0.016	0%
36.60	2.27	0.24	0.006	0.006		1.00	19	35.85	37.15	0.006	0.006	2.03	2.64	0.016	0%
37.70	0.00	0.00				1.00	20	37.15	37.70	0.002	0.002	0.51	0.28	0.000	0%
Total Flow:														8.702	100%

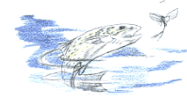
Total Flow:	8.702	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	63.89	(m ²)
Top Width:	26.70	(m)
Hydraulic Depth:	2.393	(m)
Mean Velocity:	0.136	(m/s)
Froude Number	0.028	
Photographs taken looking at:		
Photographs taken.		

Notes: slush throughout depth of flow and across most of cross section
ice jam present at station



Hydrometric Measurement / Site Visit Record

S31 - Hangstone Creek at North Star Road



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Hangstone Creek
Location: Hangstone Creek at North Star Road
Site Name: S31
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M

Time of Measurement

Date of Measurement: May 6, 2008
Start Time: 12:18 PM MDT
End Time: 12:38 PM MDT

Weather Conditions:

clear, calm, 15 C

River Conditions:

bank full, high stage

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail on LB 0.923
Water Level Reading: 1.768
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.998
Other: T-post on RB 0.788

Setup No. 1

El: 100.000 0.948
El: 99.155 1.788
El: 98.157 0.998
El: 100.135 0.815

Setup No. 2

El: 100.000
El: 99.160
El: 98.162
El: 100.134

Average

99.158
98.160
100.134

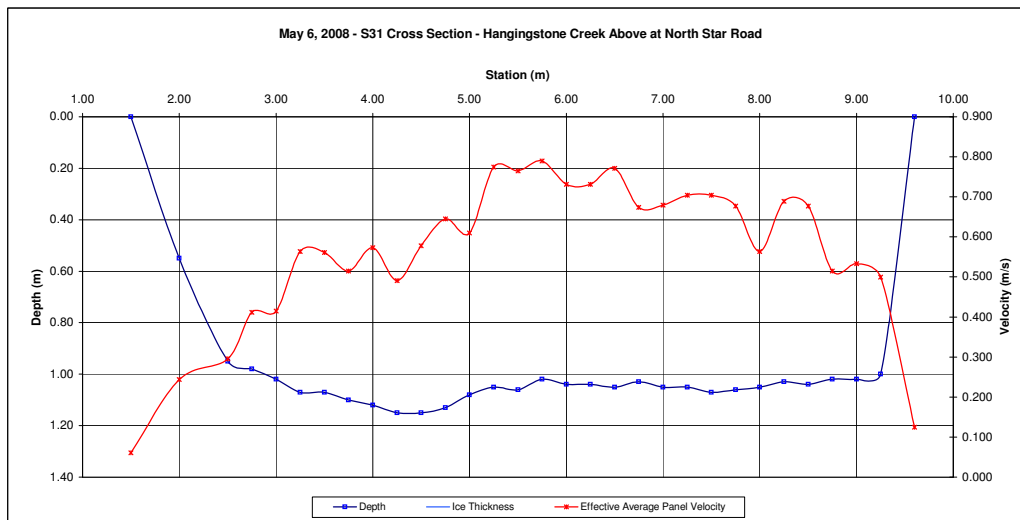
Measurement Data

RB	Measured Data					Calculated Data										Percentage of Total	
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
	1.50	0.00					1.00	1	1.50	1.75	0.061	0.061	0.14	0.03	0.002	0%	
	2.00	0.55			0.244	1.00		2	1.75	2.25	0.244	0.244	0.55	0.28	0.067	1%	
	2.50	0.95			0.296	1.00		3	2.25	2.63	0.296	0.296	0.95	0.36	0.105	2%	
	2.75	0.98			0.411	1.00		4	2.63	2.88	0.411	0.411	0.98	0.25	0.101	2%	
	3.00	1.02			0.415	1.00		5	2.88	3.13	0.415	0.415	1.02	0.26	0.106	2%	
	3.25	1.07			0.564	1.00		6	3.13	3.38	0.564	0.564	1.07	0.27	0.151	3%	
	3.50	1.07			0.561	1.00		7	3.38	3.63	0.561	0.561	1.07	0.27	0.150	3%	
	3.75	1.10			0.515	1.00		8	3.63	3.88	0.515	0.515	1.10	0.28	0.142	3%	
	4.00	1.12			0.573	1.00		9	3.88	4.13	0.573	0.573	1.12	0.28	0.160	3%	
	4.25	1.15		0.582	0.399		1.00	10	4.13	4.38	0.491	0.491	1.15	0.29	0.141	3%	
	4.50	1.15		0.637	0.518		1.00	11	4.38	4.63	0.578	0.578	1.15	0.29	0.166	4%	
	4.75	1.13		0.634	0.655		1.00	12	4.63	4.88	0.645	0.645	1.13	0.28	0.182	4%	
	5.00	1.08				0.610	1.00	13	4.88	5.13	0.610	0.610	1.08	0.27	0.165	4%	
	5.25	1.05				0.774	1.00	14	5.13	5.38	0.774	0.774	1.05	0.26	0.203	4%	
	5.50	1.06				0.765	1.00	15	5.38	5.63	0.765	0.765	1.06	0.27	0.203	4%	
	5.75	1.02				0.789	1.00	16	5.63	5.88	0.789	0.789	1.02	0.26	0.201	4%	
	6.00	1.04				0.732	1.00	17	5.88	6.13	0.732	0.732	1.04	0.26	0.190	4%	
	6.25	1.04				0.732	1.00	18	6.13	6.38	0.732	0.732	1.04	0.26	0.190	4%	
	6.50	1.05				0.771	1.00	19	6.38	6.63	0.771	0.771	1.05	0.26	0.202	4%	
	6.75	1.03				0.674	1.00	20	6.63	6.88	0.674	0.674	1.03	0.26	0.173	4%	
	7.00	1.05				0.680	1.00	21	6.88	7.13	0.680	0.680	1.05	0.26	0.178	4%	
	7.25	1.05				0.704	1.00	22	7.13	7.38	0.704	0.704	1.05	0.26	0.185	4%	
	7.50	1.07				0.704	1.00	23	7.38	7.63	0.704	0.704	1.07	0.27	0.188	4%	
	7.75	1.06				0.677	1.00	24	7.63	7.88	0.677	0.677	1.06	0.27	0.179	4%	
	8.00	1.05				0.564	1.00	25	7.88	8.13	0.564	0.564	1.05	0.26	0.148	3%	
	8.25	1.03				0.689	1.00	26	8.13	8.38	0.689	0.689	1.03	0.26	0.177	4%	
	8.50	1.04				0.677	1.00	27	8.38	8.63	0.677	0.677	1.04	0.26	0.176	4%	
	8.75	1.02				0.515	1.00	28	8.63	8.88	0.515	0.515	1.02	0.26	0.131	3%	
	9.00	1.02				0.533	1.00	29	8.88	9.13	0.533	0.533	1.02	0.26	0.136	3%	
	9.25	1.00				0.500	1.00	30	9.13	9.43	0.500	0.500	1.00	0.30	0.150	3%	
	9.60	0.00					1.00	31	9.43	9.60	0.125	0.125	0.25	0.04	0.005	0%	
LB	Total Flow:															4.656	1.000

Total Flow:	4.656	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	7.90	(m ²)
Top Width:	8.10	(m)
Hydraulic Depth:	0.975	(m)
Mean Velocity:	0.590	(m/s)
Froude Number	0.191	
Photographs taken looking at:		
Upstream, downstream, across		

Notes: Station installed
Manual water temp 3.5 C

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.9 V	83%
Data logger Memory Used:	0%	
Data logger Clock:	12:00 PM	MST
Laptop Clock:	12:00 PM	MST
Dessicant:	new	
Data logger:	207110	
PT:	0505006-5872	
Power:	Lakewood battery	



Hydrometric Measurement / Site Visit Record

S31 - Hanginstone Creek at North Star Road



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Hanginstone Creek
Location: Hanginstone Creek at North Star Road
Site Name: S31
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M

Time of Measurement

Date of Measurement: June 22, 2008
Start Time: 6:30 PM MDT
End Time: 6:50 PM MDT

Weather Conditions:

overcast 20C

River Conditions:

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: LM Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: NIT
Water Level Reading: 2.040
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 0.261
Other: T Post 0.362

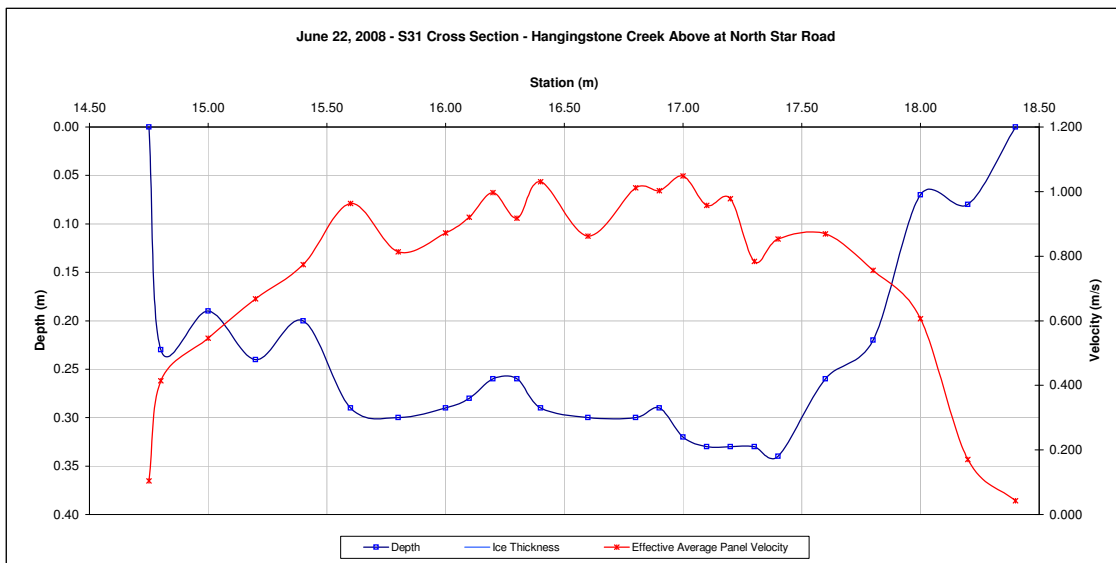
Setup No. 1	Setup No. 2	Average
El: 100.000	0.948	El: 100.000
El: 98.456	2.562	El: 98.454
El: 98.195	0.261	El: 98.193
El: 100.134	0.882	El: 100.134

Measured Data										Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at	Panel Ends at	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
LB	14.75	0.00				1.00	1	14.75	14.78	0.104	0.104	0.06	0.00	0.000	0%				
	14.80	0.23			0.415	1.00	2	14.78	14.90	0.415	0.415	0.23	0.03	0.012	2%				
	15.00	0.19			0.546	1.00	3	14.90	15.10	0.546	0.546	0.19	0.04	0.021	3%				
	15.20	0.24			0.668	1.00	4	15.10	15.30	0.668	0.668	0.24	0.05	0.032	4%				
	15.40	0.20			0.774	1.00	5	15.30	15.50	0.774	0.774	0.20	0.04	0.031	4%				
	15.60	0.29			0.963	1.00	6	15.50	15.70	0.963	0.963	0.29	0.06	0.056	8%				
	15.80	0.30			0.814	1.00	7	15.70	15.90	0.814	0.814	0.30	0.06	0.049	7%				
	16.00	0.29			0.872	1.00	8	15.90	16.05	0.872	0.872	0.29	0.04	0.038	5%				
	16.10	0.28			0.920	1.00	9	16.05	16.15	0.920	0.920	0.28	0.03	0.026	3%				
	16.20	0.26			0.997	1.00	10	16.15	16.25	0.997	0.997	0.26	0.03	0.026	3%				
	16.30	0.26			0.917	1.00	11	16.25	16.35	0.917	0.917	0.26	0.03	0.024	3%				
	16.40	0.29			1.030	1.00	12	16.35	16.50	1.030	1.030	0.29	0.04	0.045	6%				
	16.60	0.30			0.863	1.00	13	16.50	16.70	0.863	0.863	0.30	0.06	0.052	7%				
	16.80	0.30			1.012	1.00	14	16.70	16.85	1.012	1.012	0.30	0.04	0.046	6%				
	16.90	0.29			1.003	1.00	15	16.85	16.95	1.003	1.003	0.29	0.03	0.029	4%				
	17.00	0.32			1.049	1.00	16	16.95	17.05	1.049	1.049	0.32	0.03	0.034	5%				
	17.10	0.33			0.957	1.00	17	17.05	17.15	0.957	0.957	0.33	0.03	0.032	4%				
	17.20	0.33			0.978	1.00	18	17.15	17.25	0.978	0.978	0.33	0.03	0.032	4%				
	17.30	0.33			0.783	1.00	19	17.25	17.35	0.783	0.783	0.33	0.03	0.026	3%				
	17.40	0.34			0.853	1.00	20	17.35	17.50	0.853	0.853	0.34	0.05	0.044	6%				
RB	17.60	0.26			0.869	1.00	21	17.50	17.70	0.869	0.869	0.26	0.05	0.045	6%				
	17.80	0.22			0.756	1.00	22	17.70	17.90	0.756	0.756	0.22	0.04	0.033	4%				
	18.00	0.07			0.607	1.00	23	17.90	18.10	0.607	0.607	0.07	0.01	0.008	1%				
	18.20	0.08			0.171	1.00	24	18.10	18.30	0.171	0.171	0.08	0.02	0.003	0%				
	18.40	0.00			0.000	1.00	25	18.30	18.40	0.043	0.043	0.02	0.00	0.000	0%				
Total Flow:														0.742	1.000				

Total Flow:	0.742	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.89	(m ²)
Top Width:	3.65	(m)
Hydraulic Depth:	0.243	(m)
Mean Velocity:	0.838	(m/s)
Froude Number	0.543	
Photographs taken looking at:		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	13.02 V	84%
Data logger Memory Used:	55635	85%
Data logger Clock:	5:06 PM	MST
Laptop Clock:	5:06 PM	MST
Dessicant:	good	
Data logger:	207110	
PT:	0505006-5872	
Power:	Lakewood battery	

Notes: -water temp. 13 C
-TSS - yes



Hychrometric Measurement / Site Visit Record

S31 - Hanginstone Creek at North Star Road



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Hanginstone Creek
Location: Hanginstone Creek at North Star Road
Site Name: S31
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M

Time of Measurement

Date of Measurement: September 8, 2008
Start Time: 2:40 PM MDT
End Time: 2:50 PM MDT

Weather Conditions:

overcast, 15 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: NIT
Water Level Reading: 2.252
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 0.341
Other: T Post 0.538

Setup No. 1

El: 100.000
El: 98.420
El: 2.206
El: 98.079
El: 100.134

Setup No. 2

El: 100.000
El: 98.424
El: 98.083
El: 100.134

Average

98.422
98.081
100.134

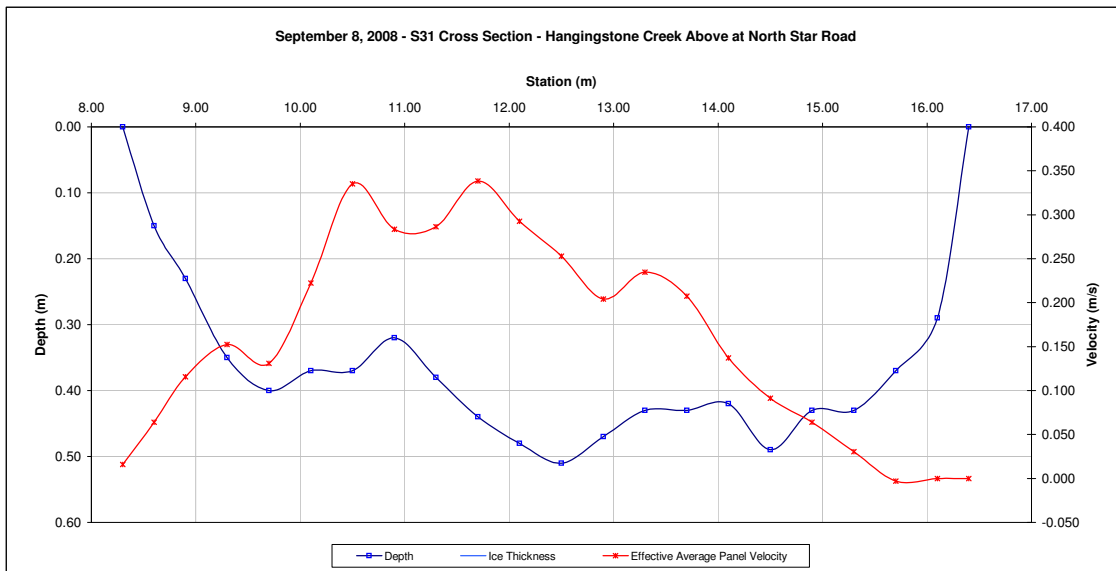
Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
8.30	0.00					1.00	1	8.30	8.45	0.016	0.016	0.04	0.01	0.000	0%
8.60	0.15				0.064	1.00	2	8.45	8.75	0.064	0.064	0.15	0.05	0.003	1%
8.90	0.23				0.116	1.00	3	8.75	9.10	0.116	0.116	0.23	0.08	0.009	2%
9.30	0.35				0.152	1.00	4	9.10	9.50	0.152	0.152	0.35	0.14	0.021	4%
9.70	0.40				0.131	1.00	5	9.50	9.90	0.131	0.131	0.40	0.16	0.021	4%
10.10	0.37				0.223	1.00	6	9.90	10.30	0.223	0.223	0.37	0.15	0.033	6%
10.50	0.37				0.335	1.00	7	10.30	10.70	0.335	0.335	0.37	0.15	0.050	9%
10.90	0.32				0.283	1.00	8	10.70	11.10	0.283	0.283	0.32	0.13	0.036	7%
11.30	0.38				0.287	1.00	9	11.10	11.50	0.287	0.287	0.38	0.15	0.044	8%
11.70	0.44				0.338	1.00	10	11.50	11.90	0.338	0.338	0.44	0.18	0.060	11%
12.10	0.48				0.293	1.00	11	11.90	12.30	0.293	0.293	0.48	0.19	0.056	10%
12.50	0.51				0.253	1.00	12	12.30	12.70	0.253	0.253	0.51	0.20	0.052	9%
12.90	0.47				0.204	1.00	13	12.70	13.10	0.204	0.204	0.47	0.19	0.038	7%
13.30	0.43				0.235	1.00	14	13.10	13.50	0.235	0.235	0.43	0.17	0.040	7%
13.70	0.43				0.207	1.00	15	13.50	13.90	0.207	0.207	0.43	0.17	0.036	6%
14.10	0.42				0.137	1.00	16	13.90	14.30	0.137	0.137	0.42	0.17	0.023	4%
14.50	0.49				0.091	1.00	17	14.30	14.70	0.091	0.091	0.49	0.20	0.018	3%
14.90	0.43				0.064	1.00	18	14.70	15.10	0.064	0.064	0.43	0.17	0.011	2%
15.30	0.43				0.030	1.00	19	15.10	15.50	0.030	0.030	0.43	0.17	0.005	1%
15.70	0.37				-0.003	1.00	20	15.50	15.90	-0.003	-0.003	0.37	0.15	0.000	0%
16.10	0.29				0.000	1.00	21	15.90	16.25	0.000	0.000	0.29	0.10	0.000	0%
16.40	0.00				1.00	1.00	22	16.25	16.40	0.000	0.000	0.07	0.01	0.000	0%
Total Flow:														0.555	1.000

Total Flow:	0.555	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	3.08	(m ²)
Top Width:	8.10	(m)
Hydraulic Depth:	0.380	(m)
Mean Velocity:	0.180	(m/s)
Froude Number	0.093	
Photographs taken looking at:		

Data logger Notes:	
Data logger Internal Power:	11.34 V 100%
Data logger External Power:	12.05 81%
Data logger Memory Used:	40%
Data logger Clock:	1:33 PM MST
Laptop Clock:	1:35 PM MST
Dessicant:	50 percent
Data logger:	207110
PT:	0505006-5872
Power:	Lakewood battery

Notes: evidence of beaver backwater
data downloaded is good, checked on site, no evidence of TD shift from initial check
bring rebar for new BM



Hydrometric Measurement / Site Visit Record

S31 - Hanginstone Creek at North Star Road



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Hanginstone Creek
Location: Hanginstone Creek at North Star Road
Site Name: S31
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M

Time of Measurement

Date of Measurement: October 13, 2008
Start Time: 1:37 PM MDT
End Time: 1:51 PM MDT

Weather Conditions:

clear, 8 C
River Conditions: open, low

Personnel & Equipment

Measurement Made By: SM/JSL
Data Entry By: SS Checked: Marsh McBirney FloMate 2000
Meter Type and No.: s/n 2004521

Level Readings

Bench Mark Reading: NIT
Water Level Reading: 1.547
Top of Ice Level Reading: 3.057
Transducer Reading & Calc'd El: 0.416
Other: T Post 1.412

Setup No. 1

El: 100.000
El: 98.490
El: 98.074
El: 100.135

Setup No. 2

El: 100.000
El: 98.490
El: 98.074
El: 100.130

Average

98.490
98.074
100.133

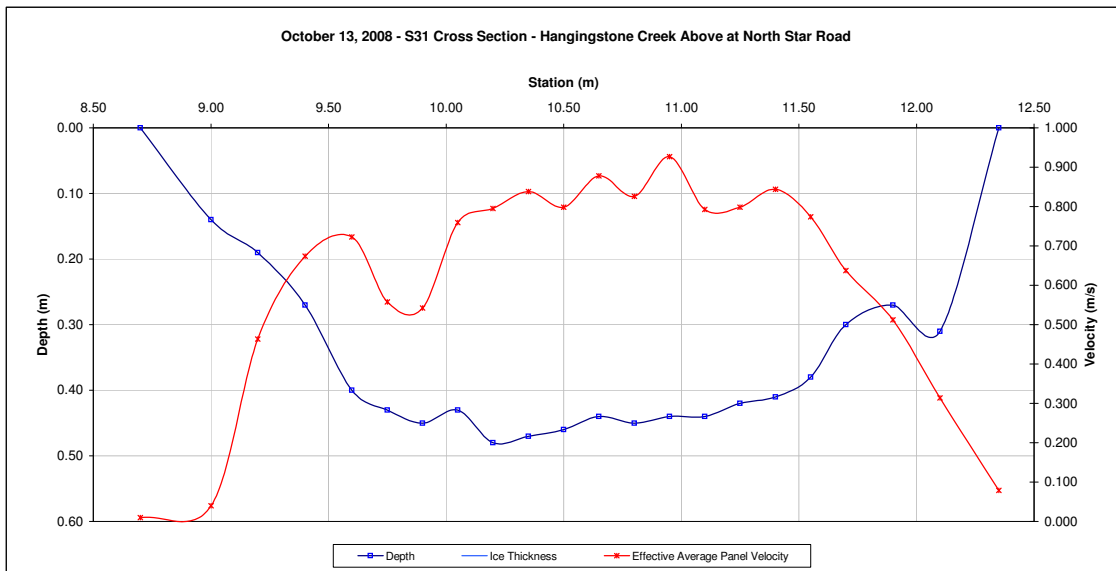
Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
8.70	0.00					1.00	1	8.70	8.85	0.010	0.010	0.04	0.01	0.000	0%
9.00	0.14				0.040	1.00	2	8.85	9.10	0.040	0.040	0.14	0.04	0.001	0%
9.20	0.19				0.463	1.00	3	9.10	9.30	0.463	0.463	0.19	0.04	0.018	2%
9.40	0.27				0.674	1.00	4	9.30	9.50	0.674	0.674	0.27	0.05	0.036	4%
9.60	0.40				0.722	1.00	5	9.50	9.68	0.722	0.722	0.40	0.07	0.051	6%
9.75	0.43				0.558	1.00	6	9.68	9.83	0.558	0.558	0.43	0.06	0.036	4%
9.90	0.45				0.543	1.00	7	9.83	9.98	0.543	0.543	0.45	0.07	0.037	4%
10.05	0.43				0.759	1.00	8	9.98	10.13	0.759	0.759	0.43	0.06	0.049	6%
10.20	0.48				0.796	1.00	9	10.13	10.28	0.796	0.796	0.48	0.07	0.057	7%
10.35	0.47				0.838	1.00	10	10.28	10.43	0.838	0.838	0.47	0.07	0.059	7%
10.50	0.46				0.799	1.00	11	10.43	10.58	0.799	0.799	0.46	0.07	0.055	6%
10.65	0.44				0.878	1.00	12	10.58	10.73	0.878	0.878	0.44	0.07	0.058	7%
10.80	0.45				0.826	1.00	13	10.73	10.88	0.826	0.826	0.45	0.07	0.056	7%
10.95	0.44				0.927	1.00	14	10.88	11.03	0.927	0.927	0.44	0.07	0.061	7%
11.10	0.44				0.792	1.00	15	11.03	11.18	0.792	0.792	0.44	0.07	0.052	6%
11.25	0.42				0.799	1.00	16	11.18	11.33	0.799	0.799	0.42	0.06	0.050	6%
11.40	0.41				0.844	1.00	17	11.33	11.48	0.844	0.844	0.41	0.06	0.052	6%
11.55	0.38				0.774	1.00	18	11.48	11.63	0.774	0.774	0.38	0.06	0.044	5%
11.70	0.30				0.637	1.00	19	11.63	11.80	0.637	0.637	0.30	0.05	0.033	4%
11.90	0.27				0.512	1.00	20	11.80	12.00	0.512	0.512	0.27	0.05	0.028	3%
12.10	0.31				0.314	1.00	21	12.00	12.23	0.314	0.314	0.31	0.07	0.022	3%
12.35	0.00					1.00	22	12.23	12.35	0.078	0.078	0.08	0.01	0.001	0%
Total Flow:														0.856	1.000

Total Flow:	0.856	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.24	(m ²)
Top Width:	3.65	(m)
Hydraulic Depth:	0.341	(m)
Mean Velocity:	0.689	(m/s)
Froude Number	0.377	
Photographs taken looking at:		

Data logger Notes:	
Data logger Internal Power:	11.34 V 100%
Data logger External Power:	12.41 V 80%
Data logger Memory Used:	20%
Data logger Clock:	12:31 PM MST
Laptop Clock:	12:31 PM MST
Dessicant:	ok
Data logger:	207110
PT:	0505006-5872
Power:	Lakewood battery

Notes: Station removed for winter



Hydrometric Measurement / Site Visit Record

S32 - Surmont Creek at Highway 881



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Surmont Creek
Location: Surmont Creek at Highway 881
Site Name: S32
Coordinates & Legal:

Time of Measurement

Date of Measurement: May 6, 2008
Start Time: 2:44 PM MDT
End Time: 3:00 PM MDT

Weather Conditions:

scat cloud, calm 17 C

River Conditions:

high stage

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS
Meter Type and No.: Marsh McBirney 2000 SN#2004521

Level Readings

Bench Mark Reading: nail in brick 1.850
Water Level Reading: 2.247
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.997
Other:IR by Logger 0.808

Setup No. 1

El: 97.942
El: 97.545
El: 97.548
El: 98.984

Setup No. 2

1.832 El: 97.942
2.228 El: 97.546
El: 97.548
0.79 El: 98.984

Average

97.546
96.548
98.984

Measurement Data

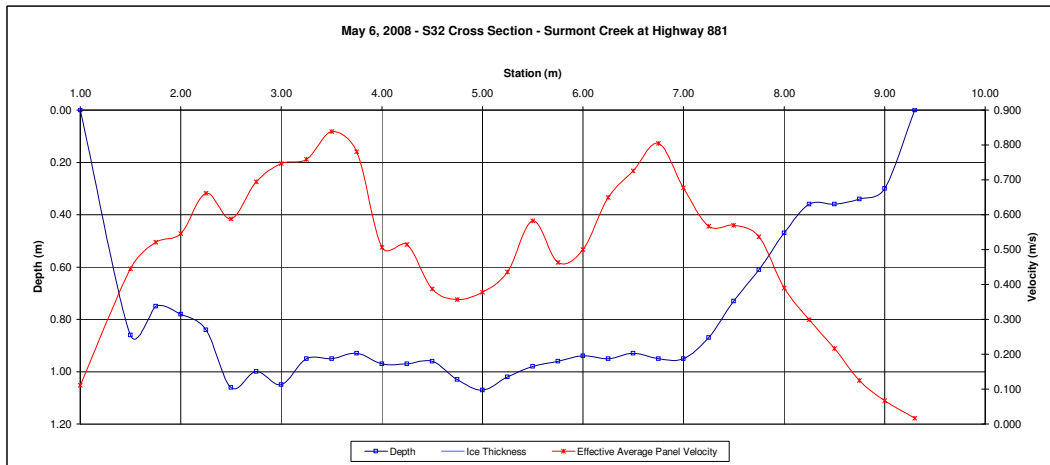
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
1.00	0.00					1.00	1	1.00	1.25	0.111	0.111	0.22	0.05	0.006	0%	
1.50	0.86				0.445	1.00	2	1.25	1.63	0.445	0.445	0.86	0.32	0.144	4%	
1.75	0.75				0.521	1.00	3	1.63	1.88	0.521	0.521	0.75	0.19	0.098	3%	
2.00	0.78				0.546	1.00	4	1.88	2.13	0.546	0.546	0.78	0.20	0.106	3%	
2.25	0.84				0.661	1.00	5	2.13	2.38	0.661	0.661	0.84	0.21	0.139	4%	
2.50	1.06				0.588	1.00	6	2.38	2.63	0.588	0.588	1.06	0.27	0.156	4%	
2.75	1.00				0.695	1.00	7	2.63	2.88	0.695	0.695	1.00	0.25	0.174	5%	
3.00	1.05				0.747	1.00	8	2.88	3.13	0.747	0.747	1.05	0.26	0.196	5%	
3.25	0.95				0.759	1.00	9	3.13	3.38	0.759	0.759	0.95	0.24	0.180	5%	
3.50	0.95				0.838	1.00	10	3.38	3.63	0.838	0.838	0.95	0.24	0.199	5%	
3.75	0.93				0.780	1.00	11	3.63	3.88	0.780	0.780	0.93	0.23	0.181	5%	
4.00	0.97				0.506	1.00	12	3.88	4.13	0.506	0.506	0.97	0.24	0.123	3%	
4.25	0.97				0.515	1.00	13	4.13	4.38	0.515	0.515	0.97	0.24	0.125	3%	
4.50	0.96				0.387	1.00	14	4.38	4.63	0.387	0.387	0.96	0.24	0.093	3%	
4.75	1.03				0.357	1.00	15	4.63	4.88	0.357	0.357	1.03	0.26	0.092	2%	
5.00	1.07				0.378	1.00	16	4.88	5.13	0.378	0.378	1.07	0.27	0.101	3%	
5.25	1.02				0.436	1.00	17	5.13	5.38	0.436	0.436	1.02	0.26	0.111	3%	
5.50	0.98				0.582	1.00	18	5.38	5.63	0.582	0.582	0.98	0.25	0.143	4%	
5.75	0.96				0.463	1.00	19	5.63	5.88	0.463	0.463	0.96	0.24	0.111	3%	
6.00	0.94				0.500	1.00	20	5.88	6.13	0.500	0.500	0.94	0.24	0.117	3%	
6.25	0.95				0.649	1.00	21	6.13	6.38	0.649	0.649	0.95	0.24	0.154	4%	
6.50	0.93				0.725	1.00	22	6.38	6.63	0.725	0.725	0.93	0.23	0.169	5%	
6.75	0.95				0.805	1.00	23	6.63	6.88	0.805	0.805	0.95	0.24	0.191	5%	
7.00	0.95				0.677	1.00	24	6.88	7.13	0.677	0.677	0.95	0.24	0.161	4%	
7.25	0.87				0.567	1.00	25	7.13	7.38	0.567	0.567	0.87	0.22	0.123	3%	
7.50	0.73				0.570	1.00	26	7.38	7.63	0.570	0.570	0.73	0.18	0.104	3%	
7.75	0.61				0.536	1.00	27	7.63	7.88	0.536	0.536	0.61	0.15	0.082	2%	
8.00	0.47				0.390	1.00	28	7.88	8.13	0.390	0.390	0.47	0.12	0.046	1%	
8.25	0.36				0.299	1.00	29	8.13	8.38	0.299	0.299	0.36	0.09	0.027	1%	
8.50	0.36				0.216	1.00	30	8.38	8.63	0.216	0.216	0.36	0.09	0.019	1%	
8.75	0.34				0.125	1.00	31	8.63	8.88	0.125	0.125	0.34	0.09	0.011	0%	
9.00	0.30				0.067	1.00	32	8.88	9.15	0.067	0.067	0.30	0.08	0.006	0%	
9.30	0.00					1.00	33	9.15	9.30	0.017	0.017	0.08	0.01	0.000	0%	
Total Flow:														3.687	1.000	

Total Flow:	3.687	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	6.65	(m ²)
Top Width:	8.30	(m)
Hydraulic Depth:	0.802	(m)
Mean Velocity:	0.554	(m/s)
Froude Number	0.198	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:

Data logger Internal Power: 100% 11.34V
Data logger External Power: 80% 12.41 V
Data logger Memory Used: 0%
Data logger Clock: 2:10 PM MST
Laptop Clock: 2:10 PM MST
Dessicant: new
Data logger: 206095
PT: 604002-5926
Power:

Notes: manual water temp 1.9 C
ice upstream under bridge, half the width of the stream
15 min sample rate, 0.810 warm up, clocks synched
installed TD



Hydrometric Measurement / Site Visit Record

S32 - Surmont Creek at Highway 881



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Surmont Creek
Location: Surmont Creek at Highway 881
Site Name: S32
Coordinates & Legal:

Time of Measurement

Date of Measurement: June 24, 2008
Start Time: 2:25 PM MDT
End Time: 2:40 PM MDT

Weather Conditions:

River Conditions:

23C

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: LM Checked: SS
Meter Type and No.: Marsh McBirney 2000 SN#2004521

Level Readings

Bench Mark Reading: nail in bric 1.902
Water Level Reading: 2.994
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.292
Other: IR by Logger 0.801

Setup No. 1

El: 97.942
El: 96.850
El: 96.558
El: 99.043

Setup No. 2

1.852
2.945
El: 97.942
El: 96.849
El: 96.557
El:

Average

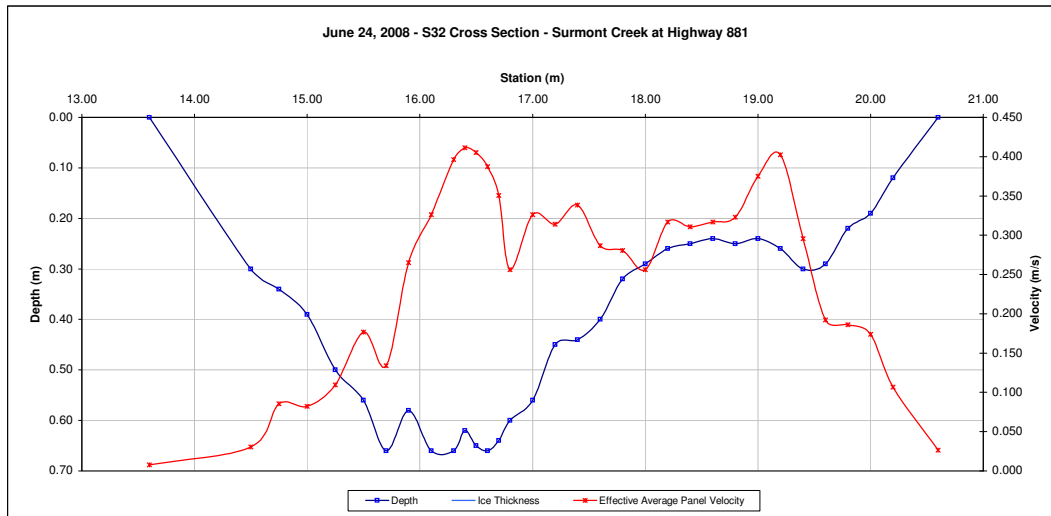
96.850
96.557
99.043

		Measurement Data														
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	13.60	0.00			0.000	1.00	1	13.60	14.05	0.008	0.008	0.08	0.03	0.000	0%	
	14.50	0.30			0.030	1.00	2	14.05	14.63	0.030	0.030	0.30	0.17	0.005	1%	
	14.75	0.34			0.085	1.00	3	14.63	14.88	0.085	0.085	0.34	0.09	0.007	1%	
	15.00	0.39			0.082	1.00	4	14.88	15.13	0.082	0.082	0.39	0.10	0.008	1%	
	15.25	0.50			0.110	1.00	5	15.13	15.38	0.110	0.110	0.50	0.13	0.014	2%	
	15.50	0.56			0.177	1.00	6	15.38	15.60	0.177	0.177	0.56	0.13	0.022	4%	
	15.70	0.66			0.134	1.00	7	15.60	15.80	0.134	0.134	0.66	0.13	0.018	3%	
	15.90	0.58			0.265	1.00	8	15.80	16.00	0.265	0.265	0.58	0.12	0.031	5%	
	16.10	0.66			0.326	1.00	9	16.00	16.20	0.326	0.326	0.66	0.13	0.043	7%	
	16.30	0.66			0.396	1.00	10	16.20	16.35	0.396	0.396	0.66	0.10	0.039	6%	
	16.40	0.62			0.411	1.00	11	16.35	16.45	0.411	0.411	0.62	0.06	0.026	4%	
	16.50	0.65			0.405	1.00	12	16.45	16.55	0.405	0.405	0.65	0.07	0.026	4%	
	16.60	0.66			0.387	1.00	13	16.55	16.65	0.387	0.387	0.66	0.07	0.026	4%	
	16.70	0.64			0.351	1.00	14	16.65	16.75	0.351	0.351	0.64	0.06	0.022	4%	
	16.80	0.60			0.256	1.00	15	16.75	16.90	0.256	0.256	0.60	0.09	0.023	4%	
	17.00	0.56			0.326	1.00	16	16.90	17.10	0.326	0.326	0.56	0.11	0.037	6%	
	17.20	0.45			0.314	1.00	17	17.10	17.30	0.314	0.314	0.45	0.09	0.028	5%	
	17.40	0.44			0.338	1.00	18	17.30	17.50	0.338	0.338	0.44	0.09	0.030	5%	
	17.60	0.40			0.287	1.00	19	17.50	17.70	0.287	0.287	0.40	0.08	0.023	4%	
	17.80	0.32			0.280	1.00	20	17.70	17.90	0.280	0.280	0.32	0.06	0.018	3%	
	18.00	0.29			0.256	1.00	21	17.90	18.10	0.256	0.256	0.29	0.06	0.015	2%	
	18.20	0.26			0.317	1.00	22	18.10	18.30	0.317	0.317	0.26	0.05	0.016	3%	
	18.40	0.25			0.311	1.00	23	18.30	18.50	0.311	0.311	0.25	0.05	0.016	3%	
	18.60	0.24			0.317	1.00	24	18.50	18.70	0.317	0.317	0.24	0.05	0.015	2%	
	18.80	0.25			0.323	1.00	25	18.70	18.90	0.323	0.323	0.25	0.05	0.016	3%	
	19.00	0.24			0.375	1.00	26	18.90	19.10	0.375	0.375	0.24	0.05	0.018	3%	
	19.20	0.26			0.402	1.00	27	19.10	19.30	0.402	0.402	0.26	0.05	0.021	3%	
	19.40	0.30			0.296	1.00	28	19.30	19.50	0.296	0.296	0.30	0.06	0.018	3%	
	19.60	0.29			0.192	1.00	29	19.50	19.70	0.192	0.192	0.29	0.06	0.011	2%	
	19.80	0.22			0.186	1.00	30	19.70	19.90	0.186	0.186	0.22	0.04	0.008	1%	
	20.00	0.19			0.174	1.00	31	19.90	20.10	0.174	0.174	0.19	0.04	0.007	1%	
	20.20	0.12			0.107	1.00	32	20.10	20.40	0.107	0.107	0.12	0.04	0.004	1%	
	20.60	0.00			0.000	1.00	33	20.40	20.60	0.027	0.027	0.03	0.01	0.000	0%	
RB													Total Flow:		0.611	1.000

Total Flow:	0.611	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	2.50	(m ²)
Top Width:	7.00	(m)
Hydraulic Depth:	0.357	(m)
Mean Velocity:	0.244	(m/s)
Froude Number	0.131	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:	
Data logger Internal Power:	11.34V
Data logger External Power:	80% 12.41 V
Data logger Memory Used:	2087 free 90% used
Data logger Clock:	1:24 PM MST
Laptop Clock:	1:25 PM MST
Dessicant:	ok
Data logger:	703
PT:	0609002
Power:	

Notes: Thermistor Installed. water temp 15.5 C
TSS yes



Hydrometric Measurement / Site Visit Record

S32 - Surmont Creek at Highway 881



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Surmont Creek
Location: Surmont Creek at Highway 881
Site Name: S32

Time of Measurement

Date of Measurement: August 5, 2008
Start Time: 6:27 PM MOT
End Time: 6:45 PM MOT

Weather Conditions:

sun, +20
River Conditions: Open Water

Personnel & Equipment

Measurement Made By: SM/LM
Data Entry By: JS Checked: sm
Meter Type and No.: Marsh McBirney 2000 SN#2004521

Level Readings

Bench Mark Reading: nail in bri 1.945
Water Level Reading: 2.811
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.533
Other:IR by Logger 0.919

Setup No. 1

El: 97.942
El: 97.076
El: 96.543
El: 98.968

Setup No. 2

El: 97.942
El: 97.077
El: 96.544
El: 98.968

Average

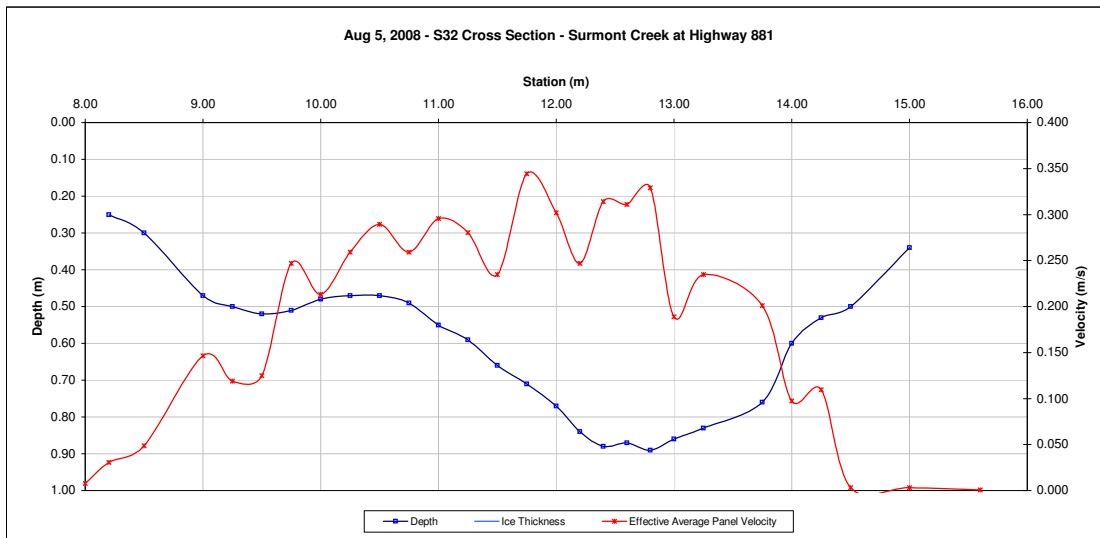
97.077
96.544
98.968

Measured Data						Measurement Data										Calculated Data				
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)						
8.00					0.000	1.00	1	8.00	8.10	0.008	0.008	0.06	0.01	0.000	0%					
8.20	0.25				0.030	1.00	2	8.10	8.35	0.030	0.030	0.25	0.06	0.002	0%					
8.50	0.30				0.049	1.00	3	8.35	8.75	0.049	0.049	0.30	0.12	0.006	1%					
9.00	0.47				0.146	1.00	4	8.75	9.13	0.146	0.146	0.47	0.18	0.026	3%					
9.25	0.50				0.119	1.00	5	9.13	9.38	0.119	0.119	0.50	0.13	0.015	2%					
9.50	0.52				0.125	1.00	6	9.38	9.63	0.125	0.125	0.52	0.13	0.016	2%					
9.75	0.51				0.247	1.00	7	9.63	9.88	0.247	0.247	0.51	0.13	0.031	4%					
10.00	0.48				0.213	1.00	8	9.88	10.13	0.213	0.213	0.48	0.12	0.026	3%					
10.25	0.47				0.259	1.00	9	10.13	10.38	0.259	0.259	0.47	0.12	0.030	4%					
10.50	0.47				0.290	1.00	10	10.38	10.63	0.290	0.290	0.47	0.12	0.034	4%					
10.75	0.49				0.259	1.00	11	10.63	10.88	0.259	0.259	0.49	0.12	0.032	4%					
11.00	0.55				0.296	1.00	12	10.88	11.13	0.296	0.296	0.55	0.14	0.041	5%					
11.25	0.59				0.280	1.00	13	11.13	11.38	0.280	0.280	0.59	0.15	0.041	5%					
11.50	0.66				0.235	1.00	14	11.38	11.63	0.235	0.235	0.66	0.17	0.039	5%					
11.75	0.71				0.344	1.00	15	11.63	11.88	0.344	0.344	0.71	0.18	0.061	7%					
12.00	0.77				0.302	1.00	16	11.88	12.10	0.302	0.302	0.77	0.17	0.052	6%					
12.20	0.84				0.247	1.00	17	12.10	12.30	0.247	0.247	0.84	0.17	0.041	5%					
12.40	0.88				0.314	1.00	18	12.30	12.50	0.314	0.314	0.88	0.18	0.055	6%					
12.60	0.87				0.311	1.00	19	12.50	12.70	0.311	0.311	0.87	0.17	0.054	6%					
12.80	0.89				0.329	1.00	20	12.70	12.90	0.329	0.329	0.89	0.18	0.059	7%					
13.00	0.86				0.189	1.00	21	12.90	13.13	0.189	0.189	0.86	0.19	0.037	4%					
13.25	0.83				0.235	1.00	22	13.13	13.50	0.235	0.235	0.83	0.31	0.073	9%					
13.75	0.76				0.201	1.00	23	13.50	13.88	0.201	0.201	0.76	0.29	0.057	7%					
14.00	0.60				0.098	1.00	24	13.88	14.13	0.098	0.098	0.60	0.15	0.015	2%					
14.25	0.53				0.110	1.00	25	14.13	14.38	0.110	0.110	0.53	0.13	0.015	2%					
14.50	0.50				0.003	1.00	26	14.38	14.75	0.003	0.003	0.50	0.19	0.001	0%					
15.00	0.34				0.003	1.00	27	14.75	15.30	0.003	0.003	0.34	0.19	0.001	0%					
15.60					0.000	1.00	28	15.30	15.60	0.001	0.001	0.09	0.03	0.000	0%					
Total Flow:														0.859	1.000					

Total Flow:	0.859	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	4.19	(m ²)
Top Width:	7.60	(m)
Hydraulic Depth:	0.552	(m)
Mean Velocity:	0.205	(m/s)
Froude Number	0.088	
Photographs taken looking at:		
Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	100%	11.34V
Data logger External Power:	78%	12.17 V
Data logger Memory Used:	10%	
Data logger Clock:	4:56 PM	MST
Laptop Clock:	4:57 PM	MST
Dessicant:	50% change next time	
Data logger:	703126	
PT:	5926	
Power:		

Notes: water temp 14.81C
TSS yes



Hydrometric Measurement / Site Visit Record

S32 - Surmont Creek at Highway 881



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Surmont Creek
Location: Surmont Creek at Highway 881
Site Name: S32
Coordinates & Legal:

Time of Measurement

Date of Measurement: September 8, 2008
Start Time: 5:29 PM MDT
End Time: 5:40 PM MDT

Weather Conditions:

overcast, 15 C
River Conditions: Open Water

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: sm
Meter Type and No.: Marsh McBirney 2000 SN#2004521

Level Readings

Bench Mark Reading: nail in brk 2.109
Water Level Reading: 3.090
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.454
Other: IR by Logger 1.065

Setup No. 1

El: 97.942
El: 96.961
El: 96.507
El: 98.986

Setup No. 2

El: 97.942
El: 96.957
El: 96.503
El: 98.986

Average

96.959
96.505
98.986

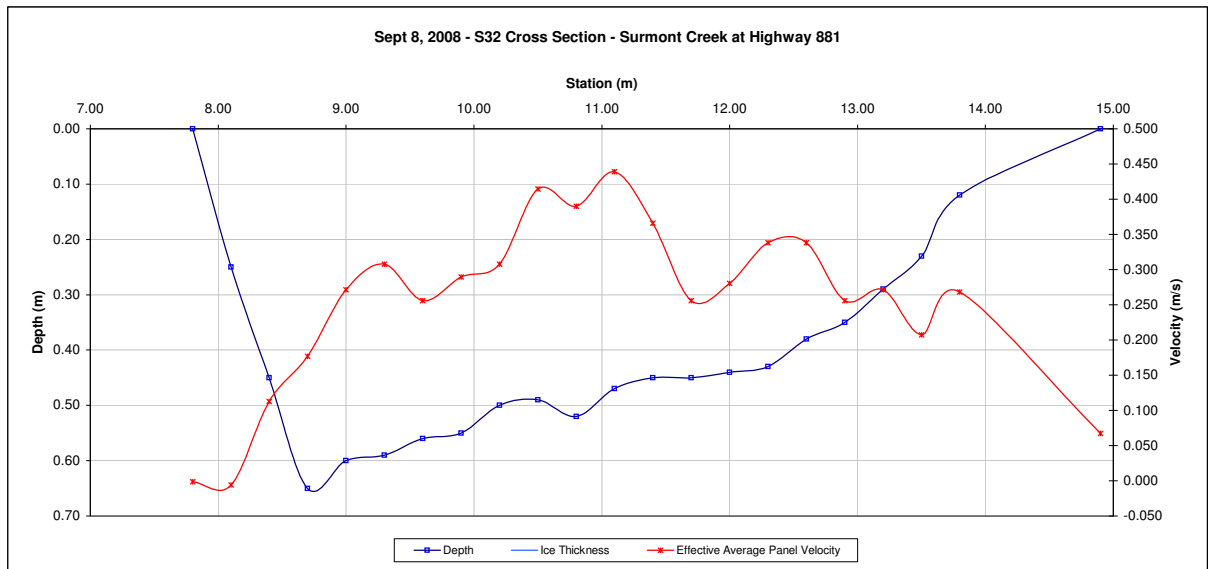
Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	7.80	0.00				1.00	1	7.80	7.95	-0.002	-0.002	0.06	0.01	0.000	0%
	8.10	0.25			-0.006	1.00	2	7.95	8.25	-0.006	-0.006	0.25	0.08	0.000	0%
	8.40	0.45			0.113	1.00	3	8.25	8.55	0.113	0.113	0.45	0.14	0.015	2%
	8.70	0.65			0.177	1.00	4	8.55	8.85	0.177	0.177	0.65	0.19	0.034	5%
	9.00	0.60			0.271	1.00	5	8.85	9.15	0.271	0.271	0.60	0.18	0.049	6%
	9.30	0.59			0.308	1.00	6	9.15	9.45	0.308	0.308	0.59	0.18	0.054	7%
	9.60	0.56			0.256	1.00	7	9.45	9.75	0.256	0.256	0.56	0.17	0.043	6%
	9.90	0.55			0.290	1.00	8	9.75	10.05	0.290	0.290	0.55	0.17	0.048	6%
	10.20	0.50			0.308	1.00	9	10.05	10.35	0.308	0.308	0.50	0.15	0.046	6%
	10.50	0.49			0.415	1.00	10	10.35	10.65	0.415	0.415	0.49	0.15	0.061	8%
	10.80	0.52			0.390	1.00	11	10.65	10.95	0.390	0.390	0.52	0.16	0.061	8%
	11.10	0.47			0.439	1.00	12	10.95	11.25	0.439	0.439	0.47	0.14	0.062	8%
	11.40	0.45			0.366	1.00	13	11.25	11.55	0.366	0.366	0.45	0.14	0.049	6%
	11.70	0.45			0.256	1.00	14	11.55	11.85	0.256	0.256	0.45	0.14	0.035	5%
	12.00	0.44			0.280	1.00	15	11.85	12.15	0.280	0.280	0.44	0.13	0.037	5%
	12.30	0.43			0.338	1.00	16	12.15	12.45	0.338	0.338	0.43	0.13	0.044	6%
	12.60	0.38			0.338	1.00	17	12.45	12.75	0.338	0.338	0.38	0.11	0.039	5%
	12.90	0.35			0.256	1.00	18	12.75	13.05	0.256	0.256	0.35	0.11	0.027	4%
	13.20	0.29			0.271	1.00	19	13.05	13.35	0.271	0.271	0.29	0.09	0.024	3%
	13.50	0.23			0.207	1.00	20	13.35	13.65	0.207	0.207	0.23	0.07	0.014	2%
	13.80	0.12			0.268	1.00	21	13.65	14.35	0.268	0.268	0.12	0.08	0.023	3%
	LB	14.90	0.00				1.00	22	14.35	14.90	0.067	0.067	0.03	0.02	0.001
Total Flow:														0.765	1.000

Total Flow:	0.765	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.70	(m ²)
Top Width:	7.10	(m)
Hydraulic Depth:	0.381	(m)
Mean Velocity:	0.283	(m/s)
Froude Number	0.146	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:		
Data logger Internal Power:	100%	11.34V
Data logger External Power:	77%	11.92 V
Data logger Memory Used:	80%	
Data logger Clock:	4:43 PM	MST
Laptop Clock:	4:43 PM	MST
Dessicant:	NEW	
Data logger:	703126	
PT:	5926	
Power:		

Notes: Thermistor 8.610 C
clocks synched, memory reset



Hydrometric Measurement / Site Visit Record

S32 - Surmont Creek at Highway 881



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Surmont Creek
Location: Surmont Creek at Highway 881
Site Name: S32

Time of Measurement

Date of Measurement: October 13, 2008
Start Time: 3:25 PM MDT
End Time: 3:26 PM MDT

Weather Conditions:

clear, 7C
River Conditions: open, higher than sept

Personnel & Equipment

Measurement Made By: SM/JSL
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney 2000 SN#2004521

Level Readings

Bench Mark Reading: nail in bri 2.027
Water Level Reading: 2.905
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.565
Other:IR by Logger 0.982

Setup No. 1

El: 97.942
El: 97.064
El: 96.499
El: 98.987

Setup No. 2

El: 97.942
El: 97.062
El: 96.497
El: 98.982

Average

97.063
96.498
98.985

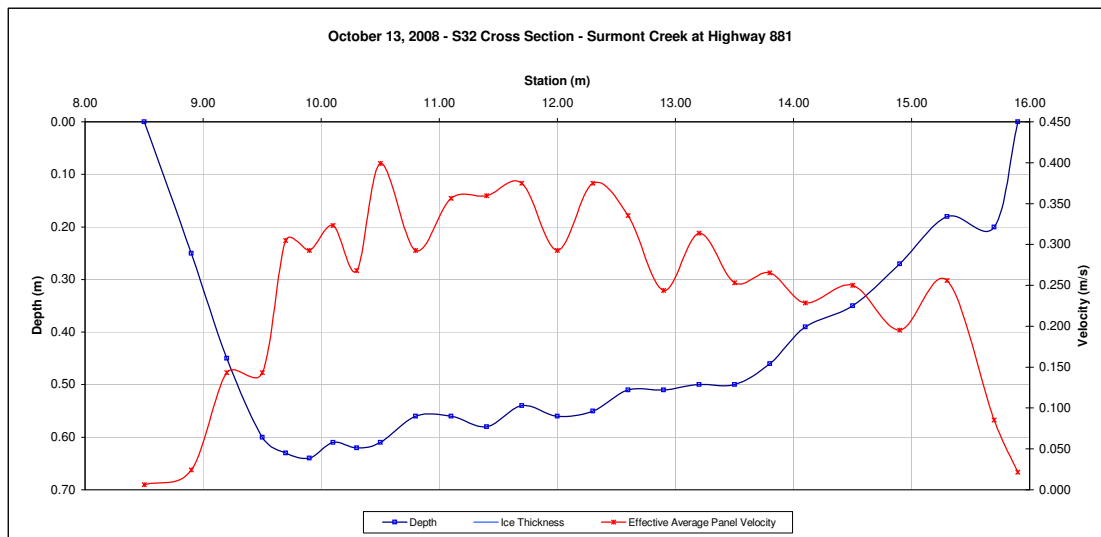
		Measurement Data															Calculated Data						
Station	Depth	Measured Data				Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total								
		Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth																		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)									
RB	8.50	0.00				1.00	1	8.50	8.70	0.006	0.006	0.06	0.01	0.000	0%								
	8.90	0.25			0.024	1.00	2	8.70	9.05	0.024	0.024	0.25	0.09	0.002	0%								
	9.20	0.45			0.143	1.00	3	9.05	9.35	0.143	0.143	0.45	0.14	0.019	2%								
	9.50	0.60			0.143	1.00	4	9.35	9.60	0.143	0.143	0.60	0.15	0.021	2%								
	9.70	0.63			0.305	1.00	5	9.60	9.80	0.305	0.305	0.63	0.13	0.038	4%								
	9.90	0.64			0.293	1.00	6	9.80	10.00	0.293	0.293	0.64	0.13	0.037	4%								
	10.10	0.61			0.323	1.00	7	10.00	10.20	0.323	0.323	0.61	0.12	0.039	4%								
	10.30	0.62			0.268	1.00	8	10.20	10.40	0.268	0.268	0.62	0.12	0.033	4%								
	10.50	0.61			0.399	1.00	9	10.40	10.65	0.399	0.399	0.61	0.15	0.061	7%								
	10.80	0.56			0.293	1.00	10	10.65	10.95	0.293	0.293	0.56	0.17	0.049	5%								
	11.10	0.56			0.357	1.00	11	10.95	11.25	0.357	0.357	0.56	0.17	0.060	7%								
	11.40	0.58			0.360	1.00	12	11.25	11.55	0.360	0.360	0.58	0.17	0.063	7%								
	11.70	0.54			0.375	1.00	13	11.55	11.85	0.375	0.375	0.54	0.16	0.061	7%								
	12.00	0.56			0.293	1.00	14	11.85	12.15	0.293	0.293	0.56	0.17	0.049	5%								
	12.30	0.55			0.375	1.00	15	12.15	12.45	0.375	0.375	0.55	0.16	0.062	7%								
	12.60	0.51			0.335	1.00	16	12.45	12.75	0.335	0.335	0.51	0.15	0.051	6%								
	12.90	0.51			0.244	1.00	17	12.75	13.05	0.244	0.244	0.51	0.15	0.037	4%								
	13.20	0.50			0.314	1.00	18	13.05	13.35	0.314	0.314	0.50	0.15	0.047	5%								
	13.50	0.50			0.253	1.00	19	13.35	13.65	0.253	0.253	0.50	0.15	0.038	4%								
	13.80	0.46			0.265	1.00	20	13.65	13.95	0.265	0.265	0.46	0.14	0.037	4%								
	14.10	0.39			0.229	1.00	21	13.95	14.30	0.229	0.229	0.39	0.14	0.031	3%								
	14.50	0.35			0.250	1.00	22	14.30	14.70	0.250	0.250	0.35	0.14	0.035	4%								
	14.90	0.27			0.195	1.00	23	14.70	15.10	0.195	0.195	0.27	0.11	0.021	2%								
	15.30	0.18			0.256	1.00	24	15.10	15.50	0.256	0.256	0.18	0.07	0.018	2%								
	15.70	0.20			0.085	1.00	25	15.50	15.80	0.085	0.085	0.20	0.06	0.005	1%								
	15.90	0.00				1.00	26	15.80	15.90	0.021	0.021	0.05	0.00	0.000	0%								
		Total Flow:												0.917	1.000								

Total Flow:	0.917	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	3.31	(m ²)
Top Width:	7.40	(m)
Hydraulic Depth:	0.447	(m)
Mean Velocity:	0.277	(m/s)
Froude Number	0.132	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:

Data logger Internal Power: 100% 11.34V
Data logger External Power: 76% 11.8 V
Data logger Memory Used: 80%
Data logger Clock: 3:25 PM MST
Laptop Clock: 3:26 PM MST
Dessicant: good
Data logger: 703126
PT: 5926
Power:

Notes: Water Temp 4.45 C
station removed for winter



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albion Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albion Boundary
Coordinates & Legal:

Time of Measurement

Date of Measurement: January 10, 2008
Start Time: 12:30 PM MST
End Time: 12:38 PM MST

Weather Conditions:

River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: JS/JMS/JV
Data Entry By: SMS checked sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rod in PVC 0.786
Water Level Reading: 2.609
Top of Ice Level Reading: 2.535
Transducer Reading & Est. El.: 1.316
Other:

Setup No. 1

El: 281.740
El: 279.917
El: 279.991
El: 278.601
El: 282.526

Setup No. 2

El: 281.740
El: 279.917
El: 279.988
El: 278.601
El: 282.399

Average

279.917
278.601

Measurement Data

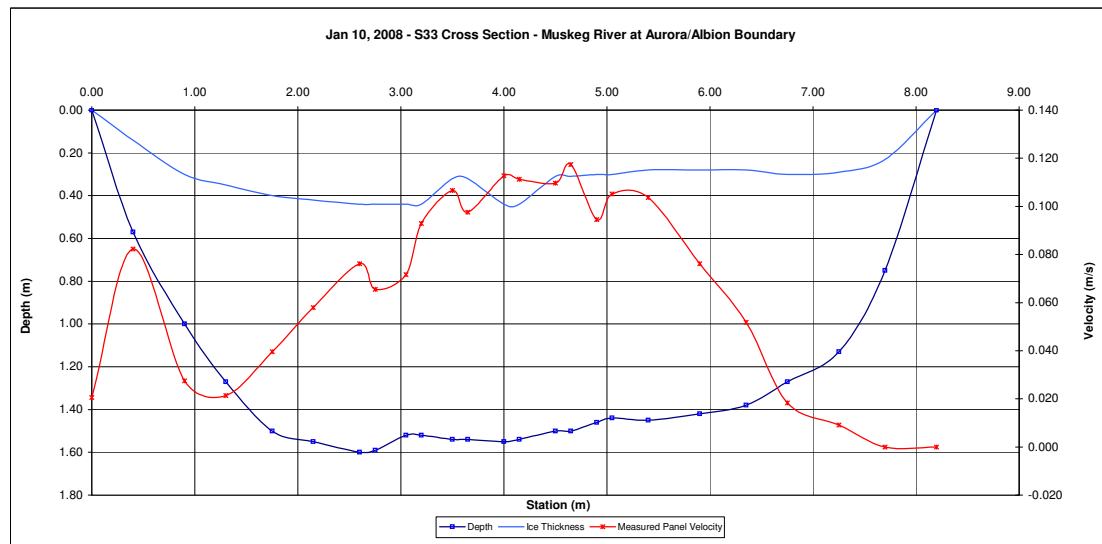
	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
LB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
	0.00	0.00	0.00			0	0.90	1	0.00	0.20	0.021	0.019	0.11	0.02	0.000	
	0.40	0.57	0.14			0.082	0.90	2	0.20	0.65	0.082	0.074	0.43	0.19	0.014	
	0.90	1.00	0.30			0.027	0.90	3	0.65	1.10	0.027	0.025	0.70	0.32	0.008	
	1.30	1.27	0.35			0.021	0.90	4	1.10	1.53	0.021	0.019	0.92	0.39	0.008	
	1.75	1.50	0.40			0.040	0.90	5	1.53	1.95	0.040	0.036	1.10	0.47	0.017	
	2.15	1.55	0.42			0.058	0.90	6	1.95	2.38	0.058	0.052	1.13	0.48	0.025	
	2.60	1.60	0.44	0.094	0.058		1.00	7	2.38	2.68	0.076	0.076	1.16	0.35	0.027	
	2.75	1.59	0.44	0.064	0.067		1.00	8	2.68	2.90	0.066	0.066	1.15	0.26	0.017	
	3.05	1.52	0.44	0.070	0.073		1.00	9	2.90	3.13	0.072	0.072	1.08	0.24	0.017	
	3.20	1.52	0.44	0.085	0.101		1.00	10	3.13	3.35	0.093	0.093	1.08	0.24	0.023	
	3.50	1.54	0.32	0.116	0.098		1.00	11	3.35	3.58	0.107	0.107	1.22	0.27	0.029	
	3.65	1.54	0.32	0.101	0.094		1.00	12	3.58	3.83	0.098	0.098	1.22	0.31	0.030	
	4.00	1.55	0.44	0.116	0.110		1.00	13	3.83	4.08	0.113	0.113	1.11	0.28	0.031	
	4.15	1.54	0.44	0.107	0.116		1.00	14	4.08	4.33	0.111	0.111	1.10	0.28	0.031	
	4.50	1.50	0.31	0.085	0.134		1.00	15	4.33	4.58	0.110	0.110	1.19	0.30	0.033	
	4.65	1.50	0.31	0.104	0.131		1.00	16	4.58	4.78	0.117	0.117	1.19	0.24	0.028	
	4.90	1.46	0.30	0.067	0.122		1.00	17	4.78	4.98	0.094	0.094	1.16	0.23	0.022	
	5.05	1.44	0.30	0.104	0.107		1.00	18	4.98	5.23	0.105	0.105	1.14	0.29	0.030	
	5.40	1.45	0.28	0.098	0.110		1.00	19	5.23	5.65	0.104	0.104	1.17	0.50	0.052	
	5.90	1.42	0.28	0.073	0.079		1.00	20	5.65	6.13	0.076	0.076	1.14	0.54	0.041	
	6.35	1.38	0.28			0.052	0.90	21	6.13	6.55	0.052	0.047	1.10	0.47	0.022	
	6.75	1.27	0.30			0.018	0.90	22	6.55	7.00	0.018	0.016	0.97	0.44	0.007	
	7.25	1.13	0.29			0.009	0.90	23	7.00	7.48	0.009	0.008	0.84	0.40	0.003	
	7.70	0.75	0.23			0	0.90	24	7.48	7.95	0.000	0.000	0.52	0.25	0.000	
8.20	0.00	0.00			0	0.90	25	7.95	8.20	0.000	0.000	0.13	0.03	0.000		
Total Flow:															0.514	1.000

Total Flow:	0.514	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	7.77	(m ²)
Top Width:	8.20	(m)
Hydraulic Depth:	0.947	(m)
Mean Velocity:	0.066	(m/s)
Froude Number:	0.022	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power: 4.69 V
Data logger External Power: 13.80 V
Data logger Memory Used: 44%
Data logger Clock: 11:30
Laptop Clock: 11:42
Dessicant: Good
Data logger: 105010290
PT: 304988
Power: 12V 20Ahr & 20 W Solar Panel

Notes: TD reading = 1.315880



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albion Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albion Boundary
Coordinates & Legal:
Time of Measurement: February 12, 2008
Date of Measurement: 4:50 PM MDT
Start Time: 5:15 PM MDT
End Time:

Personnel & Equipment

Measurement Made By: JS/JMS/JV
Data Entry By: SMS checked SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rod in PVC 0.950
Water Level Reading: 2.847
Top of Ice Level Reading: 2.764
Transducer Reading & Est. El.: 1.259
Other:

Setup No. 1

El: 281.740
El: 279.843
El: 279.926
El: 278.584
El: 282.690

Setup No. 2

El: 281.740
El: 279.844
El: 279.933
El: 278.585
El: 282.654

Average

279.844
278.585

Weather Conditions:

-20
ice

Measurement Data

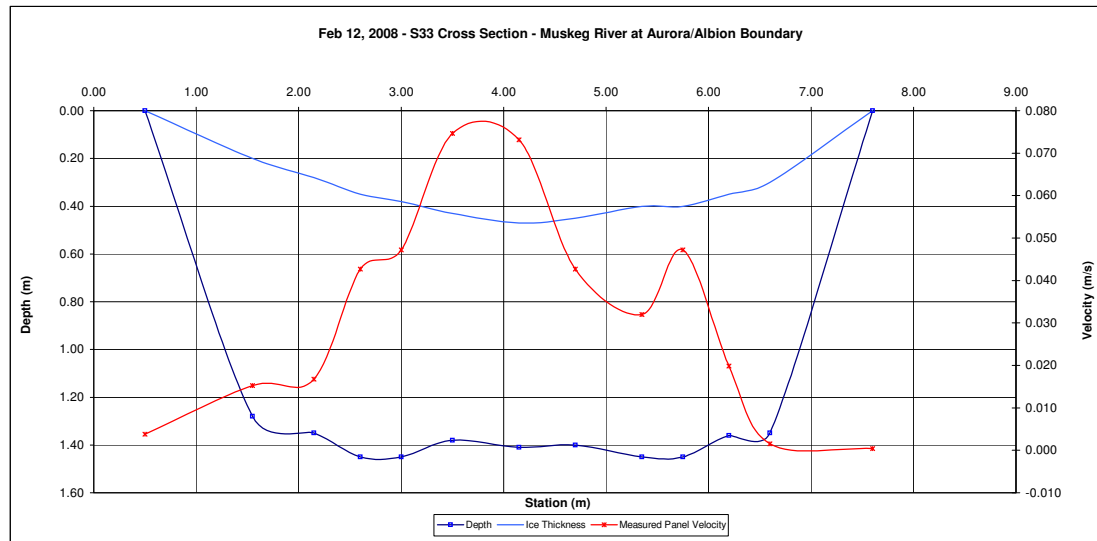
	Measured Data						Calculated Data									
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	0.50	0.00	0.00			0	1.00	1	0.50	1.03	0.004	0.004	0.27	0.14	0.001	0%
	1.55	1.28	0.20	0.012	0.018		1.00	2	1.03	1.85	0.015	0.015	1.08	0.89	0.014	6%
	2.15	1.35	0.28	0.012	0.021		1.00	3	1.85	2.38	0.017	0.017	1.07	0.56	0.009	4%
	2.60	1.45	0.35	0.024	0.061		1.00	4	2.38	2.80	0.043	0.043	1.10	0.47	0.020	9%
	3.00	1.45	0.38	0.040	0.055		1.00	5	2.80	3.25	0.047	0.047	1.07	0.48	0.023	10%
	3.50	1.38	0.43	0.073	0.076		1.00	6	3.25	3.83	0.075	0.075	0.95	0.55	0.041	18%
	4.15	1.41	0.47	0.079	0.067		1.00	7	3.83	4.43	0.073	0.073	0.94	0.56	0.041	19%
	4.70	1.40	0.45	0.052	0.034		1.00	8	4.43	5.03	0.043	0.043	0.95	0.57	0.024	11%
	5.35	1.45	0.40	0.021	0.043		1.00	9	5.03	5.55	0.032	0.032	1.05	0.55	0.018	8%
	5.75	1.45	0.40	0.058	0.037		1.00	10	5.55	5.98	0.047	0.047	1.05	0.45	0.021	10%
	6.20	1.36	0.35	0.012	0.027		1.00	11	5.98	6.40	0.020	0.020	1.01	0.43	0.009	4%
	6.60	1.35	0.30	-0.009	0.012		1.00	12	6.40	7.10	0.002	0.002	1.05	0.73	0.001	1%
RB	7.60	0.00	0.00	0.000	0.000		1.00	13	7.10	7.60	0.000	0.000	0.26	0.13	0.000	0%
Total Flow:															0.221	1.000

Total Flow:	0.221	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	6.52	(m ²)
Top Width:	7.10	(m)
Hydraulic Depth:	0.918	(m)
Mean Velocity:	0.034	(m/s)
Froude Number	0.011	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

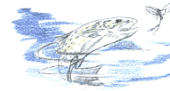
Data logger Internal Power: 4.68
Data logger External Power: 14.07
Data logger Memory Used: 47%
Data logger Clock: Feb 12, 2008 16:39
Laptop Clock: Feb 12, 2008 16:54
Dessicant: fair
Data logger: 105010290
PT: 304988
Power: 12V 20Ahr & 20 W Solar Panel

Notes: reduced discharge measurements because to Hatfield Curfew
m=1.4243176 b=-0.0450084 on cable
m=1.424278 b=-0.012492 dolphin database



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albion Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albion Boundary
Coordinates & Legal:

Time of Measurement

Date of Measurement: March 9, 2008
Start Time: 2:30 PM MDT
End Time: 2:50 PM MDT

Weather Conditions:

+7 C, Overcast, Light wind

River Conditions:

Ice covered

Personnel & Equipment

Measurement Made By: JS/SM/JV
Data Entry By: LM Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rod in PVC 0.974
Water Level Reading: 2.885
Top of Ice Level Reading: 2.789
Transducer Reading & Est. El.: 1.232
Other:

Setup No. 1

El: 281.740
El: 279.829
El: 279.925
El: 278.597
El:

Setup No. 2

El: 281.740
El: 279.830
El: 279.920
El: 278.598
El:

Average

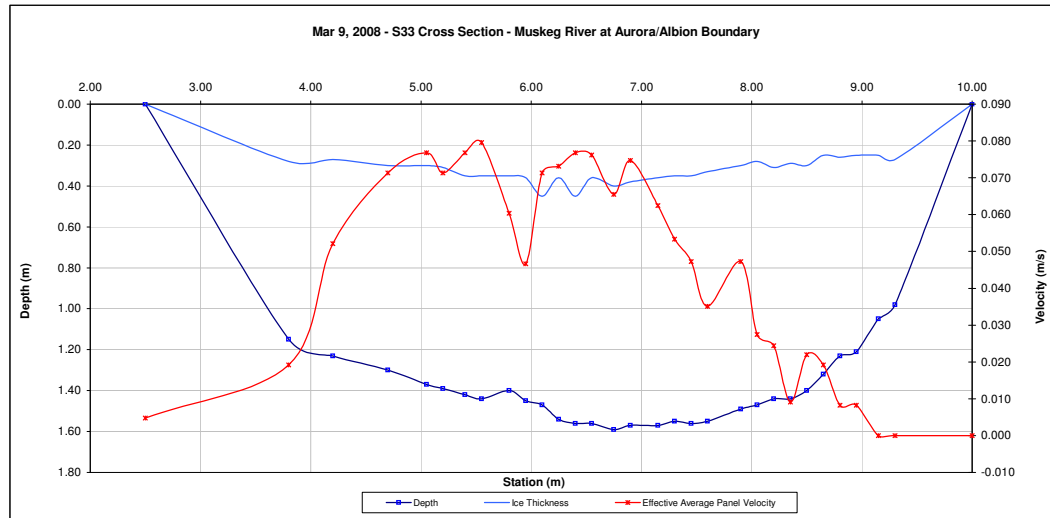
279.830
278.597

RB	Measured Data						Measurement Data									Calculated Data					Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge						
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)						
	2.50	0.00	0.00				0.90	1	2.50	3.15	0.005	0.005	0.22	0.14	0.001	0%					
	3.80	1.15	0.28			0.021	0.90	2	3.15	4.00	0.021	0.019	0.87	0.74	0.014	5%					
	4.20	1.23	0.27			0.058	0.90	3	4.00	4.45	0.058	0.052	0.96	0.43	0.023	7%					
	4.70	1.30	0.30			0.079	0.90	4	4.45	4.88	0.079	0.071	1.00	0.43	0.030	10%					
	5.05	1.37	0.30			0.085	0.90	5	4.88	5.13	0.085	0.077	1.07	0.27	0.021	7%					
	5.20	1.39	0.31			0.079	0.90	6	5.13	5.30	0.079	0.071	1.08	0.19	0.013	4%					
	5.40	1.42	0.35			0.085	0.90	7	5.30	5.48	0.085	0.077	1.07	0.19	0.014	5%					
	5.55	1.44	0.35			0.088	0.90	8	5.48	5.68	0.088	0.080	1.09	0.22	0.017	6%					
	5.80	1.40	0.35			0.067	0.90	9	5.68	5.88	0.067	0.060	1.05	0.21	0.013	4%					
	5.95	1.45	0.36			0.052	0.90	10	5.88	6.03	0.052	0.047	1.09	0.16	0.008	2%					
	6.10	1.47	0.45			0.079	0.90	11	6.03	6.18	0.079	0.071	1.02	0.15	0.011	3%					
	6.25	1.54	0.36	0.085	0.061		1.00	12	6.18	6.33	0.073	0.073	1.18	0.18	0.013	4%					
	6.40	1.56	0.45			0.085	0.90	13	6.33	6.48	0.085	0.077	1.11	0.17	0.013	4%					
	6.55	1.56	0.36	0.079	0.073		1.00	14	6.48	6.65	0.076	0.076	1.20	0.21	0.016	5%					
	6.75	1.59	0.40	0.067	0.064		1.00	15	6.65	6.83	0.066	0.066	1.19	0.21	0.014	4%					
	6.90	1.57	0.38	0.064	0.085		1.00	16	6.83	7.03	0.075	0.075	1.19	0.24	0.018	6%					
	7.15	1.57	0.36	0.061	0.064		1.00	17	7.03	7.23	0.062	0.062	1.21	0.24	0.015	5%					
	7.30	1.55	0.35	0.049	0.058		1.00	18	7.23	7.38	0.053	0.053	1.20	0.18	0.010	3%					
	7.45	1.56	0.35	0.049	0.046		1.00	19	7.38	7.53	0.047	0.047	1.21	0.18	0.009	3%					
	7.60	1.55	0.33	0.040	0.030		1.00	20	7.53	7.75	0.035	0.035	1.22	0.27	0.010	3%					
	7.90	1.49	0.30	0.061	0.034		1.00	21	7.75	7.98	0.047	0.047	1.19	0.27	0.013	4%					
	8.05	1.47	0.28	0.034	0.021		1.00	22	7.98	8.13	0.027	0.027	1.19	0.18	0.005	2%					
	8.20	1.44	0.31	0.027	0.021		1.00	23	8.13	8.28	0.024	0.024	1.13	0.17	0.004	1%					
	8.35	1.44	0.29	0.012	0.006		1.00	24	8.28	8.43	0.009	0.009	1.15	0.17	0.002	1%					
	8.50	1.40	0.30			0.024	0.90	25	8.43	8.58	0.024	0.022	1.10	0.16	0.004	1%					
	8.65	1.32	0.25			0.021	0.90	26	8.58	8.73	0.021	0.019	1.07	0.16	0.003	1%					
	8.80	1.23	0.26			0.009	0.90	27	8.73	8.88	0.009	0.008	0.97	0.15	0.001	0%					
	8.95	1.21	0.25			0.009	0.90	28	8.88	9.05	0.009	0.008	0.96	0.17	0.001	0%					
	9.15	1.05	0.25			0.90	29	9.05	9.23	0.000	0.000	0.80	0.14	0.000	0%						
	9.3	0.98	0.27			0.90	30	9.23	9.65	0.000	0.000	0.71	0.30	0.000	0%						
	10.00	0.00	0.00			0.90	31	9.65	10.00	0.00	0.000	0.000	0.18	0.06	0.000	0%					
LB	Total Flow:															0.313	1.000				

Total Flow:	0.313	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	6.94	(m ²)
Top Width:	7.50	(m)
Hydraulic Depth:	0.925	(m)
Mean Velocity:	0.045	(m/s)
Froude Number:	0.015	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	
Data logger Internal Power:	4.8 V
Data logger External Power:	14.47 V
Data logger Memory Used:	49%
Data logger Clock:	12:55 PM
Laptop Clock:	1:23 PM
Dessicant:	good
Data logger:	105010290
PT:	304988
Power:	12V 20Ahr & 20 W Solar Panel

Notes:



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albion Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albion Boundary
Coordinates & Legal:
Time of Measurement:
Date of Measurement: April 2, 2008
Start Time: 4:15 PM MDT
End Time: 4:45 PM MDT

Personnel & Equipment

Measurement Made By: js sm
Data Entry By: sm Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rod in PVC 0.620
Water Level Reading: 2.531
Top of Ice Level Reading: 2.468
Transducer Reading & Est. El.: 1.245
Other:

Setup No. 1

El: 281.740
El: 279.829
El: 279.892
El: 278.584
El:

Setup No. 2

El: 281.740
El: 279.831
El: 279.890
El: 278.586
El:

Average

279.830
278.585

Weather Conditions: 0 C, Overcast, Light wind
River Conditions: Ice covered

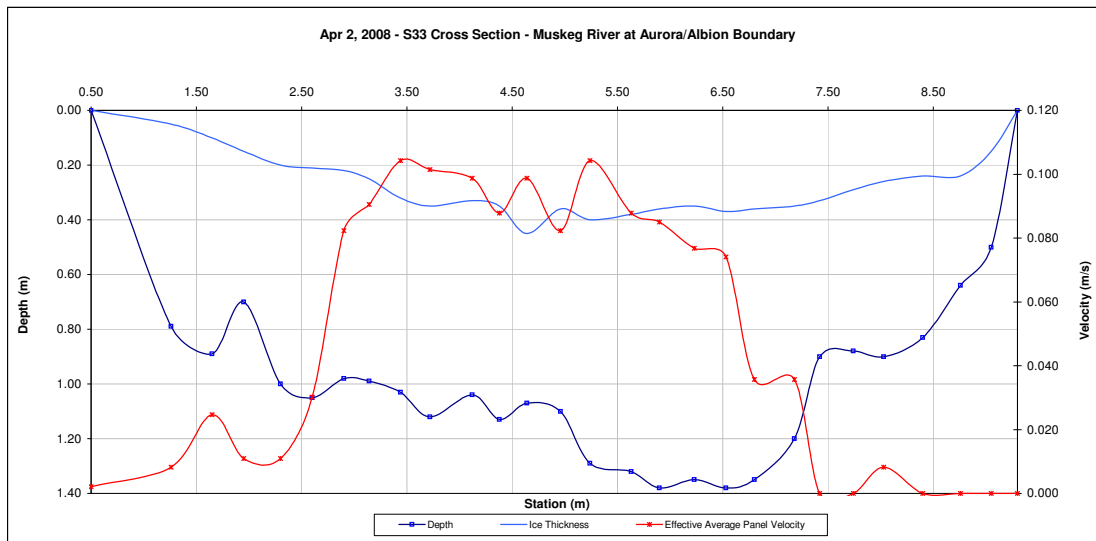
Measurement Data

	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
RB	0.50	0.00	0.00			0	0.90	1	0.50	0.88	0.002	0.002	0.19	0.07	0.000	0%
	1.26	0.79	0.05			0.009	0.90	2	0.88	1.46	0.009	0.008	0.74	0.43	0.004	1%
	1.65	0.89	0.10			0.027	0.90	3	1.46	1.80	0.027	0.025	0.79	0.27	0.007	2%
	1.95	0.70	0.15			0.012	0.90	4	1.80	2.13	0.012	0.011	0.55	0.18	0.002	1%
	2.30	1.00	0.20			0.012	0.90	5	2.13	2.45	0.012	0.011	0.80	0.26	0.003	1%
	2.60	1.05	0.21			0.034	0.90	6	2.45	2.75	0.034	0.030	0.84	0.25	0.008	2%
	2.90	0.98	0.22			0.091	0.90	7	2.75	3.02	0.091	0.082	0.76	0.21	0.017	5%
	3.14	0.99	0.25			0.101	0.90	8	3.02	3.29	0.101	0.091	0.74	0.20	0.018	5%
	3.44	1.03	0.32			0.116	0.90	9	3.29	3.58	0.116	0.104	0.71	0.21	0.021	6%
	3.72	1.12	0.35			0.113	0.90	10	3.58	3.92	0.113	0.101	0.77	0.26	0.027	8%
	4.12	1.04	0.33			0.110	0.90	11	3.92	4.25	0.110	0.099	0.71	0.23	0.023	7%
	4.38	1.13	0.35			0.098	0.90	12	4.25	4.51	0.098	0.088	0.78	0.20	0.018	5%
	4.64	1.07	0.45			0.110	0.90	13	4.51	4.80	0.110	0.099	0.62	0.18	0.018	5%
	4.96	1.10	0.36			0.091	0.90	14	4.80	5.10	0.091	0.082	0.74	0.22	0.018	5%
	5.24	1.29	0.40			0.116	0.90	15	5.10	5.44	0.116	0.104	0.89	0.30	0.031	9%
	5.63	1.32	0.38			0.098	0.90	16	5.44	5.77	0.098	0.088	0.94	0.31	0.027	8%
	5.90	1.38	0.36			0.094	0.90	17	5.77	6.07	0.094	0.085	1.02	0.31	0.026	8%
	6.23	1.35	0.35			0.085	0.90	18	6.07	6.38	0.085	0.077	1.00	0.32	0.024	7%
	6.53	1.38	0.37			0.082	0.90	19	6.38	6.67	0.082	0.074	1.01	0.29	0.021	6%
	6.80	1.35	0.36			0.040	0.90	20	6.67	6.99	0.040	0.036	0.99	0.32	0.011	3%
	7.18	1.20	0.35			0.040	0.90	21	6.99	7.30	0.040	0.036	0.85	0.26	0.009	3%
	7.42	0.90	0.33			0.000	0.90	22	7.30	7.58	0.000	0.000	0.57	0.16	0.000	0%
	7.74	0.88	0.29			0.000	0.90	23	7.58	7.89	0.000	0.000	0.59	0.18	0.000	0%
	8.03	0.90	0.26			0.009	0.90	24	7.89	8.22	0.009	0.008	0.64	0.21	0.002	1%
	8.40	0.83	0.24			0.000	0.90	25	8.22	8.58	0.000	0.000	0.59	0.22	0.000	0%
	8.76	0.64	0.24			0.000	0.90	26	8.58	8.91	0.000	0.000	0.40	0.13	0.000	0%
	9.05	0.50	0.15			0.000	0.90	27	8.91	9.18	0.000	0.000	0.35	0.09	0.000	0%
	LB	9.30	0.00	0.00			0	0.90	28	9.18	9.30	0.00	0.000	0.09	0.01	0.000
Total Flow:														0.335	100%	

Total Flow:	0.335	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	6.27	(m ²)
Top Width:	8.80	(m)
Hydraulic Depth:	0.713	(m)
Mean Velocity:	0.053	(m/s)
Froude Number	0.020	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:	
Data logger Internal Power:	4.8 V
Data logger External Power:	14.47 V
Data logger Memory Used:	51%
Data logger Clock:	2:56 PM
Laptop Clock:	3:24 PM
Dessicant:	good
Data logger:	105010290
PT:	304988
Power:	12V 20Ahr & 20 W Solar Panel

Notes:



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albion Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albion Boundary
Coordinates & Legal:

Time of Measurement

Date of Measurement: May 8, 2008
Start Time: 1:08 PM MDT
End Time: 1:40 PM MDT

Weather Conditions:

clear, calm, 8 C
River Conditions: overbank flow, high, open

Personnel & Equipment

Measurement Made By: SS/SM/SE
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rod in PVC 0.597
Water Level Reading: 1.078
Top of Ice Level Reading:
Transducer Reading & Est. El.: 2.757
Other:

Setup No. 1

El: 281.740
El: 281.259
El: 282.337
El: 278.502
El:

Setup No. 2

El: 281.740
El: 281.262
El: 282.281
El: 278.505
El:

Average

281.261
278.504

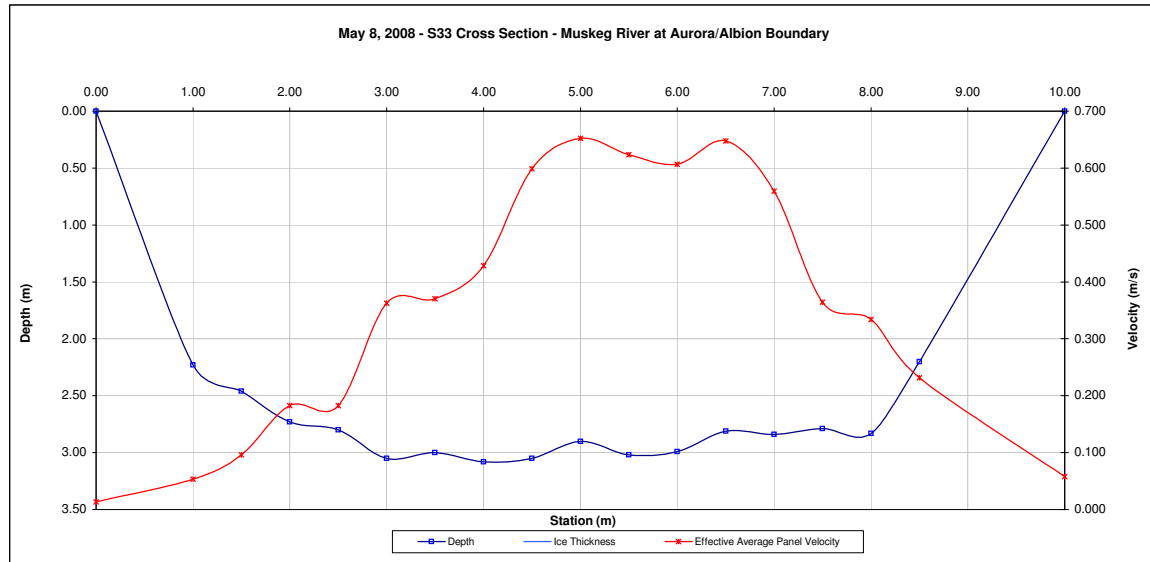
Measured Data						Measurement Data										Calculated Data			Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)					
0.00	0.00				0	1.00	1	0.00	0.50	0.013	0.013	0.56	0.28	0.004	0%				
1.00	2.23		0.052	0.055		1.00	2	0.50	1.25	0.053	0.053	2.23	1.67	0.089	1%				
1.50	2.46		0.104	0.088		1.00	3	1.25	1.75	0.096	0.096	2.46	1.23	0.118	1%				
2.00	2.73		0.155	0.210		1.00	4	1.75	2.25	0.183	0.183	2.73	1.37	0.250	3%				
2.50	2.80		0.165	0.201		1.00	5	2.25	2.75	0.183	0.183	2.80	1.40	0.256	3%				
3.00	3.05		0.247	0.479		1.00	6	2.75	3.25	0.363	0.363	3.05	1.53	0.553	6%				
3.50	3.00		0.293	0.448		1.00	7	3.25	3.75	0.370	0.370	3.00	1.50	0.555	6%				
4.00	3.08		0.326	0.530		1.00	8	3.75	4.25	0.428	0.428	3.08	1.54	0.659	7%				
4.50	3.05		0.546	0.652		1.00	9	4.25	4.75	0.599	0.599	3.05	1.53	0.913	10%				
5.00	2.90		0.637	0.668		1.00	10	4.75	5.25	0.652	0.652	2.90	1.45	0.946	10%				
5.50	3.02		0.588	0.658		1.00	11	5.25	5.75	0.623	0.623	3.02	1.51	0.941	10%				
6.00	2.99		0.567	0.646		1.00	12	5.75	6.25	0.607	0.607	2.99	1.50	0.907	10%				
6.50	2.81		0.661	0.634		1.00	13	6.25	6.75	0.648	0.648	2.81	1.41	0.910	10%				
7.00	2.84		0.573	0.546		1.00	14	6.75	7.25	0.559	0.559	2.84	1.42	0.794	8%				
7.50	2.79		0.344	0.384		1.00	15	7.25	7.75	0.364	0.364	2.79	1.40	0.508	5%				
8.00	2.83		0.247	0.421		1.00	16	7.75	8.25	0.334	0.334	2.83	1.42	0.472	5%				
8.50	2.20		0.283	0.180		1.00	17	8.25	9.25	0.232	0.232	2.20	2.20	0.510	5%				
10.00	0.00					1.00	18	9.25	10.00	0.06	0.058	0.55	0.41	0.024	0%				
Total Flow:														9.410		1.000			

Total Flow:	9.410	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	24.74	(m ²)
Top Width:	10.00	(m)
Hydraulic Depth:	2.474	(m)
Mean Velocity:	0.380	(m/s)
Froude Number	0.077	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power: 4.67 V
Data logger External Power: 14.57 V
Data logger Memory Used: 54%
Data logger Clock: 11:23 MST
Laptop Clock: 11:42 MST
Dessicant: good
Data logger: 105010290
PT: 304988
Power: 12V 20Ahr & 20 W Solar Panel

Notes: overbank flow impossible to measure.
manual water temp 6 C



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albion Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albion Boundary

Time of Measurement

Date of Measurement: June 23, 2008
Start Time: 10:26 AM MDT
End Time: 10:45 AM MDT

Weather Conditions:

River Conditions:

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: LM Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.703
Water Level Reading: 2.312
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.580
Other:

Setup No. 1

El: 281.740
El: 280.131
El:
El: 278.551
El:

Setup No. 2

El: 281.740
El: 280.128
El:
El: 278.548
El:

Average

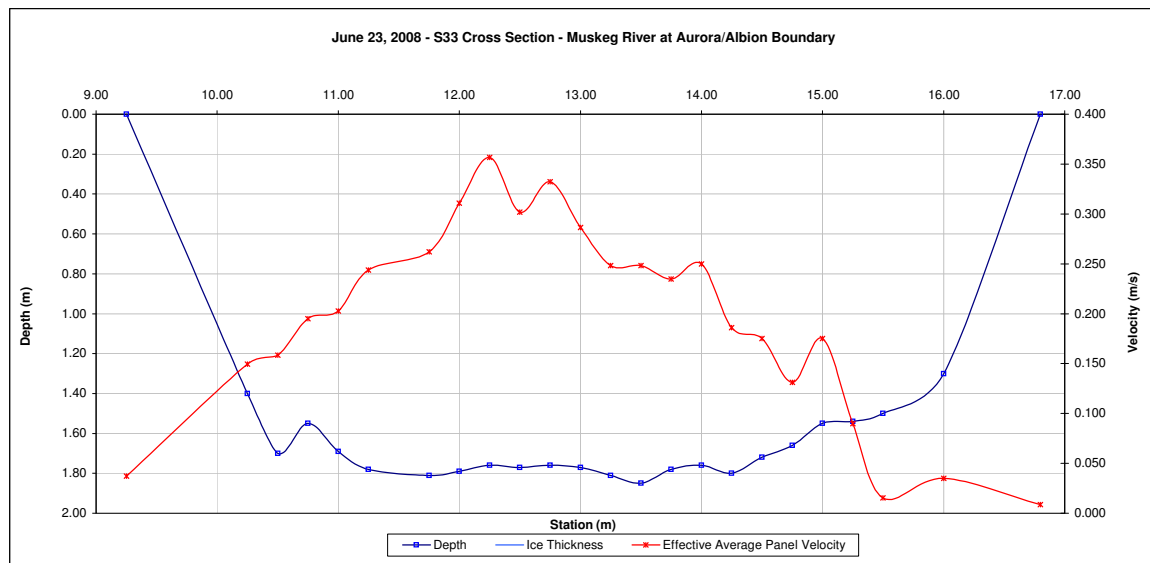
280.130
278.550

		Measurement Data														
		Measured Data				Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
RB	9.25	0.00					1.00	1	9.25	9.75	0.037	0.037	0.35	0.18	0.007	0%
	10.25	1.40		0.140	0.158		1.00	2	9.75	10.38	0.149	0.149	1.40	0.88	0.131	6%
	10.50	1.70		0.131	0.186		1.00	3	10.38	10.63	0.158	0.158	1.70	0.43	0.067	3%
	10.75	1.55		0.177	0.213		1.00	4	10.63	10.88	0.195	0.195	1.55	0.39	0.076	3%
	11.00	1.69		0.180	0.226		1.00	5	10.88	11.13	0.203	0.203	1.69	0.42	0.086	4%
	11.25	1.78		0.250	0.238		1.00	6	11.13	11.50	0.244	0.244	1.78	0.67	0.163	7%
	11.75	1.81		0.244	0.280		1.00	7	11.50	11.88	0.262	0.262	1.81	0.68	0.178	8%
	12.00	1.79		0.308	0.314		1.00	8	11.88	12.13	0.311	0.311	1.79	0.45	0.139	6%
	12.25	1.76		0.363	0.351		1.00	9	12.13	12.38	0.357	0.357	1.76	0.44	0.157	7%
	12.50	1.77		0.238	0.366		1.00	10	12.38	12.63	0.302	0.302	1.77	0.44	0.134	6%
	12.75	1.76		0.314	0.351		1.00	11	12.63	12.88	0.332	0.332	1.76	0.44	0.146	7%
	13.00	1.77		0.265	0.308		1.00	12	12.88	13.13	0.287	0.287	1.77	0.44	0.127	6%
	13.25	1.81		0.204	0.293		1.00	13	13.13	13.38	0.248	0.248	1.81	0.45	0.112	5%
	13.50	1.85		0.180	0.317		1.00	14	13.38	13.63	0.248	0.248	1.85	0.46	0.115	5%
	13.75	1.78		0.158	0.311		1.00	15	13.63	13.88	0.235	0.235	1.78	0.45	0.104	5%
	14.00	1.76		0.137	0.363		1.00	16	13.88	14.13	0.250	0.250	1.76	0.44	0.110	5%
	14.25	1.80		0.110	0.262		1.00	17	14.13	14.38	0.186	0.186	1.80	0.45	0.084	4%
	14.50	1.72		0.094	0.256		1.00	18	14.38	14.63	0.175	0.175	1.72	0.43	0.075	3%
	14.75	1.66		0.040	0.223		1.00	19	14.63	14.88	0.131	0.131	1.66	0.42	0.054	2%
	15.00	1.55		0.098	0.253		1.00	20	14.88	15.13	0.175	0.175	1.55	0.39	0.068	3%
	15.25	1.54		0.040	0.140		1.00	21	15.13	15.38	0.090	0.090	1.54	0.39	0.035	2%
	15.50	1.50		0.000	0.030		1.00	22	15.38	15.75	0.015	0.015	1.50	0.56	0.009	0%
	16.00	1.30		0.003	0.067		1.00	23	15.75	16.40	0.035	0.035	1.30	0.84	0.030	1%
	LB	16.80	0.00					1.00	24	16.40	16.80	0.01	0.009	0.33	0.13	0.001
Total Flow:														2.206	1.000	

Total Flow:	2.206	(m ³ /s)
Perceived Measurement Quality:	good	
Total Area:	11.25	(m ²)
Top Width:	7.55	(m)
Hydraulic Depth:	1.490	(m)
Mean Velocity:	0.196	(m/s)
Froude Number	0.051	
Photographs taken looking at:		
Photographs taken:		

Notes: TSS - yes
- trans serial # 4988

Data logger Notes:	
Data logger Internal Power:	4.7 V
Data logger External Power:	12.95 V
Data logger Memory Used:	15% used
Data logger Clock:	9:15 AM MST
Laptop Clock:	8:55 AM MST
Dessicant:	good
Data logger:	010290
PT:	4988
Power:	



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albion Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albion Boundary

Time of Measurement

Date of Measurement: July 28, 2008
Start Time: 12:15 PM MDT
End Time: 12:45 PM MDT

Weather Conditions:

River Conditions:

Personnel & Equipment

Measurement Made By: JMS/SM
Data Entry By: LM Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.657
Water Level Reading: 2.634
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.190
Other:

Setup No. 1

El: 281.740
El: 279.763
El: 278.573
El:

Setup No. 2

El: 281.740
El: 279.767
El: 278.577
El:

Average

279.765
278.575

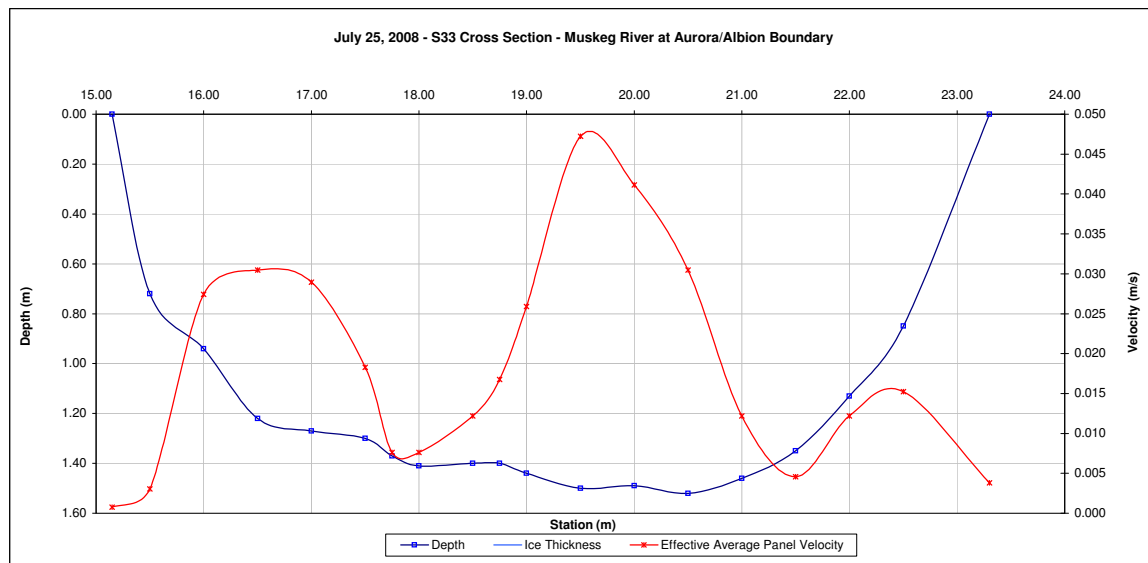
		Measurement Data														
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
RB	15.15	0.00				1.00	1	15.15	15.33	0.001	0.001	0.18	0.03	0.000	0%	
	15.50	0.72			0.003	1.00	2	15.33	15.75	0.003	0.003	0.72	0.31	0.001	0%	
	16.00	0.94			0.027	1.00	3	15.75	16.25	0.027	0.027	0.94	0.47	0.013	6%	
	16.50	1.22		0.03	0.03	1.00	4	16.25	16.75	0.030	0.030	1.22	0.61	0.019	9%	
	17.00	1.27		0.03	0.03	1.00	5	16.75	17.25	0.029	0.029	1.27	0.64	0.018	9%	
	17.50	1.30		0.03	0.00	1.00	6	17.25	17.63	0.018	0.018	1.30	0.49	0.009	4%	
	17.75	1.37		0.01	0.00	1.00	7	17.63	17.88	0.008	0.008	1.37	0.34	0.003	1%	
	18.00	1.41		0.01	0.01	1.00	8	17.88	18.25	0.008	0.008	1.41	0.53	0.004	2%	
	18.50	1.40		0.02	0.01	1.00	9	18.25	18.63	0.012	0.012	1.40	0.53	0.006	3%	
	18.75	1.40		0.02	0.01	1.00	10	18.63	18.88	0.017	0.017	1.40	0.35	0.006	3%	
	19.00	1.44		0.02	0.03	1.00	11	18.88	19.25	0.026	0.026	1.44	0.54	0.014	7%	
	19.50	1.50		0.05	0.05	1.00	12	19.25	19.75	0.047	0.047	1.50	0.75	0.035	17%	
	20.00	1.49		0.05	0.03	1.00	13	19.75	20.25	0.041	0.041	1.49	0.75	0.031	15%	
	20.50	1.52		0.05	0.02	1.00	14	20.25	20.75	0.030	0.030	1.52	0.76	0.023	11%	
	21.00	1.46		0.02	0.01	1.00	15	20.75	21.25	0.012	0.012	1.46	0.73	0.009	4%	
	21.50	1.35		0.01	0.00	1.00	16	21.25	21.75	0.005	0.005	1.35	0.68	0.003	1%	
	22.00	1.13		0.02	0.01	1.00	17	21.75	22.25	0.012	0.012	1.13	0.57	0.007	3%	
	22.50	0.85				0.015	1.00	18	22.25	22.90	0.015	0.015	0.85	0.55	0.008	4%
	23.30	0.00					1.00	19	22.90	23.30	0.004	0.004	0.00	0.00	0.000	0%
LB																
Total Flow:														0.209	1.000	

Total Flow:	0.209	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	9.60	(m ²)
Top Width:	8.15	(m)
Hydraulic Depth:	1.178	(m)
Mean Velocity:	0.022	(m/s)
Froude Number	0.006	
Photographs taken looking at:		

Notes:

Photographs taken.

Data logger Notes:		
Data logger Internal Power:	4.83 V	
Data logger External Power:	13.95 V	
Data logger Memory Used:	6%	
Data logger Clock:	10:36 PM	MST
Laptop Clock:	10:56 PM	MST
Dessicant:	pink	
Data logger:		
PT:		
Power:		



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albion Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albion Boundary
Coordinates & Legal:

Time of Measurement

Date of Measurement: August 8, 2008
Start Time: 10:45 AM MDT
End Time: 11:15 AM MDT

Weather Conditions:

Sun, +24
River Conditions: Open Water

Personnel & Equipment

Measurement Made By: JS/SM/SE
Data Entry By: JS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.718
Water Level Reading: 2.075
Top of Ice Level Reading:
TD Reading (Old TD): 1.824
TD Reading (New TD): 1.870

Setup No. 1

El: 281.740
El: 280.383
El:
El: 278.559
El: 278.513

Setup No. 2

0.702 El: 281.740
2.068 El: 280.374
El:
1.824 El: 278.550
1.870 El: 278.504

Average

280.379
278.555
278.509

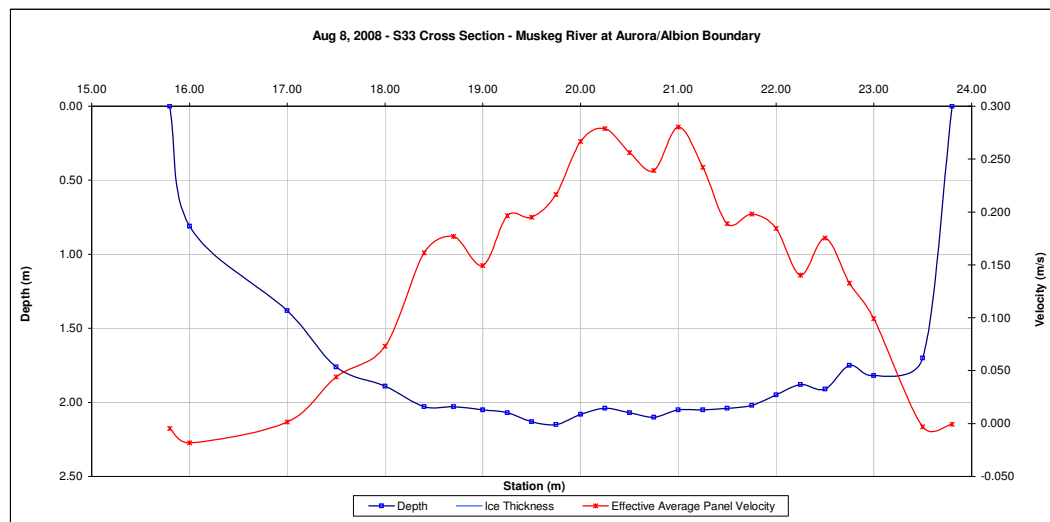
		Measured Data					Measurement Data										
							Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)			
RB	23.80	0.00				1.00	1	23.80	23.65	-0.001	-0.001	0.43	0.06	0.000	0%		
	23.50	1.70	-0.02	0.01		1.00	2	23.65	23.25	-0.003	-0.003	1.70	0.68	-0.002	0%		
	23.00	1.82	0.02	0.18		1.00	3	23.25	22.88	0.099	0.099	1.82	0.68	0.068	3%		
	22.75	1.75	0.06	0.20		1.00	4	22.88	22.63	0.133	0.133	1.75	0.44	0.058	3%		
	22.50	1.91	0.15	0.20		1.00	5	22.63	22.38	0.175	0.175	1.91	0.48	0.084	4%		
	22.25	1.88	0.08	0.20		1.00	6	22.38	22.13	0.140	0.140	1.88	0.47	0.066	3%		
	22.00	1.95	0.20	0.17		1.00	7	22.13	21.88	0.184	0.184	1.95	0.49	0.090	4%		
	21.75	2.02	0.19	0.20		1.00	8	21.88	21.63	0.198	0.198	2.02	0.51	0.100	5%		
	21.50	2.04	0.17	0.20		1.00	9	21.63	21.38	0.189	0.189	2.04	0.51	0.096	5%		
	21.25	2.05	0.27	0.21		1.00	10	21.38	21.13	0.242	0.242	2.05	0.51	0.124	6%		
	21.00	2.05	0.27	0.29		1.00	11	21.13	20.88	0.280	0.280	2.05	0.51	0.144	7%		
	20.75	2.10	0.22	0.26		1.00	12	20.88	20.63	0.239	0.239	2.10	0.53	0.126	6%		
	20.50	2.07	0.22	0.30		1.00	13	20.63	20.38	0.256	0.256	2.07	0.52	0.132	6%		
	20.25	2.04	0.28	0.28		1.00	14	20.38	20.13	0.279	0.279	2.04	0.51	0.142	7%		
	20.00	2.08	0.28	0.26		1.00	15	20.13	19.88	0.267	0.267	2.08	0.52	0.139	7%		
	19.75	2.15	0.21	0.22		1.00	16	19.88	19.63	0.216	0.216	2.15	0.54	0.116	6%		
	19.50	2.13	0.20	0.19		1.00	17	19.63	19.38	0.195	0.195	2.13	0.53	0.104	5%		
	19.25	2.07	0.15	0.25		1.00	18	19.38	19.13	0.197	0.197	2.07	0.52	0.102	5%		
	19.00	2.05	0.10	0.20		1.00	19	19.13	18.85	0.149	0.149	2.05	0.56	0.084	4%		
	18.70	2.03	0.13	0.23		1.00	20	18.85	18.55	0.177	0.177	2.03	0.61	0.108	5%		
	18.40	2.03	0.13	0.19		1.00	21	18.55	18.20	0.162	0.162	2.03	0.71	0.115	5%		
	18.00	1.89	0.04	0.10		1.00	22	18.20	17.75	0.073	0.073	1.89	0.85	0.062	3%		
	17.50	1.76	-0.01	0.09		1.00	23	17.75	17.25	0.044	0.044	1.76	0.88	0.039	2%		
	17.00	1.38	0.00	0.00		1.00	24	17.25	16.50	0.002	0.002	1.38	1.04	0.002	0%		
LB	16.00	0.81			-0.018	1.00	25	16.50	15.90	-0.018	-0.018	0.81	0.49	-0.009	0%		
	15.80	0.00				1.00	26	15.90	15.80	-0.005	-0.005	0.20	0.02	0.000	0%		
													Total Flow:	2.089	1.000		

Total Flow:	2.089	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	14.15	(m ²)
Top Width:	8.00	(m)
Hydraulic Depth:	1.769	(m)
Mean Velocity:	0.148	(m/s)
Froude Number	0.035	
Photographs taken looking at: Upstream, Downstream, perpendicular		

Notes: Water Temp = 19.1C

second TD=1.870

Data logger Notes:	
Data logger Internal Power:	4.81 V
Data logger External Power:	13.97 V
Data logger Memory Used:	7%
Data logger Clock:	9:14 PM MST
Laptop Clock:	9:34 PM MST
Dessicant:	New
Data logger:	22817219
PT:	304988 (Old) / 0603160 (New)
Power:	



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albion Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albion Boundary

Time of Measurement

Date of Measurement: September 15, 2008
Start Time: 12:41 PM MDT
End Time: 1:08 PM MDT

Weather Conditions:

partly cloudy, 13 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/SS/JE
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.682
Water Level Reading: 2.352
Top of Ice Level Reading:
Old TD Reading and El: 1.506
New TD Reading and El: 1.540

Setup No. 1

El: 281.740
El: 280.070
El: 278.564
El: 278.530

Setup No. 2

El: 281.740
El: 280.063
El: 278.557
El: 278.523

Average

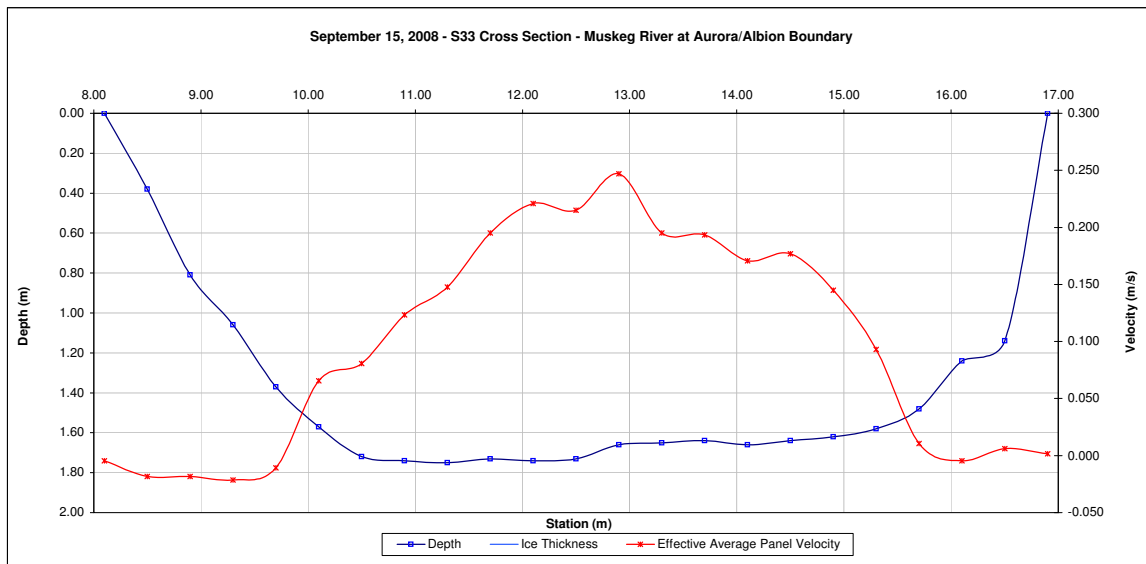
280.067
278.561
278.527

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
16.90	0.00					1.00	1	16.90	16.70	0.002	0.002	0.29	0.06	0.000	0%	
16.50	1.14		0.00	0.02		1.00	2	16.70	16.30	0.006	0.006	1.14	0.46	0.003	0%	
16.10	1.24		-0.03	0.02		1.00	3	16.30	15.90	-0.005	-0.005	1.24	0.50	-0.002	0%	
15.70	1.48		-0.01	0.03		1.00	4	15.90	15.50	0.011	0.011	1.48	0.59	0.006	0%	
15.30	1.58		0.08	0.11		1.00	5	15.50	15.10	0.093	0.093	1.58	0.63	0.059	4%	
14.90	1.62		0.12	0.17		1.00	6	15.10	14.70	0.145	0.145	1.62	0.65	0.094	6%	
14.50	1.64		0.19	0.16		1.00	7	14.70	14.30	0.177	0.177	1.64	0.66	0.116	8%	
14.10	1.66		0.16	0.18		1.00	8	14.30	13.90	0.171	0.171	1.66	0.66	0.113	8%	
13.70	1.64		0.16	0.23		1.00	9	13.90	13.50	0.194	0.194	1.64	0.66	0.127	8%	
13.30	1.65		0.21	0.18		1.00	10	13.50	13.10	0.195	0.195	1.65	0.66	0.129	9%	
12.90	1.66		0.22	0.27		1.00	11	13.10	12.70	0.247	0.247	1.66	0.66	0.164	11%	
12.50	1.73		0.20	0.23		1.00	12	12.70	12.30	0.215	0.215	1.73	0.69	0.149	10%	
12.10	1.74		0.17	0.27		1.00	13	12.30	11.90	0.221	0.221	1.74	0.70	0.154	10%	
11.70	1.73		0.16	0.23		1.00	14	11.90	11.50	0.195	0.195	1.73	0.69	0.135	9%	
11.30	1.75		0.07	0.23		1.00	15	11.50	11.10	0.148	0.148	1.75	0.70	0.103	7%	
10.90	1.74		0.10	0.15		1.00	16	11.10	10.70	0.123	0.123	1.74	0.70	0.086	6%	
10.50	1.72		0.09	0.07		1.00	17	10.70	10.30	0.081	0.081	1.72	0.69	0.056	4%	
10.10	1.57		0.08	0.05		1.00	18	10.30	9.90	0.066	0.066	1.57	0.63	0.041	3%	
9.70	1.37		-0.01	-0.02		1.00	19	9.90	9.50	-0.011	-0.011	1.37	0.55	-0.006	0%	
9.30	1.06				-0.02	1.00	20	9.50	9.10	-0.021	-0.021	1.06	0.42	-0.009	-1%	
8.90	0.81				-0.02	1.00	21	9.10	8.70	-0.018	-0.018	0.81	0.32	-0.006	0%	
8.50	0.38				-0.02	1.00	22	8.70	8.30	-0.018	-0.018	0.38	0.15	-0.003	0%	
8.10	0.00					1.00	23	8.30	8.10	-0.005	-0.005	0.10	0.02	0.000	0%	
Total Flow:														1.508	1.000	

Total Flow:	1.508	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	12.44	(m ²)
Top Width:	8.80	(m)
Hydraulic Depth:	1.414	(m)
Mean Velocity:	0.121	(m/s)
Froude Number	0.033	
Photographs taken looking at:		
Upstream, Downstream, perpendicular		

Notes: Lock code 968953
IP: 70.25.219.179
Depth new TD (optimum): 1.54

Data logger Notes:	
Data logger Internal Power:	4.79 V
Data logger External Power:	14.27 V
Data logger Memory Used:	12%
Data logger Clock:	11:13 AM MST
Laptop Clock:	11:32 AM MST
Dessicant:	good
Data logger:	22817219
PT:	304988 (Old) / 0603160 (New)
Power:	



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albian Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albian Boundary

Time of Measurement

Date of Measurement: October 17, 2008
Start Time: 9:05 AM MDT
End Time: 9:35 AM MDT

Weather Conditions:

cloudy, 3 C

River Conditions:

open, low

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.661
Water Level Reading: 2.052
Top of Ice Level Reading:
Old TD Reading and El: Optimum 1.812
Camp. Sci. TD reading: CS445 TD 1.030

Setup No. 1

El: 281.740
El: 280.349
El:
El: 278.537
El: 279.319

Setup No. 2

El: 281.740
El: 280.354
El:
El: 278.542
El: 279.324

Average

280.352
278.540
279.322

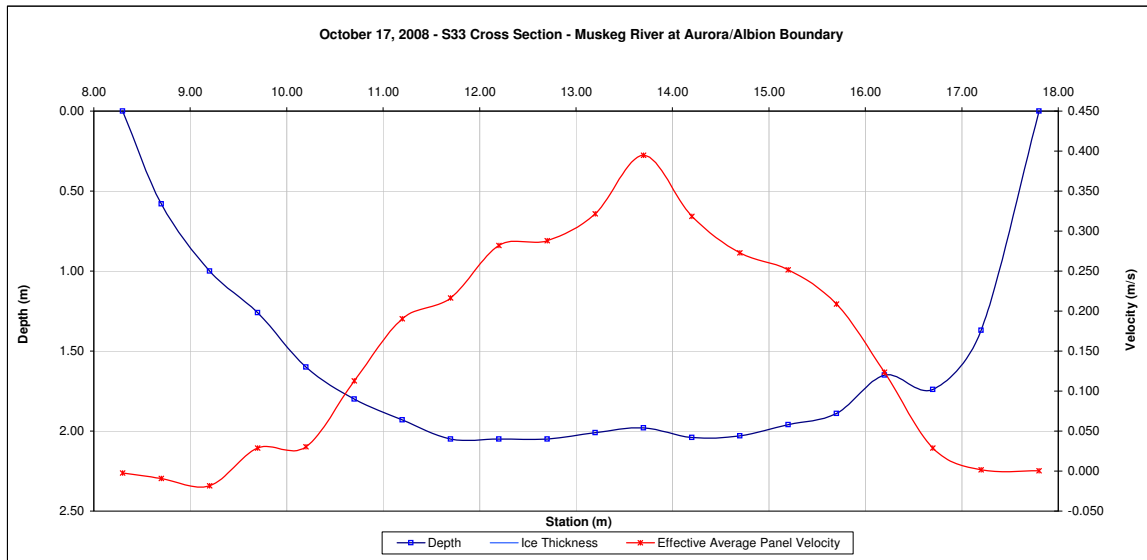
Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.6 Depth	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
						1.00	1	8.30	8.50	-0.002	-0.002	0.15	0.03	0.000	0%	
8.30	0.00					1.00	2	8.50	8.95	-0.009	-0.009	0.58	0.26	-0.002	0%	
8.70	0.58		-0.01			1.00	3	8.95	9.45	-0.018	-0.018	1.00	0.50	-0.009	0%	
9.20	1.00		-0.02			1.00	4	9.45	9.95	0.029	0.029	1.26	0.63	0.018	1%	
9.70	1.26			0.04	0.02	1.00	5	9.95	10.45	0.030	0.030	1.60	0.80	0.024	1%	
10.20	1.60			0.07	-0.01	1.00	6	10.45	10.95	0.113	0.113	1.80	0.90	0.101	3%	
10.70	1.80			0.09	0.14	1.00	7	10.95	11.45	0.191	0.191	1.93	0.97	0.184	6%	
11.20	1.93			0.10	0.28	1.00	8	11.45	11.95	0.216	0.216	2.05	1.03	0.222	7%	
11.70	2.05			0.07	0.36	1.00	9	11.95	12.45	0.282	0.282	2.05	1.03	0.289	10%	
12.20	2.05			0.19	0.37	1.00	10	12.45	12.95	0.288	0.288	2.05	1.03	0.295	10%	
12.70	2.05			0.25	0.33	1.00	11	12.95	13.45	0.322	0.322	2.01	1.01	0.323	11%	
13.20	2.01			0.34	0.30	1.00	12	13.45	13.95	0.395	0.395	1.98	0.99	0.391	13%	
13.70	1.98			0.42	0.37	1.00	13	13.95	14.45	0.319	0.319	2.04	1.02	0.325	11%	
14.20	2.04			0.31	0.33	1.00	14	14.45	14.95	0.273	0.273	2.03	1.02	0.277	9%	
14.70	2.03			0.24	0.30	1.00	15	14.95	15.45	0.251	0.251	1.96	0.98	0.246	8%	
15.20	1.96			0.22	0.29	1.00	16	15.45	15.95	0.209	0.209	1.89	0.95	0.197	7%	
15.70	1.89			0.10	0.32	1.00	17	15.95	16.45	0.123	0.123	1.65	0.83	0.102	3%	
16.20	1.65			0.03	0.21	1.00	18	16.45	16.95	0.029	0.029	1.74	0.87	0.025	1%	
16.70	1.74		-0.01	0.07	0.00	1.00	19	16.95	17.50	0.002	0.002	1.37	0.75	0.001	0%	
17.20	1.37		-0.03	0.03	0.00	1.00	20	17.50	17.80	0.000	0.000	0.34	0.10	0.000	0%	
17.80	0.00					1.00										

Total Flow:	3.010	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	15.67	(m ²)
Top Width:	9.50	(m)
Hydraulic Depth:	1.649	(m)
Mean Velocity:	0.192	(m/s)
Froude Number	0.048	
Photographs taken looking at: Upstream, Downstream, perpendicular		

Data logger Notes:		
Data logger Internal Power:	4.74 V	
Data logger External Power:	12.82 V	
Data logger Memory Used:	16%	
Data logger Clock:	7:28 AM	MST
Laptop Clock:	7:49 AM	MST
Dessicant:	NEW	
Data logger:	0105010290	
PT:	304988 (Old) / 0603160 (New)	
Power:		

Notes: NEW CS445 installed - w/ backup optimum reading 1.03 m



Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albian Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
 Location: S33
 Site Name: Muskeg River at Aurora/Albian Boundary
 Coordinates & Legal:

Time of Measurement

Date of Measurement: December 15, 2008
 Start Time: 10:10 AM MST
 End Time:

Weather Conditions:

overcast, -25 C
 River Conditions: ice cover - thin in places

Personnel & Equipment

Measurement Made By: SM/SS
 Data Entry By: SS Checked:
 Meter Type and No.: March Mc Birney Flo-Mate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC 0.731
 Water Level Reading: 2.572
 Top of Ice Level Reading: 2.474
 Old TD Reading and El: Optimum backup
 New TD Reading and El: CS445 TD

Setup No. 1

El: 281.740
 El: 279.899
 El: 279.997
 El:

Setup No. 2

El: 0.698
 El: 281.740
 El: 279.901
 El: 279.998
 El:

Average

279.900
 279.998
 279.998

Data logger Notes:

Data logger Internal Power:

Data logger External Power:

Data logger Memory Used:

Data logger Clock:

MST

Laptop Clock:

MST

Dessicant:

Data logger: 0105010290

PT: 304988 (Old) / 0603160 (New)

Power:

Notes: no discharge measurement done because ice was too thin, cracking when walked on
 no Campbell logger data, battery died on December 5 about

Hydrometric Measurement / Site Visit Record

Muskeg River at Aurora/Albian Boundary - S33



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: S33
Site Name: Muskeg River at Aurora/Albian Boundary
Coordinates & Legal:

Time of Measurement

Date of Measurement: December 18, 2008
Start Time: 10:30 AM MST
End Time:

Weather Conditions:

overcast, -25 C

River Conditions:

ice cover - thin in places

Personnel & Equipment

Measurement Made By: sm je
Data Entry By: sm Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar in PVC
Water Level Reading:
Top of Ice Level Reading:
Old TD Reading and El: Optimum t
New TD Reading and El: CS445 TD

Setup No. 1

El: 281.740
El: 281.740
El: 281.740
El: 1.337
El: 0.680

Setup No. 2

El: 281.740
El: 281.740
El: 281.740
El:
El:

Average

281.740
281.740
281.740

Data logger Notes:			
Data logger Internal Power:	4.57 v		
Data logger External Power:	12.44 v		
Data logger Memory Used:		23%	
Data logger Clock:	9:44 AM	MST	
Laptop Clock:	10:08 AM	MST	
Dessicant:			
Data logger:	0105010290		
PT:	304988 (Old) / 0603160 (New)		
Power:			

Notes: battery replaced

Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E
Time of Measurement: April 8, 2008
Date of Measurement: 10:39 AM MDT
End Time: 10:50 AM MDT

Personnel & Equipment

Measurement Made By: sm je
Data Entry By: sm checked SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in tree 1.286
Water Level Reading: 2.450
Transducer Reading & El.: 0.119
Other: rebar

Setup No. 1

El: 98.815
El: 97.651
El: 97.651
El: 99.982

Setup No. 2

El: 98.815
El: 97.656
El: 97.656
El: 99.984

Weather Conditions: +4° C, overcast, Light wind

River Conditions: ice snow

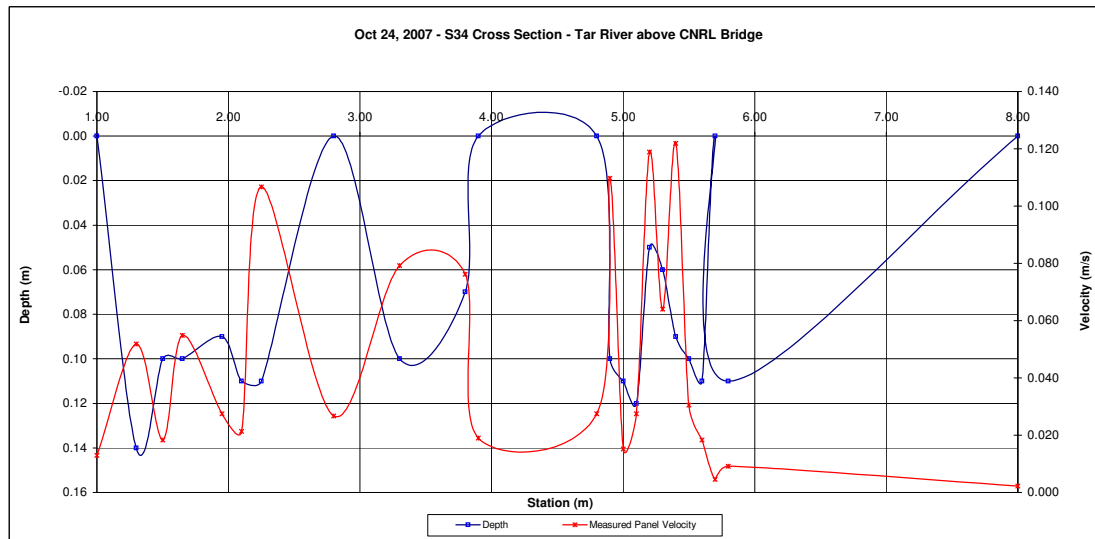
Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
1.00	0.00	0.00			0.000	0.90	1	1.00	1.15	0.013	0.012	0.03	0.00	0.000	0%
1.30	0.14	0.02			0.052	0.90	2	1.15	1.40	0.052	0.047	0.12	0.03	0.001	12%
1.50	0.10	0.04			0.018	0.90	3	1.40	1.58	0.018	0.016	0.06	0.01	0.000	1%
1.65	0.10	0.04			0.055	0.90	4	1.58	1.80	0.055	0.049	0.06	0.01	0.001	6%
1.95	0.09	0.05			0.027	0.90	5	1.80	2.03	0.027	0.025	0.04	0.01	0.000	2%
2.10	0.11	0.04			0.021	0.90	6	2.03	2.18	0.021	0.019	0.07	0.01	0.000	2%
2.25	0.11	0.05			0.107	0.90	7	2.18	2.53	0.107	0.096	0.06	0.02	0.002	17%
2.80	0.00	0.00			0.000	0.90	8	2.53	3.05	0.027	0.024	0.00	0.00	0.000	0%
3.30	0.10	0.05			0.079	0.90	9	3.05	3.55	0.079	0.071	0.05	0.03	0.002	15%
3.80	0.07	0.03			0.076	0.90	10	3.55	3.85	0.076	0.069	0.04	0.01	0.001	7%
3.90	0.00	0.00			0.000	0.90	11	3.85	4.35	0.019	0.017	0.00	0.00	0.000	0%
4.80	0.00	0.00			0.000	0.90	12	4.35	4.85	0.027	0.025	0.00	0.00	0.000	0%
4.90	0.10	0.00			0.110	0.90	13	4.85	4.95	0.110	0.099	0.10	0.01	0.001	8%
5.00	0.11	0.00			0.015	0.90	14	4.95	5.05	0.015	0.014	0.11	0.01	0.000	1%
5.10	0.12	0.05			0.027	0.90	15	5.05	5.15	0.027	0.025	0.07	0.01	0.000	1%
5.20	0.05	0.00			0.119	0.90	16	5.15	5.25	0.119	0.107	0.05	0.00	0.001	4%
5.30	0.06	0.00			0.064	0.90	17	5.25	5.35	0.064	0.058	0.06	0.01	0.000	3%
5.40	0.09	0.00			0.122	0.90	18	5.35	5.45	0.122	0.110	0.09	0.01	0.001	8%
5.50	0.10	0.00			0.030	0.90	19	5.45	5.55	0.030	0.027	0.10	0.01	0.000	2%
5.60	0.11	0.00			0.018	0.90	20	5.55	5.65	0.018	0.016	0.11	0.01	0.000	1%
5.70	0.00	0.00			0.000	0.90	21	5.65	5.75	0.005	0.004	0.00	0.00	0.000	0%
5.80	0.11	0.00			0.009	0.90	22	5.75	6.90	0.009	0.008	0.11	0.13	0.001	9%
8.00	0.00	0.00			0.000	0.90	23	6.90	8.00	0.002	0.002	0.03	0.03	0.000	1%
Total Flow:														0.012	100%

Total Flow:	0.012	(m ³ /s)
Perceived Measurement Quality:	fair	
Total Area:	0.36	(m ²)
Top Width:	7.00	(m)
Hydraulic Depth:	0.052	(m)
Mean Velocity:	0.033	(m/s)
Froude Number	0.047	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:	Database #1772
Data logger Internal Power:	
Data logger External Power:	
Data logger Memory Used:	Used
Data logger Clock:	MST
Laptop Clock:	MST
Dessicant:	Good
Data logger:	Optimum DD-128 #1772
PT:	Keller 3 psi #0101878
Power:	Solar panel and internal battery

Notes:



Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E
Time of Measurement:
Date of Measurement: April 8, 2008
Start Time: 10:39 AM MDT
End Time: 10:50 AM MDT

Personnel & Equipment

Measurement Made By: sm je
Data Entry By: sm
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in tree 1.286
Water Level Reading: 2.450
Transducer Reading & El.: 0.089
Other: rebar 0.119

Setup No. 1

El.: 98.815
El.: 97.651
El.: 97.562
El.: 99.982

Setup No. 2

El.: 98.815
El.: 97.656
El.: 97.567
El.: 99.984

Weather Conditions: +4 C, overcast, Light wind

River Conditions: ice snow

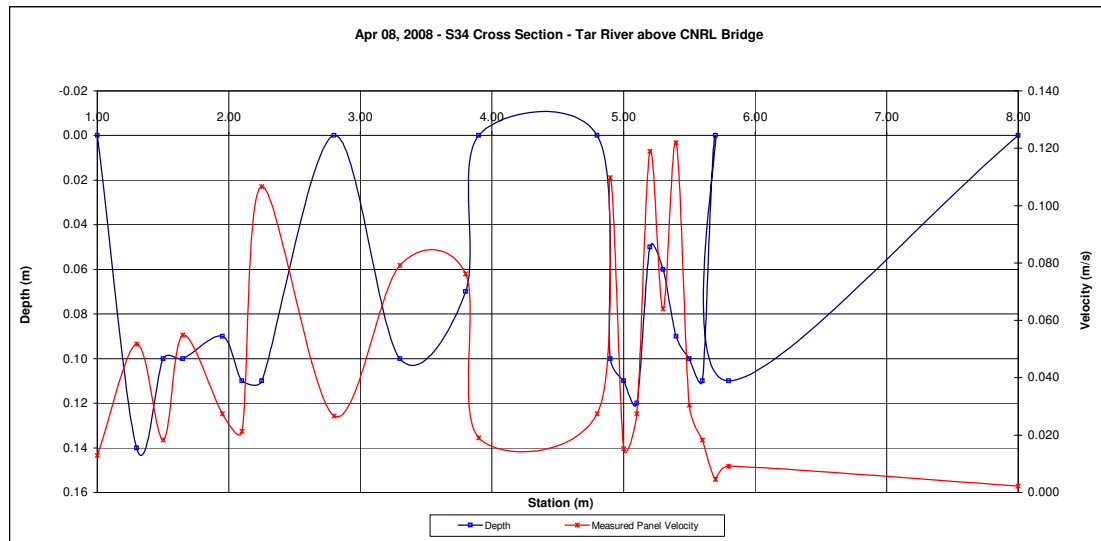
Measurement Data

	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	1.00	0.00	0.00			0.000	0.90	1	1.00	1.15	0.013	0.012	0.03	0.00	0.000	0%
	1.30	0.14	0.02			0.052	0.90	2	1.15	1.40	0.052	0.047	0.12	0.03	0.001	12%
	1.50	0.10	0.04			0.018	0.90	3	1.40	1.58	0.018	0.016	0.06	0.01	0.000	1%
	1.65	0.10	0.04			0.055	0.90	4	1.58	1.80	0.055	0.049	0.06	0.01	0.001	6%
	1.95	0.09	0.05			0.027	0.90	5	1.80	2.03	0.027	0.025	0.04	0.01	0.000	2%
	2.10	0.11	0.04			0.021	0.90	6	2.03	2.18	0.021	0.019	0.07	0.01	0.000	2%
	2.25	0.11	0.05			0.107	0.90	7	2.18	2.53	0.107	0.096	0.06	0.02	0.002	17%
	2.80	0.00	0.00			0.000	0.90	8	2.53	3.05	0.027	0.024	0.00	0.00	0.000	0%
	3.30	0.10	0.05			0.079	0.90	9	3.05	3.55	0.079	0.071	0.05	0.03	0.002	15%
	3.80	0.07	0.03			0.076	0.90	10	3.55	3.85	0.076	0.069	0.04	0.01	0.001	7%
	3.90	0.00	0.00			0.000	0.90	11	3.85	4.35	0.019	0.017	0.00	0.00	0.000	0%
	4.80	0.00	0.00			0.000	0.90	12	4.35	4.85	0.027	0.025	0.00	0.00	0.000	0%
	4.90	0.10	0.00			0.110	0.90	13	4.85	4.95	0.110	0.099	0.10	0.01	0.001	8%
	5.00	0.11	0.00			0.015	0.90	14	4.95	5.05	0.015	0.014	0.11	0.01	0.000	1%
	5.10	0.12	0.05			0.027	0.90	15	5.05	5.15	0.027	0.025	0.07	0.01	0.000	1%
	5.20	0.05	0.00			0.119	0.90	16	5.15	5.25	0.119	0.107	0.05	0.00	0.001	4%
	5.30	0.06	0.00			0.064	0.90	17	5.25	5.35	0.064	0.058	0.06	0.01	0.000	3%
	5.40	0.09	0.00			0.122	0.90	18	5.35	5.45	0.122	0.110	0.09	0.01	0.001	8%
	5.50	0.10	0.00			0.030	0.90	19	5.45	5.55	0.030	0.027	0.10	0.01	0.000	2%
	5.60	0.11	0.00			0.018	0.90	20	5.55	5.65	0.018	0.016	0.11	0.01	0.000	1%
	5.70	0.00	0.00			0.000	0.90	21	5.65	5.75	0.005	0.004	0.00	0.00	0.000	0%
	5.80	0.11	0.00			0.009	0.90	22	5.75	6.90	0.009	0.008	0.11	0.13	0.001	9%
	RB	8.00	0.00	0.00			0.000	0.90	23	6.90	8.00	0.002	0.002	0.03	0.03	0.000
Total Flow:															0.012	100%

Total Flow:	0.012	(m ³ /s)
Perceived Measurement Quality:	fair	
Total Area:	0.36	(m ²)
Top Width:	7.00	(m)
Hydraulic Depth:	0.052	(m)
Mean Velocity:	0.033	(m/s)
Froude Number	0.047	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:	Database #1772
Data logger Internal Power:	
Data logger External Power:	
Data logger Memory Used:	Used
Data logger Clock:	MST
Laptop Clock:	MST
Dessicant:	Good
Data logger:	Optimum DD-128 #1772
PT:	Keller 3 psi #0101878
Power:	Solar panel and internal battery

Notes:



Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E

Time of Measurement

Date of Measurement: May 13, 2008
Start Time: 9:30 AM MDT
End Time: 9:42 AM MDT

Weather Conditions:

sunny, clear, 7 C

River Conditions:

open, high

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: sm
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Nail in tree 1.289
Water Level Reading: 2.384
Transducer Reading & El.: 0.136
Other: rebar 0.113
Other: old solnist location WL 2.325

Setup No. 1

El: 98.815
El: 97.720
El: 97.584
El: 99.991
El: 97.779

Setup No. 2

El: 98.815
El: 97.725
El: 97.589
El: 99.993
El: 97.782

Measurement Data

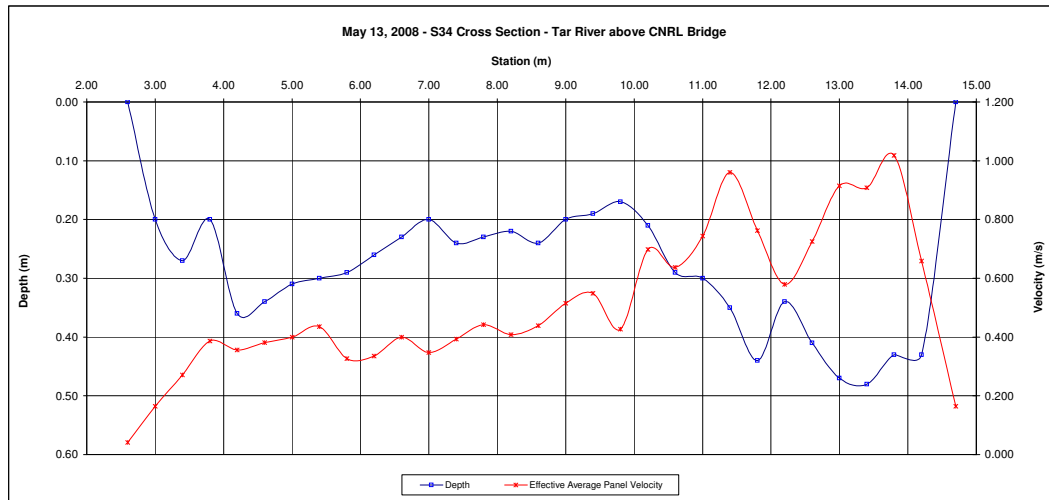
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
2.60	0.00				1.00		1	2.60	2.80	0.041	0.041	0.05	0.01	0.000	0%	
3.00					0.165		2	2.80	3.20	0.165	0.165	0.20	0.08	0.013	1%	
3.40	0.27				0.271	1.00	3	3.20	3.60	0.271	0.271	0.11	0.029	1%	1%	
3.80	0.20				0.387	1.00	4	3.60	4.00	0.387	0.387	0.20	0.08	0.031	2%	
4.20	0.36				0.357	1.00	5	4.00	4.40	0.357	0.357	0.36	0.14	0.051	3%	
4.60	0.34				0.381	1.00	6	4.40	4.80	0.381	0.381	0.34	0.14	0.052	3%	
5.00	0.31				0.399	1.00	7	4.80	5.20	0.399	0.399	0.31	0.12	0.050	2%	
5.40	0.30				0.436	1.00	8	5.20	5.60	0.436	0.436	0.30	0.12	0.052	3%	
5.80	0.29				0.326	1.00	9	5.60	6.00	0.326	0.326	0.29	0.12	0.038	2%	
6.20	0.26				0.335	1.00	10	6.00	6.40	0.335	0.335	0.26	0.10	0.035	2%	
6.60	0.23				0.399	1.00	11	6.40	6.80	0.399	0.399	0.23	0.09	0.037	2%	
7.00	0.20				0.347	1.00	12	6.80	7.20	0.347	0.347	0.20	0.08	0.028	1%	
7.40	0.24				0.393	1.00	13	7.20	7.60	0.393	0.393	0.24	0.10	0.038	2%	
7.80	0.23				0.442	1.00	14	7.60	8.00	0.442	0.442	0.23	0.09	0.041	2%	
8.20	0.22				0.408	1.00	15	8.00	8.40	0.408	0.408	0.22	0.09	0.036	2%	
8.60	0.24				0.439	1.00	16	8.40	8.80	0.439	0.439	0.24	0.10	0.042	2%	
9.00	0.20				0.515	1.00	17	8.80	9.20	0.515	0.515	0.20	0.08	0.041	2%	
9.40	0.19				0.549	1.00	18	9.20	9.60	0.549	0.549	0.19	0.08	0.042	2%	
9.80	0.17				0.427	1.00	19	9.60	10.00	0.427	0.427	0.17	0.07	0.029	1%	
10.20	0.21				0.698	1.00	20	10.00	10.40	0.698	0.698	0.21	0.08	0.059	3%	
10.60	0.29				0.637	1.00	21	10.40	10.80	0.637	0.637	0.29	0.12	0.074	4%	
11.00	0.30				0.744	1.00	22	10.80	11.20	0.744	0.744	0.30	0.12	0.089	4%	
11.40	0.35				0.960	1.00	23	11.20	11.60	0.960	0.960	0.35	0.14	0.134	7%	
11.80	0.44				0.762	1.00	24	11.60	12.00	0.762	0.762	0.44	0.18	0.134	7%	
12.20	0.34				0.579	1.00	25	12.00	12.40	0.579	0.579	0.34	0.14	0.079	4%	
12.60	0.41				0.725	1.00	26	12.40	12.80	0.725	0.725	0.41	0.16	0.119	6%	
13.00	0.47				0.914	1.00	27	12.80	13.20	0.914	0.914	0.47	0.19	0.172	8%	
13.40					0.908	1.00	28	13.20	13.60	0.908	0.908	0.48	0.19	0.174	9%	
13.80	0.43				1.018	1.00	29	13.60	14.00	1.018	1.018	0.43	0.17	0.175	9%	
14.20	0.43				0.658	1.00	30	14.00	14.45	0.658	0.658	0.43	0.19	0.127	6%	
14.70	0.00				1.00		31	14.45	14.70	0.165	0.165	0.11	0.03	0.004	0%	
Total Flow:														2.026	1.000	

Total Flow:	2.026	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	3.50	(m ²)
Top Width:	12.10	(m)
Hydraulic Depth:	0.289	(m)
Mean Velocity:	0.579	(m/s)
Froude Number	0.344	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power: 0.5 V
Data logger External Power: 14.5 V
Data logger Memory Used: 0% Used
Data logger Clock: 8:51:00 AM MST
Laptop Clock: 8:51:00 AM MST
Dessicant: replace
Data logger: Optimum 1810
PT: Keller 3 psi #0101878
Power: Solar panel and internal battery

Notes: solnist moved/installed with the TD @ 9:30
solnist SN 1031107 Altitude 500 m pulled at 8:49 MST
bring dessicant next trip
manual water temp 5 C
m=0.8522017
b=-0.1409738



Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E

Time of Measurement

Date of Measurement: May 13, 2008
Start Time: 9:30 AM MDT
End Time: 9:42 AM MDT

Weather Conditions:

sunny, clear, 7 C

River Conditions:

open, high

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: Marsh McBirney FloMate 2000
Meter Type and No.: s/n 2004521

Level Readings

Bench Mark Reading: Nail in tree 1.289
Water Level Reading: 2.384
Transducer Reading & El.: 0.144
Other: rebar 0.113
Other: old solnist location WL 2.325

Setup No. 1	El.	Setup No. 2	El.
98.815	1.368	98.815	
97.720	2.458	97.725	97.723
97.635	0.144	97.638	97.637
99.991	0.190	99.993	99.992
97.779	2.401	97.782	97.781

Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.6 Depth	Velocity at 0.8 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
2.60	0.00					1.00	1	2.60	2.80	0.041	0.041	0.05	0.01	0.000	0%
3.00	0.20				0.165	1.00	2	2.80	3.20	0.165	0.165	0.20	0.08	0.013	1%
3.40	0.27				0.271	1.00	3	3.20	3.60	0.271	0.271	0.27	0.11	0.029	1%
3.80	0.20				0.387	1.00	4	3.60	4.00	0.387	0.387	0.20	0.08	0.031	2%
4.20	0.36				0.357	1.00	5	4.00	4.40	0.357	0.357	0.36	0.14	0.051	3%
4.60	0.34				0.381	1.00	6	4.40	4.80	0.381	0.381	0.34	0.14	0.052	3%
5.00	0.31				0.399	1.00	7	4.80	5.20	0.399	0.399	0.31	0.12	0.050	2%
5.40	0.30				0.436	1.00	8	5.20	5.60	0.436	0.436	0.30	0.12	0.052	3%
5.80	0.29				0.326	1.00	9	5.60	6.00	0.326	0.326	0.29	0.12	0.038	2%
6.20	0.26				0.335	1.00	10	6.00	6.40	0.335	0.335	0.26	0.10	0.035	2%
6.60	0.23				0.399	1.00	11	6.40	6.80	0.399	0.399	0.23	0.09	0.037	2%
7.00	0.20				0.347	1.00	12	6.80	7.20	0.347	0.347	0.20	0.08	0.028	1%
7.40	0.24				0.393	1.00	13	7.20	7.60	0.393	0.393	0.24	0.10	0.038	2%
7.80	0.23				0.442	1.00	14	7.60	8.00	0.442	0.442	0.23	0.09	0.041	2%
8.20	0.22				0.424	1.00	15	8.00	8.40	0.424	0.424	0.22	0.09	0.037	2%
8.60	0.24				0.439	1.00	16	8.40	8.80	0.439	0.439	0.24	0.10	0.042	2%
9.00	0.20				0.515	1.00	17	8.80	9.20	0.515	0.515	0.20	0.08	0.041	2%
9.40	0.19				0.549	1.00	18	9.20	9.60	0.549	0.549	0.19	0.08	0.042	2%
9.80	0.17				0.427	1.00	19	9.60	10.00	0.427	0.427	0.17	0.07	0.029	1%
10.20	0.21				0.698	1.00	20	10.00	10.40	0.698	0.698	0.21	0.08	0.059	3%
10.60	0.29				0.637	1.00	21	10.40	10.80	0.637	0.637	0.29	0.12	0.074	4%
11.00	0.30				0.744	1.00	22	10.80	11.20	0.744	0.744	0.30	0.12	0.089	4%
11.40	0.35				0.960	1.00	23	11.20	11.60	0.960	0.960	0.35	0.14	0.134	7%
11.80	0.44				0.762	1.00	24	11.60	12.00	0.762	0.762	0.44	0.18	0.134	7%
12.20	0.34				0.579	1.00	25	12.00	12.40	0.579	0.579	0.34	0.14	0.079	4%
12.60	0.41				0.725	1.00	26	12.40	12.80	0.725	0.725	0.41	0.16	0.119	6%
13.00	0.47				0.914	1.00	27	12.80	13.20	0.914	0.914	0.47	0.19	0.172	8%
13.40	0.48				0.908	1.00	28	13.20	13.60	0.908	0.908	0.48	0.19	0.174	9%
13.80	0.43				1.018	1.00	29	13.60	14.00	1.018	1.018	0.43	0.17	0.175	9%
14.20	0.43				0.658	1.00	30	14.00	14.45	0.658	0.658	0.43	0.19	0.127	6%
14.70	0.00					1.00	31	14.45	14.70	0.165	0.165	0.11	0.03	0.004	0%
Total Flow:														2.027	1.000

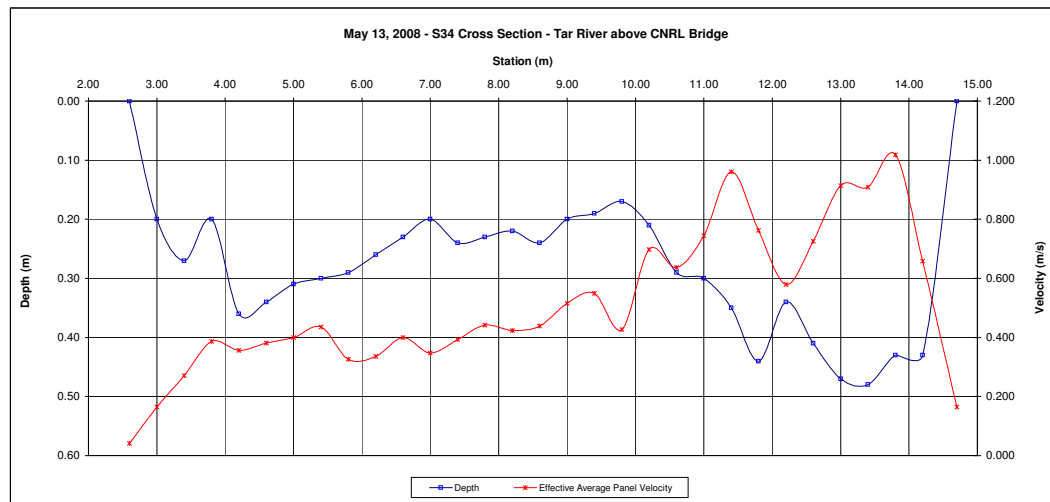
Total Flow:	2.027	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	3.50	(m ²)
Top Width:	12.10	(m)
Hydraulic Depth:	0.289	(m)
Mean Velocity:	0.579	(m/s)
Froude Number	0.344	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power: 0.5 V
Data logger External Power: 14.5 V
Data logger Memory Used: 0% Used
Data logger Clock: 8:51:00 AM MST
Laptop Clock: 8:51:00 AM MST
Dessicant: replace
Data logger: Optimum 1810
PT: Keller 3 psi #0101878
Power: Solar panel and internal battery

Notes:

solnist moved/installed with the TD @ 9:30
solnist SN 1031107 Altitude 500 m pulled at 8:49 MST
bring dessicant next trip
manual water temp 5 C
m=0.8522017
b=-0.1409738



Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E

Time of Measurement

Date of Measurement: June 28, 2008
Start Time: 12:00 PM MDT
End Time: 12:30 PM MDT

Weather Conditions:

sunny, 26 C

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in tree 1.385
Water Level Reading: 2.558
Transducer Reading & El.: 0.060
Other: rebar 0.193

Setup No. 1

El: 98.815
El: 97.642
El: 97.582
El: 100.007

Setup No. 2

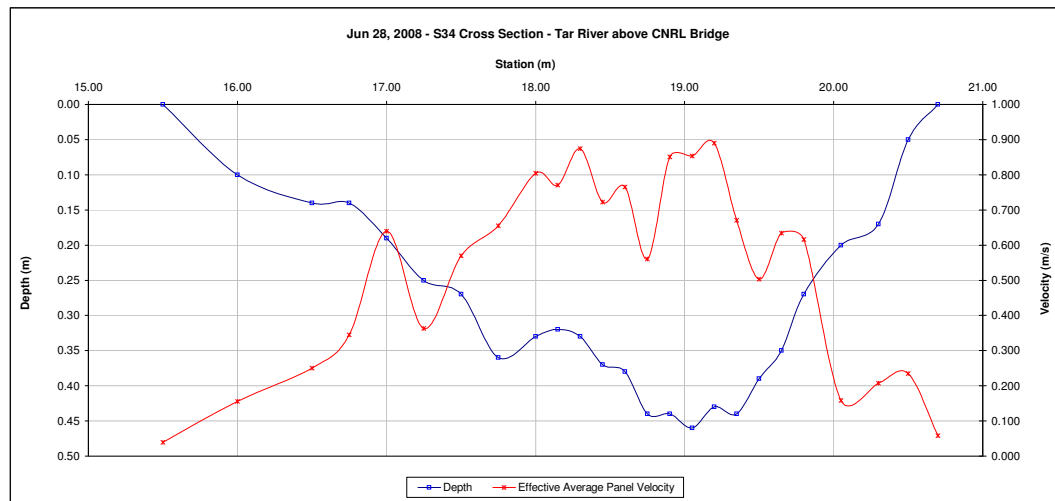
1.370 El: 98.815
2.550 El: 97.635
0.060 El: 97.575
0.180 El: 100.005

		Measurement Data														
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	15.50	0.00				1.00	1	15.50	15.75	0.039	0.039	0.03	0.01	0.000	0%	
	16.00	0.10			0.155	1.00	2	15.75	16.25	0.155	0.155	0.10	0.05	0.008	1%	
	16.50	0.14			0.250	1.00	3	16.25	16.63	0.250	0.250	0.14	0.05	0.013	2%	
	16.75	0.14			0.344	1.00	4	16.63	16.88	0.344	0.344	0.14	0.04	0.012	2%	
	17.00	0.19			0.640	1.00	5	16.88	17.13	0.640	0.640	0.19	0.05	0.030	4%	
	17.25	0.25			0.363	1.00	6	17.13	17.38	0.363	0.363	0.25	0.06	0.023	3%	
	17.50	0.27			0.570	1.00	7	17.38	17.63	0.570	0.570	0.27	0.07	0.038	5%	
	17.75	0.36			0.655	1.00	8	17.63	17.88	0.655	0.655	0.36	0.09	0.059	8%	
	18.00	0.33			0.805	1.00	9	17.88	18.08	0.805	0.805	0.33	0.07	0.053	7%	
	18.15	0.32			0.771	1.00	10	18.08	18.23	0.771	0.771	0.32	0.05	0.037	5%	
	18.30	0.33			0.875	1.00	11	18.23	18.38	0.875	0.875	0.33	0.05	0.043	6%	
	18.45	0.37			0.722	1.00	12	18.38	18.53	0.722	0.722	0.37	0.06	0.040	5%	
	18.60	0.38			0.765	1.00	13	18.53	18.68	0.765	0.765	0.38	0.06	0.044	6%	
	18.75	0.44			0.561	1.00	14	18.68	18.83	0.561	0.561	0.44	0.07	0.037	5%	
	18.90	0.44			0.850	1.00	15	18.83	18.98	0.850	0.850	0.44	0.07	0.056	7%	
	19.05	0.46			0.853	1.00	16	18.98	19.13	0.853	0.853	0.46	0.07	0.059	8%	
	19.20	0.43			0.890	1.00	17	19.13	19.28	0.890	0.890	0.43	0.06	0.057	7%	
	19.35	0.44			0.671	1.00	18	19.28	19.43	0.671	0.671	0.44	0.07	0.044	6%	
	19.50	0.39			0.503	1.00	19	19.43	19.58	0.503	0.503	0.39	0.06	0.029	4%	
	19.65	0.35			0.634	1.00	20	19.58	19.73	0.634	0.634	0.35	0.05	0.033	4%	
	19.80	0.27			0.616	1.00	21	19.73	19.93	0.616	0.616	0.27	0.05	0.033	4%	
	20.05	0.20			0.158	1.00	22	19.93	20.18	0.158	0.158	0.20	0.05	0.008	1%	
	20.30	0.17			0.207	1.00	23	20.18	20.40	0.207	0.207	0.17	0.04	0.008	1%	
	20.50	0.05			0.235	1.00	24	20.40	20.60	0.235	0.235	0.05	0.01	0.002	0%	
	LB	20.70	0.00				1.00	25	20.60	20.70	0.059	0.059	0.01	0.00	0.000	0%
Total Flow:														0.769	1.000	

Total Flow:	0.769	(m³/s)
Perceived Measurement Quality:	Excellent	
Total Area:	1.28	(m²)
Top Width:	5.20	(m)
Hydraulic Depth:	0.247	(m)
Mean Velocity:	0.599	(m/s)
Froude Number	0.385	
Photographs taken looking at:		

Data logger Notes:	
Data logger Internal Power:	0.7 V
Data logger External Power:	14.23 V
Data logger Memory Used:	1%
Data logger Clock:	10:53 AM
Laptop Clock:	10:55 AM
Dessicant:	
Data logger:	Optimum 1810
PT:	
Power:	

Notes: Solnist SN 1031107
500 m level 99.819 temp 13.7 C
battery 100%
DL clock 11:10 LT clock 10:57



Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E

Time of Measurement

Date of Measurement: June 28, 2008
Start Time: 12:00 PM MDT
End Time: 12:30 PM MDT

Weather Conditions:

sunny, 26 C

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Nail in tree
Water Level Reading: 2.558
Transducer Reading & El.: 0.030
Other: rebar

SM/JMS

DW

Checked: SS
Marsh McBirney FloMate 2000 s/n 2004521

Setup No. 1

1.385 El: 98.815
2.558 El: 97.642
0.030 El: 97.612
0.193 El: 100.007

Setup No. 2

1.370 El: 98.815
2.550 El: 97.635
0.030 El: 97.605
0.180 El: 100.005

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	15.50	0.00				1.00	1	15.50	15.75	0.039	0.039	0.03	0.01	0.000	0%
	16.00	0.10			0.155	1.00	2	15.75	16.25	0.155	0.155	0.10	0.05	0.008	1%
	16.50	0.14			0.250	1.00	3	16.25	16.63	0.250	0.250	0.14	0.05	0.013	2%
	16.75	0.14			0.344	1.00	4	16.63	16.88	0.344	0.344	0.14	0.04	0.012	2%
	17.00	0.19			0.640	1.00	5	16.88	17.13	0.640	0.640	0.19	0.05	0.030	4%
	17.25	0.25			0.363	1.00	6	17.13	17.38	0.363	0.363	0.25	0.06	0.023	3%
	17.50	0.27			0.570	1.00	7	17.38	17.63	0.570	0.570	0.27	0.07	0.038	5%
	17.75	0.36			0.655	1.00	8	17.63	17.88	0.655	0.655	0.36	0.09	0.059	8%
	18.00	0.33			0.805	1.00	9	17.88	18.08	0.805	0.805	0.33	0.07	0.053	7%
	18.15	0.32			0.771	1.00	10	18.08	18.23	0.771	0.771	0.32	0.05	0.037	5%
	18.30	0.33			0.875	1.00	11	18.23	18.38	0.875	0.875	0.33	0.05	0.043	6%
	18.45	0.37			0.722	1.00	12	18.38	18.53	0.722	0.722	0.37	0.06	0.040	5%
	18.60	0.38			0.765	1.00	13	18.53	18.68	0.765	0.765	0.38	0.06	0.044	6%
	18.75	0.44			0.561	1.00	14	18.68	18.83	0.561	0.561	0.44	0.07	0.037	5%
	18.90	0.44			0.850	1.00	15	18.83	18.98	0.850	0.850	0.44	0.07	0.056	7%
	19.05	0.46			0.853	1.00	16	18.98	19.13	0.853	0.853	0.46	0.07	0.059	8%
	19.20	0.43			0.890	1.00	17	19.13	19.28	0.890	0.890	0.43	0.06	0.057	7%
	19.35	0.44			0.671	1.00	18	19.28	19.43	0.671	0.671	0.44	0.07	0.044	6%
	19.50	0.39			0.503	1.00	19	19.43	19.58	0.503	0.503	0.39	0.06	0.029	4%
	19.65	0.35			0.634	1.00	20	19.58	19.73	0.634	0.634	0.35	0.05	0.033	4%
19.80	0.27			0.616	1.00	21	19.73	19.93	0.616	0.616	0.27	0.05	0.033	4%	
20.05	0.20			0.158	1.00	22	19.93	20.18	0.158	0.158	0.20	0.05	0.008	1%	
20.30	0.17			0.207	1.00	23	20.18	20.40	0.207	0.207	0.17	0.04	0.008	1%	
20.50	0.05			0.235	1.00	24	20.40	20.60	0.235	0.235	0.05	0.01	0.002	0%	
20.70	0.00				1.00	25	20.60	20.70	0.059	0.059	0.01	0.00	0.000	0%	
LB															
Total Flow:													0.769	1.000	

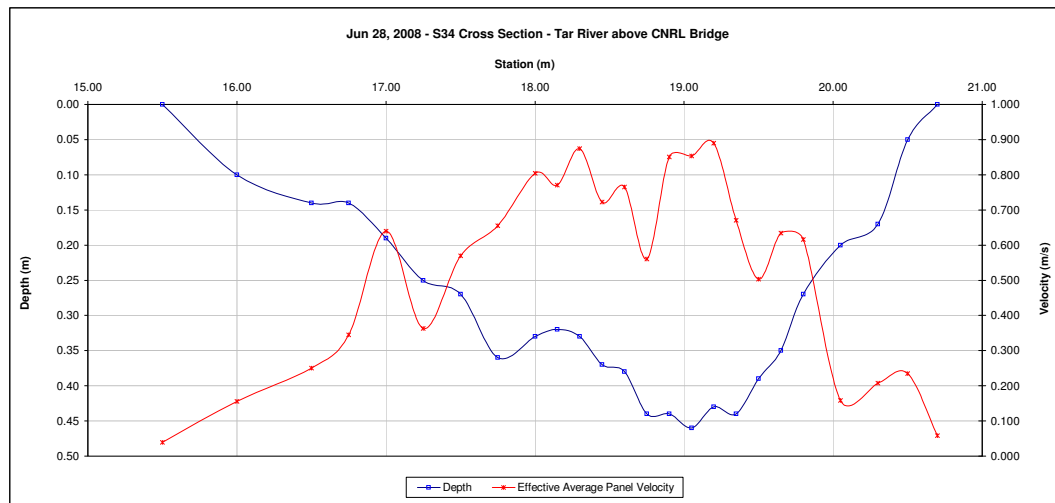
Total Flow:	0.769	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	1.28	(m ²)
Top Width:	5.20	(m)
Hydraulic Depth:	0.247	(m)
Mean Velocity:	0.599	(m/s)
Froude Number	0.385	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power: 0.7 V
Data logger External Power: 14.23 V
Data logger Memory Used: 1%
Data logger Clock: 10:53 AM MST
Laptop Clock: 10:55 AM MST
Dessicant:
Data logger: Optimum 1810
PT:
Power:

Notes:

Solinst SN 1031107
500 m level 99.819 temp 13.7 C
battery 100%
DL clock 11:10 LT clock 10:57



Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E

Time of Measurement

Date of Measurement: August 7, 2008
Start Time: 10:30 AM MDT
End Time: 10:40 AM MDT

Weather Conditions:

sunny, +30

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: JS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Nail in tree 1.198
Water Level Reading: 2.367
Transducer Reading & El.: 0.055
Other: See notes

Setup No. 1

El: 98.815
El: 97.646
El: 97.591
El: 100.013

Setup No. 2

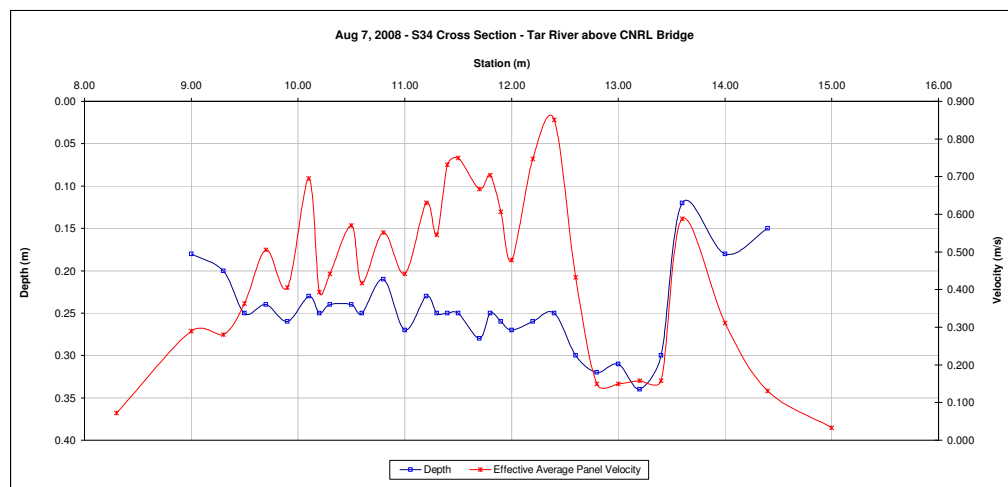
El: 98.815
El: 97.636
El: 97.581
El: 99.974

RB	Measured Data						Measurement Data									Calculated Data					Percentage of Total
	Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m ²)	Panel Discharge (m ³ /s)						
	8.30					1.00		1	8.30	8.65	0.072	0.072	0.05	0.02	0.001	0%					
	9.00	0.18			0.290	1.00		2	8.65	9.15	0.290	0.290	0.18	0.09	0.026	4%					
	9.30	0.20			0.280	1.00		3	9.15	9.40	0.280	0.280	0.20	0.05	0.014	2%					
	9.50	0.25			0.363	1.00		4	9.40	9.60	0.363	0.363	0.25	0.05	0.018	3%					
	9.70	0.24			0.506	1.00		5	9.60	9.80	0.506	0.506	0.24	0.05	0.024	4%					
	9.90	0.26			0.405	1.00		6	9.80	10.00	0.405	0.405	0.26	0.05	0.021	4%					
	10.10	0.23			0.695	1.00		7	10.00	10.15	0.695	0.695	0.23	0.03	0.024	4%					
	10.20	0.25			0.393	1.00		8	10.15	10.25	0.393	0.393	0.25	0.03	0.010	2%					
	10.30	0.24			0.442	1.00		9	10.25	10.40	0.442	0.442	0.24	0.04	0.016	3%					
	10.50	0.24			0.570	1.00		10	10.40	10.55	0.570	0.570	0.24	0.04	0.021	3%					
	10.60	0.25			0.418	1.00		11	10.55	10.70	0.418	0.418	0.25	0.04	0.016	3%					
	10.80	0.21			0.552	1.00		12	10.70	10.90	0.552	0.552	0.21	0.04	0.023	4%					
	11.00	0.27			0.442	1.00		13	10.90	11.10	0.442	0.442	0.27	0.05	0.024	4%					
	11.20	0.23			0.631	1.00		14	11.10	11.25	0.631	0.631	0.23	0.03	0.022	4%					
	11.30	0.25			0.546	1.00		15	11.25	11.35	0.546	0.546	0.25	0.03	0.014	2%					
	11.40	0.25			0.732	1.00		16	11.35	11.45	0.732	0.732	0.25	0.02	0.018	3%					
	11.50	0.25			0.750	1.00		17	11.45	11.60	0.750	0.750	0.25	0.04	0.028	5%					
	11.70	0.28			0.668	1.00		18	11.60	11.75	0.668	0.668	0.28	0.04	0.028	5%					
	11.80	0.25			0.704	1.00		19	11.75	11.85	0.704	0.704	0.25	0.03	0.018	3%					
	11.90	0.26			0.607	1.00		20	11.85	11.95	0.607	0.607	0.26	0.03	0.016	3%					
	12.00	0.27			0.479	1.00		21	11.95	12.10	0.479	0.479	0.27	0.04	0.019	3%					
	12.20	0.26			0.747	1.00		22	12.10	12.30	0.747	0.747	0.26	0.05	0.039	6%					
	12.40	0.25			0.850	1.00		23	12.30	12.50	0.850	0.850	0.25	0.05	0.043	7%					
	12.60	0.30			0.433	1.00		24	12.50	12.70	0.433	0.433	0.30	0.06	0.026	4%					
	12.80	0.32			0.149	1.00		25	12.70	12.90	0.149	0.149	0.32	0.06	0.010	2%					
	13.00	0.31			0.149	1.00		26	12.90	13.10	0.149	0.149	0.31	0.06	0.009	2%					
	13.20	0.34			0.158	1.00		27	13.10	13.30	0.158	0.158	0.34	0.07	0.011	2%					
	13.40	0.30			0.158	1.00		28	13.30	13.50	0.158	0.158	0.30	0.06	0.010	2%					
	13.60	0.12			0.588	1.00		29	13.50	13.80	0.588	0.588	0.12	0.04	0.021	4%					
	14.00	0.18			0.311	1.00		30	13.80	14.20	0.311	0.311	0.18	0.07	0.022	4%					
	14.40	0.15			0.131	1.00		31	14.20	14.70	0.131	0.131	0.15	0.08	0.010	2%					
	15.00				0.070	1.00		32	14.70	15.00	0.033	0.033	0.04	0.01	0.000	0%					
LB																					
	Total Flow:														0.600	1.000					

Total Flow:	0.600	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.44	(m ²)
Top Width:	6.70	(m)
Hydraulic Depth:	0.214	(m)
Mean Velocity:	0.418	(m/s)
Froude Number	0.288	
Photographs taken looking at:		

Data logger Notes:	
Data logger Internal Power:	
Data logger External Power:	14.27 V
Data logger Memory Used:	3%
Data logger Clock:	9:07 AM
Laptop Clock:	9:10 AM
Dessicant:	New
Data logger:	Optimum 1810
PT:	101876
Power:	

Notes:



Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E

Time of Measurement

Date of Measurement: August 7, 2008
Start Time: 10:30 AM MDT
End Time: 10:40 AM MDT

Weather Conditions:

sunny, +30

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: JS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in tree 1.198
Water Level Reading: 2.367
Transducer Reading & El.: 0.055
Other: See notes

Setup No. 1

El.: 98.815
El.: 97.646
El.: 97.591
El.: 100.013

Setup No. 2

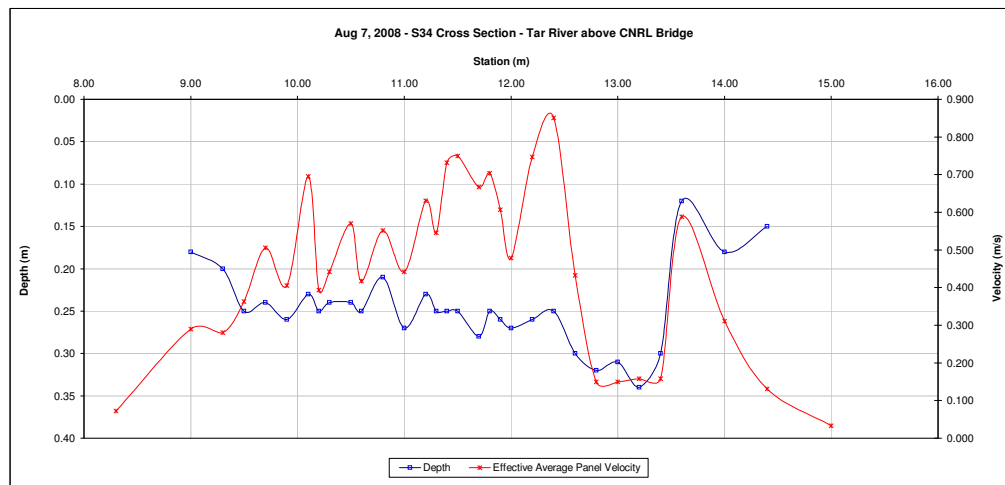
El.: 98.815
El.: 97.636
El.: 97.581
El.: 99.994

		Measurement Data														
Measured Data						Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
RB	8.30					1.00		1	8.30	8.65	0.072	0.072	0.05	0.02	0.001	0%
	9.00	0.18				0.290	1.00	2	8.65	9.15	0.290	0.290	0.18	0.09	0.026	4%
	9.30	0.20				0.280	1.00	3	9.15	9.40	0.280	0.280	0.20	0.05	0.014	2%
	9.50	0.25				0.363	1.00	4	9.40	9.60	0.363	0.363	0.25	0.05	0.018	3%
	9.70	0.24				0.506	1.00	5	9.60	9.80	0.506	0.506	0.24	0.05	0.024	4%
	9.90	0.26				0.405	1.00	6	9.80	10.00	0.405	0.405	0.26	0.05	0.021	4%
	10.10	0.23				0.695	1.00	7	10.00	10.15	0.695	0.695	0.23	0.03	0.024	4%
	10.20	0.25				0.393	1.00	8	10.15	10.25	0.393	0.393	0.25	0.03	0.010	2%
	10.30	0.24				0.442	1.00	9	10.25	10.40	0.442	0.442	0.24	0.04	0.016	3%
	10.50	0.24				0.570	1.00	10	10.40	10.55	0.570	0.570	0.24	0.04	0.021	3%
	10.60	0.25				0.418	1.00	11	10.55	10.70	0.418	0.418	0.25	0.04	0.016	3%
	10.80	0.21				0.552	1.00	12	10.70	10.90	0.552	0.552	0.21	0.04	0.023	4%
	11.00	0.27				0.442	1.00	13	10.90	11.10	0.442	0.442	0.27	0.05	0.024	4%
	11.20	0.23				0.631	1.00	14	11.10	11.25	0.631	0.631	0.23	0.03	0.022	4%
	11.30	0.25				0.546	1.00	15	11.25	11.35	0.546	0.546	0.25	0.03	0.014	2%
	11.40	0.25				0.732	1.00	16	11.35	11.45	0.732	0.732	0.25	0.02	0.018	3%
	11.50	0.25				0.750	1.00	17	11.45	11.60	0.750	0.750	0.25	0.04	0.028	5%
	11.70	0.28				0.668	1.00	18	11.60	11.75	0.668	0.668	0.28	0.04	0.028	5%
	11.80	0.25				0.704	1.00	19	11.75	11.85	0.704	0.704	0.25	0.03	0.018	3%
	11.90	0.26				0.607	1.00	20	11.85	11.95	0.607	0.607	0.26	0.03	0.016	3%
	12.00	0.27				0.479	1.00	21	11.95	12.10	0.479	0.479	0.27	0.04	0.019	3%
	12.20	0.26				0.747	1.00	22	12.10	12.30	0.747	0.747	0.26	0.05	0.039	6%
	12.40	0.25				0.850	1.00	23	12.30	12.50	0.850	0.850	0.25	0.05	0.043	7%
	12.60	0.30				0.433	1.00	24	12.50	12.70	0.433	0.433	0.30	0.06	0.026	4%
	12.80	0.32				0.149	1.00	25	12.70	12.90	0.149	0.149	0.32	0.06	0.010	2%
	13.00	0.31				0.149	1.00	26	12.90	13.10	0.149	0.149	0.31	0.06	0.009	2%
	13.20	0.34				0.158	1.00	27	13.10	13.30	0.158	0.158	0.34	0.07	0.011	2%
	13.40	0.30				0.158	1.00	28	13.30	13.50	0.158	0.158	0.30	0.06	0.010	2%
	13.60	0.12				0.588	1.00	29	13.50	13.80	0.588	0.588	0.12	0.04	0.021	4%
	14.00	0.18				0.311	1.00	30	13.80	14.20	0.311	0.311	0.18	0.07	0.022	4%
	14.40	0.15				0.131	1.00	31	14.20	14.70	0.131	0.131	0.15	0.08	0.010	2%
	LB	15.00				0.070	1.00	32	14.70	15.00	0.033	0.033	0.04	0.01	0.000	0%
Total Flow:															0.600	1.000

Total Flow:	0.600	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.44	(m ²)
Top Width:	6.70	(m)
Hydraulic Depth:	0.214	(m)
Mean Velocity:	0.418	(m/s)
Froude Number	0.288	
Photographs taken looking at:		

Data logger Notes:	This Data for the Solinst
Data logger Internal Power:	
Data logger External Power:	14.27 V
Data logger Memory Used:	3%
Data logger Clock:	9:25 AM
Laptop Clock:	9:14 AM
Dessicant:	New
Data logger:	Sol SN 28370
Water Temp:	13.7
Level:	96.18

Notes:



Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E

Time of Measurement

Date of Measurement: September 12, 2008
Start Time: 12:15 PM MDT
End Time: 12:30 PM MDT

Weather Conditions:

clear 20
open, backwatered d/t beaver dam

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SM Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in tree	1.178	El:	98.815	1.133	El:	98.815	
Water Level Reading:	2.385	El:	97.608	2.342	El:	97.606	97.607
Transducer Reading & El:	0.020	El:	97.588	0.020	El:	97.586	97.587
TD Reading (moved) and El:	0.091	El:	97.517	0.091	El:	97.515	97.516

Measurement Data

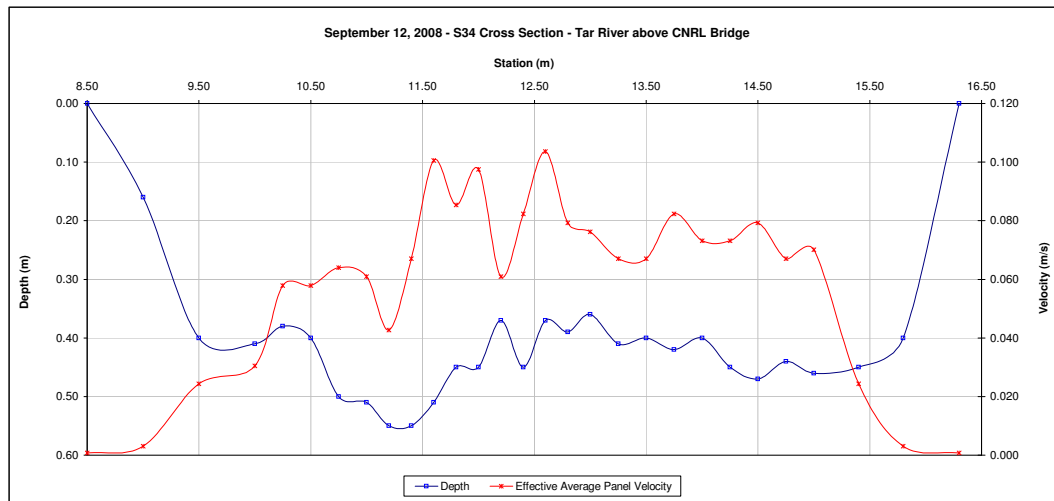
	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	8.50	0.00					1.00	1	8.50	8.75	0.001	0.001	0.04	0.01	0.000	0%
	9.00	0.16				0.003	1.00	2	8.75	9.25	0.003	0.003	0.16	0.08	0.000	0%
	9.50	0.40				0.024	1.00	3	9.25	9.75	0.024	0.024	0.40	0.20	0.005	3%
	10.00	0.41				0.030	1.00	4	9.75	10.13	0.030	0.030	0.41	0.15	0.005	3%
	10.25	0.38				0.058	1.00	5	10.13	10.38	0.058	0.058	0.38	0.10	0.006	3%
	10.50	0.40				0.058	1.00	6	10.38	10.63	0.058	0.058	0.40	0.10	0.006	3%
	10.75	0.50				0.064	1.00	7	10.63	10.88	0.064	0.064	0.50	0.13	0.008	5%
	11.00	0.51				0.061	1.00	8	10.88	11.10	0.061	0.061	0.51	0.11	0.007	4%
	11.20	0.55				0.043	1.00	9	11.10	11.30	0.043	0.043	0.55	0.11	0.005	3%
	11.40	0.55				0.067	1.00	10	11.30	11.50	0.067	0.067	0.55	0.11	0.007	4%
	11.60	0.51				0.101	1.00	11	11.50	11.70	0.101	0.101	0.51	0.10	0.010	6%
	11.80	0.45				0.085	1.00	12	11.70	11.90	0.085	0.085	0.45	0.09	0.008	4%
	12.00	0.45				0.098	1.00	13	11.90	12.10	0.098	0.098	0.45	0.09	0.009	5%
	12.20	0.37				0.061	1.00	14	12.10	12.30	0.061	0.061	0.37	0.07	0.005	3%
	12.40	0.45				0.082	1.00	15	12.30	12.50	0.082	0.082	0.45	0.09	0.007	4%
	12.60	0.37				0.104	1.00	16	12.50	12.70	0.104	0.104	0.37	0.07	0.008	4%
	12.80	0.39				0.079	1.00	17	12.70	12.90	0.079	0.079	0.39	0.08	0.006	3%
	13.00	0.36				0.076	1.00	18	12.90	13.13	0.076	0.076	0.36	0.08	0.006	3%
	13.25	0.41				0.067	1.00	19	13.13	13.38	0.067	0.067	0.41	0.10	0.007	4%
	13.50	0.40				0.067	1.00	20	13.38	13.63	0.067	0.067	0.40	0.10	0.007	4%
	13.75	0.42				0.082	1.00	21	13.63	13.88	0.082	0.082	0.42	0.11	0.009	5%
	14.00	0.40				0.073	1.00	22	13.88	14.13	0.073	0.073	0.40	0.10	0.007	4%
	14.25	0.45				0.073	1.00	23	14.13	14.38	0.073	0.073	0.45	0.11	0.008	5%
	14.50	0.47				0.079	1.00	24	14.38	14.63	0.079	0.079	0.47	0.12	0.009	5%
	14.75	0.44				0.067	1.00	25	14.63	14.88	0.067	0.067	0.44	0.11	0.007	4%
	15.00	0.46				0.070	1.00	26	14.88	15.20	0.070	0.070	0.46	0.15	0.010	6%
	15.40	0.45				0.024	1.00	27	15.20	15.60	0.024	0.024	0.45	0.18	0.004	2%
	15.80	0.40				0.003	1.00	28	15.60	16.05	0.003	0.003	0.40	0.18	0.001	0%
	LB	16.30	0.00					1.00	29	16.05	16.30	0.001	0.001	0.10	0.03	0.000
Total Flow:														0.177	1.000	

Total Flow:	0.177	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	3.06	(m ²)
Top Width:	7.80	(m)
Hydraulic Depth:	0.392	(m)
Mean Velocity:	0.058	(m/s)
Froude Number	0.029	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power: 0.54 V
Data logger External Power: 14.50 V
Data logger Memory Used: 3%
Data logger Clock: 10:56 AM MST
Laptop Clock: 11:01 AM MST
Dessicant: good
Data logger: Optimum 1810
PT: 101876
Power:

Notes: TD rotated into new spot, new depth 0.091



Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E

Time of Measurement

Date of Measurement: October 16, 2008
Start Time: 12:34 PM MDT
End Time: 12:45 PM MDT

Weather Conditions:

clear, 8 C
River Conditions: open, backwatered

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SM Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Nail in tree
Water Level Reading: 0.976
Transducer Reading & El.: 2.078
Other: BM4 NIT new
Other: BM3 rebar new
Other: Water Level new

Setup No. 1

El: 98.815
El: 97.713
El: 97.503
El: 1.108
El: 1.133

Setup No. 2

El: 98.815
El: 97.723
El: 97.513
El: 98.656
El: 98.631

Se

98.815
97.723
97.513
98.656
98.631
2.08

		Measured Data					Measurement Data										Calculated Data						
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total							
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)								
RB	0.65	0.00					1.00	1	0.65	0.83	0.003	0.003	0.04	0.01	0.000	0%							
	1.00	0.15				0.012	1.00	2	0.83	1.13	0.012	0.012	0.15	0.05	0.001	0%							
	1.25	0.19				0.058	1.00	3	1.13	1.38	0.058	0.058	0.19	0.05	0.003	1%							
	1.50	0.26				0.101	1.00	4	1.38	1.63	0.101	0.101	0.26	0.07	0.007	3%							
	1.75	0.30				0.079	1.00	5	1.63	1.88	0.079	0.079	0.30	0.08	0.006	3%							
	2.00	0.32				0.098	1.00	6	1.88	2.13	0.098	0.098	0.32	0.08	0.008	3%							
	2.25	0.40				0.171	1.00	7	2.13	2.38	0.171	0.171	0.40	0.10	0.017	8%							
	2.50	0.39				0.259	1.00	8	2.38	2.63	0.259	0.259	0.39	0.10	0.025	11%							
	2.75	0.45				0.210	1.00	9	2.63	2.88	0.210	0.210	0.45	0.11	0.024	10%							
	3.00	0.44				0.174	1.00	10	2.88	3.13	0.174	0.174	0.44	0.11	0.019	8%							
	3.25	0.36				0.079	1.00	11	3.13	3.38	0.079	0.079	0.36	0.09	0.007	3%							
	3.50	0.46				0.058	1.00	12	3.38	3.63	0.058	0.058	0.46	0.12	0.007	3%							
	3.75	0.46				0.058	1.00	13	3.63	3.88	0.058	0.058	0.46	0.12	0.007	3%							
	4.00	0.47				0.061	1.00	14	3.88	4.13	0.061	0.061	0.47	0.12	0.007	3%							
	4.25	0.50				0.034	1.00	15	4.13	4.38	0.034	0.034	0.50	0.13	0.004	2%							
	4.50	0.46				0.030	1.00	16	4.38	4.63	0.030	0.030	0.46	0.12	0.004	2%							
	4.75	0.40				0.073	1.00	17	4.63	4.88	0.073	0.073	0.40	0.10	0.007	3%							
	5.00	0.35				0.140	1.00	18	4.88	5.13	0.140	0.140	0.35	0.09	0.012	5%							
	5.25	0.33				0.152	1.00	19	5.13	5.38	0.152	0.152	0.33	0.08	0.013	6%							
	5.50	0.24				0.265	1.00	20	5.38	5.63	0.265	0.265	0.24	0.06	0.016	7%							
	5.75	0.21				0.290	1.00	21	5.63	5.88	0.290	0.290	0.21	0.05	0.015	7%							
	6.00	0.30				0.168	1.00	22	5.88	6.13	0.168	0.168	0.30	0.08	0.013	6%							
	6.25	0.15				0.098	1.00	23	6.13	6.38	0.098	0.098	0.15	0.04	0.004	2%							
	6.50	0.12				0.024	1.00	24	6.38	6.63	0.024	0.024	0.12	0.03	0.001	0%							
	6.75	0.10				0.098	1.00	25	6.63	6.93	0.098	0.098	0.10	0.03	0.003	1%							
	LB	7.10	0.00					1.00	26	6.93	7.10	0.024	0.024	0.03	0.00	0.000	0%						
Total Flow:															0.227	1.000							

Total Flow:	0.227	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.98	(m ²)
Top Width:	6.45	(m)
Hydraulic Depth:	0.306	(m)
Mean Velocity:	0.115	(m/s)
Froude Number	0.066	
Photographs taken looking at:		

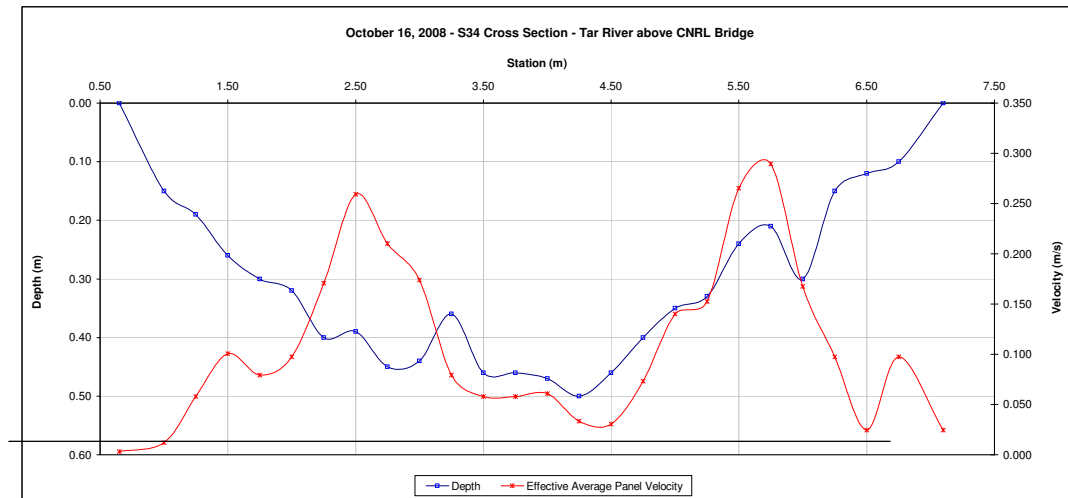
Data logger Notes:

Data logger Internal Power: 0.28 V
Data logger External Power: 14.66 V
Data logger Memory Used: 3%
Data logger Clock: 11:19 AM
Laptop Clock: 11:24 AM
Dessicant: GOOD
Data logger: Optimum 1810
PT:
Power:

Notes: installed new Campbell Scientific data logger and transducer 50 m downstream on LB
removed old station, data logger, and transducer
Water temp 0.9 C

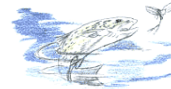
CR800 data logger
CS445 transducer serial number 083600079
installed 14:08
depth 1.03 m
solinst moved and installed with new TD

Solinst memory 1031107
21641
temp 0.90
level 110.88



Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River above CNRL Lake
Site Name: S34
Coordinates & Legal: 6361689 N, 440729 E

Time of Measurement

Date of Measurement: December 14, 2008
Start Time: 2:30 PM MST
End Time: 2:45 PM MST

Weather Conditions:

light snow, overcast, -25 C

River Conditions:

ice-cover, still appears backwatered

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

	Setup No. 1	Setup No. 2	Average		
Bench Mark 4 Reading: Nail in tree	1.088	El: 98.656	1.063	El: 98.656	
Water Level Reading:	2.153	El: 97.591	2.126	El: 97.593	97.592
Top of Ice Reading:	2.084	El: 97.660	2.055	El: 97.664	97.662
Transducer Reading & El.:		El:		El:	
Other: BM3 rebar	1.107	El: 98.637	1.080	El: 98.639	98.638

Measurement Data

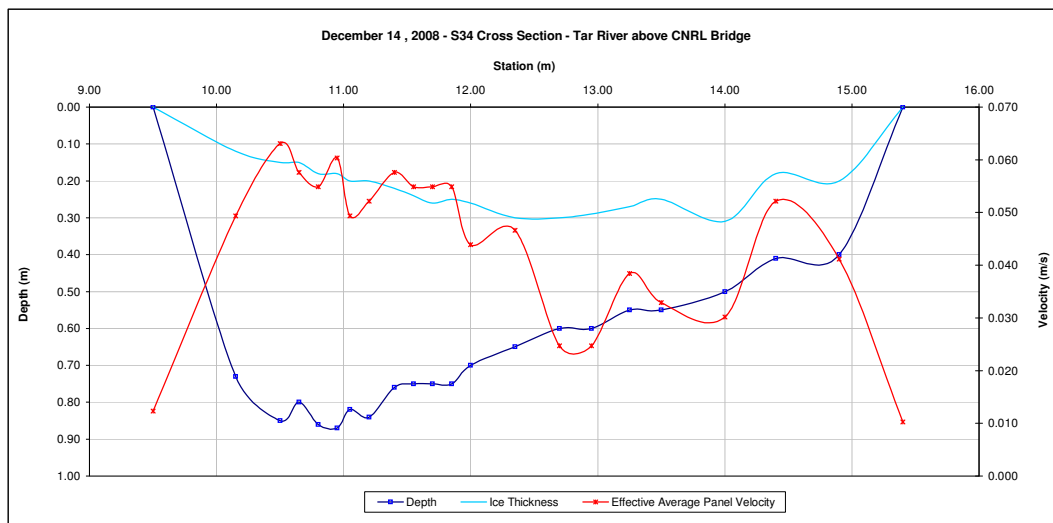
	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
LB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
	9.50	0.00	0.00				0.90	1	9.50	9.83	0.014	0.012	0.15	0.05	0.001	
	10.15	0.73	0.12			0.055	0.90	2	9.83	10.33	0.055	0.049	0.61	0.31	0.015	
	10.50	0.85	0.15			0.070	0.90	3	10.33	10.58	0.070	0.063	0.70	0.18	0.011	
	10.65	0.80	0.15			0.064	0.90	4	10.58	10.73	0.064	0.058	0.65	0.10	0.006	
	10.80	0.86	0.18			0.061	0.90	5	10.73	10.88	0.061	0.055	0.68	0.10	0.006	
	10.95	0.87	0.18			0.067	0.90	6	10.88	11.00	0.067	0.060	0.69	0.09	0.005	
	11.05	0.82	0.20			0.055	0.90	7	11.00	11.13	0.055	0.049	0.62	0.08	0.004	
	11.20	0.84	0.20			0.058	0.90	8	11.13	11.30	0.058	0.052	0.64	0.11	0.006	
	11.40	0.76	0.22			0.064	0.90	9	11.30	11.48	0.064	0.058	0.54	0.09	0.005	
	11.55	0.75	0.24			0.061	0.90	10	11.48	11.63	0.061	0.055	0.51	0.08	0.004	
	11.70	0.75	0.26			0.061	0.90	11	11.63	11.78	0.061	0.055	0.49	0.07	0.004	
	11.85	0.75	0.25			0.061	0.90	12	11.78	11.93	0.061	0.055	0.50	0.08	0.004	
	12.00	0.70	0.26			0.049	0.90	13	11.93	12.18	0.049	0.044	0.44	0.11	0.005	
	12.35	0.65	0.30			0.052	0.90	14	12.18	12.53	0.052	0.047	0.35	0.12	0.006	
	12.70	0.60	0.30			0.027	0.90	15	12.53	12.83	0.027	0.025	0.30	0.09	0.002	
	12.95	0.60	0.29			0.027	0.90	16	12.83	13.10	0.027	0.025	0.31	0.09	0.002	
	13.25	0.55	0.27			0.043	0.90	17	13.10	13.38	0.043	0.038	0.28	0.08	0.003	
	13.50	0.55	0.25			0.037	0.90	18	13.38	13.75	0.037	0.033	0.30	0.11	0.004	
	14.00	0.50	0.31			0.034	0.90	19	13.75	14.20	0.034	0.030	0.19	0.09	0.003	
14.40	0.41	0.18			0.058	0.90	20	14.20	14.65	0.058	0.052	0.23	0.10	0.005		
RB	14.90	0.40	0.20			0.046	0.90	21	14.65	15.15	0.046	0.041	0.20	0.10	0.004	
	15.40	0.00	0.00				0.90	22	15.15	15.40	0.011	0.010	0.05	0.01	0.000	
Total Flow:															0.104	1.000

Total Flow:	0.104	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.22	(m ²)
Top Width:	5.90	(m)
Hydraulic Depth:	0.377	(m)
Mean Velocity:	0.047	(m/s)
Froude Number	0.024	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock: MST
Laptop Clock: MST
Dessicant:
Data logger: Optimum 1810
PT:
Power:

Notes: solnist did not connect to computer. Campbell data logger did not connect to computer. Campbell battery dead, did not have a spare battery because it was used at another site site continues to have a dead battery for Campbell data logger.....



Vertical Profile at Offset 10.5 m
Total Depth 0.85 m
Ice Thickness 0.15 m
Effective Depth 0.7 m

Depth Reading	Depth Above Bed	% Effective Depth above Bed	Velocity	Velocity	Panel Start	Panel End	Vel x Depth	v/vavg
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Hydrometric Measurement / Site Visit Record

McClelland Outlet above Firebag - S36



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Outlet
Location: S36
Site Name: McClelland Outlet above Firebag
Coordinates & Legal:

Time of Measurement

Date of Measurement: May 14, 2008
Start Time: 11:41 AM MDT
End Time: 12:00 PM MDT

Weather Conditions:

clear, calm, 10 C

River Conditions:

high, open

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: pipe on LB 0.889
Water Level Reading: 2.081
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.556
Other:

Setup No. 1

El: 100.000
El: 98.808
El:
El: 98.252
El:

Setup No. 2

El: 100.000
El: 98.805
El:
El: 98.249
El:

Average

98.807
98.251

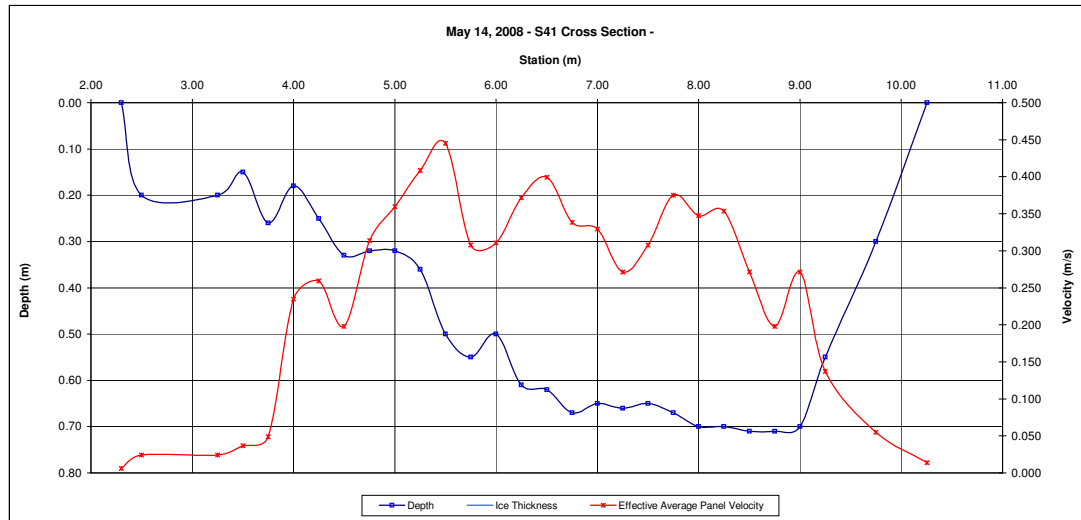
		Measurement Data															Calculated Data						
		Measured Data																					
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total							
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)								
RB	2.30	0.00					1.00	1	2.30	2.40	0.006	0.006	0.05	0.01	0.000	0%							
	2.50	0.20			0.024	1.00	1.00	2	2.40	2.88	0.024	0.024	0.20	0.10	0.002	0%							
	3.25	0.20			0.024	1.00	1.00	3	2.88	3.38	0.024	0.024	0.20	0.10	0.002	0%							
	3.50	0.15			0.037	1.00	1.00	4	3.38	3.63	0.037	0.037	0.15	0.04	0.001	0%							
	3.75	0.26			0.049	1.00	1.00	5	3.63	3.88	0.049	0.049	0.26	0.07	0.003	0%							
	4.00	0.18			0.235	1.00	1.00	6	3.88	4.13	0.235	0.235	0.18	0.05	0.011	1%							
	4.25	0.25			0.259	1.00	1.00	7	4.13	4.38	0.259	0.259	0.25	0.06	0.016	2%							
	4.50	0.33			0.198	1.00	1.00	8	4.38	4.63	0.198	0.198	0.33	0.08	0.016	2%							
	4.75	0.32			0.314	1.00	1.00	9	4.63	4.88	0.314	0.314	0.32	0.08	0.025	3%							
	5.00	0.32			0.360	1.00	1.00	10	4.88	5.13	0.360	0.360	0.32	0.08	0.029	3%							
	5.25	0.36			0.408	1.00	1.00	11	5.13	5.38	0.408	0.408	0.36	0.09	0.037	4%							
	5.50	0.50			0.445	1.00	1.00	12	5.38	5.63	0.445	0.445	0.50	0.13	0.056	6%							
	5.75	0.55			0.308	1.00	1.00	13	5.63	5.88	0.308	0.308	0.55	0.14	0.042	4%							
	6.00	0.50			0.311	1.00	1.00	14	5.88	6.13	0.311	0.311	0.50	0.13	0.039	4%							
	6.25	0.61			0.372	1.00	1.00	15	6.13	6.38	0.372	0.372	0.61	0.15	0.057	6%							
	6.50	0.62			0.399	1.00	1.00	16	6.38	6.63	0.399	0.399	0.62	0.16	0.062	6%							
	6.75	0.67			0.338	1.00	1.00	17	6.63	6.88	0.338	0.338	0.67	0.17	0.057	6%							
	7.00	0.65			0.329	1.00	1.00	18	6.88	7.13	0.329	0.329	0.65	0.16	0.053	6%							
	7.25	0.66			0.271	1.00	1.00	19	7.13	7.38	0.271	0.271	0.66	0.17	0.045	5%							
	7.50	0.65			0.308	1.00	1.00	20	7.38	7.63	0.308	0.308	0.65	0.16	0.050	5%							
	7.75	0.67			0.375	1.00	1.00	21	7.63	7.88	0.375	0.375	0.67	0.17	0.063	7%							
	8.00	0.70			0.347	1.00	1.00	22	7.88	8.13	0.347	0.347	0.70	0.18	0.061	6%							
	8.25	0.70			0.354	1.00	1.00	23	8.13	8.38	0.354	0.354	0.70	0.18	0.062	6%							
	8.50	0.71			0.271	1.00	1.00	24	8.38	8.63	0.271	0.271	0.71	0.18	0.048	5%							
	8.75	0.71			0.198	1.00	1.00	25	8.63	8.88	0.198	0.198	0.71	0.18	0.035	4%							
	9.00	0.70			0.271	1.00	1.00	26	8.88	9.13	0.271	0.271	0.70	0.18	0.047	5%							
	9.25	0.55			0.137	1.00	1.00	27	9.13	9.50	0.137	0.137	0.55	0.21	0.028	3%							
	9.75	0.30			0.055	1.00	1.00	28	9.50	10.00	0.055	0.055	0.30	0.15	0.008	1%							
LB	10.25	0.00					1.00	29	10.00	10.25	0.014	0.014	0.08	0.02	0.000	0%							
	Total Flow:															0.957	1.000						

Total Flow:	0.957	(m³/s)
Perceived Measurement Quality:	Excellent	
Total Area:	3.52	(m²)
Top Width:	7.95	(m)
Hydraulic Depth:	0.442	(m)
Mean Velocity:	0.272	(m/s)
Froude Number	0.131	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes: Station installed
Area cleared for helicopter landing



Hydrometric Measurement / Site Visit Record

McClelland Outlet above Firebag - S36



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Outlet
Location: S36
Site Name: McClelland Outlet above Firebag
Coordinates & Legal:

Time of Measurement

Date of Measurement: June 29, 2008
Start Time: 8:05 AM MDT
End Time: 8:20 AM MDT

Weather Conditions:

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: pipe on LB 0.482
Water Level Reading: 1.776
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.468
Other:

Setup No. 1

El: 100.000
El: 98.706
El: 98.238
El:

Setup No. 2

El: 100.000
El: 98.722
El: 98.254
El:

Average

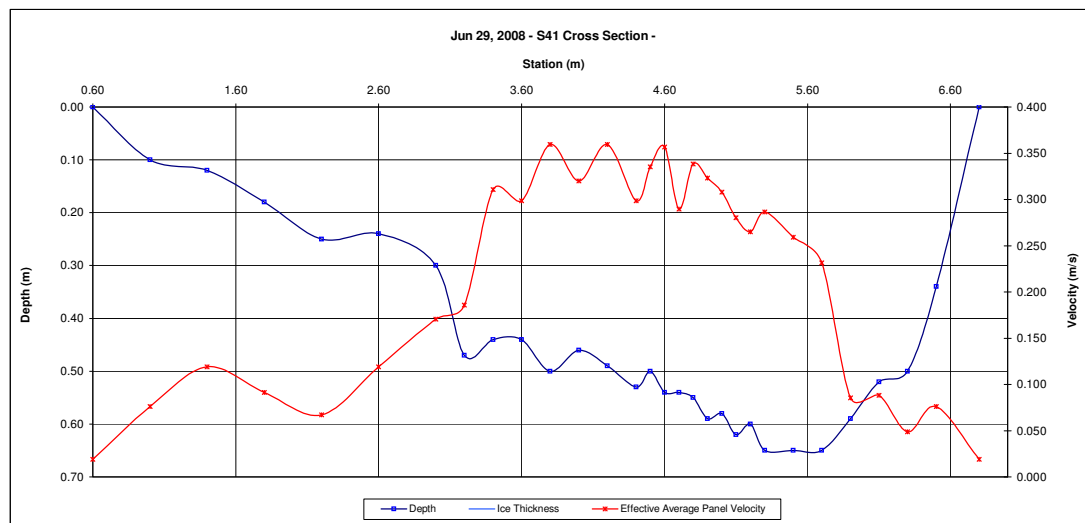
98.714
98.246

Measured Data						Measurement Data										Calculated Data				
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)						
LB	6.80	0.00				1.00	1	6.80	6.65	0.019	0.019	0.09	0.01	0.000	0%					
	6.50	0.34			0.076	1.00	2	6.65	6.40	0.076	0.076	0.34	0.09	0.006	1%					
	6.30	0.50			0.049	1.00	3	6.40	6.20	0.049	0.049	0.50	0.10	0.005	1%					
	6.10	0.52			0.088	1.00	4	6.20	6.00	0.088	0.088	0.52	0.10	0.009	2%					
	5.90	0.59			0.085	1.00	5	6.00	5.80	0.085	0.085	0.59	0.12	0.010	2%					
	5.70	0.65			0.232	1.00	6	5.80	5.60	0.232	0.232	0.65	0.13	0.030	6%					
	5.50	0.65			0.259	1.00	7	5.60	5.40	0.259	0.259	0.65	0.13	0.034	7%					
	5.30	0.65			0.287	1.00	8	5.40	5.25	0.287	0.287	0.65	0.10	0.028	6%					
	5.20	0.60			0.265	1.00	9	5.25	5.15	0.265	0.265	0.60	0.06	0.016	3%					
	5.10	0.62			0.280	1.00	10	5.15	5.05	0.280	0.280	0.62	0.06	0.017	3%					
	5.00	0.58			0.308	1.00	11	5.05	4.95	0.308	0.308	0.58	0.06	0.018	4%					
	4.90	0.59			0.323	1.00	12	4.95	4.85	0.323	0.323	0.59	0.06	0.019	4%					
	4.80	0.55			0.338	1.00	13	4.85	4.75	0.338	0.338	0.55	0.05	0.019	4%					
	4.70	0.54			0.290	1.00	14	4.75	4.65	0.290	0.290	0.54	0.05	0.016	3%					
	4.60	0.54			0.357	1.00	15	4.65	4.55	0.357	0.357	0.54	0.05	0.019	4%					
	4.50	0.50			0.335	1.00	16	4.55	4.45	0.335	0.335	0.50	0.05	0.017	3%					
	4.40	0.53			0.299	1.00	17	4.45	4.30	0.299	0.299	0.53	0.08	0.024	5%					
	4.20	0.49			0.360	1.00	18	4.30	4.10	0.360	0.360	0.49	0.10	0.035	7%					
	4.00	0.46			0.320	1.00	19	4.10	3.90	0.320	0.320	0.46	0.09	0.029	6%					
	3.80	0.50			0.360	1.00	20	3.90	3.70	0.360	0.360	0.50	0.10	0.036	7%					
	3.60	0.44			0.299	1.00	21	3.70	3.50	0.299	0.299	0.44	0.09	0.026	5%					
	3.40	0.44			0.311	1.00	22	3.50	3.30	0.311	0.311	0.44	0.09	0.027	5%					
	3.20	0.47			0.186	1.00	23	3.30	3.10	0.186	0.186	0.47	0.09	0.017	3%					
	3.00	0.30			0.171	1.00	24	3.10	2.80	0.171	0.171	0.30	0.09	0.015	3%					
	2.60	0.24			0.119	1.00	25	2.80	2.40	0.119	0.119	0.24	0.10	0.011	2%					
	2.20	0.25			0.067	1.00	26	2.40	2.00	0.067	0.067	0.25	0.10	0.007	1%					
	1.80	0.18			0.091	1.00	27	2.00	1.60	0.091	0.091	0.18	0.07	0.007	1%					
	1.40	0.12			0.119	1.00	28	1.60	1.20	0.119	0.119	0.12	0.05	0.006	1%					
	1.00	0.10			0.076	1.00	29	1.20	0.80	0.076	0.076	0.10	0.04	0.003	1%					
RB	0.60	0.00				1.00	30	0.80	0.60	0.019	0.019	0.03	0.01	0.000	0%					
Total Flow:														0.508	1.000					

Total Flow:	0.508	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.32	(m ²)
Top Width:	6.20	(m)
Hydraulic Depth:	0.374	(m)
Mean Velocity:	0.219	(m/s)
Froude Number	0.114	
Photographs taken looking at:		

Data logger Notes:
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

McClelland Outlet above Firebag - S36



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Outlet
Location: S36
Site Name: McClelland Outlet above Firebag
Coordinates & Legal:

Time of Measurement

Date of Measurement: August 9, 2008
Start Time: 12:10 PM MDT
End Time: 12:30 PM MDT

Weather Conditions:

sunny, 29 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: SS Checked: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: pipe on LB 0.663
Water Level Reading: 1.895
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.604
Other:

Setup No. 1

El: 100.000
El: 98.768
El:
El: 98.164
El:

Setup No. 2

El: 100.000
El: 98.775
El:
El: 98.171
El:

Average

98.772
98.168

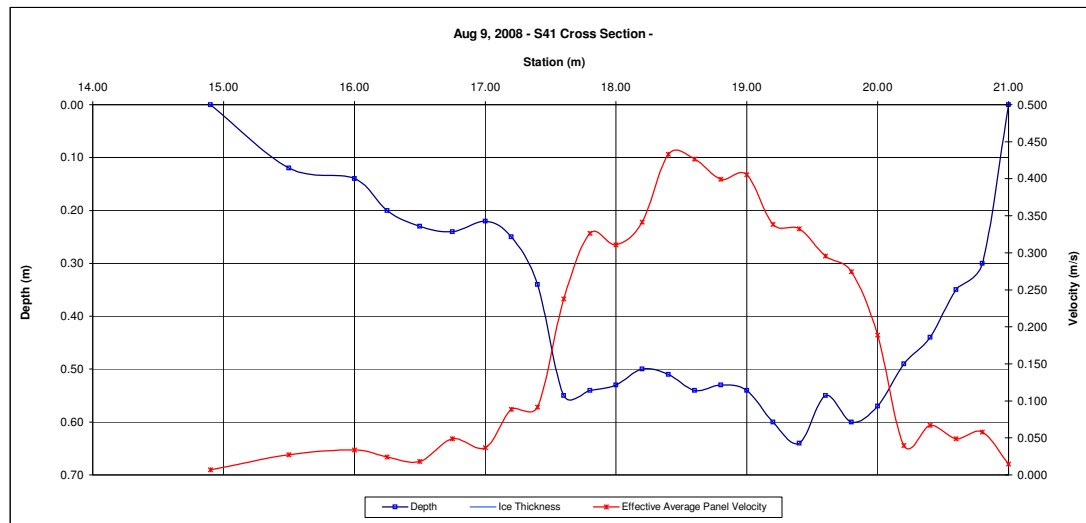
		Measurement Data															
Measured Data							Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correctio n Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
RB	14.90	0.00					1.00	1	14.90	15.20	0.007	0.007	0.03	0.01	0.000	0%	
	15.50	0.12				0.027	1.00	2	15.20	15.75	0.027	0.027	0.12	0.07	0.002	0%	
	16.00	0.14				0.034	1.00	3	15.75	16.13	0.034	0.034	0.14	0.05	0.002	0%	
	16.25	0.20				0.024	1.00	4	16.13	16.38	0.024	0.024	0.20	0.05	0.001	0%	
	16.50	0.23				0.018	1.00	5	16.38	16.63	0.018	0.018	0.23	0.06	0.001	0%	
	16.75	0.24				0.049	1.00	6	16.63	16.88	0.049	0.049	0.24	0.06	0.003	1%	
	17.00	0.22				0.037	1.00	7	16.88	17.10	0.037	0.037	0.22	0.05	0.002	0%	
	17.20	0.25				0.088	1.00	8	17.10	17.30	0.088	0.088	0.25	0.05	0.004	1%	
	17.40	0.34				0.091	1.00	9	17.30	17.50	0.091	0.091	0.34	0.07	0.006	1%	
	17.60	0.55				0.238	1.00	10	17.50	17.70	0.238	0.238	0.55	0.11	0.026	5%	
	17.80	0.54				0.326	1.00	11	17.70	17.90	0.326	0.326	0.54	0.11	0.035	7%	
	18.00	0.53				0.311	1.00	12	17.90	18.10	0.311	0.311	0.53	0.11	0.033	6%	
	18.20	0.50				0.341	1.00	13	18.10	18.30	0.341	0.341	0.50	0.10	0.034	7%	
	18.40	0.51				0.433	1.00	14	18.30	18.50	0.433	0.433	0.51	0.10	0.044	9%	
	18.60	0.54				0.427	1.00	15	18.50	18.70	0.427	0.427	0.54	0.11	0.046	9%	
	18.80	0.53				0.399	1.00	16	18.70	18.90	0.399	0.399	0.53	0.11	0.042	8%	
	19.00	0.54				0.405	1.00	17	18.90	19.10	0.405	0.405	0.54	0.11	0.044	9%	
	19.20	0.60				0.338	1.00	18	19.10	19.30	0.338	0.338	0.60	0.12	0.041	8%	
	19.40	0.64				0.332	1.00	19	19.30	19.50	0.332	0.332	0.64	0.13	0.043	8%	
	19.60	0.55				0.296	1.00	20	19.50	19.70	0.296	0.296	0.55	0.11	0.033	6%	
19.80	0.60				0.274	1.00	21	19.70	19.90	0.274	0.274	0.60	0.12	0.033	6%		
20.00	0.57				0.189	1.00	22	19.90	20.10	0.189	0.189	0.57	0.11	0.022	4%		
20.20	0.49				0.040	1.00	23	20.10	20.30	0.040	0.040	0.49	0.10	0.004	1%		
20.40	0.44				0.067	1.00	24	20.30	20.50	0.067	0.067	0.44	0.09	0.006	1%		
20.60	0.35				0.049	1.00	25	20.50	20.70	0.049	0.049	0.35	0.07	0.003	1%		
20.80	0.30				0.058	1.00	26	20.70	20.90	0.058	0.058	0.30	0.06	0.003	1%		
LB	21.00	0.00					1.00	27	20.90	21.00	0.014	0.014	0.08	0.01	0.000	0%	
Total Flow:															0.513	1.000	

Total Flow:	0.513	(m ³ /s)
Perceived Measurement Quality:	good	
Total Area:	2.23	(m ²)
Top Width:	6.10	(m)
Hydraulic Depth:	0.365	(m)
Mean Velocity:	0.230	(m/s)
Froude Number	0.122	
Photographs taken looking at:		

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes: Water temp = 15.5 C



Hydrometric Measurement / Site Visit Record

McClelland Outlet above Firebag - S36



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Outlet
Location: S36
Site Name: McClelland Outlet above Firebag
Coordinates & Legal:

Time of Measurement

Date of Measurement: September 13, 2008
Start Time: 10:45 AM MDT
End Time: 11:00 AM MDT

Weather Conditions:

clear, 15 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading pipe on LB 0.642
Water Level Reading: 1.870
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.589
Other:

Setup No. 1

El: 100.000
El: 98.772
El: 98.183
El:

Setup No. 2

El: 100.000
El: 98.773
El: 98.184
El:

Average

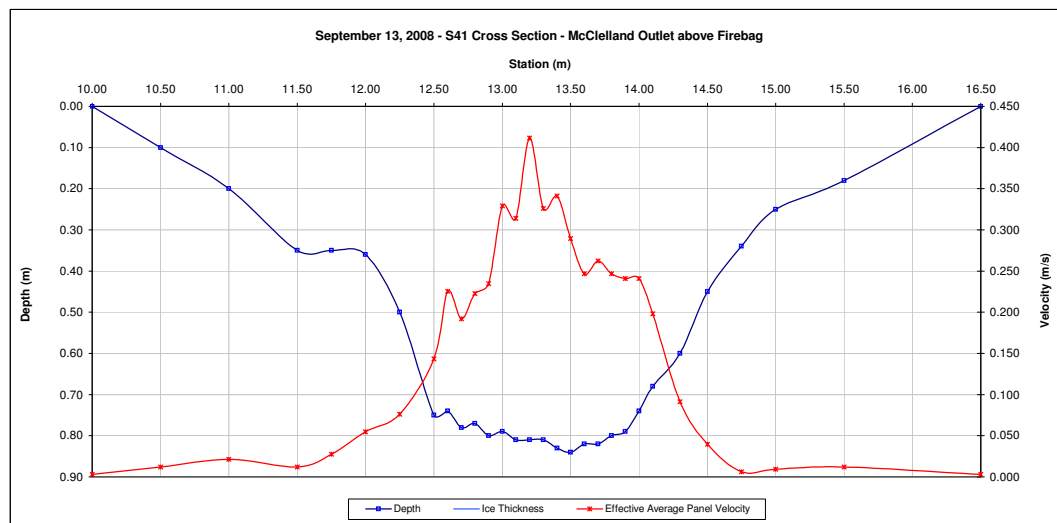
98.773
98.184

LB	Measured Data						Measurement Data										Calculated Data					Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge							
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)								
16.50	0.00					1.00	1	16.50	16.00	0.003	0.003	0.05	0.02	0.000	0%							
15.50	0.18				0.012	1.00	2	16.00	15.25	0.012	0.012	0.18	0.14	0.002	0%							
15.00	0.25				0.009	1.00	3	15.25	14.88	0.009	0.009	0.25	0.09	0.001	0%							
14.75	0.34				0.006	1.00	4	14.88	14.63	0.006	0.006	0.34	0.09	0.001	0%							
14.50	0.45				0.040	1.00	5	14.63	14.40	0.040	0.040	0.45	0.10	0.004	1%							
14.30	0.60				0.091	1.00	6	14.40	14.20	0.091	0.091	0.60	0.12	0.011	3%							
14.10	0.68				0.198	1.00	7	14.20	14.05	0.198	0.198	0.68	0.10	0.020	5%							
14.00	0.74				0.241	1.00	8	14.05	13.95	0.241	0.241	0.74	0.07	0.018	4%							
13.90	0.79				0.241	1.00	9	13.95	13.85	0.241	0.241	0.79	0.08	0.019	5%							
13.80	0.80				0.247	1.00	10	13.85	13.75	0.247	0.247	0.80	0.08	0.020	5%							
13.70	0.82				0.262	1.00	11	13.75	13.65	0.262	0.262	0.82	0.08	0.021	5%							
13.60	0.82				0.247	1.00	12	13.65	13.55	0.247	0.247	0.82	0.08	0.020	5%							
13.50	0.84				0.290	1.00	13	13.55	13.45	0.290	0.290	0.84	0.08	0.024	6%							
13.40	0.83				0.341	1.00	14	13.45	13.35	0.341	0.341	0.83	0.08	0.028	7%							
13.30	0.81				0.326	1.00	15	13.35	13.25	0.326	0.326	0.81	0.08	0.026	6%							
13.20	0.81				0.411	1.00	16	13.25	13.15	0.411	0.411	0.81	0.08	0.033	8%							
13.10	0.81				0.314	1.00	17	13.15	13.05	0.314	0.314	0.81	0.08	0.025	6%							
13.00	0.79				0.329	1.00	18	13.05	12.95	0.329	0.329	0.79	0.08	0.026	6%							
12.90	0.80				0.235	1.00	19	12.95	12.85	0.235	0.235	0.80	0.08	0.019	5%							
12.80	0.77				0.223	1.00	20	12.85	12.75	0.223	0.223	0.77	0.08	0.017	4%							
12.70	0.78				0.192	1.00	21	12.75	12.65	0.192	0.192	0.78	0.08	0.015	4%							
12.60	0.74				0.226	1.00	22	12.65	12.55	0.226	0.226	0.74	0.07	0.017	4%							
12.50	0.75				0.143	1.00	23	12.55	12.38	0.143	0.143	0.75	0.13	0.019	5%							
12.25	0.50				0.076	1.00	24	12.38	12.13	0.076	0.076	0.50	0.13	0.010	2%							
12.00	0.36				0.055	1.00	25	12.13	11.88	0.055	0.055	0.36	0.09	0.005	1%							
11.75	0.35				0.027	1.00	26	11.88	11.63	0.027	0.027	0.35	0.09	0.002	1%							
11.50	0.35				0.012	1.00	27	11.63	11.25	0.012	0.012	0.35	0.13	0.002	0%							
11.00	0.20				0.021	1.00	28	11.25	10.75	0.021	0.021	0.20	0.10	0.002	1%							
10.50	0.10				0.012	1.00	29	10.75	10.25	0.012	0.012	0.10	0.05	0.001	0%							
10.00	0.00					1.00	30	10.25	10.00	0.003	0.003	0.03	0.01	0.000	0%							
Total Flow:															0.408	1.000						

Total Flow:	0.408	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.58	(m ²)
Top Width:	6.50	(m)
Hydraulic Depth:	0.396	(m)
Mean Velocity:	0.158	(m/s)
Froude Number	0.080	
Photographs taken looking at:		

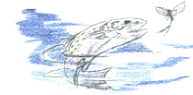
Data logger Notes:	SOLNIST
Data logger Internal Power:	
Data logger External Power:	
Data logger Memory Used:	
Data logger Clock:	
Laptop Clock:	
Dessicant:	
Data logger:	
PT:	
Power:	

Notes: Solnist installed at station so no data logger information
Vegetation from 16.5 - 14.3 LB and 12.5 - 10 RB



Hydrometric Measurement / Site Visit Record

McClelland Outlet above Firebag - S36



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: McClelland Outlet
Location: S36
Site Name: McClelland Outlet above Firebag
Coordinates & Legal:

Time of Measurement

Date of Measurement: October 21, 2008
Start Time: 9:41 AM MDT
End Time: 9:49 AM MDT

Weather Conditions:

Light Rain, Cloudy, 2C
River Conditions: Flow - faster than September

Personnel & Equipment

Measurement Made By: SM/AM
Data Entry By: LS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading (pipe on LB): 0.442
Water Level Reading: 1.690
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.579
Other:

Setup No. 1

El.: 100.000
El.: 98.752
El.:
El.: 98.173
El.:

Setup No. 2

El.: 100.000
El.: 98.759
El.:
El.: 98.180
El.:

Average

98.756
98.176

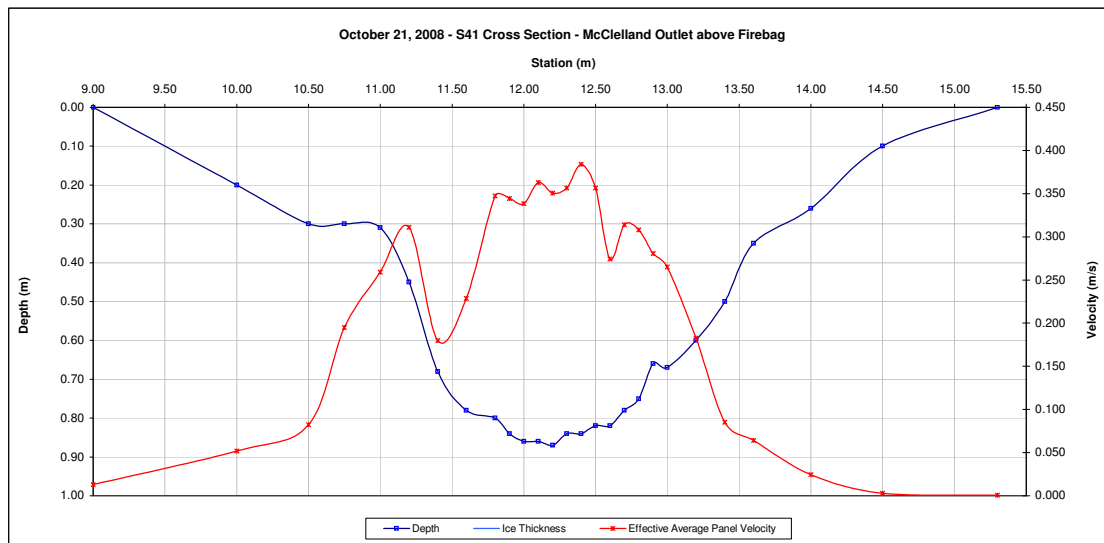
Measurement Data

Measured Data							Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	9.00	0.00				1.00	1	9.00	9.50	0.013	0.013	0.05	0.03	0.000	0%
	10.00	0.20			0.052	1.00	2	9.50	10.25	0.052	0.052	0.20	0.15	0.008	1%
	10.50	0.30			0.082	1.00	3	10.25	10.63	0.082	0.082	0.30	0.11	0.009	2%
	10.75	0.30			0.195	1.00	4	10.63	10.88	0.195	0.195	0.30	0.08	0.015	3%
	11.00	0.31			0.259	1.00	5	10.88	11.10	0.259	0.259	0.31	0.07	0.018	3%
	11.20	0.45			0.311	1.00	6	11.10	11.30	0.311	0.311	0.45	0.09	0.028	5%
	11.40	0.68			0.180	1.00	7	11.30	11.50	0.180	0.180	0.68	0.14	0.024	4%
	11.60	0.78			0.229	1.00	8	11.50	11.70	0.229	0.229	0.78	0.16	0.036	7%
	11.80	0.80			0.347	1.00	9	11.70	11.85	0.347	0.347	0.80	0.12	0.042	8%
	11.90	0.84			0.344	1.00	10	11.85	11.95	0.344	0.344	0.84	0.08	0.029	5%
	12.00	0.86			0.338	1.00	11	11.95	12.05	0.338	0.338	0.86	0.09	0.029	5%
	12.10	0.86			0.363	1.00	12	12.05	12.15	0.363	0.363	0.86	0.09	0.031	6%
	12.20	0.87			0.351	1.00	13	12.15	12.25	0.351	0.351	0.87	0.09	0.030	6%
	12.30	0.84			0.357	1.00	14	12.25	12.35	0.357	0.357	0.84	0.08	0.030	5%
	12.40	0.84			0.384	1.00	15	12.35	12.45	0.384	0.384	0.84	0.08	0.032	6%
	12.50	0.82			0.357	1.00	16	12.45	12.55	0.357	0.357	0.82	0.08	0.029	5%
	12.60	0.82			0.274	1.00	17	12.55	12.65	0.274	0.274	0.82	0.08	0.022	4%
	12.70	0.78			0.314	1.00	18	12.65	12.75	0.314	0.314	0.78	0.08	0.024	4%
	12.80	0.75			0.308	1.00	19	12.75	12.85	0.308	0.308	0.75	0.08	0.023	4%
	12.90	0.66			0.280	1.00	20	12.85	12.95	0.280	0.280	0.66	0.07	0.019	3%
	13.00	0.67			0.265	1.00	21	12.95	13.10	0.265	0.265	0.67	0.10	0.027	5%
	13.20	0.60			0.183	1.00	22	13.10	13.30	0.183	0.183	0.60	0.12	0.022	4%
	13.40	0.50			0.085	1.00	23	13.30	13.50	0.085	0.085	0.50	0.10	0.009	2%
	13.60	0.35			0.064	1.00	24	13.50	13.80	0.064	0.064	0.35	0.11	0.007	1%
	14.00	0.26			0.024	1.00	25	13.80	14.25	0.024	0.024	0.26	0.12	0.003	1%
	14.50	0.10			0.003	1.00	26	14.25	14.90	0.003	0.003	0.10	0.07	0.000	0%
	RB	15.30	0.00				1.00	27	14.90	15.30	0.001	0.001	0.03	0.01	0.000
Total Flow:														0.547	1.000

Total Flow:	0.547	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	2.45	(m²)
Top Width:	6.30	(m)
Hydraulic Depth:	0.388	(m)
Mean Velocity:	0.223	(m/s)
Froude Number	0.115	
Photographs taken looking at:		

Data logger Notes:	SOLNIST
Data logger Internal Power:	
Data logger External Power:	
Data logger Memory Used:	
Data logger Clock:	
Laptop Clock:	
Dessicant:	
Data logger:	
PT:	
Power:	

Notes:



Hydrometric Measurement / Site Visit Record

S37 - East Jackpine Ck at the 1300 m contour



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: East Jackpine Ck at the 1300 m contour
Site Name: S37
Coordinates & Legal:
Time of Measurement: May 13, 2008
Date of Measurement: 3:40 PM MDT
Start Time: 3:55 PM MDT
End Time:

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: solnist pos 1.065
Water Level Reading: 1.995
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.696
Other:

Setup No. 1

El: 100.000
El: 99.070
El: 101.065
El: 98.374
El: 101.065

Setup No. 2

El: 100.000
El: 99.070
El: 101.032
El: 98.374
El: 101.032

Weather Conditions:

overcast, light wind, 14 C

River Conditions:

high flow, turbulent

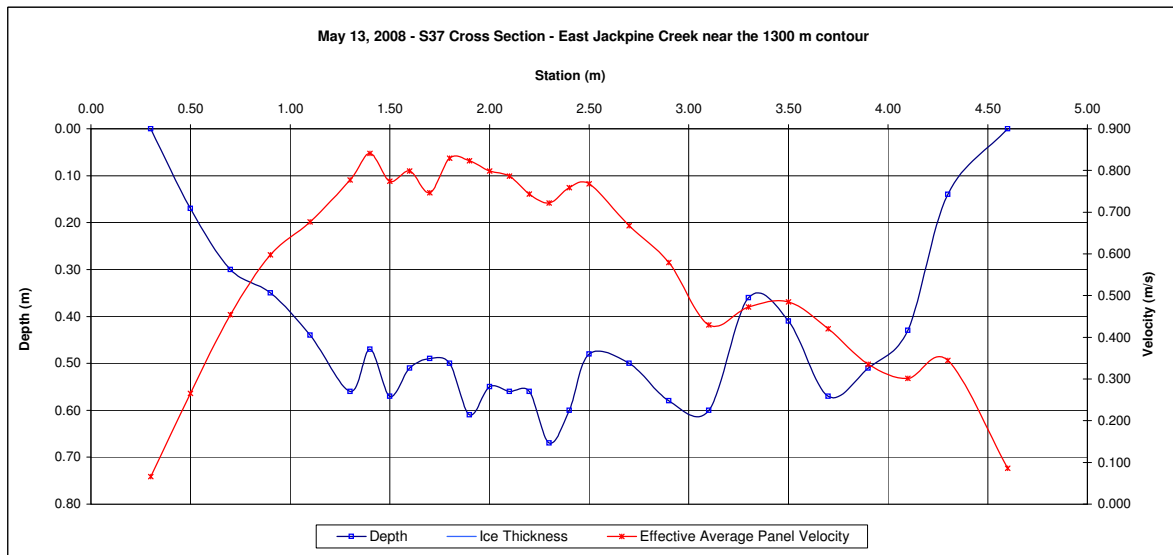
Measurement Data

	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB	0.30	0.00				0.000	1.00	1	0.30	0.40	0.066	0.066	0.04	0.00	0.000	0%
	0.50	0.17				0.265	1.00	2	0.40	0.60	0.265	0.265	0.17	0.03	0.009	1%
	0.70	0.30				0.454	1.00	3	0.60	0.80	0.454	0.454	0.30	0.06	0.027	2%
	0.90	0.35				0.597	1.00	4	0.80	1.00	0.597	0.597	0.35	0.07	0.042	4%
	1.10	0.44				0.677	1.00	5	1.00	1.20	0.677	0.677	0.44	0.09	0.060	5%
	1.30	0.56				0.777	1.00	6	1.20	1.35	0.777	0.777	0.56	0.08	0.065	6%
	1.40	0.47				0.841	1.00	7	1.35	1.45	0.841	0.841	0.47	0.05	0.040	4%
	1.50	0.57				0.774	1.00	8	1.45	1.55	0.774	0.774	0.57	0.06	0.044	4%
	1.60	0.51				0.799	1.00	9	1.55	1.65	0.799	0.799	0.51	0.05	0.041	4%
	1.70	0.49				0.747	1.00	10	1.65	1.75	0.747	0.747	0.49	0.05	0.037	3%
	1.80	0.50				0.829	1.00	11	1.75	1.85	0.829	0.829	0.50	0.05	0.041	4%
	1.90	0.61				0.823	1.00	12	1.85	1.95	0.823	0.823	0.61	0.06	0.050	5%
	2.00	0.55				0.799	1.00	13	1.95	2.05	0.799	0.799	0.55	0.05	0.044	4%
	2.10	0.56				0.786	1.00	14	2.05	2.15	0.786	0.786	0.56	0.06	0.044	4%
	2.20	0.56				0.744	1.00	15	2.15	2.25	0.744	0.744	0.56	0.06	0.042	4%
	2.30	0.67				0.722	1.00	16	2.25	2.35	0.722	0.722	0.67	0.07	0.048	4%
	2.40	0.60				0.759	1.00	17	2.35	2.45	0.759	0.759	0.60	0.06	0.046	4%
	2.50	0.48				0.768	1.00	18	2.45	2.60	0.768	0.768	0.48	0.07	0.055	5%
	2.70	0.50				0.668	1.00	19	2.60	2.80	0.668	0.668	0.50	0.10	0.067	6%
	2.90	0.58				0.579	1.00	20	2.80	3.00	0.579	0.579	0.58	0.12	0.067	6%
	3.10	0.60				0.430	1.00	21	3.00	3.20	0.430	0.430	0.60	0.12	0.052	5%
	3.30	0.36				0.472	1.00	22	3.20	3.40	0.472	0.472	0.36	0.07	0.034	3%
	3.50	0.41				0.485	1.00	23	3.40	3.60	0.485	0.485	0.41	0.08	0.040	4%
	3.70	0.57				0.421	1.00	24	3.60	3.80	0.421	0.421	0.57	0.11	0.048	4%
	3.90	0.51				0.335	1.00	25	3.80	4.00	0.335	0.335	0.51	0.10	0.034	3%
	4.10	0.43				0.302	1.00	26	4.00	4.20	0.302	0.302	0.43	0.09	0.026	2%
	4.30	0.14				0.344	1.00	27	4.20	4.45	0.344	0.344	0.14	0.04	0.012	1%
	LB	4.60	0.00				0.000	1.00	28	4.45	4.60	0.086	0.086	0.04	0.01	0.000
Total Flow:														1.115	1.000	

Total Flow:	1.115	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.85	(m ²)
Top Width:	4.30	(m)
Hydraulic Depth:	0.431	(m)
Mean Velocity:	0.601	(m/s)
Froude Number	0.292	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:	
Data logger Internal Power:	5.44 V
Data logger External Power:	13.08 V
Data logger Memory Used:	0.0%
Data logger Clock:	3:01:00 PM MST
Laptop Clock:	3:01:00 PM MST
Dessicant:	new
Data logger:	1909
PT:	
Power:	

Notes: station and TD installed



Hydrometric Measurement / Site Visit Record

S37 - East Jackpine Ck at the 1300 m contour



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: East Jackpine Ck at the 1300 m contour
Site Name: S37
Coordinates & Legal:

Time of Measurement

Date of Measurement: June 28, 2008
Start Time: 5:00 PM MDT
End Time: 5:15 PM MDT

Weather Conditions:

clear, 30 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: solnist pos 0.963
Water Level Reading: 2.240
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.347
Other:

Setup No. 1

El: 100.000 0.941
El: 98.723 2.214
El: 98.376 0.347

Setup No. 2

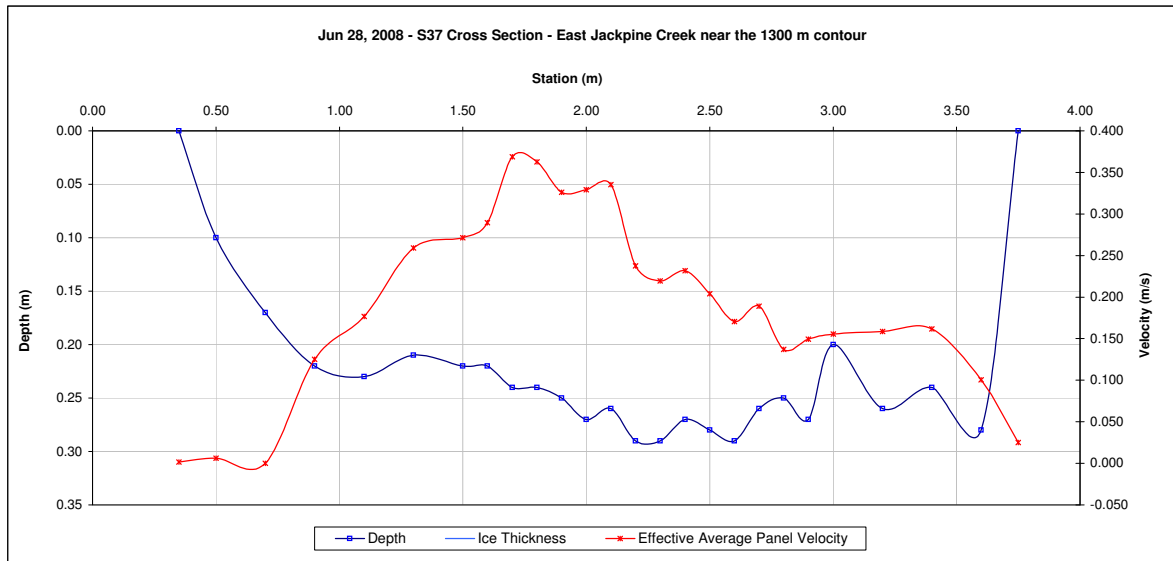
El: 100.000
El: 98.727 98.725
El: 98.380 98.378
El:

Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)					
LB	0.35	0.00				1.00	1	0.35	0.43	0.002	0.002	0.03	0.00	0.000	0%				
	0.50	0.10			0.006	1.00	2	0.43	0.60	0.006	0.006	0.10	0.02	0.000	0%				
	0.70	0.17			0.000	1.00	3	0.60	0.80	0.000	0.000	0.17	0.03	0.000	0%				
	0.90	0.22			0.125	1.00	4	0.80	1.00	0.125	0.125	0.22	0.04	0.005	4%				
	1.10	0.23			0.177	1.00	5	1.00	1.20	0.177	0.177	0.23	0.05	0.008	5%				
	1.30	0.21			0.259	1.00	6	1.20	1.40	0.259	0.259	0.21	0.04	0.011	7%				
	1.50	0.22			0.271	1.00	7	1.40	1.55	0.271	0.271	0.22	0.03	0.009	6%				
	1.60	0.22			0.290	1.00	8	1.55	1.65	0.290	0.290	0.22	0.02	0.006	4%				
	1.70	0.24			0.369	1.00	9	1.65	1.75	0.369	0.369	0.24	0.02	0.009	6%				
	1.80	0.24			0.363	1.00	10	1.75	1.85	0.363	0.363	0.24	0.02	0.009	6%				
	1.90	0.25			0.326	1.00	11	1.85	1.95	0.326	0.326	0.25	0.03	0.008	5%				
	2.00	0.27			0.329	1.00	12	1.95	2.05	0.329	0.329	0.27	0.03	0.009	6%				
	2.10	0.26			0.335	1.00	13	2.05	2.15	0.335	0.335	0.26	0.03	0.009	6%				
	2.20	0.29			0.238	1.00	14	2.15	2.25	0.238	0.238	0.29	0.03	0.007	5%				
	2.30	0.29			0.219	1.00	15	2.25	2.35	0.219	0.219	0.29	0.03	0.006	4%				
	2.40	0.27			0.232	1.00	16	2.35	2.45	0.232	0.232	0.27	0.03	0.006	4%				
	2.50	0.28			0.204	1.00	17	2.45	2.55	0.204	0.204	0.28	0.03	0.006	4%				
	2.60	0.29			0.171	1.00	18	2.55	2.65	0.171	0.171	0.29	0.03	0.005	3%				
	2.70	0.26			0.189	1.00	19	2.65	2.75	0.189	0.189	0.26	0.03	0.005	3%				
	2.80	0.25			0.137	1.00	20	2.75	2.85	0.137	0.137	0.25	0.02	0.003	2%				
	2.90	0.27			0.149	1.00	21	2.85	2.95	0.149	0.149	0.27	0.03	0.004	3%				
	3.00	0.20			0.155	1.00	22	2.95	3.10	0.155	0.155	0.20	0.03	0.005	3%				
	3.20	0.26			0.158	1.00	23	3.10	3.30	0.158	0.158	0.26	0.05	0.008	5%				
	3.40	0.24			0.162	1.00	24	3.30	3.50	0.162	0.162	0.24	0.05	0.008	5%				
	3.60	0.28			0.101	1.00	25	3.50	3.68	0.101	0.101	0.28	0.05	0.005	3%				
	RB	3.75	0.00				1.00	26	3.68	3.75	0.025	0.025	0.07	0.01	0.000	0%			
Total Flow:														0.152	1.000				

Total Flow:	0.152	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.77	(m ²)
Top Width:	3.40	(m)
Hydraulic Depth:	0.227	(m)
Mean Velocity:	0.197	(m/s)
Froude Number	0.132	
Photographs taken looking at:		
Photos taken		

Data logger Notes:		
Data logger Internal Power:	5.44 V	
Data logger External Power:	11.79 V	
Data logger Memory Used:	2%	
Data logger Clock:	3:55 PM	MST
Laptop Clock:	4:00 PM	MST
Dessicant:	good	
Data logger:	1909	
PT:		
Power:		

Notes: Data looks good



Hydrometric Measurement / Site Visit Record

S37 - East Jackpine Ck at the 1300 m contour



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: East Jackpine Ck at the 1300 m contour
Site Name: S37
Coordinates & Legal:

Time of Measurement

Date of Measurement: August 9, 2008
Start Time: 1:45 PM MDT
End Time: 1:55 PM MDT

Weather Conditions:

hot, 32 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/JS
Data Entry By: SS
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: solnist pos 1.174
Water Level Reading: 2.363
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.433
Other: NIT Logger 0.786
Other: NI Stump by river 2.164

Setup No. 1

El: 100.000
El: 98.811
El:
El: 98.378
El: 100.388
El: 99.010

Setup No. 2

El: 100.000
El: 98.810
El:
El: 98.377
El: 100.388
El: 99.010

Average

98.811
98.378
100.388
99.010

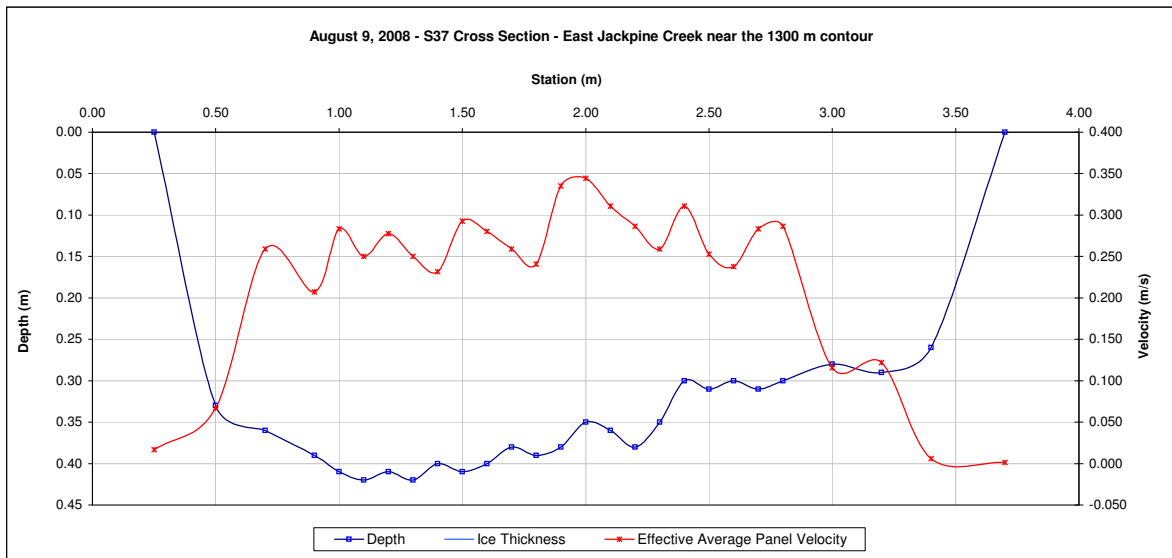
Measurement Data

	Measured Data					Calculated Data										Percentage of Total
	Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m²)	Panel Discharge (m³/s)	
RB	0.25	0.00					1.00	1	0.25	0.38	0.017	0.017	0.08	0.01	0.000	0%
	0.50	0.33				0.067	1.00	2	0.38	0.60	0.067	0.067	0.33	0.07	0.005	2%
	0.70	0.36				0.259	1.00	3	0.60	0.80	0.259	0.259	0.36	0.07	0.019	8%
	0.90	0.39				0.207	1.00	4	0.80	0.95	0.207	0.207	0.39	0.06	0.012	5%
	1.00	0.41				0.283	1.00	5	0.95	1.05	0.283	0.283	0.41	0.04	0.012	5%
	1.10	0.42				0.250	1.00	6	1.05	1.15	0.250	0.250	0.42	0.04	0.010	4%
	1.20	0.41				0.277	1.00	7	1.15	1.25	0.277	0.277	0.41	0.04	0.011	5%
	1.30	0.42				0.250	1.00	8	1.25	1.35	0.250	0.250	0.42	0.04	0.010	4%
	1.40	0.40				0.232	1.00	9	1.35	1.45	0.232	0.232	0.40	0.04	0.009	4%
	1.50	0.41				0.293	1.00	10	1.45	1.55	0.293	0.293	0.41	0.04	0.012	5%
	1.60	0.40				0.280	1.00	11	1.55	1.65	0.280	0.280	0.40	0.04	0.011	5%
	1.70	0.38				0.259	1.00	12	1.65	1.75	0.259	0.259	0.38	0.04	0.010	4%
	1.80	0.39				0.241	1.00	13	1.75	1.85	0.241	0.241	0.39	0.04	0.009	4%
	1.90	0.38				0.335	1.00	14	1.85	1.95	0.335	0.335	0.38	0.04	0.013	5%
	2.00	0.35				0.344	1.00	15	1.95	2.05	0.344	0.344	0.35	0.03	0.012	5%
	2.10	0.36				0.311	1.00	16	2.05	2.15	0.311	0.311	0.36	0.04	0.011	5%
	2.20	0.38				0.287	1.00	17	2.15	2.25	0.287	0.287	0.38	0.04	0.011	4%
	2.30	0.35				0.259	1.00	18	2.25	2.35	0.259	0.259	0.35	0.03	0.009	4%
	2.40	0.30				0.311	1.00	19	2.35	2.45	0.311	0.311	0.30	0.03	0.009	4%
	2.50	0.31				0.253	1.00	20	2.45	2.55	0.253	0.253	0.31	0.03	0.008	3%
2.60	0.30				0.238	1.00	21	2.55	2.65	0.238	0.238	0.30	0.03	0.007	3%	
2.70	0.31				0.283	1.00	22	2.65	2.75	0.283	0.283	0.31	0.03	0.009	4%	
2.80	0.30				0.287	1.00	23	2.75	2.90	0.287	0.287	0.30	0.05	0.013	5%	
3.00	0.28				0.116	1.00	24	2.90	3.10	0.116	0.116	0.28	0.06	0.006	3%	
3.20	0.29				0.122	1.00	25	3.10	3.30	0.122	0.122	0.29	0.06	0.007	3%	
3.40	0.26				0.006	1.00	26	3.30	3.55	0.006	0.006	0.26	0.07	0.000	0%	
3.70	0.00					1.00	27	3.55	3.70	0.002	0.002	0.07	0.01	0.000	0%	
													Total Flow:		0.248	1.000

Total Flow:	0.248	(m ³ /s)
Perceived Measurement Quality:	excellent	
Total Area:	1.12	(m ²)
Top Width:	3.45	(m)
Hydraulic Depth:	0.324	(m)
Mean Velocity:	0.222	(m/s)
Froude Number	0.124	
Photographs taken looking at:		
Photos taken		

Notes: Water temp = 18.6 C
battery was dead, changed

Data logger Notes:	Site 1909
Data logger Internal Power:	5.44 V
Data logger External Power:	12.66 V
Data logger Memory Used:	3%
Data logger Clock:	12:36 PM MST
Laptop Clock:	12:44 PM MST
Dessicant:	good
Data logger:	1909
PT:	25892
Power:	



Hydrometric Measurement / Site Visit Record

S37 - East Jackpine Ck at the 1300 m contour



Regional Aquatics Monitoring Program

top of post
nail in post

Measurement Location

River/Stream: Jackpine Creek
Location: East Jackpine Ck at the 1300 m contour
Site Name: S37
Coordinates & Legal:

Time of Measurement

Date of Measurement: September 12, 2008
Start Time: 3:10 PM MDT
End Time: 3:25 PM MDT

Weather Conditions:

partly cloudy, 15 C

River Conditions:

open, low stage

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS Checked: sm
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: nail in post 2.130 El: 99.010
Water Level Reading: 2.400 El: 98.740
Top of Ice Level Reading: El: 101.140
Transducer Reading & Calc'd El.: 0.352 El: 98.388
Other: nail in logger tre 0.755 El: 100.385

Setup No. 1

El: 99.010
El: 98.740
El: 101.140
El: 98.388
El: 100.385

Setup No. 2

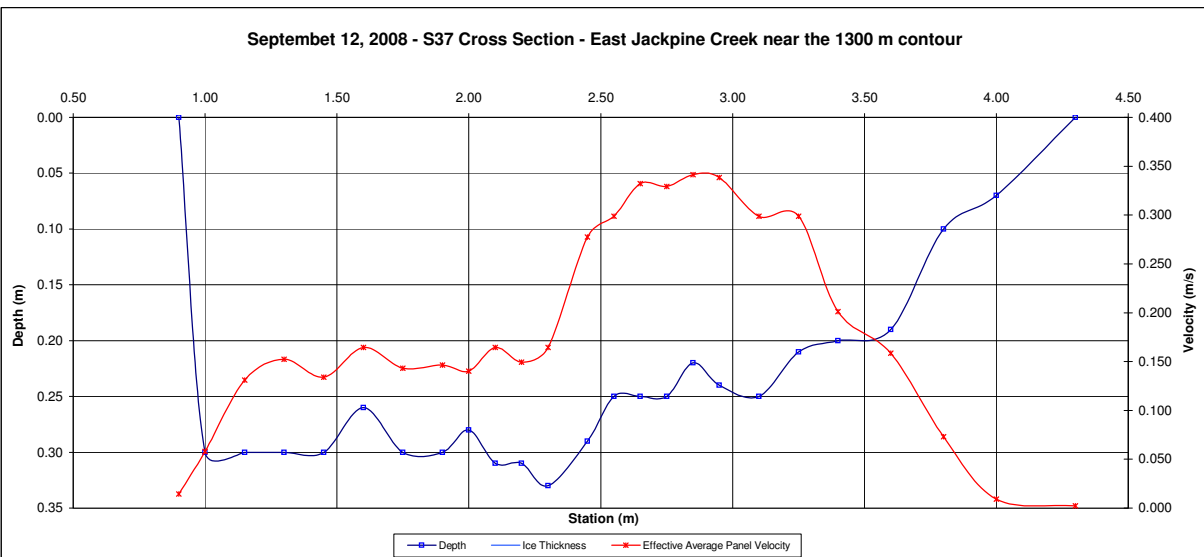
El: 99.010
El: 98.735
El: 101.120
El: 98.383
El: 100.385

		Measurement Data															
Measured Data							Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)			
RB	0.90	0.00				1.00	1	0.90	0.95	0.014	0.014	0.08	0.00	0.000	0%		
	1.00	0.30			0.058	1.00	2	0.95	1.08	0.058	0.058	0.30	0.04	0.002	1%		
	1.15	0.30			0.131	1.00	3	1.08	1.23	0.131	0.131	0.30	0.05	0.006	4%		
	1.30	0.30			0.152	1.00	4	1.23	1.38	0.152	0.152	0.30	0.05	0.007	5%		
	1.45	0.30			0.134	1.00	5	1.38	1.53	0.134	0.134	0.30	0.05	0.006	4%		
	1.60	0.26			0.165	1.00	6	1.53	1.68	0.165	0.165	0.26	0.04	0.006	4%		
	1.75	0.30			0.143	1.00	7	1.68	1.83	0.143	0.143	0.30	0.05	0.006	4%		
	1.90	0.30			0.146	1.00	8	1.83	1.95	0.146	0.146	0.30	0.04	0.005	4%		
	2.00	0.28			0.140	1.00	9	1.95	2.05	0.140	0.140	0.28	0.03	0.004	3%		
	2.10	0.31			0.165	1.00	10	2.05	2.15	0.165	0.165	0.31	0.03	0.005	3%		
	2.20	0.31			0.149	1.00	11	2.15	2.25	0.149	0.149	0.31	0.03	0.005	3%		
	2.30	0.33			0.165	1.00	12	2.25	2.38	0.165	0.165	0.33	0.04	0.007	5%		
	2.45	0.29			0.277	1.00	13	2.38	2.50	0.277	0.277	0.29	0.04	0.010	7%		
	2.55	0.25			0.299	1.00	14	2.50	2.60	0.299	0.299	0.25	0.02	0.007	5%		
	2.65	0.25			0.332	1.00	15	2.60	2.70	0.332	0.332	0.25	0.03	0.008	6%		
	2.75	0.25			0.329	1.00	16	2.70	2.80	0.329	0.329	0.25	0.02	0.008	6%		
	2.85	0.22			0.341	1.00	17	2.80	2.90	0.341	0.341	0.22	0.02	0.008	5%		
	2.95	0.24			0.338	1.00	18	2.90	3.03	0.338	0.338	0.24	0.03	0.010	7%		
	3.10	0.25			0.299	1.00	19	3.03	3.18	0.299	0.299	0.25	0.04	0.011	8%		
	3.25	0.21			0.299	1.00	20	3.18	3.33	0.299	0.299	0.21	0.03	0.009	6%		
	3.40	0.20			0.201	1.00	21	3.33	3.50	0.201	0.201	0.20	0.04	0.007	5%		
	3.60	0.19			0.158	1.00	22	3.50	3.70	0.158	0.158	0.19	0.04	0.006	4%		
	3.80	0.10			0.073	1.00	23	3.70	3.90	0.073	0.073	0.10	0.02	0.001	1%		
	4.00	0.07			0.009	1.00	24	3.90	4.15	0.009	0.009	0.07	0.02	0.000	0%		
	4.30	0.00				1.00	25	4.15	4.30	0.002	0.002	0.02	0.00	0.000	0%		
LB																	
Total Flow:													0.147	1.000			

Total Flow:	0.147	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	0.77	(m ²)
Top Width:	3.40	(m)
Hydraulic Depth:	0.228	(m)
Mean Velocity:	0.190	(m/s)
Froude Number	0.127	
Photographs taken looking at:	Upstream, downstream, across	

Notes: data looks good, reviewed in field

Data logger Notes:	
Data logger Internal Power:	5.44 V
Data logger External Power:	11.77 V
Data logger Memory Used:	4.0%
Data logger Clock:	1:57 PM MST
Laptop Clock:	2:00 PM MST
Dessicant:	
Data logger:	1909
PT:	
Power:	



Hydrometric Measurement / Site Visit Record

S37 - East Jackpine Ck at the 1300 m contour



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek
Location: East Jackpine Ck at the 1300 m contour
Site Name: S37
Coordinates & Legal:

Time of Measurement

Date of Measurement: October 21, 2008
Start Time: 1:22 PM MDT
End Time: 1:28 PM MDT

Weather Conditions:

cloudy, rain

River Conditions:

Personnel & Equipment

Measurement Made By: SM/AM
Data Entry By: LS Checked: SM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: nail in post 1.722
Water Level Reading: 1.912
Top of Ice Level Reading: 0.335
Transducer Reading & Calc'd El.:
Other: nail in logger tree

Setup No. 1

El: 99.010
El: 98.820
El: 100.397
El: 98.820
El: 100.732

Setup No. 2

El: 99.010
El: 98.820
El: 100.399
El: 98.820
El: 100.720

Measurement Data																
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)		
LB	0.70	0.00				1.00	1	0.70	0.90	0.019	0.019	0.06	0.01	0.000	0%	
	1.10	0.25			0.076	1.00	2	0.90	1.30	0.076	0.076	0.25	0.10	0.008	2%	
	1.50	0.26			0.250	1.00	3	1.30	1.58	0.250	0.250	0.26	0.07	0.018	5%	
	1.65	0.30			0.332	1.00	4	1.58	1.73	0.332	0.332	0.30	0.05	0.015	4%	
	1.80	0.30			0.341	1.00	5	1.73	1.88	0.341	0.341	0.30	0.05	0.015	5%	
	1.95	0.34			0.317	1.00	6	1.88	2.03	0.317	0.317	0.34	0.05	0.016	5%	
	2.10	0.34			0.399	1.00	7	2.03	2.18	0.399	0.399	0.34	0.05	0.020	6%	
	2.25	0.37			0.399	1.00	8	2.18	2.33	0.399	0.399	0.37	0.06	0.022	7%	
	2.40	0.41			0.381	1.00	9	2.33	2.45	0.381	0.381	0.41	0.05	0.020	6%	
	2.50	0.42			0.372	1.00	10	2.45	2.55	0.372	0.372	0.42	0.04	0.016	5%	
	2.60	0.40			0.351	1.00	11	2.55	2.65	0.351	0.351	0.40	0.04	0.014	4%	
	2.70	0.40			0.351	1.00	12	2.65	2.75	0.351	0.351	0.40	0.04	0.014	4%	
	2.80	0.41			0.360	1.00	13	2.75	2.85	0.360	0.360	0.41	0.04	0.015	4%	
	2.90	0.41			0.372	1.00	14	2.85	2.95	0.372	0.372	0.41	0.04	0.015	5%	
	3.00	0.40			0.332	1.00	15	2.95	3.05	0.332	0.332	0.40	0.04	0.013	4%	
	3.10	0.39			0.418	1.00	16	3.05	3.15	0.418	0.418	0.39	0.04	0.016	5%	
	3.20	0.38			0.430	1.00	17	3.15	3.25	0.430	0.430	0.38	0.04	0.016	5%	
	3.30	0.39			0.341	1.00	18	3.25	3.35	0.341	0.341	0.39	0.04	0.013	4%	
	3.40	0.38			0.351	1.00	19	3.35	3.45	0.351	0.351	0.38	0.04	0.013	4%	
	3.50	0.34			0.317	1.00	20	3.45	3.55	0.317	0.317	0.34	0.03	0.011	3%	
	3.60	0.35			0.329	1.00	21	3.55	3.65	0.329	0.329	0.35	0.04	0.012	3%	
	3.70	0.32			0.274	1.00	22	3.65	3.75	0.274	0.274	0.32	0.03	0.009	3%	
	3.80	0.30			0.259	1.00	23	3.75	3.85	0.259	0.259	0.30	0.03	0.008	2%	
	3.90	0.30			0.268	1.00	24	3.85	3.95	0.268	0.268	0.30	0.03	0.008	2%	
	4.00	0.27			0.155	1.00	25	3.95	4.05	0.155	0.155	0.27	0.03	0.004	1%	
RB	4.10	0.24			0.046	1.00	26	4.05	4.20	0.046	0.046	0.24	0.04	0.002	0%	
	4.30	0.00			1.00		27	4.20	4.30	0.011	0.011	0.06	0.01	0.000	0%	
Total Flow:														0.333	1.000	

Total Flow:	0.333	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	1.11	(m ²)
Top Width:	3.60	(m)
Hydraulic Depth:	0.309	(m)
Mean Velocity:	0.300	(m/s)
Froude Number	0.172	
Photographs taken looking at: Upstream, downstream, across		

Data logger Notes:

Data logger Internal Power:

Data logger External Power:

Data logger Memory Used:

Data logger Clock:

Laptop Clock:

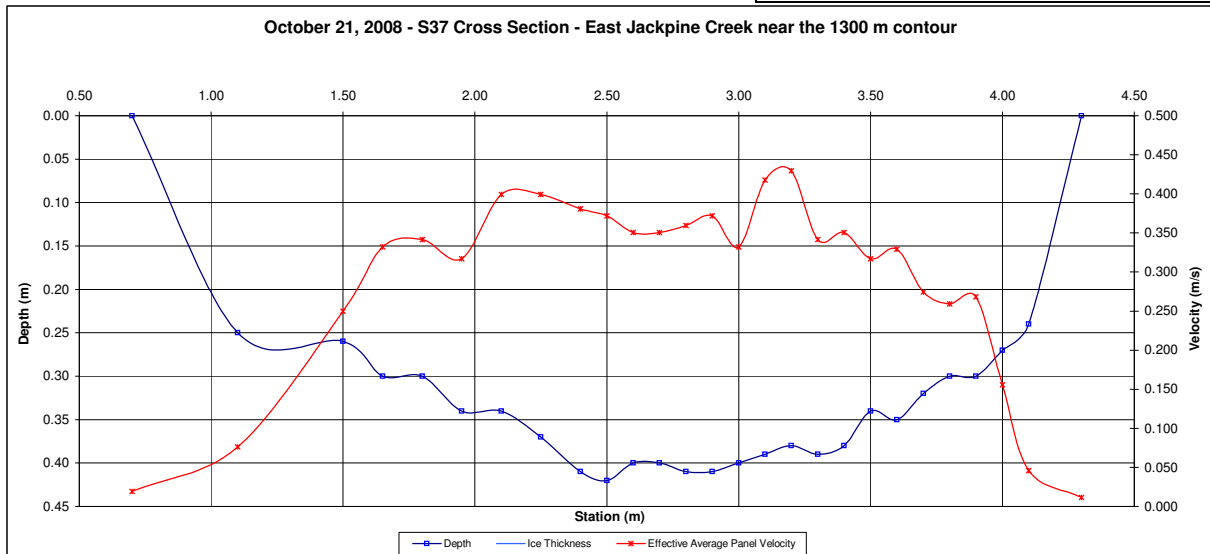
Dessicant:

Data logger: 1909

PT:

Power:

Notes:



Hydrometric Measurement / Site Visit Record

Beaver River above Syncrude - S39



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Beaver River
Location: S39
Site Name: Beaver River above Syncrude
Coordinates & Legal:

Time of Measurement

Date of Measurement: January 11, 2008
Start Time: 3:45 PM MST
End Time: 4:00 PM MST

Weather Conditions:

Cloudy
Ice Cover

Personnel & Equipment

Measurement Made By: JS/JV
Data Entry By: SMS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: 0.888
Water Level Reading: 2.620
Top of Ice Level Reading: 2.605
Transducer Reading & Est. EL:

Setup No. 1

EL: 100.000
EL: 98.268
EL: 98.283
EL:

Setup No. 2

EL: 100.000
EL: 98.272
EL: 98.271
EL:

Average

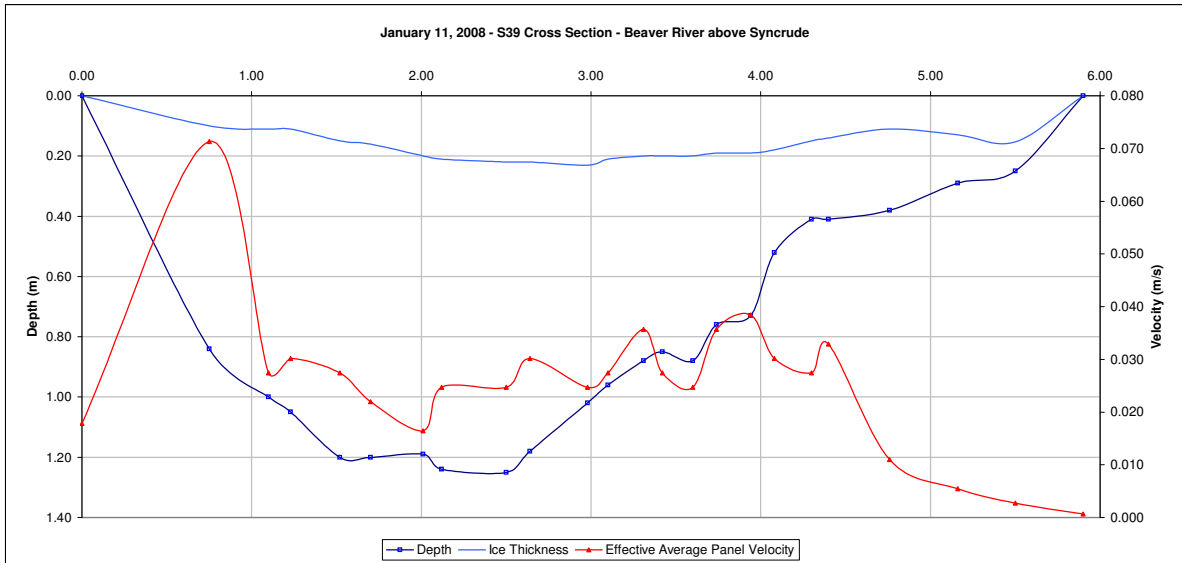
98.270

Measured Data							Measurement Data										Calculated Data		
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)					
LB 0.00	0.00	0.00				0.90	1	0.00	0.38	0.020	0.018	0.19	0.07	0.001	1%				
0.75	0.84	0.10			0.079	0.90	2	0.38	0.93	0.079	0.071	0.74	0.41	0.029	27%				
1.10	1.00	0.11			0.030	0.90	3	0.93	1.17	0.030	0.027	0.89	0.21	0.006	5%				
1.23	1.05	0.11			0.034	0.90	4	1.17	1.38	0.034	0.030	0.94	0.20	0.006	6%				
1.52	1.20	0.15			0.030	0.90	5	1.38	1.61	0.030	0.027	1.05	0.25	0.007	6%				
1.70	1.20	0.16			0.024	0.90	6	1.61	1.86	0.024	0.022	1.04	0.25	0.006	5%				
2.01	1.19	0.20			0.018	0.90	7	1.86	2.07	0.018	0.016	0.99	0.21	0.003	3%				
2.12	1.24	0.21			0.027	0.90	8	2.07	2.31	0.027	0.025	1.03	0.25	0.006	6%				
2.50	1.25	0.22			0.027	0.90	9	2.31	2.57	0.027	0.025	1.03	0.27	0.007	6%				
2.64	1.18	0.22			0.034	0.90	10	2.57	2.81	0.034	0.030	0.96	0.23	0.007	6%				
2.98	1.02	0.23			0.027	0.90	11	2.81	3.04	0.027	0.025	0.79	0.18	0.004	4%				
3.10	0.96	0.21			0.030	0.90	12	3.04	3.21	0.030	0.027	0.75	0.12	0.003	3%				
3.31	0.88	0.20			0.040	0.90	13	3.21	3.37	0.040	0.036	0.68	0.11	0.004	4%				
3.42	0.85	0.20			0.030	0.90	14	3.37	3.51	0.030	0.027	0.65	0.09	0.003	2%				
3.60	0.88	0.20			0.027	0.90	15	3.51	3.67	0.027	0.025	0.68	0.11	0.003	2%				
3.74	0.76	0.19			0.040	0.90	16	3.67	3.84	0.040	0.036	0.57	0.10	0.003	3%				
3.94	0.73	0.19			0.043	0.90	17	3.84	4.01	0.043	0.038	0.54	0.09	0.004	3%				
4.08	0.52	0.18			0.034	0.90	18	4.01	4.19	0.034	0.030	0.34	0.06	0.002	2%				
4.30	0.41	0.15			0.030	0.90	19	4.19	4.35	0.030	0.027	0.26	0.04	0.001	1%				
4.40	0.41	0.14			0.037	0.90	20	4.35	4.58	0.037	0.033	0.27	0.06	0.002	2%				
4.76	0.38	0.11			0.012	0.90	21	4.58	4.96	0.012	0.011	0.27	0.10	0.001	1%				
5.16	0.29	0.13			0.006	0.90	22	4.96	5.33	0.006	0.005	0.16	0.06	0.000	0%				
5.50	0.25	0.15			0.003	0.90	23	5.33	5.70	0.003	0.003	0.10	0.04	0.000	0%				
RB 5.90	0.00	0.00				0.90	24	5.70	5.90	0.001	0.001	0.02	0.00	0.000	0%				
Total Flow:														0.108	1.000				

Total Flow:	0.108	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	3.52	(m ²)
Top Width:	5.90	(m)
Hydraulic Depth:	0.597	(m)
Mean Velocity:	0.031	(m/s)
Froude Number	0.013	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

Beaver River above Syncrude - S39



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Beaver River
Location: S39
Site Name: Beaver River above Syncrude
Coordinates & Legal: [Redacted]

Time of Measurement

Date of Measurement: February 11, 2008
Start Time: 4:04 PM MST
End Time: 4:33 PM MST

Weather Conditions:

clear -17
River Conditions: Ice Cover

Personnel & Equipment

Measurement Made By: sms sm jvr
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: WSC 94-2 0.560
Water Level Reading: 2.391
Top of Ice Level Reading: 2.282
Transducer Reading & Est. El.: 1.978
Other:

Setup No. 1

El: 100.000
El: 98.169
El: 98.278
El: 96.191

Setup No. 2

El: 100.000
El: 98.174
El: 98.280
El: 96.196

Average

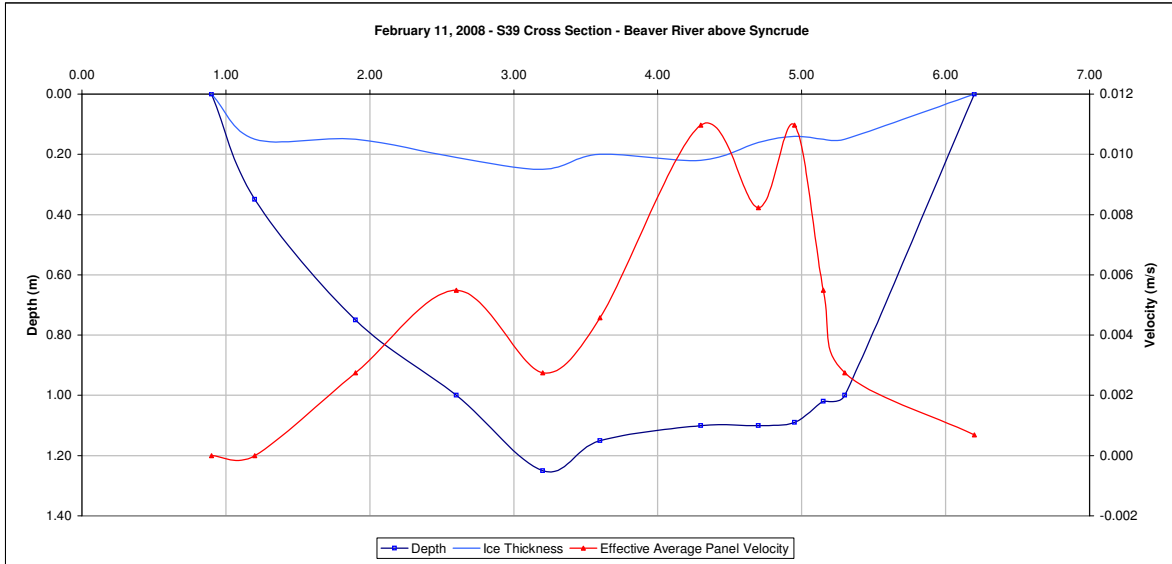
98.172
98.279
96.194

Measured Data							Measurement Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
LB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
	0.90	0.00	0.00				0.90	1	0.90	1.05	0.000	0.000	0.05	0.01	0.000	0%	
	1.20	0.35	0.15				0.90	2	1.05	1.55	0.000	0.000	0.20	0.10	0.000	0%	
	1.90	0.75	0.15			0.003	0.90	3	1.55	2.25	0.003	0.003	0.60	0.42	0.001	6%	
	2.60	1.00	0.21			0.006	0.90	4	2.25	2.90	0.006	0.005	0.79	0.51	0.003	14%	
	3.20	1.25	0.25			0.003	0.90	5	2.90	3.40	0.003	0.003	1.00	0.50	0.001	7%	
	3.60	1.15	0.20	0.003	0.006		1.00	6	3.40	3.95	0.005	0.005	0.95	0.52	0.002	12%	
	4.30	1.10	0.22			0.012	0.90	7	3.95	4.50	0.012	0.011	0.88	0.48	0.005	27%	
	4.70	1.10	0.16			0.009	0.90	8	4.50	4.83	0.009	0.008	0.94	0.31	0.003	13%	
	4.95	1.09	0.14			0.012	0.90	9	4.83	5.05	0.012	0.011	0.95	0.21	0.002	12%	
	5.15	1.02	0.15			0.006	0.90	10	5.05	5.23	0.006	0.005	0.87	0.15	0.001	4%	
RB	5.30	1.00	0.15			0.003	0.90	11	5.23	5.75	0.003	0.003	0.85	0.45	0.001	6%	
	6.20	0.00	0.00			0.006	0.90	24	5.75	6.20	0.001	0.001	0.21	0.10	0.000	0%	
Total Flow:														0.020	1.000		

Total Flow:	0.020	(m ³ /s)
Perceived Measurement Quality:	Poor	
Total Area:	3.76	(m ²)
Top Width:	5.30	(m)
Hydraulic Depth:	0.710	(m)
Mean Velocity:	0.005	(m/s)
Froude Number	0.002	
Photographs taken looking at:		
Photographs taken:	yes	

Data logger Notes:
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes: very slow velocities



Hydrometric Measurement / Site Visit Record

Beaver River above Syncrude - S39



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Beaver River
Location: S39
Site Name: Beaver River above Syncrude
Coordinates & Legal:

Time of Measurement

Date of Measurement: March 8, 2008
Start Time: 2:40 PM MST
End Time: 3:00 PM MST

Weather Conditions:

clear +9
Ice Cover

Personnel & Equipment

Measurement Made By: JS JVR SM
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Checked by: LMM

Level Readings

Bench Mark Reading: WSC 94-2 1.300
Water Level Reading: 3.098
Top of Ice Level Reading: 3.045
Transducer Reading & Est. EL: 2.015
Other:

Setup No. 1

EL: 100.000
EL: 98.202
EL: 98.255
EL: 96.187

Setup No. 2

EL: 1.101
EL: 2.891
EL: 2.838
EL: 2.015

Average

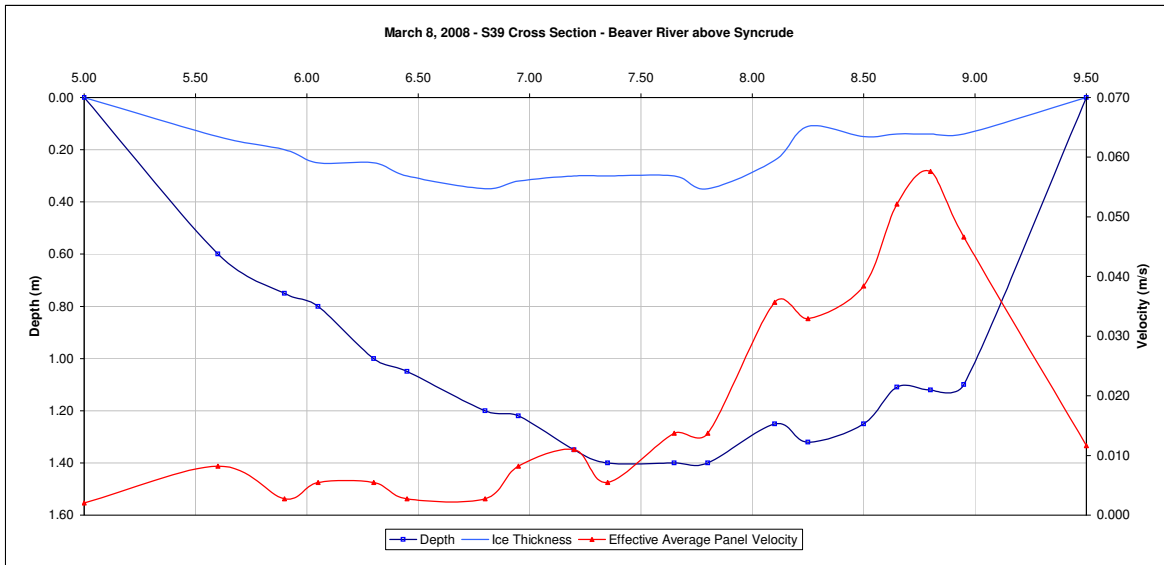
98.206
98.259
96.195

Measured Data							Measurement Data									Calculated Data					
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total						
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)							
LB	5.00	0.00	0.00			0.90	1	5.00	5.30	0.002	0.002	0.11	0.03	0.000	0%						
	5.60	0.60	0.15		0.009	0.90	2	5.30	5.75	0.009	0.008	0.45	0.20	0.002	2%						
	5.90	0.75	0.20		0.003	0.90	3	5.75	5.98	0.003	0.003	0.55	0.12	0.000	0%						
	6.05	0.80	0.25		0.006	0.90	4	5.98	6.18	0.006	0.005	0.55	0.11	0.001	1%						
	6.30	1.00	0.25		0.006	0.90	5	6.18	6.38	0.006	0.005	0.75	0.15	0.001	1%						
	6.45	1.05	0.30		0.003	0.90	6	6.38	6.63	0.003	0.003	0.75	0.19	0.001	1%						
	6.80	1.20	0.35		0.003	0.90	7	6.63	6.88	0.003	0.003	0.85	0.21	0.001	1%						
	6.95	1.22	0.32		0.009	0.90	8	6.88	7.08	0.009	0.008	0.90	0.18	0.001	2%						
	7.20	1.35	0.30		0.012	0.90	9	7.08	7.28	0.012	0.011	1.05	0.21	0.002	3%						
	7.35	1.40	0.30		0.006	0.90	10	7.28	7.50	0.006	0.005	1.10	0.25	0.001	2%						
	7.65	1.40	0.30		0.015	0.90	11	7.50	7.73	0.015	0.014	1.10	0.25	0.003	5%						
	7.80	1.40	0.35		0.015	0.90	12	7.73	7.95	0.015	0.014	1.05	0.24	0.003	4%						
	8.10	1.25	0.24		0.040	0.90	13	7.95	8.18	0.040	0.036	1.01	0.23	0.008	11%						
	8.25	1.32	0.11		0.037	0.90	14	8.18	8.38	0.037	0.033	1.21	0.24	0.008	11%						
	8.50	1.25	0.15		0.043	0.90	15	8.38	8.58	0.043	0.038	1.10	0.22	0.008	12%						
	8.65	1.11	0.14		0.058	0.90	16	8.58	8.73	0.058	0.052	0.97	0.15	0.008	10%						
	8.80	1.12	0.14		0.064	0.90	17	8.73	8.88	0.064	0.058	0.98	0.15	0.008	12%						
	8.95	1.10	0.14		0.052	0.90	18	8.88	9.23	0.052	0.047	0.96	0.34	0.016	21%						
	9.50	0.00	0.00			0.90		19	9.23	9.50	0.013	0.012	0.24	0.07	0.001	1%					
Total Flow:														0.073	1.000						

Total Flow:	0.073	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	3.53	(m ²)
Top Width:	4.50	(m)
Hydraulic Depth:	0.783	(m)
Mean Velocity:	0.021	(m/s)
Froude Number	0.008	
Photographs taken looking at:		
Photographs taken:	yes	

Data logger Notes:
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

Beaver River above Syncrude - S39



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Beaver River
Location: S39
Site Name: Beaver River above Syncrude
Coordinates & Legal: 465547E, 6311437N
Time of Measurement
Date of Measurement: April 1, 2008
Start Time: 4:58 PM MST
End Time: 5:15 PM MST

Personnel & Equipment

Measurement Made By: JS SM
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: wsc 94-2
Water Level Reading:
Top of Ice Level Reading:
Transducer Reading & Est. El.:
Other: wsc 94-1

Setup No. 1

2.084 El: 100.000
3.874 El: 98.210
3.881 El: 98.203
El:
1.317 El: 100.767

Setup No. 2

2.038 El: 100.000
3.838 El: 98.200
3.759 El: 98.279
El:
1.279 El: 100.759

Average

98.205
98.241
100.763

Weather Conditions:

clear +2

River Conditions:

Ice Cover

Measurement Data

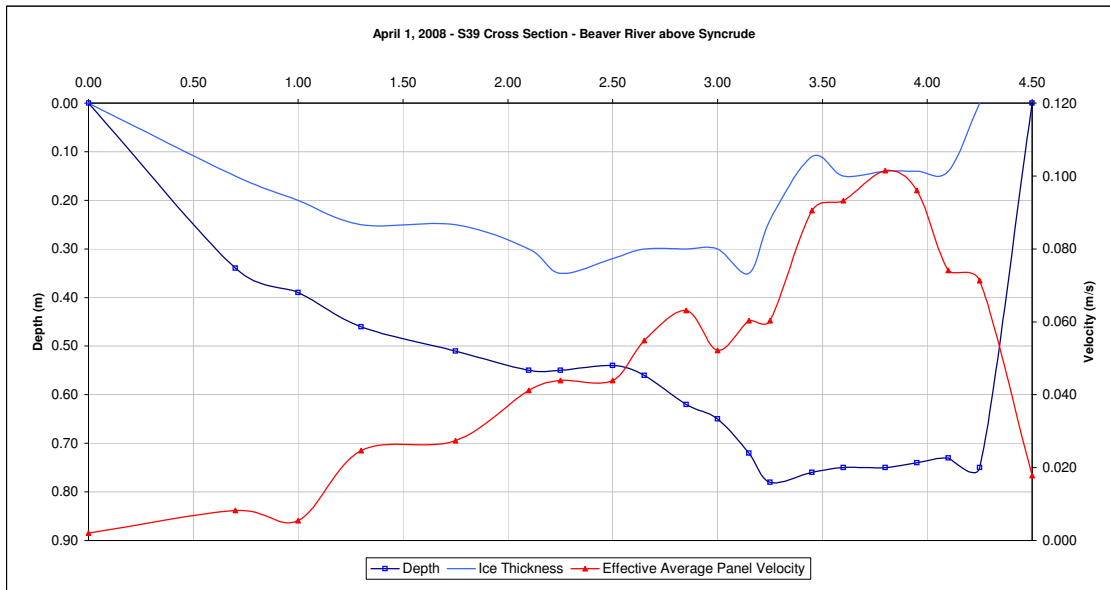
LB	Measured Data						Calculated Data								Percentage of Total	
			Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area		Panel Discharge
	Station	Depth	s	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)		(m ³ /s)
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
	0.00	0.00	0.00			0.000	0.90	1	0.00	0.35	0.002	0.002	0.08	0.03	0.000	0%
	0.70	0.34	0.03			0.009	0.90	2	0.35	0.85	0.009	0.008	0.31	0.16	0.001	2%
	1.00	0.39	0.02			0.006	0.90	3	0.85	1.15	0.006	0.005	0.37	0.11	0.001	1%
	1.30	0.46	0.09			0.027	0.90	4	1.15	1.53	0.027	0.025	0.37	0.14	0.003	4%
	1.75	0.51	0.10			0.030	0.90	5	1.53	1.93	0.030	0.027	0.41	0.16	0.004	6%
	2.10	0.55	0.15			0.046	0.90	6	1.93	2.18	0.046	0.041	0.40	0.10	0.004	5%
	2.25	0.55	0.16			0.049	0.90	7	2.18	2.38	0.049	0.044	0.39	0.08	0.003	4%
	2.50	0.54	0.16			0.049	0.90	8	2.38	2.58	0.049	0.044	0.38	0.08	0.003	4%
	2.65	0.56	0.20			0.061	0.90	9	2.58	2.75	0.061	0.055	0.36	0.06	0.003	4%
	2.85	0.62	0.23			0.070	0.90	10	2.75	2.93	0.070	0.063	0.39	0.07	0.004	5%
	3.00	0.65	0.19			0.058	0.90	11	2.93	3.08	0.058	0.052	0.46	0.07	0.004	5%
	3.15	0.72	0.22			0.067	0.90	12	3.08	3.20	0.067	0.060	0.50	0.06	0.004	5%
	3.25	0.78	0.22			0.067	0.90	13	3.20	3.35	0.067	0.060	0.56	0.08	0.005	6%
	3.45	0.76	0.33			0.101	0.90	14	3.35	3.53	0.101	0.091	0.43	0.08	0.007	9%
	3.60	0.75	0.34			0.104	0.90	15	3.53	3.70	0.104	0.093	0.41	0.07	0.007	8%
	3.80	0.75	0.37			0.113	0.90	16	3.70	3.88	0.113	0.101	0.38	0.07	0.007	9%
	3.95	0.74	0.35			0.107	0.90	17	3.88	4.03	0.107	0.096	0.39	0.06	0.006	7%
	4.10	0.73	0.27			0.082	0.90	18	4.03	4.18	0.082	0.074	0.46	0.07	0.005	6%
	4.25	0.75	0.26			0.079	0.90	19	4.18	4.38	0.079	0.071	0.49	0.10	0.007	9%
RB	4.50	0.00	0.00			0.000	0.90	19	4.38	4.50	0.020	0.018	0.12	0.02	0.000	0%
Total Flow:															0.079	100%

Total Flow:	0.079	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.65	(m ²)
Top Width:	4.50	(m)
Hydraulic Depth:	0.367	(m)
Mean Velocity:	0.048	(m/s)
Froude Number	0.025	
Photographs taken looking at:		
Photographs taken:	yes	

Data logger Notes:

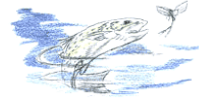
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

Beaver River above Syncrude - S39



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Beaver River
Location: S39
Site Name: Beaver River above Syncrude
Coordinates & Legal: 465547E, 6311437N

Time of Measurement

Date of Measurement: December 11, 2008
Start Time: 2:20 PM MST
End Time:

Weather Conditions: partly cloudy, calm, -14 C

River Conditions: thin ice cover

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS Checked:
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

	Setup No. 1		Setup No. 2		Average
Bench Mark Reading: wsc 94-2	2.276	El: 100.000	2.252	El: 100.000	
Water Level Reading:	3.946	El: 98.330	3.918	El: 98.334	98.332
Top of Ice Level Reading:	3.883	El: 98.393	3.86	El: 98.392	98.393
Transducer Reading & Est. El.:		El:		El:	
Other: wsc 94-1	1.518	El: 100.758	1.496	El: 100.756	100.757

Notes: ice to thin to do discharge measurement

Hydrometric Measurement / Site Visit Record

MacKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MacKay River
Location: S40
Site Name: MacKay River at Petro-Canada Bridge
Coordinates & Legal:

Time of Measurement

Date of Measurement: January 11, 2008
Start Time: 2:00 PM MST
End Time: 2:30 PM MST

Weather Conditions:

Cloudy, light snow, -15 C
River Conditions: Ice Cover of 35 cm, 30-40 cms snow cover

Personnel & Equipment

Measurement Made By: JS/JV
Data Entry By: SMS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rebar 1.047
Water Level Reading: 3.564
Top of Ice Level Reading: 3.520
Transducer Reading & Est. El.: 0.640
Other: nail on bridge 0.062

Setup No. 1

El: 100.000
El: 97.483
El: 97.527
El: 96.843
El: 100.985

Setup No. 2

El: 1.007
El: 3.532
El: 3.485
El: 0.640
El: 100.988

Average

100.000
97.475
97.525
96.835
100.987

Measurement Data

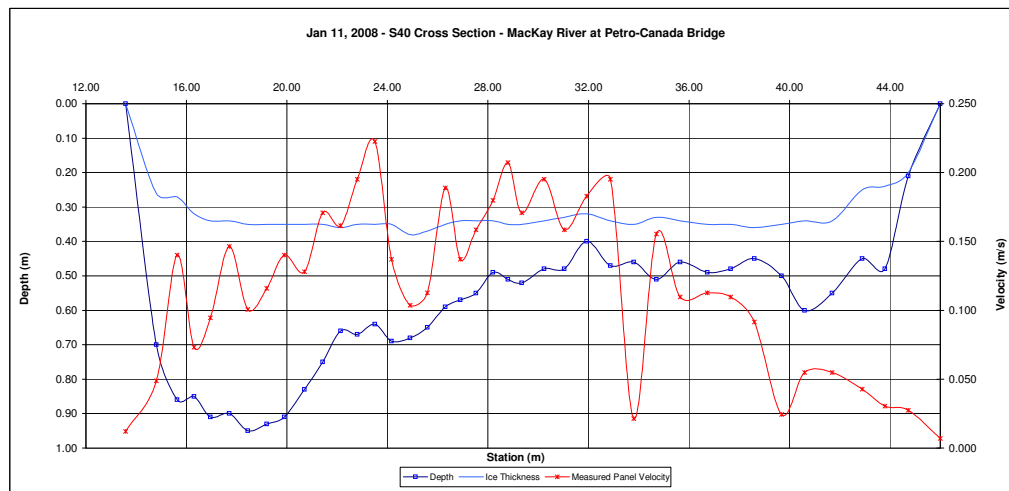
	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
LB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
	13.58	0.00	0.00			0.90	0.90	1	13.58	14.19	0.012	0.011	0.11	0.07	0.001	
	14.80	0.70	0.26			0.049	0.90	2	14.19	15.22	0.049	0.044	0.44	0.45	0.020	
	15.63	0.86	0.27			0.140	0.90	3	15.22	15.97	0.140	0.126	0.59	0.44	0.056	
	16.30	0.85	0.32			0.073	0.90	4	15.97	16.63	0.073	0.066	0.53	0.35	0.023	
	16.95	0.91	0.34			0.094	0.90	5	16.63	17.33	0.094	0.085	0.57	0.40	0.034	
	17.70	0.90	0.34			0.146	0.90	6	17.33	18.07	0.146	0.132	0.56	0.42	0.055	
	18.44	0.95	0.35			0.101	0.90	7	18.07	18.82	0.101	0.091	0.60	0.45	0.041	
	19.20	0.93	0.35			0.116	0.90	8	18.82	19.55	0.116	0.104	0.58	0.42	0.044	
	19.90	0.91	0.35			0.140	0.90	9	19.55	20.30	0.140	0.126	0.56	0.42	0.053	
	20.70	0.83	0.35			0.128	0.90	10	20.30	21.06	0.128	0.115	0.48	0.36	0.042	
	21.42	0.75	0.35			0.171	0.90	11	21.06	21.78	0.171	0.154	0.40	0.29	0.044	
	22.13	0.66	0.36			0.162	0.90	12	21.78	22.47	0.162	0.145	0.30	0.21	0.030	
	22.80	0.67	0.35			0.195	0.90	13	22.47	23.15	0.195	0.176	0.32	0.22	0.038	
	23.50	0.64	0.35			0.223	0.90	14	23.15	23.83	0.223	0.200	0.29	0.20	0.039	
	24.16	0.69	0.35			0.137	0.90	15	23.83	24.53	0.137	0.123	0.34	0.24	0.029	
	24.90	0.68	0.38			0.104	0.90	16	24.53	25.25	0.104	0.093	0.30	0.21	0.020	
	25.59	0.65	0.37			0.113	0.90	17	25.25	25.95	0.113	0.101	0.28	0.20	0.020	
	26.30	0.59	0.35			0.189	0.90	18	25.95	26.60	0.189	0.170	0.24	0.16	0.027	
	26.90	0.57	0.34			0.137	0.90	19	26.60	27.21	0.137	0.123	0.23	0.14	0.017	
	27.52	0.55	0.34			0.158	0.90	20	27.21	27.86	0.158	0.143	0.21	0.14	0.019	
	28.20	0.49	0.34			0.180	0.90	21	27.86	28.50	0.180	0.162	0.15	0.10	0.016	
	28.80	0.51	0.35			0.207	0.90	22	28.50	29.07	0.207	0.187	0.16	0.09	0.017	
	29.34	0.52	0.35			0.171	0.90	23	29.07	29.79	0.171	0.154	0.17	0.12	0.019	
	30.23	0.48	0.34			0.195	0.90	24	29.79	30.64	0.195	0.176	0.14	0.12	0.021	
	31.04	0.48	0.33			0.158	0.90	25	30.64	31.49	0.158	0.143	0.15	0.13	0.018	
	31.93	0.40	0.32			0.183	0.90	26	31.49	32.40	0.183	0.165	0.08	0.07	0.012	
	32.87	0.47	0.34			0.195	0.90	27	32.40	33.34	0.195	0.176	0.13	0.12	0.021	
	33.80	0.46	0.35			0.021	0.90	28	33.34	34.25	0.021	0.019	0.11	0.10	0.002	
	34.70	0.51	0.33			0.155	0.90	29	34.25	35.18	0.155	0.140	0.18	0.17	0.023	
	35.65	0.46	0.34			0.110	0.90	30	35.18	36.19	0.110	0.099	0.12	0.12	0.012	
	36.73	0.49	0.35			0.113	0.90	31	36.19	37.20	0.113	0.101	0.14	0.14	0.014	
	37.66	0.48	0.35			0.110	0.90	32	37.20	38.13	0.110	0.099	0.13	0.12	0.012	
	38.60	0.45	0.36			0.091	0.90	33	38.13	39.14	0.091	0.082	0.09	0.09	0.007	
	39.68	0.50	0.35			0.024	0.90	34	39.14	40.14	0.024	0.022	0.15	0.15	0.003	
	40.60	0.60	0.34			0.055	0.90	35	40.14	41.15	0.055	0.049	0.26	0.26	0.013	
	41.70	0.55	0.34			0.055	0.90	36	41.15	42.30	0.055	0.049	0.21	0.24	0.012	
	42.89	0.45	0.25			0.043	0.90	37	42.30	43.35	0.043	0.038	0.20	0.21	0.008	
	43.80	0.48	0.24			0.030	0.90	38	43.35	44.27	0.030	0.027	0.24	0.22	0.006	
	44.73	0.21	0.20			0.027	0.90	39	44.27	45.37	0.027	0.025	0.01	0.01	0.000	
46.00	0.00	0.00			0.90	0.90	40	45.37	46.00	0.007	0.006	0.00	0.00	0.000		

Total Flow:	0.890	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	8.37	(m ²)
Top Width:	32.42	(m)
Hydraulic Depth:	0.258	(m)
Mean Velocity:	0.106	(m/s)
Froude Number	0.067	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

MacKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MacKay River
 Location: S40
 Site Name: MacKay River at Petro-Canada Bridge
 Coordinates & Legal:
 Time of Measurement: February 11, 2008
 Date of Measurement: 2:40 PM MST
 Start Time: 2:55 PM MST
 End Time:

Personnel & Equipment

Measurement Made By: sm jvr sms
 Data Entry By: sm
 Meter Type and No.: March Mc Birney Flo-Mate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: Rebar 1.809
 Water Level Reading: 4.400
 Top of Ice Level Reading: 4.330
 Transducer Reading & Est. El.: 0.568
 Other: nail on bridge 0.823

Setup No. 1

El: 100.000
 El: 97.409
 El: 97.479
 El: 96.841
 El: 100.986

Setup No. 2

El: 100.000
 El: 97.415
 El: 97.481
 El: 96.847
 El: 100.986

Average

97.412
 97.480
 96.844
 100.986

Weather Conditions:

Cloudy, light snow, -15 C

River Conditions:

Ice Cover of 35 cm, 30-40 cms snow cover

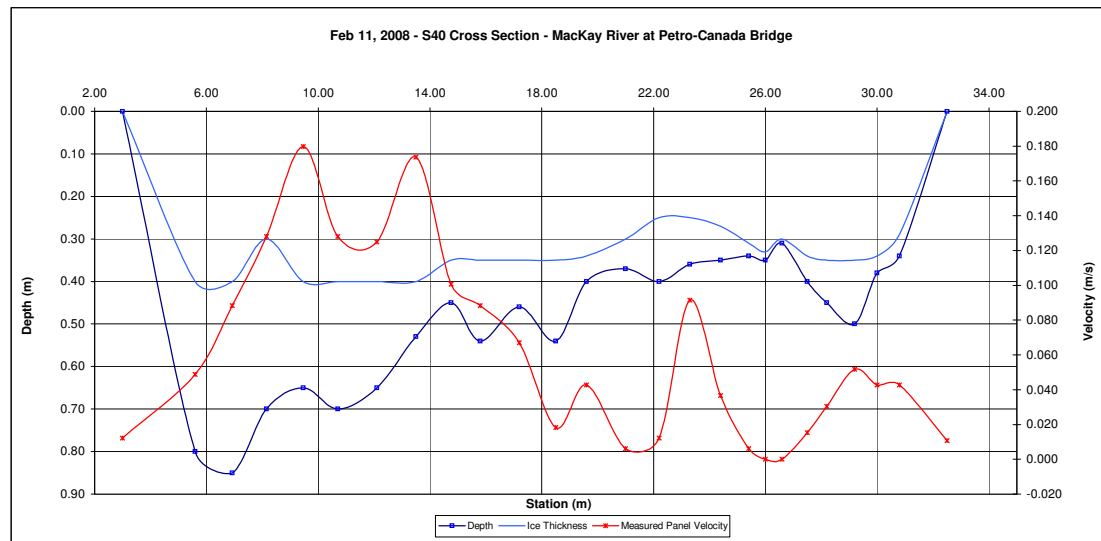
Measurement Data

	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
LB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
	3.00	0.00	0.00				0.90	1	3.00	4.30	0.012	0.011	0.10	0.13	0.001	0%
	5.60	0.80	0.40			0.049	0.90	2	4.30	6.26	0.049	0.044	0.40	0.78	0.034	9%
	6.92	0.85	0.40			0.088	0.90	3	6.26	7.54	0.088	0.080	0.45	0.57	0.046	12%
	8.15	0.70	0.30			0.128	0.90	4	7.54	8.81	0.128	0.115	0.40	0.51	0.059	16%
	9.47	0.65	0.40			0.180	0.90	5	8.81	10.09	0.180	0.162	0.25	0.32	0.052	14%
	10.70	0.70	0.40			0.128	0.90	6	10.09	11.40	0.128	0.115	0.30	0.39	0.045	12%
	12.10	0.65	0.40			0.125	0.90	7	11.40	12.80	0.125	0.112	0.25	0.35	0.039	10%
	13.50	0.53	0.40			0.174	0.90	8	12.80	14.13	0.174	0.156	0.13	0.17	0.027	7%
	14.75	0.45	0.35			0.101	0.90	9	14.13	15.28	0.101	0.091	0.10	0.12	0.010	3%
	15.80	0.54	0.35			0.088	0.90	10	15.28	16.50	0.088	0.080	0.19	0.23	0.019	5%
	17.20	0.46	0.35			0.067	0.90	11	16.50	17.85	0.067	0.060	0.11	0.15	0.009	2%
	18.50	0.54	0.35			0.018	0.90	12	17.85	19.05	0.018	0.016	0.19	0.23	0.004	1%
	19.60	0.40	0.34			0.043	0.90	13	19.05	20.30	0.043	0.038	0.06	0.08	0.003	1%
	21.00	0.37	0.30			0.006	0.90	14	20.30	21.60	0.006	0.005	0.07	0.09	0.000	0%
	22.20	0.40	0.25			0.012	0.90	15	21.60	22.75	0.012	0.011	0.15	0.17	0.002	1%
	23.30	0.36	0.25			0.091	0.90	16	22.75	23.85	0.091	0.082	0.11	0.12	0.010	3%
	24.40	0.35	0.27			0.037	0.90	17	23.85	24.90	0.037	0.033	0.08	0.08	0.003	1%
	25.40	0.34	0.31			0.006	0.90	18	24.90	25.70	0.006	0.005	0.03	0.02	0.000	0%
	26.00	0.35	0.33				0.90	19	25.70	26.30	0.000	0.000	0.02	0.01	0.000	0%
	26.60	0.31	0.30				0.90	20	26.30	27.05	0.000	0.000	0.01	0.01	0.000	0%
	27.50	0.40	0.34			0.015	0.90	21	27.05	27.85	0.015	0.014	0.06	0.05	0.001	0%
	28.20	0.45	0.35			0.030	0.90	22	27.85	28.70	0.030	0.027	0.10	0.08	0.002	1%
	29.20	0.50	0.35			0.052	0.90	23	28.70	29.60	0.052	0.047	0.15	0.14	0.006	2%
	30.00	0.38	0.34			0.043	0.90	24	29.60	30.40	0.043	0.038	0.04	0.03	0.001	0%
	30.80	0.34	0.29			0.043	0.90	25	30.40	31.65	0.043	0.038	0.05	0.06	0.002	1%
32.50	0.00	0.00				0.90	26	31.65	32.50	0.011	0.010	0.01	0.01	0.000	0%	
RB																
Total Flow:														0.376	1.000	

Total Flow:	0.376	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	4.92	(m ²)
Top Width:	29.50	(m)
Hydraulic Depth:	0.167	(m)
Mean Velocity:	0.077	(m/s)
Froude Number	0.060	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:
 Data logger Internal Power:
 Data logger External Power:
 Data logger Memory Used:
 Data logger Clock:
 Laptop Clock:
 Dessicant:
 Data logger:
 PT:
 Power:

Notes:



Hydrometric Measurement / Site Visit Record

MacKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MacKay River
Location: S40
Site Name: MacKay River at Petro-Canada Bridge
Coordinates & Legal:
Time of Measurement:
Date of Measurement: March 8, 2008
Start Time: 1:15 PM MST
End Time: 1:30 PM MST

Personnel & Equipment

Measurement Made By: sm jvr sms
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Checked by: LMM

Level Readings

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: Rebar	1.605	El: 100.000	1.589
Water Level Reading:	4.165	El: 97.440	4.15
Top of Ice Level Reading:	4.100	El: 97.505	4.08
Transducer Reading & Est. El.:	0.592	El: 96.848	0.592
Other: nail on bridge	0.623	El: 100.982	0.605

Weather Conditions:

Cloudy, light snow, -15 C

River Conditions:

Ice Cover of 35 cm, 30-40 cms snow cover

Measurement Data

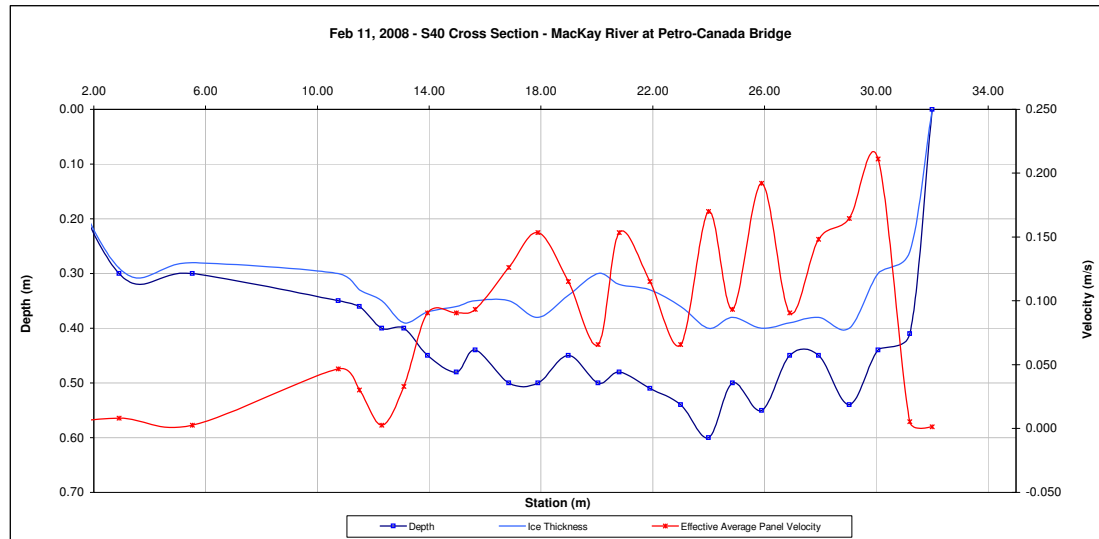
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
LB	0.00	0.00	0.00			0.90	1	0.00	1.45	0.002	0.002	0.00	0.00	0.000	0%
	2.90	0.30	0.29		0.009	0.90	2	1.45	4.22	0.009	0.008	0.01	0.03	0.000	0%
	5.53	0.30	0.28		0.003	0.90	3	4.22	8.14	0.003	0.003	0.02	0.08	0.000	0%
	10.75	0.35	0.30		0.052	0.90	4	8.14	11.13	0.052	0.047	0.05	0.15	0.007	2%
	11.50	0.36	0.33		0.034	0.90	5	11.13	11.90	0.034	0.030	0.03	0.02	0.001	0%
	12.30	0.40	0.35		0.003	0.90	6	11.90	12.70	0.003	0.003	0.05	0.04	0.000	0%
	13.10	0.40	0.39		0.037	0.90	7	12.70	13.52	0.037	0.033	0.01	0.01	0.000	0%
	13.94	0.45	0.37		0.101	0.90	8	13.52	14.46	0.101	0.091	0.08	0.07	0.007	2%
	14.97	0.48	0.36		0.101	0.90	9	14.46	15.31	0.101	0.091	0.12	0.10	0.009	3%
	15.65	0.44	0.35		0.104	0.90	10	15.31	16.25	0.104	0.093	0.09	0.08	0.008	3%
	16.85	0.50	0.35		0.140	0.90	11	16.25	17.37	0.140	0.126	0.15	0.17	0.021	7%
	17.89	0.50	0.38		0.171	0.90	12	17.37	18.44	0.171	0.154	0.12	0.13	0.020	6%
	18.98	0.45	0.34		0.128	0.90	13	18.44	19.52	0.128	0.115	0.11	0.12	0.014	5%
	20.05	0.50	0.30		0.073	0.90	14	19.52	20.43	0.073	0.066	0.20	0.18	0.012	4%
	20.80	0.48	0.32		0.171	0.90	15	20.43	21.35	0.171	0.154	0.16	0.15	0.023	8%
	21.90	0.51	0.33		0.128	0.90	16	21.35	22.45	0.128	0.115	0.18	0.20	0.023	8%
	23.00	0.54	0.36		0.073	0.90	17	22.45	23.50	0.073	0.066	0.18	0.19	0.012	4%
	24.00	0.60	0.40		0.189	0.90	18	23.50	24.43	0.189	0.170	0.20	0.19	0.031	10%
	24.85	0.50	0.38		0.104	0.90	19	24.43	25.38	0.104	0.093	0.12	0.11	0.011	4%
	25.90	0.55	0.40		0.213	0.90	20	25.38	26.40	0.213	0.192	0.15	0.15	0.030	10%
	26.90	0.45	0.39		0.101	0.90	21	26.40	27.42	0.101	0.091	0.06	0.06	0.006	2%
	27.94	0.45	0.38		0.165	0.90	22	27.42	28.49	0.165	0.148	0.07	0.07	0.011	4%
	29.03	0.54	0.40		0.183	0.90	23	28.49	29.55	0.183	0.165	0.14	0.15	0.025	8%
	30.07	0.44	0.30		0.235	0.90	24	29.55	30.64	0.235	0.211	0.14	0.15	0.032	11%
RB	31.20	0.41	0.26		0.006	0.90	25	30.64	31.60	0.006	0.005	0.15	0.14	0.001	0%
	32.00	0.00	0.00			0.90	26	31.60	32.00	0.002	0.001	0.04	0.01	0.000	0%
Total Flow:														0.303	1.000

Total Flow:	0.303	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	2.77	(m ²)
Top Width:	32.00	(m)
Hydraulic Depth:	0.087	(m)
Mean Velocity:	0.109	(m/s)
Froude Number	0.118	
Photographs taken looking at:	Photographs taken.	

Data logger Notes:

Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

MacKay River at Petro-Canada Bridge - S40



Measurement Location

River/Stream: MacKay River
Location: S40
Site Name: MacKay River at Petro-Canada Bridge
Coordinates & Legal: 444888E, 6314179N

Time of Measurement

Date of Measurement: April 1, 2008
Start Time: 3:57 PM MST
End Time: 4:15 PM MST

Weather Conditions:

Cloudy, light snow, 4 C

River Conditions:

Personnel & Equipment

Measurement Made By: JS/SM
Data Entry By: sm
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rebar 1.090
Water Level Reading: 3.631
Top of Ice Level Reading: 3.539
Transducer Reading & Est. El.: 0.629
Other: nail on bridge 0.105

Setup No. 1

El: 100.000
El: 97.459
El: 97.551
El: 96.830
El: 100.985

Setup No. 2

1.058 El: 100.000
3.6 El: 97.458
3.5 El: 97.555
0.629 El: 96.829
0.76 El: 100.298

Average

97.459
97.555
96.830
100.642

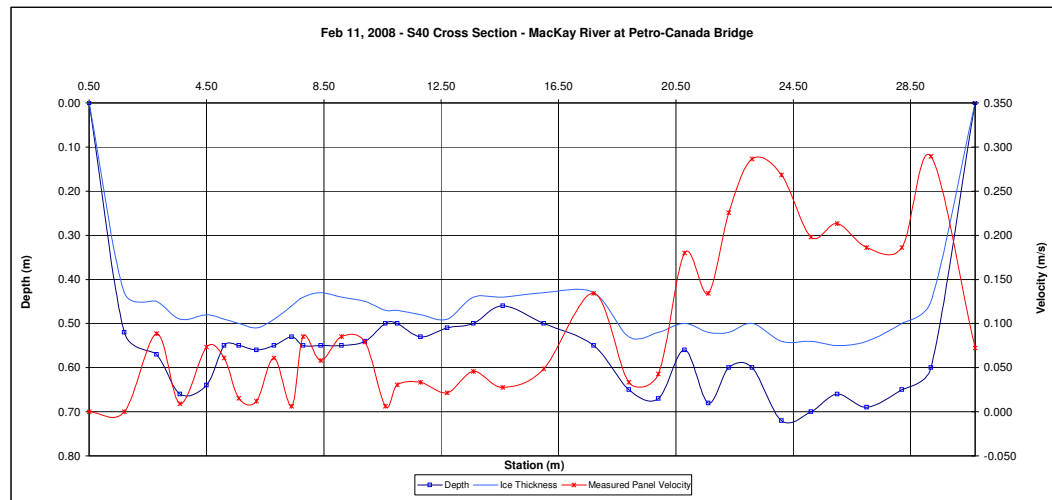
Measurement Data

	Measured Data					Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)	
LB	0.50	0.00	0.00			0.000	0.90	1	0.50	1.10	0.000	0.000	0.02	0.01	0.000	0%
	1.70	0.52	0.43			0.000	0.90	2	1.10	2.25	0.000	0.000	0.09	0.10	0.000	0%
	2.80	0.57	0.45			0.088	0.90	3	2.25	3.20	0.088	0.080	0.12	0.11	0.009	3%
	3.60	0.66	0.49			0.009	0.90	4	3.20	4.05	0.009	0.008	0.17	0.14	0.001	0%
	4.50	0.64	0.48			0.073	0.90	5	4.05	4.80	0.073	0.066	0.16	0.12	0.008	2%
	5.10	0.55	0.49			0.061	0.90	6	4.80	5.35	0.061	0.055	0.06	0.03	0.002	1%
	5.60	0.55	0.50			0.015	0.90	7	5.35	5.90	0.015	0.014	0.05	0.03	0.000	0%
	6.20	0.56	0.51			0.012	0.90	8	5.90	6.50	0.012	0.011	0.05	0.03	0.000	0%
	6.80	0.55	0.49			0.061	0.90	9	6.50	7.10	0.061	0.055	0.06	0.04	0.002	1%
	7.40	0.53	0.46			0.006	0.90	10	7.10	7.60	0.006	0.005	0.07	0.04	0.000	0%
	7.80	0.55	0.44			0.085	0.90	11	7.60	8.10	0.085	0.077	0.11	0.06	0.004	1%
	8.40	0.55	0.43			0.058	0.90	12	8.10	8.75	0.058	0.052	0.12	0.08	0.004	1%
	9.10	0.55	0.44			0.085	0.90	13	8.75	9.50	0.085	0.077	0.11	0.08	0.006	2%
	9.90	0.54	0.45			0.079	0.90	14	9.50	10.25	0.079	0.071	0.09	0.07	0.005	1%
	10.60	0.50	0.47			0.006	0.90	15	10.25	10.80	0.006	0.005	0.03	0.02	0.000	0%
	11.00	0.50	0.47			0.030	0.90	16	10.80	11.40	0.030	0.027	0.03	0.02	0.000	0%
	11.80	0.53	0.48			0.034	0.90	17	11.40	12.25	0.034	0.030	0.05	0.04	0.001	0%
	12.70	0.51	0.49			0.021	0.90	18	12.25	13.15	0.021	0.019	0.02	0.02	0.000	0%
	13.60	0.50	0.44			0.046	0.90	19	13.15	14.10	0.046	0.041	0.06	0.06	0.002	1%
	14.60	0.46	0.44			0.027	0.90	20	14.10	15.30	0.027	0.025	0.02	0.02	0.001	0%
	16.00	0.50	0.43			0.049	0.90	21	15.30	16.85	0.049	0.044	0.07	0.11	0.005	1%
	17.70	0.55	0.43			0.134	0.90	22	16.85	18.30	0.134	0.121	0.12	0.17	0.021	6%
	18.90	0.65	0.53			0.034	0.90	23	18.30	19.40	0.034	0.030	0.12	0.13	0.004	1%
	19.90	0.67	0.52			0.043	0.90	24	19.40	20.35	0.043	0.038	0.15	0.14	0.005	2%
	20.80	0.56	0.50			0.180	0.90	25	20.35	21.20	0.180	0.162	0.06	0.05	0.008	2%
	21.60	0.68	0.52			0.134	0.90	26	21.20	21.95	0.134	0.121	0.16	0.12	0.014	4%
	22.30	0.60	0.52			0.226	0.90	27	21.95	22.70	0.226	0.203	0.08	0.06	0.012	4%
	23.10	0.60	0.50			0.287	0.90	28	22.70	23.60	0.287	0.258	0.10	0.09	0.023	7%
	24.10	0.72	0.54			0.268	0.90	29	23.60	24.60	0.268	0.241	0.18	0.18	0.043	13%
	25.10	0.70	0.54			0.198	0.90	30	24.60	25.55	0.198	0.178	0.16	0.15	0.027	8%
	26.00	0.66	0.55			0.213	0.90	31	25.55	26.50	0.213	0.192	0.11	0.10	0.020	6%
	27.00	0.69	0.54			0.186	0.90	32	26.50	27.60	0.186	0.167	0.15	0.17	0.028	8%
	28.20	0.65	0.50			0.186	0.90	33	27.60	28.70	0.186	0.167	0.15	0.17	0.028	8%
	29.20	0.60	0.45			0.290	0.90	34	28.70	29.95	0.290	0.261	0.15	0.19	0.049	14%
	30.70	0.00	0.00			0.000	0.90	35	29.95	30.70	0.072	0.065	0.04	0.03	0.002	1%
RB																
														Total Flow:	0.337	100%

Total Flow:	0.337	(m ³ /s)
Perceived Measurement Quality:	Fair	
Total Area:	2.98	(m ²)
Top Width:	30.20	(m)
Hydraulic Depth:	0.099	(m)
Mean Velocity:	0.113	(m/s)
Froude Number	0.115	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:
Data logger Internal Power:
Data logger External Power:
Data logger Memory Used:
Data logger Clock:
Laptop Clock:
Dessicant:
Data logger:
PT:
Power:

Notes:



Hydrometric Measurement / Site Visit Record

MackKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MacKay River
 Location: S40
 Site Name: MacKay River at Petro-Canada Bridge
 Coordinates & Legal: 444888E, 6314179N
Time of Measurement
 Date of Measurement: May 6, 2008
 Start Time: 5:45 PM MDT
 End Time:

Weather Conditions: clear, calm, 10 C
River Conditions: high stage, near bank full, fast moving

Personnel & Equipment

Measurement Made By: SS/SM
 Data Entry By: SS
 Meter Type and No.: March Mc Birney Flo-Mate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: Rebar 1.588
 Water Level Reading: 2.985
 Top of Ice Level Reading:
 Transducer Reading & Est. El.: 1.792
 Other: nail on bridge 0.603

Setup No. 1

El: 100.000
 El: 98.603
 El:
 El: 96.811
 El: 100.985

Setup No. 2

El: 100.000
 El: 98.610
 El:
 El: 96.818
 El: 100.985

Average

98.607
 96.815
 100.985

Data logger Notes:			
Data logger Internal Power:	11.34 V		
Data logger External Power:	12.77 V		
Data logger Memory Used:	0%		
Data logger Clock:	5:05 PM	MST	
Laptop Clock:	5:05 PM	MST	
Dessicant:	new		
Data logger:	207085		
PT:	505006		
Power:	battery		

Notes: manual water temp 6.5 C
 water surface moving approx 2 meters per second
 warm up time 0.810 s, sample 15 mins, clocks synched
 no flow mmt made because of safety reasons

Hydrometric Measurement / Site Visit Record

MackKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MackKay River
Location: S40
Site Name: MackKay River at Petro-Canada Bridge
Coordinates & Legal: 444888E, 6314179N

Time of Measurement

Date of Measurement: May 8, 2008
Start Time: 7:25 PM MDT
End Time:

Weather Conditions: Clear, sunny, 8 C

River Conditions: high flow, open

Personnel & Equipment

Measurement Made By: SS/SM/SE
Data Entry By: SS Checked:
Meter Type and No.: Marsh Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rebar 1.808
Water Level Reading: 3.208
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.002
Other: nail on bridge 0.799
Other: solnist depth 1.771

Setup No. 1

El: 100.000
El: 98.600
El:
El: 97.598
El: 101.009
El: 96.830

Setup No. 2

El: 1.761
El: 3.158
El:
El: 1.002
El: 0.749
El: 1.771

Average

El: 100.000
El: 98.603
El:
El: 97.601
El: 101.012
El: 96.833

98.602

97.600

101.011

96.831

Data logger Notes:

Data logger Internal Power:

Data logger External Power:

Data logger Memory Used:

Data logger Clock:

Laptop Clock:

Dessicant:

Data logger:

PT:

Power:

Notes:

Hydrometric Measurement / Site Visit Record

MackKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MackKay River
Location: S40
Site Name: MackKay River at Petro-Canada Bridge
Coordinates & Legal: 444888E, 6314179N

Time of Measurement

Date of Measurement: May 15, 2008
Start Time: 5:00 PM MDT
End Time: 5:50 PM MDT

Weather Conditions:

overcast, light wind, 15 C

River Conditions:

high, open

Personnel & Equipment

Measurement Made By: SS/SM
Data Entry By: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: 1.636
Water Level Reading: 3.172
Top of Ice Level Reading: 0.824
Transducer Reading & Est. El.: 0.653
Other: nail on bridge

Setup No. 1

El: 100.000
El: 98.464
El: 97.640
El: 100.983

Setup No. 2

El: 100.000
El: 98.463
El: 97.639
El: 100.984

Average

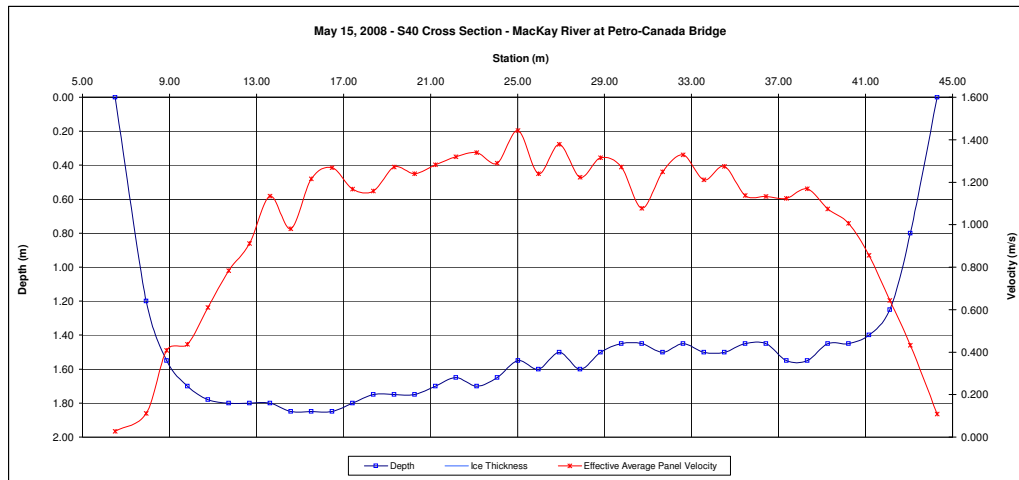
98.464
97.640
100.984

		Measurement Data															Calculated Data															
RB	Measured Data																								Percenta ge of Total							
	Station	Corrected Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge																
	(m)	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)																
	4.50	6.50	0.00					1.00	1	6.50	7.21	0.028	0.028	0.30	0.21	0.006	0%															
	6.00	7.92	1.20		0.143	0.079		1.00	2	7.21	8.40	0.111	0.111	1.20	1.42	0.158	0%															
	7.00	8.87	1.55		0.415	0.402		1.00	3	8.40	9.35	0.408	0.408	1.55	1.47	0.601	1%															
	8.00	9.82	1.70		0.637	0.238		1.00	4	9.35	10.30	0.437	0.437	1.70	1.61	0.706	1%															
	9.00	10.77	1.78		0.869	0.351		1.00	5	10.30	11.25	0.610	0.610	1.78	1.69	1.031	2%															
	10.00	11.72	1.80				0.783	1.00	6	11.25	12.20	0.783	0.783	1.80	1.71	1.339	2%															
	11.00	12.67	1.80				0.911	1.00	7	12.20	13.15	0.911	0.911	1.80	1.71	1.558	3%															
	12.00	13.62	1.80				1.134	1.00	8	13.15	14.10	1.134	1.134	1.80	1.71	1.938	3%															
	13.00	14.57	1.85				0.981	1.00	9	14.10	15.05	0.981	0.981	1.85	1.76	1.724	3%															
	14.00	15.52	1.85				1.216	1.00	10	15.05	16.00	1.216	1.216	1.85	1.76	2.137	3%															
	15.00	16.47	1.85				1.268	1.00	11	16.00	16.95	1.268	1.268	1.85	1.76	2.228	4%															
	16.00	17.42	1.80		1.402	0.933		1.00	12	16.95	17.90	1.167	1.167	1.80	1.71	1.996	3%															
	17.00	18.37	1.75		1.460	0.856		1.00	13	17.90	18.85	1.158	1.158	1.75	1.66	1.925	3%															
	18.00	19.32	1.75		1.622	0.920		1.00	14	18.85	19.80	1.271	1.271	1.75	1.66	2.113	3%															
	19.00	20.27	1.75		1.570	0.911		1.00	15	19.80	20.75	1.241	1.241	1.75	1.66	2.062	3%															
	20.00	21.22	1.70		1.564	1.000		1.00	16	20.75	21.70	1.282	1.282	1.70	1.61	2.069	3%															
	21.00	22.17	1.65		1.637	1.003		1.00	17	21.70	22.65	1.320	1.320	1.65	1.57	2.068	3%															
	22.00	23.12	1.70		1.475	1.204		1.00	18	22.65	23.60	1.340	1.340	1.70	1.61	2.163	4%															
	23.00	24.07	1.65		1.564	1.015		1.00	19	23.60	24.55	1.289	1.289	1.65	1.57	2.020	3%															
	24.00	25.02	1.55		1.628	1.259		1.00	20	24.55	25.49	1.443	1.443	1.55	1.47	2.125	3%															
	25.00	25.97	1.60		1.384	1.097		1.00	21	25.49	26.44	1.241	1.241	1.60	1.52	1.885	3%															
	26.00	26.92	1.50		1.603	1.155		1.00	22	26.44	27.39	1.379	1.379	1.50	1.42	1.965	3%															
	27.00	27.87	1.60		1.558	0.890		1.00	23	27.39	28.34	1.224	1.224	1.60	1.52	1.860	3%															
	28.00	28.82	1.50		1.640	0.991		1.00	24	28.34	29.29	1.315	1.315	1.50	1.42	1.874	3%															
	29.00	29.77	1.45		1.484	1.058		1.00	25	29.29	30.24	1.271	1.271	1.45	1.38	1.750	3%															
	30.00	30.72	1.45		1.301	0.853		1.00	26	30.24	31.19	1.077	1.077	1.45	1.38	1.484	2%															
	31.00	31.67	1.50		1.417	1.082		1.00	27	31.19	32.14	1.250	1.250	1.50	1.42	1.780	3%															
	32.00	32.62	1.45		1.436	1.222		1.00	28	32.14	33.09	1.329	1.329	1.45	1.38	1.830	3%															
	33.00	33.57	1.50		1.350	1.073		1.00	29	33.09	34.04	1.212	1.212	1.50	1.42	1.726	3%															
	34.00	34.52	1.50		1.463	1.085		1.00	30	34.04	34.99	1.274	1.274	1.50	1.42	1.815	3%															
	35.00	35.47	1.45		1.460	0.814		1.00	31	34.99	35.94	1.137	1.137	1.45	1.38	1.566	3%															
	36.00	36.42	1.45		1.262	1.003		1.00	32	35.94	36.89	1.132	1.132	1.45	1.38	1.559	3%															
	37.00	37.37	1.55		1.280	0.966		1.00	33	36.89	37.84	1.123	1.123	1.55	1.47	1.653	3%															
	38.00	38.32	1.55		1.369	0.969		1.00	34	37.84	38.79	1.169	1.169	1.55	1.47	1.721	3%															
	39.00	39.27	1.45		1.292	0.856		1.00	35	38.79	39.74	1.074	1.074	1.45	1.38	1.480	2%															
	40.00	40.22	1.45		1.183	0.829		1.00	36	39.74	40.69	1.006	1.006	1.45	1.38	1.385	2%															
	41.00	41.17	1.40		1.155	0.558		1.00	37	40.69	41.64	0.856	0.856	1.40	1.33	1.139	2%															
	42.00	42.12	1.25		0.741	0.546		1.00	38	41.64	42.59	0.643	0.643	1.25	1.19	0.764	1%															
	43.00	43.07	0.80				0.433	1.00	39	42.59	43.68	0.433	0.433	0.80	0.87	0.378	1%															
	44.30	44.30	0.00					1.00	40	43.68	44.30	0.108	0.108	0.20	0.12	0.013	0%															
LB																																
															Total Flow:	61.595	1.000															

Total Flow:	61.595	(m³/s)
Perceived Measurement Quality:	Fair	
Total Area:	57.61	(m²)
Top Width:	37.80	(m)
Hydraulic Depth:	1.524	(m)
Mean Velocity:	1.069	(m/s)
Froude Number	0.277	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:	
Data logger Internal Power:	11.39 V
Data logger External Power:	12.9 V
Data logger Memory Used:	63099 free
Data logger Clock:	5:08 PM MST
Laptop Clock:	5:08 PM MST
Dessicant:	
Data logger:	
PT:	
Power:	

Notes: returned to site to do flow measurement
accuracy of flow mmt is questionable as the length tape broke when the mmt was 2/3 finished
continued to do the mmt using the marsh rod to measure out meters on the rope, adjustments are made above due to the inaccuracy of the rod measuring



Hydrometric Measurement / Site Visit Record

MacKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MacKay River
Location: S40
Site Name: MacKay River at Petro-Canada Bridge
Coordinates & Legal: 444888E, 6314179N

Time of Measurement

Date of Measurement: June 26, 2008
Start Time: 4:25 PM MDT
End Time: 4:47 PM MDT

Weather Conditions:

overcast, 22 C

River Conditions:

Personnel & Equipment

Measurement Made By: SM/JMS
Data Entry By: DW Checked: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Petrar
Water Level Reading: 3.142
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.259
Other: nail on bridge

Setup No. 1

El: 100.000
El: 98.163
El: 96.904
El: 100.981

Setup No. 2

El: 100.000
El: 98.160
El: 96.901
El: 100.980

Average

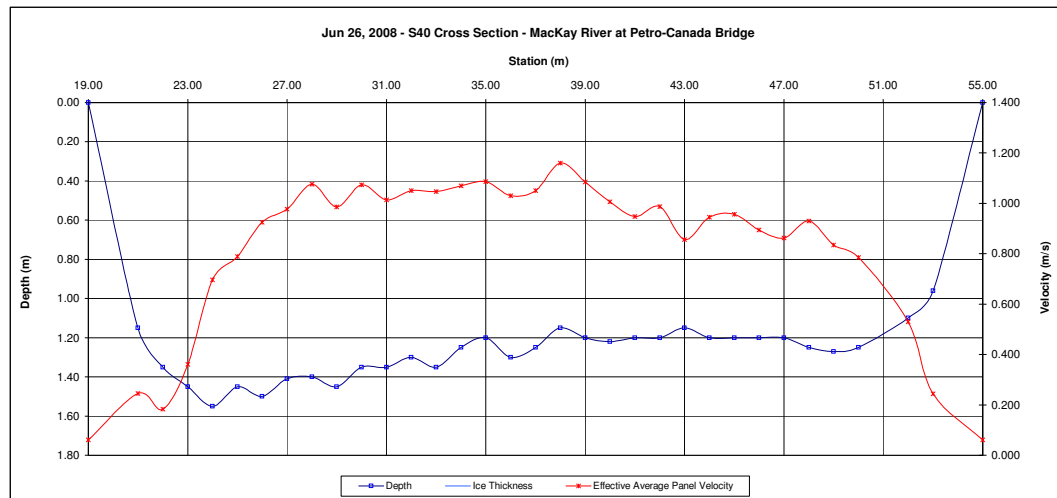
98.162
96.903
100.981

LB	Measured Data						Measurement Data										Calculated Data					Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge							
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m ²)	(m ³ /s)							
	55.00	0.00					1.00	1	55.00	54.00	0.061	0.061	0.24	0.24	0.015	0%						
	53.00	0.96				0.244	1.00	2	54.00	52.50	0.244	0.244	0.96	1.44	0.351	1%						
	52.00	1.10				0.530	1.00	3	52.50	51.00	0.530	0.530	1.10	1.65	0.875	2%						
	50.00	1.25		0.978	0.591		1.00	4	51.00	49.50	0.785	0.785	1.25	1.88	1.472	4%						
	49.00	1.27		0.933	0.738		1.00	5	49.50	48.50	0.835	0.835	1.27	1.27	1.061	3%						
	48.00	1.25		1.055	0.805		1.00	6	48.50	47.50	0.930	0.930	1.25	1.25	1.162	3%						
	47.00	1.20		1.082	0.643		1.00	7	47.50	46.50	0.863	0.863	1.20	1.20	1.035	3%						
	46.00	1.20		1.088	0.701		1.00	8	46.50	45.50	0.895	0.895	1.20	1.20	1.074	3%						
	45.00	1.20		1.155	0.759		1.00	9	45.50	44.50	0.957	0.957	1.20	1.20	1.148	3%						
	44.00	1.20		1.143	0.747		1.00	10	44.50	43.50	0.945	0.945	1.20	1.20	1.134	3%						
	43.00	1.15		1.058	0.655		1.00	11	43.50	42.50	0.856	0.856	1.15	1.15	0.985	3%						
	42.00	1.20		1.186	0.789		1.00	12	42.50	41.50	0.988	0.988	1.20	1.20	1.185	3%						
	41.00	1.20		1.106	0.789		1.00	13	41.50	40.50	0.948	0.948	1.20	1.20	1.138	3%						
	40.00	1.22		1.192	0.820		1.00	14	40.50	39.50	1.006	1.006	1.22	1.22	1.227	3%						
	39.00	1.20		1.170	1.000		1.00	15	39.50	38.50	1.085	1.085	1.20	1.20	1.302	4%						
	38.00	1.15		1.347	0.972		1.00	16	38.50	37.50	1.160	1.160	1.15	1.15	1.334	4%						
	37.00	1.25		1.277	0.823		1.00	17	37.50	36.50	1.050	1.050	1.25	1.25	1.313	4%						
	36.00	1.30		1.207	0.853		1.00	18	36.50	35.50	1.030	1.030	1.30	1.30	1.339	4%						
	35.00	1.20		1.292	0.881		1.00	19	35.50	34.50	1.087	1.087	1.20	1.20	1.304	4%						
	34.00	1.25		1.292	0.847		1.00	20	34.50	33.50	1.070	1.070	1.25	1.25	1.337	4%						
	33.00	1.35		1.283	0.811		1.00	21	33.50	32.50	1.047	1.047	1.35	1.35	1.413	4%						
	32.00	1.30		1.244	0.856		1.00	22	32.50	31.50	1.050	1.050	1.30	1.30	1.365	4%						
	31.00	1.35		1.420	0.607		1.00	23	31.50	30.50	1.013	1.013	1.35	1.35	1.368	4%						
	30.00	1.35		1.414	0.732		1.00	24	30.50	29.50	1.073	1.073	1.35	1.35	1.448	4%						
	29.00	1.45		1.192	0.780		1.00	25	29.50	28.50	0.986	0.986	1.45	1.45	1.430	4%						
	28.00	1.40		1.170	0.981		1.00	26	28.50	27.50	1.076	1.076	1.40	1.40	1.506	4%						
	27.00	1.41		1.183	0.771		1.00	27	27.50	26.50	0.977	0.977	1.41	1.41	1.377	4%						
	26.00	1.50		1.204	0.646		1.00	28	26.50	25.50	0.925	0.925	1.50	1.50	1.388	4%						
	25.00	1.45		1.186	0.393		1.00	29	25.50	24.50	0.789	0.789	1.45	1.45	1.145	3%						
	24.00	1.55		0.856	0.536		1.00	30	24.50	23.50	0.696	0.696	1.55	1.55	1.080	3%						
	23.00	1.45		0.463	0.259		1.00	31	23.50	22.50	0.361	0.361	1.45	1.45	0.524	1%						
	22.00	1.35		0.305	0.061		1.00	32	22.50	21.50	0.183	0.183	1.35	1.35	0.247	1%						
	21.00	1.15		0.308	0.183		1.00	33	21.50	20.00	0.245	0.245	1.15	1.73	0.423	1%						
	19.00	0.00					1.00	34	20.00	19.00	0.061	0.061	0.29	0.29	0.018	0%						
RB																						
				</																		

Total Flow:	36.522	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	43.57	(m ²)
Top Width:	36.00	(m)
Hydraulic Depth:	1.210	(m)
Mean Velocity:	0.838	(m/s)
Froude Number	0.243	
Photographs taken looking at:		
Photographs taken.		

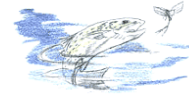
Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.77 V	82%
Data logger Memory Used:	20%	used
Data logger Clock:	4:11 PM	MST
Laptop Clock:	4:11 PM	MST
Dessicant:		
Data logger:	207085	
PT:	703001-3669	??
Power:		

Notes:



Hydrometric Measurement / Site Visit Record

MacKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MacKay River
 Location: S40
 Site Name: MacKay River at Petro-Canada Bridge
 Coordinates & Legal: 444888E, 6314179N
 Time of Measurement: August 10, 2008
 Date of Measurement: 5:46 PM MDT
 End Time: 6:20 PM MDT

Personnel & Equipment

Measurement Made By: SM/JS
 Data Entry By: SS
 Meter Type and No.: March Mc Birney Flo-Mate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: Rebar 1.178
 Water Level Reading: El.:
 Top of Ice Level Reading: El.:
 Transducer Reading & Est. El.: 1.321
 Other: nail on bridge 0.190

Setup No. 1

El.: 100.000
 El.:
 El.:
 El.: 100.988

Setup No. 2

El.: 100.000
 El.: 98.223
 El.:
 El.: 96.902
 El.: 100.987

Average

98.223
 96.902
 100.988

Weather Conditions:

sunny 27 C

River Conditions:

open, high stage

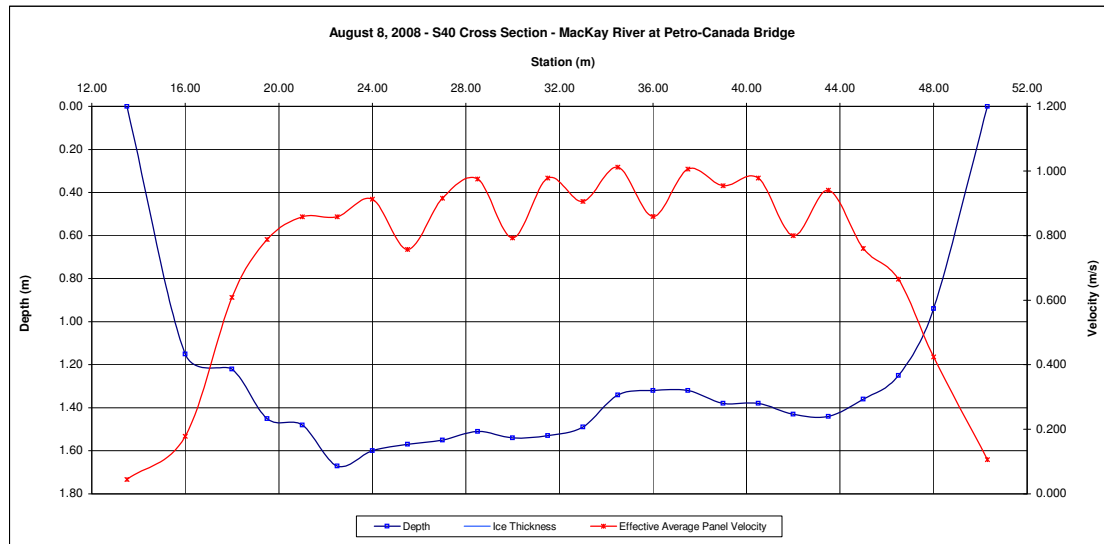
Measurement Data

	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
LB	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
	50.30	0.00					1.00	1	50.30	49.15	0.106	0.106	0.24	0.27	0.029	0%
	48.00	0.94				0.424	1.00	2	49.15	47.25	0.424	0.424	0.94	1.79	0.757	2%
	46.50	1.25		0.786	0.543		1.00	3	47.25	45.75	0.664	0.664	1.25	1.88	1.246	3%
	45.00	1.36		0.975	0.546		1.00	4	45.75	44.25	0.760	0.760	1.36	2.04	1.551	4%
	43.50	1.44		1.042	0.838		1.00	5	44.25	42.75	0.940	0.940	1.44	2.16	2.031	5%
	42.00	1.43		0.936	0.664		1.00	6	42.75	41.25	0.800	0.800	1.43	2.15	1.716	4%
	40.50	1.38		1.100	0.856		1.00	7	41.25	39.75	0.978	0.978	1.38	2.07	2.025	5%
	39.00	1.38		1.146	0.762		1.00	8	39.75	38.25	0.954	0.954	1.38	2.07	1.975	5%
	37.50	1.32		1.155	0.856		1.00	9	38.25	36.75	1.006	1.006	1.32	1.98	1.992	5%
	36.00	1.32		1.021	0.698		1.00	10	36.75	35.25	0.860	0.860	1.32	1.98	1.702	4%
	34.50	1.34		1.195	0.829		1.00	11	35.25	33.75	1.012	1.012	1.34	2.01	2.034	5%
	33.00	1.49		1.094	0.716		1.00	12	33.75	32.25	0.905	0.905	1.49	2.24	2.023	5%
	31.50	1.53		0.954	1.003		1.00	13	32.25	30.75	0.978	0.978	1.53	2.30	2.245	6%
	30.00	1.54		0.985	0.600		1.00	14	30.75	29.25	0.792	0.792	1.54	2.31	1.831	5%
	28.50	1.51		1.061	0.890		1.00	15	29.25	27.75	0.975	0.975	1.51	2.27	2.209	6%
	27.00	1.55		1.000	0.832		1.00	16	27.75	26.25	0.916	0.916	1.55	2.33	2.130	5%
	25.50	1.57		0.847	0.668		1.00	17	26.25	24.75	0.757	0.757	1.57	2.36	1.784	5%
	24.00	1.60		0.945	0.881		1.00	18	24.75	23.25	0.913	0.913	1.60	2.40	2.191	6%
	22.50	1.67		1.198	0.518		1.00	19	23.25	21.75	0.858	0.858	1.67	2.51	2.149	6%
	21.00	1.48		1.152	0.564		1.00	20	21.75	20.25	0.858	0.858	1.48	2.22	1.905	5%
	19.50	1.45		0.917	0.658		1.00	21	20.25	18.75	0.788	0.788	1.45	2.18	1.714	4%
	18.00	1.22		0.719	0.497		1.00	22	18.75	17.00	0.608	0.608	1.22	2.14	1.298	3%
	16.00	1.15		0.271	0.085		1.00	23	17.00	14.75	0.178	0.178	1.15	2.59	0.461	1%
RB	13.50	0.00					1.00	24	14.75	13.50	0.045	0.045	0.29	0.36	0.016	0%
Total Flow:															39.014	1.000

Total Flow:	39.014	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	48.55	(m²)
Top Width:	36.80	(m)
Hydraulic Depth:	1.319	(m)
Mean Velocity:	0.804	(m/s)
Froude Number	0.223	
Photographs taken looking at:		
Photographs taken.		

Data logger Notes:		
Data logger Internal Power:	11.34 V	100%
Data logger External Power:	12.65 V	81%
Data logger Memory Used:	46142	free
Data logger Clock:	4:14 PM	MST
Laptop Clock:	4:15 PM	MST
Dessicant:		
Data logger:	207085	
PT:	0.505006	
Power:		

Notes:



Hydrometric Measurement / Site Visit Record

MacKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MacKay River
Location: S40
Site Name: MacKay River at Petro-Canada Bridge
Coordinates & Legal: 444888E, 6314179N

Time of Measurement

Date of Measurement: September 13, 2008
Start Time: 9:00 AM MDT
End Time: 9:20 AM MDT

Weather Conditions:

clear, calm, 10 C

River Conditions:

open

Personnel & Equipment

Measurement Made By: SM/SS
Data Entry By: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: *rebar* 1.695 El: 100.000
Water Level Reading: 3.920 El: 97.775
Top of Ice Level Reading: 3.91 El: 97.770
Transducer Reading & Est. El.: 0.880 El: 96.895
Other: nail on bridge 0.716 El: 100.979

Setup No. 1

El: 100.000
El: 97.775
El: 97.770
El: 96.895
El: 100.979

Setup No. 2

El: 100.000
El: 97.770
El: 97.770
El: 96.890
El: 100.979

Average

97.773
96.893
100.979

Measurement Data

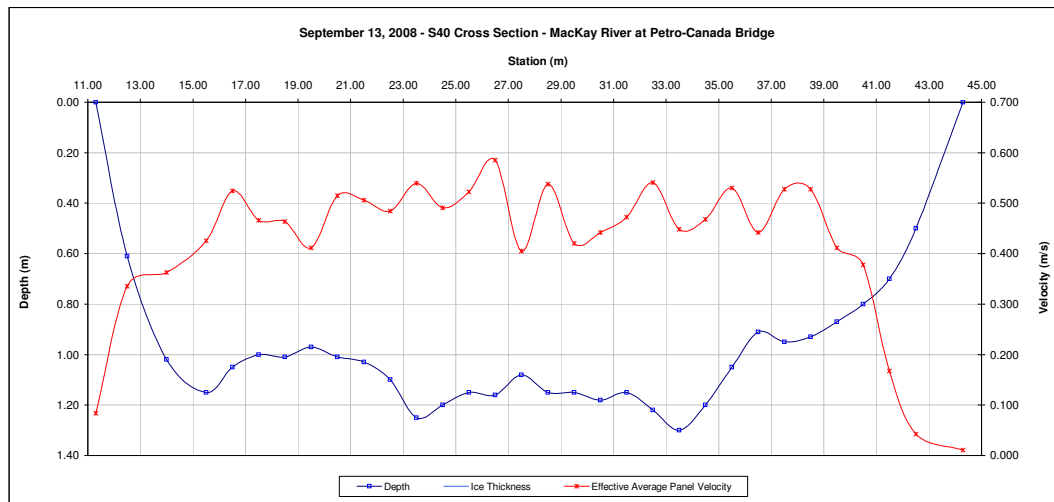
LB	Measured Data						Calculated Data								Percentage of Total	
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correctio n Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area		Panel Discharge
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)		(m³/s)
	11.30	0.00					1.00	1	11.30	11.90	0.084	0.084	0.15	0.09	0.008	0%
	12.50	0.61				0.335	1.00	2	11.90	13.25	0.335	0.335	0.61	0.82	0.276	2%
	14.00	1.02				0.363	1.00	3	13.25	14.75	0.363	0.363	1.02	1.53	0.555	4%
	15.50	1.15		0.512	0.338		1.00	4	14.75	16.00	0.425	0.425	1.15	1.44	0.611	4%
	16.50	1.05				0.524	1.00	5	16.00	17.00	0.524	0.524	1.05	1.05	0.550	4%
	17.50	1.00				0.466	1.00	6	17.00	18.00	0.466	0.466	1.00	1.00	0.466	3%
	18.50	1.01				0.463	1.00	7	18.00	19.00	0.463	0.463	1.01	1.01	0.468	3%
	19.50	0.97				0.411	1.00	8	19.00	20.00	0.411	0.411	0.97	0.97	0.399	3%
	20.50	1.01				0.515	1.00	9	20.00	21.00	0.515	0.515	1.01	1.01	0.520	4%
	21.50	1.03				0.506	1.00	10	21.00	22.00	0.506	0.506	1.03	1.03	0.521	4%
	22.50	1.10		0.594	0.375		1.00	11	22.00	23.00	0.485	0.485	1.10	1.10	0.533	4%
	23.50	1.25		0.655	0.424		1.00	12	23.00	24.00	0.539	0.539	1.25	1.25	0.674	5%
	24.50	1.20		0.607	0.375		1.00	13	24.00	25.00	0.491	0.491	1.20	1.20	0.589	4%
	25.50	1.15		0.616	0.430		1.00	14	25.00	26.00	0.523	0.523	1.15	1.15	0.601	4%
	26.50	1.16		0.677	0.494		1.00	15	26.00	27.00	0.585	0.585	1.16	1.16	0.679	5%
	27.50	1.08				0.405	1.00	16	27.00	28.00	0.405	0.405	1.08	1.08	0.438	3%
	28.50	1.15		0.625	0.451		1.00	17	28.00	29.00	0.538	0.538	1.15	1.15	0.619	4%
	29.50	1.15		0.543	0.299		1.00	18	29.00	30.00	0.421	0.421	1.15	1.15	0.484	3%
	30.50	1.18		0.576	0.308		1.00	19	30.00	31.00	0.442	0.442	1.18	1.18	0.522	4%
	31.50	1.15		0.607	0.338		1.00	20	31.00	32.00	0.472	0.472	1.15	1.15	0.543	4%
	32.50	1.22		0.698	0.384		1.00	21	32.00	33.00	0.541	0.541	1.22	1.22	0.660	5%
	33.50	1.30		0.597	0.299		1.00	22	33.00	34.00	0.448	0.448	1.30	1.30	0.582	4%
	34.50	1.20		0.530	0.405		1.00	23	34.00	35.00	0.468	0.468	1.20	1.20	0.561	4%
	35.50	1.05				0.530	1.00	24	35.00	36.00	0.530	0.530	1.05	1.05	0.557	4%
	36.50	0.91				0.442	1.00	25	36.00	37.00	0.442	0.442	0.91	0.91	0.402	3%
	37.50	0.95				0.527	1.00	26	37.00	38.00	0.527	0.527	0.95	0.95	0.501	3%
	38.50	0.93				0.527	1.00	27	38.00	39.00	0.527	0.527	0.93	0.93	0.490	3%
	39.50	0.87				0.411	1.00	28	39.00	40.00	0.411	0.411	0.87	0.87	0.358	2%
	40.50	0.80				0.378	1.00	29	40.00	41.00	0.378	0.378	0.80	0.80	0.302	2%
	41.50	0.70				0.168	1.00	30	41.00	42.00	0.168	0.168	0.70	0.70	0.117	1%
	42.50	0.50				0.043	1.00	31	42.00	43.40	0.043	0.043	0.50	0.70	0.030	0%
	44.30	0.00					1.00	32	43.40	44.30	0.011	0.011	0.13	0.11	0.001	0%
RB																

Total Flow:	14.620	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Total Area:	32.27	(m ²)
Top Width:	33.00	(m)
Hydraulic Depth:	0.978	(m)
Mean Velocity:	0.453	(m/s)
Froude Number	0.146	
Photographs taken looking at:		
Photographs taken.		

Notes: logger changed, new logger SN 203058
thermistor installed

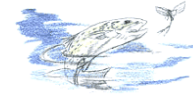
Data logger Notes:

Data logger Internal Power: 11.34 V 100%
Data logger External Power: 12.29 V 79%
Data logger Memory Used: 30%
Data logger Clock: 8:31 AM MST
Laptop Clock: 8:32 AM MST
Dessicant: NEW
Data logger: 207085
PT: 07030011-5869 ??
Power:



Hydrometric Measurement / Site Visit Record

MacKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MacKay River
Location: S40
Site Name: MacKay River at Petro-Canada Bridge
Coordinates & Legal: 444888E, 6314179N
Time of Measurement: October 15, 2008
Date of Measurement: 10:44 AM MDT
Start Time: 11:06 AM MDT
End Time:

Personnel & Equipment

Measurement Made By: SM/JSL
Data Entry By: SS
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rebar 1.077
Water Level Reading: 3.350
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.858
Other: nail on bridge 0.098

Setup No. 1

El: 100.000
El: 97.727
El:
El: 96.869
El: 100.979

Setup No. 2

El: 100.000
El: 97.727
El:
El: 96.869
El: 100.979

Average

97.727
96.869
100.979

Weather Conditions: clear, -1 C
River Conditions: open, low

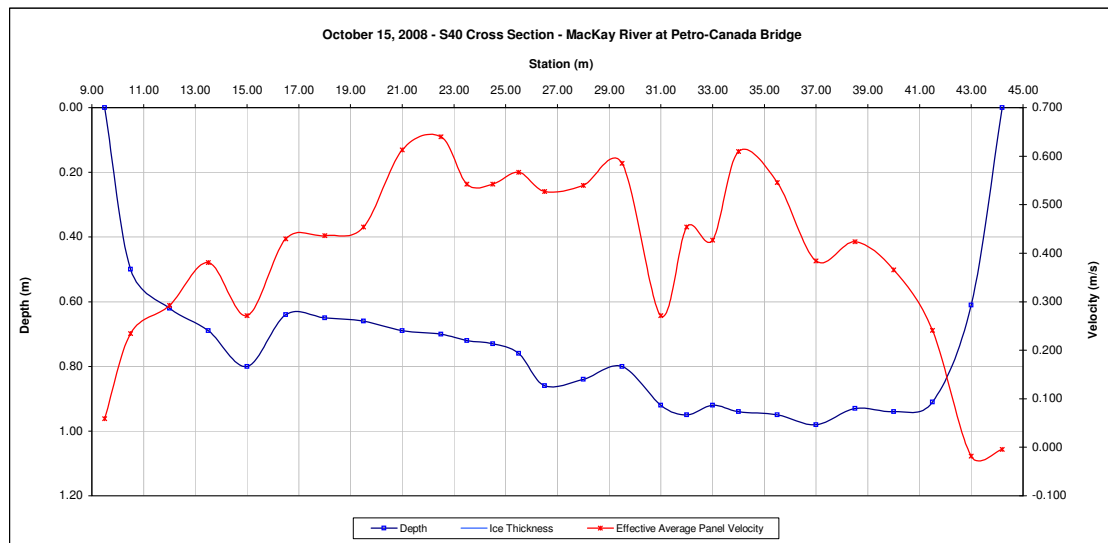
Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	9.50	0.00				1.00	1	9.50	10.00	0.059	0.059	0.13	0.06	0.004	0%	
	10.50	0.50			0.235	1.00	2	10.00	11.25	0.235	0.235	0.50	0.63	0.147	1%	
	12.00	0.62			0.293	1.00	3	11.25	12.75	0.293	0.293	0.62	0.93	0.272	2%	
	13.50	0.69			0.381	1.00	4	12.75	14.25	0.381	0.381	0.69	1.04	0.394	3%	
	15.00	0.80			0.271	1.00	5	14.25	15.75	0.271	0.271	0.80	1.20	0.326	3%	
	16.50	0.64			0.430	1.00	6	15.75	17.25	0.430	0.430	0.64	0.96	0.413	4%	
	18.00	0.65			0.436	1.00	7	17.25	18.75	0.436	0.436	0.65	0.98	0.425	4%	
	19.50	0.66			0.454	1.00	8	18.75	20.25	0.454	0.454	0.66	0.99	0.450	4%	
	21.00	0.69			0.613	1.00	9	20.25	21.75	0.613	0.613	0.69	1.04	0.634	6%	
	22.50	0.70			0.640	1.00	10	21.75	23.00	0.640	0.640	0.70	0.88	0.560	5%	
	23.50	0.72			0.543	1.00	11	23.00	24.00	0.543	0.543	0.72	0.72	0.391	3%	
	24.50	0.73			0.543	1.00	12	24.00	25.00	0.543	0.543	0.73	0.73	0.396	3%	
	25.50	0.76			0.567	1.00	13	25.00	26.00	0.567	0.567	0.76	0.76	0.431	4%	
	26.50	0.86			0.527	1.00	14	26.00	27.25	0.527	0.527	0.86	1.08	0.567	5%	
	28.00	0.84			0.539	1.00	15	27.25	28.75	0.539	0.539	0.84	1.26	0.680	6%	
	29.50	0.80			0.585	1.00	16	28.75	30.25	0.585	0.585	0.80	1.20	0.702	6%	
	31.00	0.92			0.271	1.00	17	30.25	31.50	0.271	0.271	0.92	1.15	0.312	3%	
	32.00	0.95			0.454	1.00	18	31.50	32.50	0.454	0.454	0.95	0.95	0.431	4%	
	33.00	0.92			0.427	1.00	19	32.50	33.50	0.427	0.427	0.92	0.92	0.393	3%	
	34.00	0.94			0.610	1.00	20	33.50	34.75	0.610	0.610	0.94	1.18	0.716	6%	
	35.50	0.95			0.546	1.00	21	34.75	36.25	0.546	0.546	0.95	1.43	0.777	7%	
	37.00	0.98			0.384	1.00	22	36.25	37.75	0.384	0.384	0.98	1.47	0.565	5%	
	38.50	0.93			0.424	1.00	23	37.75	39.25	0.424	0.424	0.93	1.40	0.591	5%	
	40.00	0.94			0.366	1.00	24	39.25	40.75	0.366	0.366	0.94	1.41	0.516	5%	
	41.50	0.91			0.241	1.00	25	40.75	42.25	0.241	0.241	0.91	1.37	0.329	3%	
	43.00	0.61			-0.018	1.00	26	42.25	43.60	-0.018	-0.018	0.61	0.82	-0.015	0%	
RB	44.20	0.00				1.00	27	43.60	44.20	-0.005	-0.005	0.15	0.09	0.000	0%	
Total Flow:														11.404	1.000	

Total Flow:	11.404	(m ³ /s)
Perceived Measurement Quality:	Good	
Total Area:	26.61	(m ²)
Top Width:	34.70	(m)
Hydraulic Depth:	0.767	(m)
Mean Velocity:	0.429	(m/s)
Froude Number	0.156	
Photographs taken looking at:		
Photographs taken:		

Data logger Notes:	
Data logger Internal Power:	11.34 V 100%
Data logger External Power:	11.82 V 75%
Data logger Memory Used:	40%
Data logger Clock:	9:36 AM MST
Laptop Clock:	9:37 AM MST
Dessicant:	NEW
Data logger:	203085
PT:	07030011-5869
Power:	

Notes: TD was found out of water upon arrival. Looks like curious person pulled it out.
TD replaced in water.



Hydrometric Measurement / Site Visit Record

MackKay River at Petro-Canada Bridge - S40



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MackKay River
 Location: S40
 Site Name: MackKay River at Petro-Canada Bridge
 Coordinates & Legal: 444888E, 6314179N
Time of Measurement
 Date of Measurement: December 11, 2008
 Start Time: 12:25 PM MST
 End Time:

Weather Conditions: overcast, light snow, -20 C
River Conditions: ice-cover, thin ice leads visible from bridge

Personnel & Equipment

Measurement Made By: SM/SS
 Data Entry By: SS
 Meter Type and No.: March Mc Birney Flo-Mate 2000
 s/n 2004521

Level Readings

Bench Mark Reading: Rebar 1.618
 Water Level Reading: 3.794
 Top of Ice Level Reading: 3.660
 Transducer Reading & Est. El.: 0.948
 Other: nail on bridge 0.632

Setup No. 1

El: 100.000
 El: 97.824
 El: 97.958
 El: 96.876
 El: 100.986

Setup No. 2

El: 1.608
 El: 3.788
 El: 3.651
 El: 0.948
 El: 0.622

Average

100.000
 97.820
 97.957
 96.872
 100.986

Data logger Notes:

Data logger Internal Power: 11.34 V 100%
 Data logger External Power: 11.19 V 72%
 Data logger Memory Used: 100%
 Data logger Clock: 12:21 PM MST
 Laptop Clock: 12:25 PM MST

Dessicant:

Data logger: 208058
 PT: 07030011-5869
 Power:

Notes: battery replaced, memory cleared
 no discharge measurement done because ice was too thin in places.
 trucks pumping water from 20 m downstream of bridge

C.7 UPDATED NATURALIZED FLOW CALCULATION RESULTS

As discussed in Appendix Section C.3, the method used to compute naturalized flows was revised in 2008. The results for 2005, 2006 and 2007 presented in previous RAMP reports have been updated to be consistent with the current methodology, and are presented here.

RAMP Naturalized Flow Calculation

Station
S24 Athabasca River below Eymundson Creek

Year
2005

Inputs	
Total Closed Circuit Area, km ²	210
Total Cleared Area, km ²	75.2
Total Catchment Area, km ²	146,000
Contributing (Effective) Catchment Area, km ²	145,790
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	24,700
Closed-circuit loss (million m ³)	-35.6
Incremental runoff from land clearing (million m ³)	2.55
Withdrawals from the stream (million m ³)	-98.9
Releases into the stream (million m ³)	8.37
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	-3.36
Observed hydrograph (million m ³)	24,600
Incremental volume (million m ³)	-127
Incremental volume (% of natural)	-0.5%
Naturalized Runoff Depth (mm)	169

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	1200	1200	-0.4%
Mean winter discharge	266	263	-1.1%
Annual maximum daily discharge	2670	2660	-0.2%
Open-water season minimum daily discharge	530	526	-0.7%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S7 - Muskeg River near Fort MacKay

Year
2005

Inputs	
Total Closed Circuit Area, km ²	56.0
Total Cleared Area, km ²	29.5
Total Catchment Area, km ²	1457
Contributing (Effective) Catchment Area, km ²	1401
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	215
Closed-circuit loss (million m ³)	-8.27
Incremental runoff from land clearing (million m ³)	0.869
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	4.36
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	212
Incremental volume (million m ³)	-3.04
Incremental volume (% of natural)	-1.4%
Naturalized Runoff Depth (mm)	148

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	10.0	9.91	-1.0%
Mean winter discharge	0.900	0.908	0.9%
Annual maximum daily discharge	35.9	34.7	-3.4%
Open-water season minimum daily discharge	3.29	3.18	-3.4%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
Steepbank River near Ft McMurray, 07DA006

Year
2005

Inputs	
Total Closed Circuit Area, km ²	2.39
Total Cleared Area, km ²	1.21
Total Catchment Area, km ²	1320
Contributing (Effective) Catchment Area, km ²	1318
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	216
Closed-circuit loss (million m ³)	-0.390
Incremental runoff from land clearing (million m ³)	0.040
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	215
Incremental volume (million m ³)	-0.35
Incremental volume (% of natural)	-0.2%
Naturalized Runoff Depth (mm)	163

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	10.8	10.7	-0.2%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	40.0	40.0	-0.2%
Open-water season minimum daily discharge	2.35	2.35	-0.2%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S15 Tar River near the Mouth, 07DA015

Year
2005

Inputs	
Total Closed Circuit Area, km ²	9.05
Total Cleared Area, km ²	53.0
Total Catchment Area, km ²	301
Contributing (Effective) Catchment Area, km ²	292
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	15.0
Closed-circuit loss (million m ³)	-0.451
Incremental runoff from land clearing (million m ³)	0.528
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	15.1
Incremental volume (million m ³)	0.08
Incremental volume (% of natural)	0.5%
Naturalized Runoff Depth (mm)	49.8

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	0.989	0.994	0.5%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	6.20	6.23	0.5%
Open-water season minimum daily discharge	0.372	0.374	0.5%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S26 MacKay River near Fort MacKay, 07DB001

Year
2005

Inputs	
Total Closed Circuit Area, km ²	1.71
Total Cleared Area, km ²	0.66
Total Catchment Area, km ²	5570
Contributing (Effective) Catchment Area, km ²	5568
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	545
Closed-circuit loss (million m ³)	-0.167
Incremental runoff from land clearing (million m ³)	0.013
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	545
Incremental volume (million m ³)	-0.154
Incremental volume (% of natural)	-0.03%
Naturalized Runoff Depth (mm)	97.8

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	25.4	25.3	-0.03%
Mean winter discharge	1.52	1.52	-0.03%
Annual maximum daily discharge	99.8	99.7	-0.03%
Open-water season minimum daily discharge	5.91	5.91	-0.03%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
Calumet River, CNRL

Year
2005

Inputs	
Total Closed Circuit Area, km ²	0.00
Total Cleared Area, km ²	1.56
Total Catchment Area, km ²	175
Contributing (Effective) Catchment Area, km ²	175
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	6.09
Closed-circuit loss (million m ³)	0.00
Incremental runoff from land clearing (million m ³)	0.011
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	6.10
Incremental volume (million m ³)	0.011
Incremental volume (% of natural)	0.2%
Naturalized Runoff Depth (mm)	34.8

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	0.412	0.413	0.2%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	10.8	10.8	0.2%
Open-water season minimum daily discharge	0.034	0.034	0.2%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S27 Firebag River near the Mouth, 07DC001

Year
2005

Inputs	
Total Closed Circuit Area, km ²	1.16
Total Cleared Area, km ²	0.00
Total Catchment Area, km ²	5990
Contributing (Effective) Catchment Area, km ²	5989
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	1,370
Closed-circuit loss (million m ³)	-0.27
Incremental runoff from land clearing (million m ³)	0.00
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	1370
Incremental volume (million m ³)	-0.27
Incremental volume (% of natural)	0.00%
Naturalized Runoff Depth (mm)	229

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	58.4	58.4	-0.02%
Mean winter discharge	18.5	18.5	-0.02%
Annual maximum daily discharge	192	192	-0.02%
Open-water season minimum daily discharge	28.0	28.0	-0.02%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S14 Ells River above Joslyn Creek

Year
2005

Inputs	
Total Closed Circuit Area, km ²	0.00
Total Cleared Area, km ²	1.38
Total Catchment Area, km ²	2450
Contributing (Effective) Catchment Area, km ²	2450
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	202
Closed-circuit loss (million m ³)	0.00
Incremental runoff from land clearing (million m ³)	0.023
Withdrawals from the stream (million m ³)	0
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed (operational) hydrograph (million m ³)	202
Incremental volume (million m ³)	0.02
Incremental volume (% of natural)	0.0%
Naturalized Runoff Depth (mm)	82.5

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	13.0	13.0	0.01%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	47.5	47.5	0.01%
Open-water season minimum daily discharge	4.84	4.84	0.01%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S29 Christina River near Chard, 07CE002

Year
2005

Inputs	
Total Closed Circuit Area, km ²	13.4
Total Cleared Area, km ²	86.2
Total Catchment Area, km ²	4863
Contributing (Effective) Catchment Area, km ²	4850
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	794
Closed-circuit loss (million m ³)	-2.19
Incremental runoff from land clearing (million m ³)	2.82
Withdrawals from the stream (million m ³)	0
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed (operational) hydrograph (million m ³)	795
Incremental volume (million m ³)	0.63
Incremental volume (% of natural)	0.1%
Naturalized Runoff Depth (mm)	163

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	41.7	41.7	0.1%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	116	116	0.1%
Open-water season minimum daily discharge	10.3	10.3	0.1%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
Hangingstone River at Ft. McMurray, 07CD004

Year
2005

Inputs	
Total Closed Circuit Area, km ²	2.27
Total Cleared Area, km ²	0.00
Total Catchment Area, km ²	962
Contributing (Effective) Catchment Area, km ²	960
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	125
Closed-circuit loss (million m ³)	-0.29
Incremental runoff from land clearing (million m ³)	0.00
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	124
Incremental volume (million m ³)	-0.29
Incremental volume (% of natural)	-0.2%
Naturalized Runoff Depth (mm)	130

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	7.31	7.29	-0.2%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	35.6	35.5	-0.2%
Open-water season minimum daily discharge	1.41	1.40	-0.2%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

S24 Athabasca River below Eymundson Creek

Year

2006

RAMP Funders

Inputs

Total Closed Circuit Area, km ²	261
Total Cleared Area, km ²	83.9
Total Catchment Area, km ²	146,000
Contributing (Effective) Catchment Area, km ²	145,739
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	15,600
Closed-circuit loss (million m ³)	-27.9
Incremental runoff from land clearing (million m ³)	1.79
Withdrawals from the stream (million m ³)	-93.7
Releases into the stream (million m ³)	0.314
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	-1.61
Observed hydrograph (million m ³)	15,500
Incremental volume (million m ³)	-121
Incremental volume (% of natural)	-0.8%
Naturalized Runoff Depth (mm)	107

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	724	720	-0.6%
Mean winter discharge	210	207	-1.5%
Annual maximum daily discharge	1750	1750	-0.4%
Open-water season minimum daily discharge	337	333	-1.1%

* Percent of natural

RAMP Naturalized Flow Calculation

Station **S24 Athabasca River below Eymundson Creek** Year **2006** All Development

Inputs	
Total Closed Circuit Area, km ²	266
Total Cleared Area, km ²	83.9
Total Catchment Area, km ²	146,000
Contributing (Effective) Catchment Area, km ²	145,734
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	15,600
Closed-circuit loss (million m ³)	-28.4
Incremental runoff from land clearing (million m ³)	1.79
Withdrawals from the stream (million m ³)	-93.7
Releases into the stream (million m ³)	0.31
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	-2.39
Observed hydrograph (million m ³)	15,500
Incremental volume (million m ³)	-122
Incremental volume (% of natural)	-0.8%
Naturalized Runoff Depth (mm)	107

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	724	720	-0.6%
Mean winter discharge	210	207	-1.5%
Annual maximum daily discharge	1750	1750	-0.4%
Open-water season minimum daily discharge	337	333	-1.1%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S7 Muskeg River near Fort MacKay, 07DA008

Year
2006

Inputs	
Total Closed Circuit Area, km ²	74.1
Total Cleared Area, km ²	25.5
Total Catchment Area, km ²	1457
Contributing (Effective) Catchment Area, km ²	1383
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	72.2
Closed-circuit loss (million m ³)	-3.67
Incremental runoff from land clearing (million m ³)	0.252
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	2.53
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	71.4
Incremental volume (million m ³)	-0.890
Incremental volume (% of natural)	-1.2%
Naturalized Runoff Depth (mm)	49.6

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	3.50	3.41	-2.6%
Mean winter discharge	0.495	0.552	11.4%
Annual maximum daily discharge	10.7	10.3	-4.0%
Open-water season minimum daily discharge	0.615	0.661	7.5%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
Steepbank River near Ft McMurray, 07DA006

Year
2006

Inputs	
Total Closed Circuit Area, km ²	2.43
Total Cleared Area, km ²	3.36
Total Catchment Area, km ²	1320
Contributing (Effective) Catchment Area, km ²	1318
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	95.0
Closed-circuit loss (million m ³)	-0.175
Incremental runoff from land clearing (million m ³)	0.048
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	94.9
Incremental volume (million m ³)	-0.126
Incremental volume (% of natural)	-0.1%
Naturalized Runoff Depth (mm)	72.0

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	6.21	6.20	-0.1%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	14.5	14.5	-0.1%
Open-water season minimum daily discharge	1.43	1.43	-0.1%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S15 Tar River near the Mouth, 07DA015

Year
2006

Inputs	
Total Closed Circuit Area, km ²	0.00
Total Cleared Area, km ²	69.6
Total Catchment Area, km ²	301
Contributing (Effective) Catchment Area, km ²	301
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	11.8
Closed-circuit loss (million m ³)	0.00
Incremental runoff from land clearing (million m ³)	0.546
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.088
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	12.4
Incremental volume (million m ³)	0.635
Incremental volume (% of natural)	5.4%
Naturalized Runoff Depth (mm)	39.2

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	0.694	0.732	5.4%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	4.56	4.77	4.7%
Open-water season minimum daily discharge	0.109	0.121	10.5%

* Percent of natural

RAMP Naturalized Flow Calculation

Station **S26 MacKay River near Fort MacKay 07DB001** Year **2006**

Inputs	
Total Closed Circuit Area, km ²	2.10
Total Cleared Area, km ²	6.27
Total Catchment Area, km ²	5570
Contributing (Effective) Catchment Area, km ²	5568
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	203
Closed-circuit loss (million m ³)	-0.076
Incremental runoff from land clearing (million m ³)	0.046
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	203
Incremental volume (million m ³)	-0.031
Incremental volume (% of natural)	-0.02%
Naturalized Runoff Depth (mm)	36.4

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	11.3	11.3	-0.02%
Mean winter discharge	1.15	1.15	-0.02%
Annual maximum daily discharge	38.6	38.6	-0.02%
Open-water season minimum daily discharge	2.25	2.25	-0.02%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

CR-1 Calumet River, CNRL

Year

2006

Inputs

Total Closed Circuit Area, km ²	0.00
Total Cleared Area, km ²	2.00
Total Catchment Area, km ²	175
Contributing (Effective) Catchment Area, km ²	175
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	3.45
Closed-circuit loss (million m ³)	0.00
Incremental runoff from land clearing (million m ³)	0.008
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	3.46
Incremental volume (million m ³)	0.008
Incremental volume (% of natural)	0.2%
Naturalized Runoff Depth (mm)	19.7

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	0.230	0.230	0.2%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	Missing	Missing	N/A
Open-water season minimum daily discharge	0.009	0.009	0.2%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S27 Firebag River near the Mouth, 07DC001

Year
2006

Inputs	
Total Closed Circuit Area, km ²	3.07
Total Cleared Area, km ²	0.450
Total Catchment Area, km ²	5990
Contributing (Effective) Catchment Area, km ²	5987
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	871
Closed-circuit loss (million m ³)	-0.447
Incremental runoff from land clearing (million m ³)	0.013
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	871
Incremental volume (million m ³)	-0.434
Incremental volume (% of natural)	-0.05%
Naturalized Runoff Depth (mm)	145

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	37.6	37.6	-0.05%
Mean winter discharge	11.6	11.6	-0.05%
Annual maximum daily discharge	127	127	-0.05%
Open-water season minimum daily discharge	7.54	7.54	-0.05%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

S14 Ells River above Joslyn Creek

Year

2006

Inputs

Total Closed Circuit Area, km ²	1.33
Total Cleared Area, km ²	0.600
Total Catchment Area, km ²	2450
Contributing (Effective) Catchment Area, km ²	2449
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	112
Closed-circuit loss (million m ³)	-0.061
Incremental runoff from land clearing (million m ³)	0.006
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	112
Incremental volume (million m ³)	-0.055
Incremental volume (% of natural)	-0.05%
Naturalized Runoff Depth (mm)	45.9

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	8.08	8.07	-0.05%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	28.5	28.4	-0.05%
Open-water season minimum daily discharge	2.30	2.30	-0.05%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

S29 Christina River near Chard, 07CE002

Year

2006

RAMP Funders

Inputs

Total Closed Circuit Area, km ²	9.35
Total Cleared Area, km ²	17.4
Total Catchment Area, km ²	4863
Contributing (Effective) Catchment Area, km ²	4854
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	594
Closed-circuit loss (million m ³)	-1.14
Incremental runoff from land clearing (million m ³)	0.425
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	593
Incremental volume (million m ³)	-0.717
Incremental volume (% of natural)	-0.1%
Naturalized Runoff Depth (mm)	122

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	28.8	28.8	-0.1%
Mean winter discharge	4.98	5.04	1.2%
Annual maximum daily discharge	63.6	63.5	-0.1%
Open-water season minimum daily discharge	9.84	9.83	-0.1%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

S29 Christina River near Chard, 07CE002

Year

2006 All Development

Inputs

Total Closed Circuit Area, km ²	15.0
Total Cleared Area, km ²	25.5
Total Catchment Area, km ²	4863
Contributing (Effective) Catchment Area, km ²	4848
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	594
Closed-circuit loss (million m ³)	-1.83
Incremental runoff from land clearing (million m ³)	0.622
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	593
Incremental volume (million m ³)	-1.21
Incremental volume (% of natural)	-0.2%
Naturalized Runoff Depth (mm)	122

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	28.9	28.8	-0.2%
Mean winter discharge	4.98	5.04	1.1%
Annual maximum daily discharge	63.6	63.5	-0.2%
Open-water season minimum daily discharge	9.85	9.83	-0.2%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
Hangingstone River at Ft. McMurray, 07CD004

Year
2006 All Development

Inputs	
Total Closed Circuit Area, km ²	3.86
Total Cleared Area, km ²	0.00
Total Catchment Area, km ²	962
Contributing (Effective) Catchment Area, km ²	958
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	71.7
Closed-circuit loss (million m ³)	-0.288
Incremental runoff from land clearing (million m ³)	0.000
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	71.4
Incremental volume (million m ³)	-0.288
Incremental volume (% of natural)	-0.4%
Naturalized Runoff Depth (mm)	74.5

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	3.24	3.22	-0.4%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	16.7	16.6	-0.4%
Open-water season minimum daily discharge	0.127	0.126	-0.4%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

S12 Fort Creek at Highway 63

Year

2006

Inputs

Total Closed Circuit Area, km ²	0.240
Total Cleared Area, km ²	1.77
Total Catchment Area, km ²	31.9
Contributing (Effective) Catchment Area, km ²	31.7
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	0.858
Closed-circuit loss (million m ³)	-0.006
Incremental runoff from land clearing (million m ³)	0.010
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	0.861
Incremental volume (million m ³)	0.003
Incremental volume (% of natural)	0.4%
Naturalized Runoff Depth (mm)	26.9

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	0.046	0.046	0.4%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	0.326	0.327	0.4%
Open-water season minimum daily discharge	0.005	0.005	0.4%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

S24 Athabasca River below Eymundson Creek

Year

2007

RAMP Funders

Inputs

Total Closed Circuit Area, km ²	266
Total Cleared Area, km ²	98.2
Total Catchment Area, km ²	146,000
Contributing (Effective) Catchment Area, km ²	145,734
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	20,800
Closed-circuit loss (million m ³)	-38.0
Incremental runoff from land clearing (million m ³)	2.80
Withdrawals from the stream (million m ³)	-92.4
Releases into the stream (million m ³)	0.334
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	-2.17
Observed hydrograph (million m ³)	20,700
Incremental volume (million m ³)	-129
Incremental volume (% of natural)	-0.6%
Naturalized Runoff Depth (mm)	143

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	1010	1000	-0.5%
Mean winter discharge	190	187	-1.7%
Annual maximum daily discharge	3410	3400	-0.3%
Open-water season minimum daily discharge	290	286	-1.3%

* Percent of natural

RAMP Naturalized Flow Calculation

Station **S24 Athabasca River below Eymundson Creek** Year **2007** All Development

Inputs	
Total Closed Circuit Area, km ²	271
Total Cleared Area, km ²	98.2
Total Catchment Area, km ²	146,000
Contributing (Effective) Catchment Area, km ²	145,729
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	20,800
Closed-circuit loss (million m ³)	-38.7
Incremental runoff from land clearing (million m ³)	2.80
Withdrawals from the stream (million m ³)	-92.4
Releases into the stream (million m ³)	0.334
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	-2.86
Observed hydrograph (million m ³)	20,700
Incremental volume (million m ³)	-131
Incremental volume (% of natural)	-0.6%
Naturalized Runoff Depth (mm)	143

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	1010	1000	-0.5%
Mean winter discharge	190	187	-1.7%
Annual maximum daily discharge	3410	3400	-0.3%
Open-water season minimum daily discharge	290	286	-1.3%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S7 - Muskeg River near Fort MacKay

Year
2007

Inputs	
Total Closed Circuit Area, km ²	93.8
Total Cleared Area, km ²	36.6
Total Catchment Area, km ²	1457
Contributing (Effective) Catchment Area, km ²	1363
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	88.8
Closed-circuit loss (million m ³)	-5.72
Incremental runoff from land clearing (million m ³)	0.446
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	1.99
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	85.5
Incremental volume (million m ³)	-3.28
Incremental volume (% of natural)	-3.7%
Naturalized Runoff Depth (mm)	60.9

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	4.15	3.96	-4.6%
Mean winter discharge	0.572	0.609	6.4%
Annual maximum daily discharge	19.8	18.7	-5.6%
Open-water season minimum daily discharge	0.223	0.265	18.7%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
Steepbank River near Ft McMurray, 07DA006

Year
2007

Inputs	
Total Closed Circuit Area, km ²	1.86
Total Cleared Area, km ²	15.4
Total Catchment Area, km ²	1320
Contributing (Effective) Catchment Area, km ²	1318
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	102
Closed-circuit loss (million m ³)	-0.143
Incremental runoff from land clearing (million m ³)	0.237
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	102
Incremental volume (million m ³)	0.094
Incremental volume (% of natural)	0.1%
Naturalized Runoff Depth (mm)	77.1

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	4.84	4.85	0.1%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	25.7	25.7	0.1%
Open-water season minimum daily discharge	0.737	0.738	0.1%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S15A Tar River near the Mouth, 07DA015

Year
2007

Inputs	
Total Closed Circuit Area, km ²	0.00
Total Cleared Area, km ²	70.4
Total Catchment Area, km ²	326
Contributing (Effective) Catchment Area, km ²	326
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	19.5
Closed-circuit loss (million m ³)	0.00
Incremental runoff from land clearing (million m ³)	0.843
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.19
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	20.6
Incremental volume (million m ³)	1.04
Incremental volume (% of natural)	5.3%
Naturalized Runoff Depth (mm)	59.9

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	1.31	1.38	5.3%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	17.4	18.2	4.4%
Open-water season minimum daily discharge	0.077	0.094	23.5%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S26 MacKay River near Fort MacKay, 07DB001

Year
2007

Inputs	
Total Closed Circuit Area, km ²	2.64
Total Cleared Area, km ²	8.39
Total Catchment Area, km ²	5570
Contributing (Effective) Catchment Area, km ²	5567
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	470
Closed-circuit loss (million m ³)	-0.223
Incremental runoff from land clearing (million m ³)	0.142
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	470
Incremental volume (million m ³)	-0.081
Incremental volume (% of natural)	-0.02%
Naturalized Runoff Depth (mm)	84.3

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	22.2	22.2	-0.02%
Mean winter discharge	1.73	1.73	-0.02%
Annual maximum daily discharge	114	114	-0.02%
Open-water season minimum daily discharge	4.19	4.19	-0.02%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

CR-1 Calumet River, CNRL

Year

2007

Inputs

Total Closed Circuit Area, km ²	0.00
Total Cleared Area, km ²	2.17
Total Catchment Area, km ²	175
Contributing (Effective) Catchment Area, km ²	175
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	4.38
Closed-circuit loss (million m ³)	0.00
Incremental runoff from land clearing (million m ³)	0.011
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	4.39
Incremental volume (million m ³)	0.011
Incremental volume (% of natural)	0.2%
Naturalized Runoff Depth (mm)	25.0

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	0.291	0.292	0.2%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	7.03	7.05	0.2%
Open-water season minimum daily discharge	0.027	0.027	0.2%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S27 Firebag River near the Mouth, 07DC001

Year
2007

Inputs	
Total Closed Circuit Area, km ²	2.70
Total Cleared Area, km ²	9.82
Total Catchment Area, km ²	5990
Contributing (Effective) Catchment Area, km ²	5987
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	819
Closed-circuit loss (million m ³)	-0.369
Incremental runoff from land clearing (million m ³)	0.269
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	819
Incremental volume (million m ³)	-0.101
Incremental volume (% of natural)	-0.01%
Naturalized Runoff Depth (mm)	137

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	33.7	33.7	-0.01%
Mean winter discharge	13.0	13.0	-0.01%
Annual maximum daily discharge	115	115	-0.01%
Open-water season minimum daily discharge	11.4	11.4	-0.01%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

S14 Ells River above Joslyn Creek

Year

2007

Inputs

Total Closed Circuit Area, km ²	0.870
Total Cleared Area, km ²	1.46
Total Catchment Area, km ²	2450
Contributing (Effective) Catchment Area, km ²	2449
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	205
Closed-circuit loss (million m ³)	-0.073
Incremental runoff from land clearing (million m ³)	0.024
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	205
Incremental volume (million m ³)	-0.048
Incremental volume (% of natural)	-0.02%
Naturalized Runoff Depth (mm)	83.6

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	9.97	9.96	-0.02%
Mean winter discharge	3.17	3.16	-0.02%
Annual maximum daily discharge	52.5	52.5	-0.02%
Open-water season minimum daily discharge	2.55	2.55	-0.02%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S29 Christina River near Chard, 07CE002

Year
2007

RAMP Funders

Inputs	
Total Closed Circuit Area, km ²	1.14
Total Cleared Area, km ²	10.0
Total Catchment Area, km ²	4863
Contributing (Effective) Catchment Area, km ²	4862
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	593
Closed-circuit loss (million m ³)	-0.139
Incremental runoff from land clearing (million m ³)	0.244
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	593
Incremental volume (million m ³)	0.105
Incremental volume (% of natural)	0.02%
Naturalized Runoff Depth (mm)	122

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	28.2	28.3	0.02%
Mean winter discharge	5.33	5.33	0.02%
Annual maximum daily discharge	104	104	0.02%
Open-water season minimum daily discharge	6.54	6.54	0.02%

* Percent of natural

RAMP Naturalized Flow Calculation

Station **S29 Christina River near Chard, 07CE002** Year **2007** **All Development**

Inputs	
Total Closed Circuit Area, km ²	5.63
Total Cleared Area, km ²	18.3
Total Catchment Area, km ²	4863
Contributing (Effective) Catchment Area, km ²	4857
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	593
Closed-circuit loss (million m ³)	-0.686
Incremental runoff from land clearing (million m ³)	0.445
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	593
Incremental volume (million m ³)	-0.241
Incremental volume (% of natural)	-0.04%
Naturalized Runoff Depth (mm)	122

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	28.3	28.3	-0.04%
Mean winter discharge	5.33	5.33	-0.04%
Annual maximum daily discharge	104	104	-0.04%
Open-water season minimum daily discharge	6.54	6.54	-0.04%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
Hangingstone River at Ft. McMurray, 07CD004

Year
2007 All Development

Inputs	
Total Closed Circuit Area, km ²	3.86
Total Cleared Area, km ²	0.00
Total Catchment Area, km ²	962
Contributing (Effective) Catchment Area, km ²	958
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	86.0
Closed-circuit loss (million m ³)	-0.345
Incremental runoff from land clearing (million m ³)	0.00
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	85.6
Incremental volume (million m ³)	-0.345
Incremental volume (% of natural)	-0.4%
Naturalized Runoff Depth (mm)	89.4

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	3.86	3.84	-0.4%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	31.1	31.0	-0.4%
Open-water season minimum daily discharge	0.621	0.619	-0.4%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

S12 Fort Creek at Highway 63

Year

2007

Inputs

Total Closed Circuit Area, km ²	0.400
Total Cleared Area, km ²	16.3
Total Catchment Area, km ²	31.9
Contributing (Effective) Catchment Area, km ²	31.5
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	1.09
Closed-circuit loss (million m ³)	-0.014
Incremental runoff from land clearing (million m ³)	0.111
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	1.19
Incremental volume (million m ³)	0.098
Incremental volume (% of natural)	8.9%
Naturalized Runoff Depth (mm)	34.2

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	0.068	0.075	8.9%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	0.232	0.252	8.9%
Open-water season minimum daily discharge	0.016	0.017	8.9%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

S24 Athabasca River below Eymundson Creek

Year

2008

RAMP Funders

Inputs	
Total Closed Circuit Area, km ²	299
Total Cleared Area, km ²	106
Total Catchment Area, km ²	146,000
Contributing (Effective) Catchment Area, km ²	145,701
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	17,500
Closed-circuit loss (million m ³)	-35.9
Incremental runoff from land clearing (million m ³)	2.53
Withdrawals from the stream (million m ³)	-118
Releases into the stream (million m ³)	1.02
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	-28.0
Observed hydrograph (million m ³)	17,400
Incremental volume (million m ³)	-179
Incremental volume (% of natural)	-1.0%
Naturalized Runoff Depth (mm)	120

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	906	899	-0.8%
Mean winter discharge	190	186	-2.2%
Annual maximum daily discharge	1830	1820	-0.5%
Open-water season minimum daily discharge	315	311	-1.1%

* Percent of natural

RAMP Naturalized Flow Calculation

Station **S24 Athabasca River below Eymundson Creek** Year **2008** All Development

Inputs	
Total Closed Circuit Area, km ²	300
Total Cleared Area, km ²	109
Total Catchment Area, km ²	146,000
Contributing (Effective) Catchment Area, km ²	145,700
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	17,500
Closed-circuit loss (million m ³)	-36.0
Incremental runoff from land clearing (million m ³)	2.61
Withdrawals from the stream (million m ³)	-118
Releases into the stream (million m ³)	1.02
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	-28.1
Observed hydrograph (million m ³)	17,400
Incremental volume (million m ³)	-179
Incremental volume (% of natural)	-1.0%
Naturalized Runoff Depth (mm)	120

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	906	899	-0.8%
Mean winter discharge	190	186	-2.2%
Annual maximum daily discharge	1830	1820	-0.5%
Open-water season minimum daily discharge	315	311	-1.1%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S7 - Muskeg River near Fort MacKay

Year
2008

Inputs	
Total Closed Circuit Area, km ²	99.0
Total Cleared Area, km ²	43.6
Total Catchment Area, km ²	1457
Contributing (Effective) Catchment Area, km ²	1358
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	143.5
Closed-circuit loss (million m ³)	-9.75
Incremental runoff from land clearing (million m ³)	0.858
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	2.53
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	137.1
Incremental volume (million m ³)	-6.36
Incremental volume (% of natural)	-4.4%
Naturalized Runoff Depth (mm)	98.5

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	8.03	7.64	-4.9%
Mean winter discharge	0.94	0.94	0.1%
Annual maximum daily discharge	38.0	35.7	-6.0%
Open-water season minimum daily discharge	1.20	1.21	0.7%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
Steepbank River near Ft McMurray, 07DA006

Year
2008

Inputs	
Total Closed Circuit Area, km ²	9.61
Total Cleared Area, km ²	25.2
Total Catchment Area, km ²	1320
Contributing (Effective) Catchment Area, km ²	1310
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	176
Closed-circuit loss (million m ³)	-1.278
Incremental runoff from land clearing (million m ³)	0.670
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	175
Incremental volume (million m ³)	-0.608
Incremental volume (% of natural)	-0.3%
Naturalized Runoff Depth (mm)	133.0

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	10.8	10.7	-0.3%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	33.9	33.8	-0.3%
Open-water season minimum daily discharge	2.62	2.61	-0.3%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S15A Tar River near the Mouth, 07DA015

Year
2008

Inputs	
Total Closed Circuit Area, km ²	64.0
Total Cleared Area, km ²	8.26
Total Catchment Area, km ²	326
Contributing (Effective) Catchment Area, km ²	262
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	18.91
Closed-circuit loss (million m ³)	-3.71
Incremental runoff from land clearing (million m ³)	0.096
Withdrawals from the stream (million m ³)	-10.36
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	4.94
Incremental volume (million m ³)	-13.97
Incremental volume (% of natural)	-73.9%
Naturalized Runoff Depth (mm)	58.0

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	1.386	0.362	-73.9%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge**	8.72	2.85	-67.3%
Open-water season minimum daily discharge	0.309	0.076	-75.3%

* Percent of natural

** Annual maximum daily discharge is the highest observed value. Higher values may have occurred outside of monitored period.

RAMP Naturalized Flow Calculation

Station
S26 MacKay River near Fort MacKay, 07DB001

Year
2008

Inputs	
Total Closed Circuit Area, km ²	2.78
Total Cleared Area, km ²	11.0
Total Catchment Area, km ²	5570
Contributing (Effective) Catchment Area, km ²	5567
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	557
Closed-circuit loss (million m ³)	-0.278
Incremental runoff from land clearing (million m ³)	0.220
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	557
Incremental volume (million m ³)	-0.058
Incremental volume (% of natural)	-0.01%
Naturalized Runoff Depth (mm)	100.0

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	32.7	32.7	-0.01%
Mean winter discharge**	2.83	2.83	-0.01%
Annual maximum daily discharge	106	106	-0.01%
Open-water season minimum daily discharge	6.99	6.99	-0.01%

* Percent of natural

** missing winter flow in part of February.

RAMP Naturalized Flow Calculation

Station

CR-1 Calumet River, CNRL

Year

2008

Inputs

Total Closed Circuit Area, km ²	1.75
Total Cleared Area, km ²	0.40
Total Catchment Area, km ²	175
Contributing (Effective) Catchment Area, km ²	173
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	4.02
Closed-circuit loss (million m ³)	-0.04
Incremental runoff from land clearing (million m ³)	0.002
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	3.98
Incremental volume (million m ³)	-0.038
Incremental volume (% of natural)	-1.0%
Naturalized Runoff Depth (mm)	23.0

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	0.470	0.466	-1.0%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	2.34	2.32	-1.0%
Open-water season minimum daily discharge	0.055	0.054	-1.0%

* Percent of natural

Note: Data missing in part of July and August.

RAMP Naturalized Flow Calculation

Station
S27 Firebag River near the Mouth, 07DC001

Year
2008

Inputs	
Total Closed Circuit Area, km ²	4.36
Total Cleared Area, km ²	9.67
Total Catchment Area, km ²	5990
Contributing (Effective) Catchment Area, km ²	5986
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	939
Closed-circuit loss (million m ³)	-0.683
Incremental runoff from land clearing (million m ³)	0.303
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	939
Incremental volume (million m ³)	-0.380
Incremental volume (% of natural)	-0.04%
Naturalized Runoff Depth (mm)	157

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value	Observed Value	Percent Change*
	(m³/s)	(m³/s)	
Mean-open-water season discharge	47.3	47.3	-0.04%
Mean winter discharge	11.6	11.5	-0.04%
Annual maximum daily discharge	171	171	-0.04%
Open-water season minimum daily discharge	14.3	14.3	-0.04%

* Percent of natural

RAMP Naturalized Flow Calculation

Station

S14A Ells River at CNRL Bridge

Year

2008

Inputs

Total Closed Circuit Area, km ²	1.61
Total Cleared Area, km ²	2.95
Total Catchment Area, km ²	2430
Contributing (Effective) Catchment Area, km ²	2428
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	203
Closed-circuit loss (million m ³)	-0.134
Incremental runoff from land clearing (million m ³)	0.049
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	202
Incremental volume (million m ³)	-0.085
Incremental volume (% of natural)	-0.04%
Naturalized Runoff Depth (mm)	83.3

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	11.7	11.7	-0.04%
Mean winter discharge**	2.08	2.08	-0.04%
Annual maximum daily discharge	29.5	29.5	-0.04%
Open-water season minimum daily discharge	2.60	2.60	-0.04%

* Percent of natural

** Missing some winter flow

RAMP Naturalized Flow Calculation

Station

S29 Christina River near Chard, 07CE002

Year

2008

RAMP Funders

Inputs

Total Closed Circuit Area, km ²	1.12
Total Cleared Area, km ²	13.3
Total Catchment Area, km ²	4863
Contributing (Effective) Catchment Area, km ²	4862
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	634
Closed-circuit loss (million m ³)	-0.146
Incremental runoff from land clearing (million m ³)	0.346
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	635
Incremental volume (million m ³)	0.200
Incremental volume (% of natural)	0.03%
Naturalized Runoff Depth (mm)	130

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	33.2	33.2	0.03%
Mean winter discharge	6.79	6.79	0.03%
Annual maximum daily discharge	100	100	0.03%
Open-water season minimum daily discharge	5.55	5.55	0.03%

* Percent of naturalized. The percent change calculated for the Christina River is not presented in the RAMP report, because the observed hydrograph is measured at the Christina River near Chard, while the land change is measured for the entire Christina River catchment.

RAMP Naturalized Flow Calculation

Station **S29 Christina River near Chard, 07CE002** Year **2008** All Development

Inputs	
Total Closed Circuit Area, km ²	6.47
Total Cleared Area, km ²	34.0
Total Catchment Area, km ²	4863
Contributing (Effective) Catchment Area, km ²	4857
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	634
Closed-circuit loss (million m ³)	-0.844
Incremental runoff from land clearing (million m ³)	0.887
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	635
Incremental volume (million m ³)	0.043
Incremental volume (% of natural)	0.01%
Naturalized Runoff Depth (mm)	130

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	33.2	33.2	0.01%
Mean winter discharge	6.79	6.79	0.01%
Annual maximum daily discharge	100	100	0.01%
Open-water season minimum daily discharge	5.55	5.55	0.01%

* Percent of naturalized. The percent change calculated for the Christina River is not presented in the RAMP report, because the observed hydrograph is measured at the Christina River near Chard, while the land change is measured for the entire Christina River catchment.

RAMP Naturalized Flow Calculation

Station
Hangingstone River at Ft. McMurray, 07CD004

Year
2008 All Development

Inputs	
Total Closed Circuit Area, km ²	0.47
Total Cleared Area, km ²	0.17
Total Catchment Area, km ²	962
Contributing (Effective) Catchment Area, km ²	962
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	88.3
Closed-circuit loss (million m ³)	-0.043
Incremental runoff from land clearing (million m ³)	0.003
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	88.3
Incremental volume (million m ³)	-0.040
Incremental volume (% of natural)	-0.05%
Naturalized Runoff Depth (mm)	91.8

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	6.07	6.07	-0.05%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge	53.2	53.2	-0.05%
Open-water season minimum daily discharge	0.566	0.566	-0.05%

* Percent of natural

RAMP Naturalized Flow Calculation

Station
S11 Poplar Creek at Highway 63, 07DA007

Year
2008

Inputs	
Total Closed Circuit Area, km ²	2.99
Total Cleared Area, km ²	1.27
Total Catchment Area, km ²	151
Contributing (Effective) Catchment Area, km ²	148
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)***	14.9
Closed-circuit loss (million m ³)	-0.295
Incremental runoff from land clearing (million m ³)	0.025
Withdrawals from the stream (million m ³)	0.000
Releases into the stream (million m ³)	0.250
Diversions into or out of the watershed (million m ³)	9.68
Tributary changes (million m ³)	0.000
Observed hydrograph (million m ³)	20.8
Incremental volume (million m ³)	5.90
Incremental volume (% of natural)	40%
Naturalized Runoff Depth (mm)	8.53

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	1.12	1.56	40%
Mean winter discharge	not measured	not measured	-
Annual maximum daily discharge**	5.54	5.54	-0.1%
Open-water season minimum daily discharge	0.000	0.175	-

* Percent of natural

** Data in the table is for the monitored period May 14 - October 14.

*** Seasonal volume presented in the table do not balance, because daily runoff values computed to be less than zero (when reported Poplar Creek spillway release were greater than observed S11 discharges) were set to zero.

RAMP Naturalized Flow Calculation

Station

S12 Fort Creek at Highway 63

Year

2008

Inputs

Total Closed Circuit Area, km ²	0.300
Total Cleared Area, km ²	19.5
Total Catchment Area, km ²	31.9
Contributing (Effective) Catchment Area, km ²	31.6
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	1.32
Closed-circuit loss (million m ³)	-0.012
Incremental runoff from land clearing (million m ³)	0.162
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	1.47
Incremental volume (million m ³)	0.149
Incremental volume (% of natural)	11.3%
Naturalized Runoff Depth (mm)	41.4

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	0.096	0.107	11.3%
Mean winter discharge	N/A	N/A	N/A
Annual maximum daily discharge**	0.224	0.249	11.3%
Open-water season minimum daily discharge	0.016	0.018	11.3%

* Percent of natural

** Annual maximum daily discharge is the highest observed value. Higher values may have occurred outside of monitored period.

RAMP Naturalized Flow Calculation

Station

S6 Mill Creek at Highway 63

Year

2008

Inputs

Total Closed Circuit Area, km ²	2.52
Total Cleared Area, km ²	0.0
Total Catchment Area, km ²	23.8
Contributing (Effective) Catchment Area, km ²	21.3
Cleared Land Runoff Increment	20%

Water Balance Summary

Component	Annual
Naturalized hydrograph (million m ³)	1.33
Closed-circuit loss (million m ³)	-0.141
Incremental runoff from land clearing (million m ³)	0.000
Withdrawals from the stream (million m ³)	0.00
Releases into the stream (million m ³)	0.00
Diversions into or out of the watershed (million m ³)	0.00
Tributary changes (million m ³)	0.00
Observed hydrograph (million m ³)	1.19
Incremental volume (million m ³)	-0.141
Incremental volume (% of natural)	-10.59%
Naturalized Runoff Depth (mm)	56.1

Change in Measurement Endpoints

Measurement Endpoint	Naturalized Value (m ³ /s)	Observed Value (m ³ /s)	Percent Change*
Mean-open-water season discharge	0.071	0.063	-10.59%
Mean winter discharge**	0.013	0.011	-10.59%
Annual maximum daily discharge	0.230	0.206	-10.59%
Open-water season minimum daily discharge	0.010	0.009	-10.59%

* Percent of natural

Appendix D
Water Quality Component

D.0 WATER QUALITY COMPONENT

D.1 PCA AND CLUSTER ANALYSIS OF WATER QUALITY DATA

D.1.1 RAMP Stations

D.1.1.1 Introduction

RAMP water quality data from 1997 to 2008 for the Athabasca River, Athabasca River Delta (ARD), tributaries of the Athabasca River within the RAMP FSA, and regional lakes were analyzed using objective classification analysis (OCA) to determine if there were any spatial or temporal patterns present. OCA is a multivariate statistical technique that first uses principal components analysis (PCA) to reduce the dataset, followed by cluster analysis to classify stations based on water or sediment quality; a similar OCA approach is presented by Jones and Boyer (2002); further information and discussion regarding this approach may be found in Appendix E of the RAMP 2005 Technical Report (RAMP 2005a).

D.1.1.2 Analysis of Water Chemistry Data

The historical water chemistry dataset included 67 monitoring stations (Table D.1-1), which had been monitored in the fall for two to eleven years (data for other seasons were excluded) from 1997 to 2008, for a total of 396 observations (i.e., station/year combinations).

Table D.1-1 RAMP water quality stations included in the historical dataset, 1997 to 2008.

Region	Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Athabasca River	ATR-DC-CC						✓	✓	✓	✓	✓	✓	
	ATR-DC-CC-D	✓											
	ATR-DC-E		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
	ATR-DC-M				✓								
	ATR-DC-W		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
	ATR-DD-CC						✓	✓	✓	✓			
	ATR-DD-E									✓	✓	✓	✓
	ATR-DD-W									✓	✓	✓	✓
	ATR-ER				✓	✓			✓				
	ATR-FC-CC-D	✓											
	ATR-FC-E				✓	✓	✓	✓					
	ATR-FC-E-D		✓										
	ATR-FC-M				✓								
	ATR-FC-W				✓	✓	✓	✓					
	ATR-FC-W-D		✓										
	ATR-FR-CC											✓	✓
	ATR-FR						✓	✓	✓	✓	✓		
	ATR-MR-E				✓	✓	✓	✓	✓	✓	✓	✓	✓
	ATR-MR-E-D		✓										
	ATR-MR-M				✓								
	ATR-MR-W				✓	✓	✓	✓	✓	✓	✓	✓	✓
	ATR-MR-W-D		✓										
	ATR-SR-E				✓	✓	✓	✓	✓	✓	✓	✓	✓

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

Region	Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Athabasca River (Cont'd.)	ATR-SR-M				✓								
	ATR-SR-W				✓	✓	✓	✓	✓	✓	✓	✓	✓
	EMR-1							✓					
Athabasca River Delta	ARD-1				✓	✓		✓	✓				
Eastern Tributaries	FIR-1						✓	✓	✓	✓	✓	✓	✓
	FIR-2							✓	✓	✓	✓	✓	✓
	FIR-2X						✓						
	FOC-1				✓	✓	✓	✓			✓	✓	✓
	MCC-1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	UNC-1				✓								
Western Tributaries	BER-1							✓	✓	✓	✓	✓	✓
	BER-2												✓
	CAR-1						✓	✓	✓	✓	✓	✓	✓
	CAR-2									✓	✓	✓	✓
	ELR-1		✓				✓	✓	✓	✓	✓	✓	✓
	ELR-2								✓	✓	✓	✓	✓
	MAR-1		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
	MAR-2						✓	✓	✓	✓	✓	✓	✓
	POC-1				✓	✓	✓	✓	✓	✓	✓	✓	✓
	TAR-1		✓				✓	✓	✓	✓	✓	✓	✓
	TAR-2								✓	✓	✓	✓	✓
	IYC-1											✓	✓
Southern Tributaries	CHR-1						✓	✓	✓	✓	✓	✓	✓
	CHR-2						✓	✓	✓	✓	✓	✓	✓
	CHR-2A											✓	
	CLR-1					✓	✓	✓	✓	✓	✓	✓	✓
	CLR-2					✓	✓	✓	✓	✓	✓	✓	✓
	HAR-1								✓	✓	✓	✓	✓
Muskeg River	ALD-1			✓									✓
	JAC-1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	JAC-2												✓
	MUC-1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	MUR-1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	MUR-2			✓									
	MUR-4			✓									
	MUR-6		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	SHC-1			✓							✓	✓	
	STC-1					✓	✓	✓	✓	✓	✓	✓	✓
	WAC-1		✓	✓					✓	✓	✓	✓	✓
Steepbank River	NSR-1						✓	✓	✓	✓	✓	✓	✓
	STR-1	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
	STR-2						✓	✓	✓	✓	✓	✓	✓
	STR-3								✓	✓	✓	✓	✓
Lakes	ISL-1				✓	✓			✓	✓	✓	✓	✓
	KEL-1		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
	MCL-1				✓	✓	✓	✓			✓	✓	✓
	SHL-1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

D.1.1.3 Methods

Principal Components Analysis (PCA)

PCA was used to reduce the water chemistry dataset to facilitate broad comparisons of water quality among stations.

Data Screening

Before PCA were conducted, data were screened to exclude:

- Any variables with concentrations below detection limits in over 50% of observations (i.e., station/year combinations); and
- Any variables with missing values for 15% or more of observations (i.e., station/year combinations).

For the remaining analytes in the dataset, non-detectable values were substituted with a value equal to the detection limit and missing values were substituted with the mean for all years for a given station.

The historical dataset was comprised of results of metals analyses conducted by two different laboratories, EnviroTest Laboratories (ETL, now a component of ALS Environmental Ltd. [ALS]), which conducted the analyses from 1997-2001, and Alberta Research Council (ARC), which conducted analyses from 2002 to 2006. In general, detection limits for metals were higher (i.e., analytical methods were less sensitive) at ALS/ETL. As a result, the analytical detection limits reported by ARC were revised to match the higher detection limit historically reported by ALS/ETL, to ensure the variable detection limits did not confound results of statistical analyses.

Data Reduction

Data were ranked prior to PCA to standardize the dataset using Systat; ranks were corrected for ties. Separate PCAs, using no rotation, were conducted for dissolved metals, total metals, and major ions. Organic compounds were excluded from these analyses because of the high numbers of non-detectable and missing values present in the dataset. Unstandardized principal components (PCs) were saved for use as summary variables in subsequent analysis.

Relationships between the input variables and output summary variables were evaluated using correlation analysis to determine which input variables were most strongly influencing the summary variables. The magnitude and direction of these correlations were used to interpret PC scores in subsequent analyses. r -values between either 0.50 and 0.75 or -0.50 and -0.75 were classified as moderate correlations, while those $> |0.75|$ were classified as strong. The direction of correlation was used to determine whether metals or ion input variables tended to increase or decrease with PCs.

Cluster Analysis

Cluster analysis was conducted in two steps. First, hierarchical clustering was conducted using Ward's linkage methods and Euclidean distance measures to determine the number of clusters. Second, k-means cluster analysis was used to specify cluster membership of each stations/year combination; the results of the hierarchical clustering was used as a guide to select the number of clusters used in the k-means cluster analysis.

All cluster analyses were conducted on PC scores using SYSTAT v. 10.

Correlation Analyses

Spearman's Rank correlations (r_s) were used to evaluate the relationships between conventional variables, nutrients, and PCs.

D.1.1.4 Results

Principal Components Analysis

Data Screening

The following analytes with missing values for 15% or more of station/year combinations and/or non-detectable values for 50% or more of station/year combinations, were excluded from the dataset:

- **Non-detectable values:**
 - **Dissolved metals** – beryllium, bismuth, cadmium, mercury, selenium, silver, tin;
 - **Total metals** – mercury, ultra-trace mercury, selenium, silver, tin;
 - **Ions** – bicarbonate, hydroxide;
- **Missing values:**
 - **Dissolved Metals** – bismuth, chlorine, sulfur, thorium, tin;
 - **Total Metals** – bismuth, chlorine, ultra-trace mercury, sulfur, thorium;
 - **Ions** – hydroxide.

An additional screening method was used for the total metals dataset. Four variables including beryllium, thallium, arsenic, and antimony were strongly influenced by the data preparation techniques, such as the standardizing of the detection limits. Setting consistent detection limits within variables created a constant variable (beryllium) or variables with only less than 3 values above detection. Beryllium was removed because it was a constant and thallium, arsenic, and antimony were removed because their inclusion dictated the clustering patterns.

Data Reduction

Dissolved Metals

The dissolved metals PCA produced a total of five principal components (PCs; Table D.1-2). The first three PCs accounted for a total of 52.1% (25.50, 15.87, 10.73%, respectively) of the variance of the dataset and were used in subsequent analyses. The fourth and fifth PCs contributed little to the explanation of variance (8.32 and 7.14% respectively) and were excluded from further analysis.

The first summary variable, DISMET PC1 explained a majority of the variance of the data set and was moderately or strongly correlated with 8 of the 19 input variables: nickel, uranium, strontium, copper, and molybdenum, cobalt, barium, and vanadium.

DISMET PC2, the second summary variable, was moderately correlated with 5 of the 19 input variables: iron, lithium, boron, manganese, and titanium.

The final principal component used in the analyses was DISMET PC3 and it was moderately and negatively correlated with: aluminum and lithium.

Table D.1-2 Pearson correlation coefficients of input variables with output summary variables (i.e., principal components) for dissolved metals.

Input Variable	Summary Variable (Principal Component)				
	DISMET PC1	DISMET PC2	DISMET PC3	DISMET PC4	DISMET PC5
Nickel	0.790	0.017	0.086	-0.092	-0.151
Uranium	0.762	0.398	0.105	0.274	0.166
Strontium	0.714	0.221	-0.376	0.305	0.281
Copper	0.684	0.387	0.091	-0.213	-0.095
Molybdenum	0.673	0.348	0.341	0.194	-0.042
Cobalt	0.660	-0.371	-0.163	-0.198	-0.145
Barium	0.566	0.292	-0.482	0.157	0.181
Vanadium	0.504	-0.160	0.408	0.275	-0.242
Chromium	0.490	-0.166	-0.033	0.195	-0.417
Arsenic	0.423	-0.401	0.425	0.144	0.341
Aluminum	0.416	0.006	0.509	-0.390	0.191
Lithium	0.395	-0.607	-0.502	0.067	0.205
Zinc	0.343	0.384	-0.217	-0.484	-0.219
Lead	0.337	0.299	-0.009	-0.641	0.072
Boron	0.311	-0.662	-0.357	0.096	0.164
Manganese	0.295	-0.533	-0.337	-0.424	-0.075
Titanium	0.199	-0.500	0.474	0.071	0.161
Iron	0.112	-0.741	0.291	-0.232	-0.153
Antimony	-0.120	0.090	0.113	-0.270	0.776

moderate correlation ($|0.50| < r_s < |0.75|$) between input variable and summary variable (i.e., PC)

strong correlation ($r_s > |0.75|$) between input variable and summary variable (i.e., PC)

Total Metals

The total metals PCA produced a total of five PCs (Table D.1-3). Three of the five PCs accounted for a total of 62.8% (37.24, 15.38, 9.46% respectively) of the total variance of the in the dataset and were used in subsequent analyses. The fourth and fifth PC accounted for little of the variance in the dataset (6.81 and 5.6 % respectively) and was excluded from subsequent analyses.

TOTMET PC1 was strongly or moderately correlated with most (14 of 19) metals, including vanadium, aluminum, titanium, cobalt, lead, nickel, copper, chromium, iron, barium, molybdenum, zinc, strontium, and manganese. The second principal component, TOTMET PC2, was strongly correlated with calcium and lithium and was moderately correlated with boron, barium, and strontium. These metals were typically found in dissolved form in RAMP samples. Finally, TOTMET PC3 was moderately correlated with manganese and iron, which exhibit similar biogeochemical cycles and are frequently found in higher dissolved concentrations in highly humic waters (Wetzel 2001), such as those draining muskeg.

Table D.1-3 Pearson correlation coefficients of input variables with output summary variables (i.e., principal components) for total metals.

Input Variable	Summary Variable (Principal Component)				
	TOTMET PC1	TOTMET PC2	TOTMET PC3	TOTMET PC4	TOTMET PC5
Vanadium	0.836	-0.324	-0.081	-0.159	-0.056
Aluminum	0.824	-0.317	-0.169	-0.293	0.004
Titanium	0.820	-0.290	-0.209	-0.266	-0.050
Cobalt	0.816	0.042	-0.238	0.158	0.088
Lead	0.789	-0.240	0.068	0.139	0.050
Nickel	0.729	0.160	0.008	0.083	0.351
Copper	0.690	-0.038	0.342	0.190	0.185
Chromium	0.688	-0.122	0.014	0.391	0.075
Iron	0.664	0.091	-0.604	0.055	-0.155
Barium	0.600	0.501	0.330	-0.007	-0.372
Molybdenum	0.589	-0.030	0.310	-0.428	0.312
Zinc	0.565	0.039	0.362	0.472	0.137
Strontium	0.523	0.568	0.373	-0.310	-0.082
Manganese	0.520	0.280	-0.570	0.111	-0.420
Uranium	0.456	0.118	0.262	-0.289	-0.137
Calcium	0.144	0.811	0.275	0.160	-0.316
Cadmium	0.094	0.146	-0.101	0.455	0.164
Lithium	-0.019	0.824	-0.305	-0.106	0.299
Boron	-0.082	0.705	-0.363	-0.165	0.436

#	moderate correlation ($ 0.50 > r < 0.75 $) between input variable and summary variable (i.e., PC)
#	strong correlation ($r > 0.75 $) between input variable and summary variable (i.e., PC)

Ions

The ion PCA generated three PCs (Table D.1-4), which accounted for a total of 81.33% (46.37, 22.44, 12.52% respectively) of the variance in the dataset; all three PCs were used in subsequent analyses.

ION PC1 was strongly correlated with magnesium, calcium, and bicarbonate and moderately correlated with potassium, sulphate, and sodium. ION PC2 was strongly correlated with chloride and moderately correlated with sodium, both constituents of saline waters. ION PC3 was strongly (negatively) correlated only with sulphide.

Table D.1-4 Pearson correlation coefficients of input variables with output summary variables (i.e., principal components) for ions.

Input Variable	Summary Variable (Principal Component)		
	ION PC1	ION PC2	ION PC3
Magnesium	0.868	0.434	-0.069
Calcium	0.863	0.375	-0.135
Bicarbonate	0.836	0.485	0.034
Potassium	0.745	-0.167	-0.101
Sodium	0.590	-0.643	0.224
Sulphate	0.531	-0.470	-0.351
Chloride	0.483	-0.753	0.010
Sulphide	0.306	0.038	0.891

#	moderate correlation ($ 0.50 > r < 0.75 $) between input variable and summary variable (i.e., PC)
#	strong correlation ($r > 0.75 $) between input variable and summary variable (i.e., PC)

Relationships among Principal Components

Rank correlations were used to assess whether any strong relationships exist among the principal components both within and between the input variable types (total metals, dissolved metals, and ions; Table D.1-5). The only strong correlation was between ION PC1 and TOTMET PC2 ($r_s=0.782$) and there were several moderate correlations: TOTMET PC1 versus DISMET PC1 (0.696), TOTMET PC2 versus DISMET PC3 (-0.587), TOTMET PC3 versus DISMET PC2 (0.690), TOTMET PC3 versus ION PC3 (0.529), DISMET PC2 versus ION PC3 (0.522), and DISMET PC3 versus ION PC1 (-0.531).

With a total number of station/year combinations of 396, the critical r_s coefficient value is $|0.0986|$. Although a large number of correlations among the principal components were statistically significant (25 of 36), many of these correlations were weak.

Cluster Analysis

Based on the results of hierarchical cluster analysis, k-means cluster analysis was completed that produced three groupings Table D.1-6)

Cluster Membership

Cluster 1 is comprised of a total of 144 station/year combinations (Table D.1-7), predominantly including Firebag River (all Firebag sites), Jackpine Creek, Christina, Clearwater, Steepbank, North Steepbank and Ells Rivers and Kearl and McClelland Lakes. Some combinations of Muskeg, Stanley, Wapasu, Iyininim Creeks and the Athabasca River mainstem also fall into the first clustering.

The second cluster is composed of 124 station/year combinations, including, Fort, McLean and Poplar Creeks, Isadore's and Shipyard Lakes, and Muskeg, Calumet, Beaver and Tar Rivers. Infrequent contributions (less than 5) to the second clustering included Alsands Drain, Hangingstone, and Ells Rivers, and Jackpine, Muskeg, Shelley, Stanley, and Wapsau Creeks.

Finally, Cluster 3 is composed of 128 site/year combinations, of which 96 are from the Athabasca River. Minor contributions are made by Unnamed Creek, Kearl Lake, and the Muskeg, Christina, Clearwater, Hangingstone, Ells, and Tar Rivers.

Table D.1-5 Rank correlations among ion, dissolved metal, and total metal principal components.

	Rank Correlation (r_s)								
	TOTMET PC1	TOTMET PC2	TOTMET PC3	DISMET PC1	DISMET PC2	DISMET PC3	ION PC1	ION PC2	ION PC3
TOTMET PC1	1.000								
TOTMET PC2	0.015	1.000							
TOTMET PC3	-0.043	0.006	1.000						
DISMET PC1	0.696	0.414	0.076	1.000					
DISMET PC2	0.217	-0.481	0.690	-0.045	1.000				
DISMET PC3	0.144	-0.587	-0.312	-0.005	-0.003	1.000			
ION PC1	0.221	0.782	0.177	0.464	-0.189	-0.531	1.000		
ION PC2	-0.468	0.259	0.093	-0.350	-0.179	-0.394	0.002	1.000	
ION PC3	0.361	0.062	0.529	0.315	0.522	-0.170	0.241	-0.040	1.000

Bold values represent significant correlation where $|r_s| \geq |0.0986|$ for $n=396$

Light shading indicates a moderate correlation ($|0.50| > r_s < |0.75|$) exists between the input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r_s > |0.75|$) exists between the input variable and summary variable (i.e., PC).

Table D.1-6 Summary of cluster membership by region; shading shows assigned clusters.

Waterbody	Total No. of Station/Year Combinations	Cluster		
		1	2	3
Athabasca River	102	6		96
Athabasca River Delta	5			5
Eastern tributaries	32	14	15	3
Firebag River	14	14		
Fort Creek	7		7	
McLean Creek	10		8	2
Unnamed Creek	1			1
Regional Lakes	34	16	17	1
Isadore's Lake	7		7	
Kearl Lake	10	9		1
McClelland Lake	7	7		
Shipyard Lake	10		10	
Muskeg River	87	45	41	1
Alsands Drain	1		1	
Jackpine Creek	11	10	1	
Muskeg Creek	11	6	5	
Muskeg River	43	15	27	1
Shelley Creek	3		3	
Iyininim Creek	2	2		
Stanley Creek	9	6	3	
Wapasu Creek	7	6	1	
Southern tributaries	36	25	1	10
Christina River	15	10		5
Clearwater River	16	14		2
Hangingstone River	5	1	1	3
Steepbank River	30	23	5	2
North Steepbank River	7	7		
Steepbank River	23	16	5	2
Western tributaries	70	15	45	10
Beaver River	7		7	
Calumet River	11		11	
Ells River	13	7	2	4
MacKay River	17	8	7	2
Poplar Creek	9		9	
Tar River	13		9	4
Total	396	144	124	128

Shading denotes assigned cluster for calculation of baseline ranges.

Table D.1-7 Summary of cluster membership by station and year for the water quality dataset.

Region	Site	Year	Cluster	Site	Year	Cluster
Athabasca	ATR-DC-CC	2002	3	ATR-FC-W	2001	3
	ATR-DC-CC	2003	3	ATR-FC-W	2002	3
	ATR-DC-CC	2004	3	ATR-FC-W	2003	3
	ATR-DC-CC	2005	3	ATR-FC-W-D	1998	3
	ATR-DC-CC	2006	1	ATR-FR	2002	3
	ATR-DC-CC	2007	3	ATR-FR	2003	3
	ATR-DC-CC-D	1997	3	ATR-FR	2004	3
	ATR-DC-E	1998	3	ATR-FR-CC	2005	3
	ATR-DC-E	2000	3	ATR-FR-CC	2006	3
	ATR-DC-E	2001	3	ATR-FR-CC	2007	3
	ATR-DC-E	2002	3	ATR-FR-CC	2008	3
	ATR-DC-E	2003	1	ATR-MR-E	2000	3
	ATR-DC-E	2004	3	ATR-MR-E	2001	3
	ATR-DC-E	2005	1	ATR-MR-E	2002	3
	ATR-DC-E	2006	1	ATR-MR-E	2003	3
	ATR-DC-E	2007	3	ATR-MR-E	2004	3
	ATR-DC-E	2008	1	ATR-MR-E	2005	3
	ATR-DC-M	2000	3	ATR-MR-E	2006	3
	ATR-DC-W	1998	3	ATR-MR-E	2007	3
	ATR-DC-W	2000	3	ATR-MR-E	2008	3
	ATR-DC-W	2001	3	ATR-MR-E-D	1998	3
	ATR-DC-W	2002	3	ATR-MR-M	2000	3
	ATR-DC-W	2003	3	ATR-MR-W	2000	3
	ATR-DC-W	2004	3	ATR-MR-W	2001	3
	ATR-DC-W	2005	3	ATR-MR-W	2002	3
	ATR-DC-W	2006	3	ATR-MR-W	2003	3
	ATR-DC-W	2007	3	ATR-MR-W	2004	3
	ATR-DC-W	2008	3	ATR-MR-W	2005	3
	ATR-DD	2002	3	ATR-MR-W	2006	3
	ATR-DD	2003	3	ATR-MR-W	2007	3
	ATR-DD	2004	3	ATR-MR-W	2008	3
	ATR-DD	2005	3	ATR-MR-W-D	1998	3
	ATR-DD-E	2005	3	ATR-SR-E	2000	3
	ATR-DD-E	2006	3	ATR-SR-E	2001	3
	ATR-DD-E	2007	3	ATR-SR-E	2002	1
	ATR-DD-E	2008	3	ATR-SR-E	2003	3
	ATR-DD-W	2005	3	ATR-SR-E	2004	3
	ATR-DD-W	2006	3	ATR-SR-E	2005	3
	ATR-DD-W	2007	3	ATR-SR-E	2006	3
	ATR-DD-W	2008	3	ATR-SR-E	2007	3
	ATR-ER	2000	3	ATR-SR-E	2008	3
	ATR-ER	2001	3	ATR-SR-M	2000	3
	ATR-ER	2004	3	ATR-SR-W	2000	3
	ATR-FC-CC-D	1997	3	ATR-SR-W	2001	3
	ATR-FC-E	2000	3	ATR-SR-W	2002	3
	ATR-FC-E	2001	3	ATR-SR-W	2003	3
	ATR-FC-E	2002	3	ATR-SR-W	2004	3
	ATR-FC-E	2003	3	ATR-SR-W	2005	3
	ATR-FC-E-D	1998	3	ATR-SR-W	2006	3
	ATR-FC-M	2000	3	ATR-SR-W	2007	3
	ATR-FC-W	2000	3	ATR-SR-W	2008	3

Table D.1-7 (Cont'd.)

Region	Site	Year	Cluster	Site	Year	Cluster
Athabasca River Delta	EMR1	2003	3	ARD1	2003	3
	ARD1	2000	3	ARD1	2004	3
	ARD1	2001	3			
Eastern Tributaries	FIR1	2002	1	FOC1	2007	2
	FIR1	2003	1	FOC1	2008	2
	FIR1	2004	1	MCC1	1999	2
	FIR1	2005	1	MCC1	2000	3
	FIR1	2006	1	MCC1	2001	2
	FIR1	2007	1	MCC1	2002	3
	FIR1	2008	1	MCC1	2003	2
	FIR2	2003	1	MCC1	2004	2
	FIR2	2004	1	MCC1	2005	2
	FIR2	2005	1	MCC1	2006	2
	FIR2	2006	1	MCC1	2007	2
	FIR2	2007	1	MCC1	2008	2
	FIR2	2008	1	UNC1	2000	3
	FIR2X	2002	1			
	FOC1	2000	2			
	FOC1	2001	2			
	FOC1	2002	2			
	FOC1	2003	2			
	FOC1	2006	2			
Lakes	ISL1	2000	2	MCL1	2002	1
	ISL1	2001	2	MCL1	2003	1
	ISL1	2004	2	MCL1	2006	1
	ISL1	2005	2	MCL1	2007	1
	ISL1	2006	2	MCL1	2008	1
	ISL1	2007	2	SHL1	1999	2
	ISL1	2008	2	SHL1	2000	2
	KEL1	1998	3	SHL1	2001	2
	KEL1	2000	1	SHL1	2002	2
	KEL1	2001	1	SHL1	2003	2
	KEL1	2002	1	SHL1	2004	2
	KEL1	2003	1	SHL1	2005	2
	KEL1	2004	1	SHL1	2006	2
	KEL1	2005	1	SHL1	2007	2
	KEL1	2006	1	SHL1	2008	2
	KEL1	2007	1			
	KEL1	2008	1			
	MCL1	2000	1			
	MCL1	2001	1			
Muskeg River	ALD1	1999	2	JAC1	2008	1
	JAC1	1999	2	JAC2	2008	1
	JAC1	2000	1	MUC1	1998	2
	JAC1	2001	1	MUC1	1999	2
	JAC1	2002	1	MUC1	2000	1
	JAC1	2003	1	MUC1	2001	2
	JAC1	2004	1	MUC1	2002	1
	JAC1	2005	1	MUC1	2003	1
	JAC1	2006	1	MUC1	2004	2
	JAC1	2007	1	MUC1	2005	1

Table D.1-7 (Cont'd.)

Region	Site	Year	Cluster	Site	Year	Cluster
Muskeg River	MUC1	2006	2	MUR-5	2002	2
	MUC1	2007	1	MUR-5	2006	2
	MUC1	2008	1	MUR-6	1998	2
	MUR1	1997	3	MUR-6	1999	2
	MUR1	1998	2	MUR-6	2000	1
	MUR1	1999	2	MUR-6	2001	1
	MUR1	2000	1	MUR-6	2002	1
	MUR1	2001	2	MUR-6	2003	1
	MUR1	2002	1	MUR-6	2004	1
	MUR1	2003	1	MUR-6	2005	1
	MUR1	2004	2	MUR-6	2006	1
	MUR1	2005	1	MUR6	2007	1
	MUR1	2006	2	MUR6	2008	1
	MUR1	2007	1	SHC1	1999	2
	MUR1	2008	1	SHC1	2006	2
	MUR-2	1999	2	SHC1	2007	2
	MUR2	1999	2	STC1	1999	1
	MUR-2	2000	2	STC1	2001	1
	MUR-2	2001	2	STC1	2002	1
	MUR-2	2006	2	STC1	2003	2
	MUR-2	2002	2	STC1	2004	1
	MUR-2	2007	2	STC1	2005	2
	MUR-4	1999	2	STC1	2006	2
	MUR-4	1999	2	STC1	2007	1
	MUR-4	2000	2	STC1	2008	1
	MUR-4	2001	2	WAC1	1998	2
	MUR-4	2002	2	WAC1	1999	1
	MUR-4	2006	2	WAC1	2004	1
	MUR-4	2006	2	WAC1	2005	1
	MUR-4	2007	2	WAC1	2006	1
	MUR-5	1999	2	WAC1	2007	1
	MUR-5	2000	2	WAC1	2008	1
	MUR-5	2001	2			
Southern Tributaries	CHR1	2002	3	CLR1	2004	3
	CHR1	2003	1	CLR1	2005	3
	CHR1	2004	3	CLR1	2006	1
	CHR1	2005	1	CLR1	2007	1
	CHR1	2006	3	CLR1	2008	1
	CHR1	2007	3	CLR2	2001	1
	CHR1	2008	3	CLR2	2002	1
	CHR2	2002	1	CLR2	2003	1
	CHR2	2003	1	CLR2	2004	1
	CHR2	2004	1	CLR2	2005	1
	CHR2	2005	1	CLR2	2006	1
	CHR2	2006	1	CLR2	2007	1
	CHR2	2007	1	CLR2	2008	1
	CHR2	2008	1	HAR1	2004	1
	CHR2A	2007	1	HAR1	2005	3
	CLR1	2001	1	HAR1	2006	2
	CLR1	2002	1	HAR1	2007	3
	CLR1	2003	1	HAR1	2008	3

Table D.1-7 (Cont'd.)

Region	Site	Year	Cluster	Site	Year	Cluster
Steepbank River	NSR1	2002	1	STR1	2006	1
	NSR1	2003	1	STR1	2007	1
	NSR1	2004	1	STR1	2008	1
	NSR1	2005	1	STR2	2002	1
	NSR1	2006	1	STR2	2003	1
	NSR1	2007	1	STR2	2004	2
	NSR1	2008	1	STR2	2005	1
	STR1	1997	3	STR2	2006	1
	STR1	1998	2	STR2	2007	1
	STR1	2000	3	STR2	2008	1
	STR1	2001	2	STR-3	2004	1
	STR1	2002	1	STR-3	2005	1
	STR1	2003	1	STR-3	2006	2
	STR1	2004	2	STR3	2007	1
	STR1	2005	1	STR3	2008	1
Western Tributaries	BER1	2003	2	Mar-1	2004	2
	BER1	2004	2	Mar-1	2005	1
	BER1	2005	2	Mar-1	2006	2
	BER1	2006	2	Mar-1	2007	2
	BER1	2007	2	Mar-1	2008	1
	BER1	2008	2	Mar-2	2002	1
	BER2	2008	2	Mar-2	2003	1
	CAR1	2002	2	Mar-2	2004	2
	CAR1	2003	2	Mar-2	2005	1
	CAR1	2004	2	Mar-2	2006	1
	CAR1	2005	2	Mar-2	2007	1
	CAR1	2006	2	Mar-2	2008	1
	CAR1	2007	2	IYC1	2007	1
	CAR1	2008	2	IYC1	2008	1
	CAR2	2005	2	POC1	2000	2
	CAR2	2006	2	POC1	2001	2
	CAR2	2007	2	POC1	2002	2
	CAR2	2008	2	POC1	2003	2
	ELR1	1998	3	POC1	2004	2
	ELR1	2002	1	POC1	2005	2
	ELR1	2003	3	POC1	2006	2
	ELR1	2004	2	POC1	2007	2
	ELR1	2005	3	POC1	2008	2
	ELR1	2006	1	TAR1	1998	2
	ELR1	2007	2	TAR1	2002	3
	ELR1	2008	3	TAR1	2003	2
	ELR2	2004	1	TAR1	2004	3
	ELR2	2005	1	TAR1	2005	3
	ELR2	2006	1	TAR1	2006	2
	ELR2	2007	1	TAR1	2007	2
	ELR2	2008	1	TAR1	2008	2
	Mar-1	1998	2	TAR2	2004	2
	Mar-1	2000	3	TAR2	2005	3
	Mar-1	2001	3	TAR2	2006	2
	Mar-1	2002	2	TAR2	2007	2
	Mar-1	2003	2	TAR2	2008	2

Detailed Cluster Characteristics

The characteristics of each of the three site clusters were evaluated by visually examining plots of the principal components for dissolved and total metals and ions to identify trends in water quality common to each grouping (Figure D.1-1 to Figure D.1-3); each plot used only the first two respective PCs.

Dissolved Metals

The clustering of water quality sites using the dissolved metals PCs exhibited overlap between all three site groups (Figure D.1-1); Cluster 1 is almost completely enveloped by Cluster 2. All three clusters have higher variability along the second (DISMET PC2) axis. Cluster 1 generally had low concentrations of uranium and nickel (DISMET PC1 axis), along with varying concentrations of iron (DISMET PC2 axis). The second clustering has higher levels of iron and higher levels of uranium and nickel. Finally, the third clustering of sites tends towards lower concentrations of iron, with slightly positive values of nickel and uranium.

Total Metals

Clustering of water quality sites based on the total metal principal components (Figure D.1-2) exhibited less overlap versus the dissolved metals plots between clusters. The first grouping of sites generally had lower concentrations of vanadium, aluminum, titanium, and lead (negative values along TOTMET PC1) and variable concentrations of calcium and lithium. The second cluster of sites has positive values of TOTMET PC2 (increased concentrations of lithium and calcium) and varying concentrations of the metals associated with TOTMET PC1. The final group of sites, cluster 3, has increasing concentrations of cobalt, vanadium, titanium, and aluminum, and lower concentrations of lithium and calcium.

Ions

Clusters of water quality sites separated by ION PC1 and ION PC2 values showed a high degree of overlap (Figure D.1-3); Cluster 3 is almost enveloped by cluster 1. The first cluster of sites again tended towards lower concentrations of ions associated with ION PC1 (Magnesium, calcium, and bicarbonate) with much more variable levels of chloride (ion associated with ION PC2). The second cluster has variable concentrations of chloride and has slightly positive values along ION PC1. The final cluster has variable concentrations of ions associated with ION PC1 and highly variable concentrations of chloride.

Other Variables

Variables that also exhibited strong correlations with the principal components were used to characterize clustering. Additional analyses included conventional variables (conductivity, hardness, etc.), nutrients (ammonia, phosphorus, etc.) and general organics (naphthenic acids, total phenolics, recoverable hydrocarbons; Table D.1-8) and their relationships with the PCs and the input variables relationships amongst each other (Table D.1-9).

Figure D.1-1 Relationship dissolved metals principal component 1 (DISMET PC1) versus dissolved metals principal component 2 (DISMET PC2) for all sites with water quality data (1997-2008) with 95% confidence ellipses.

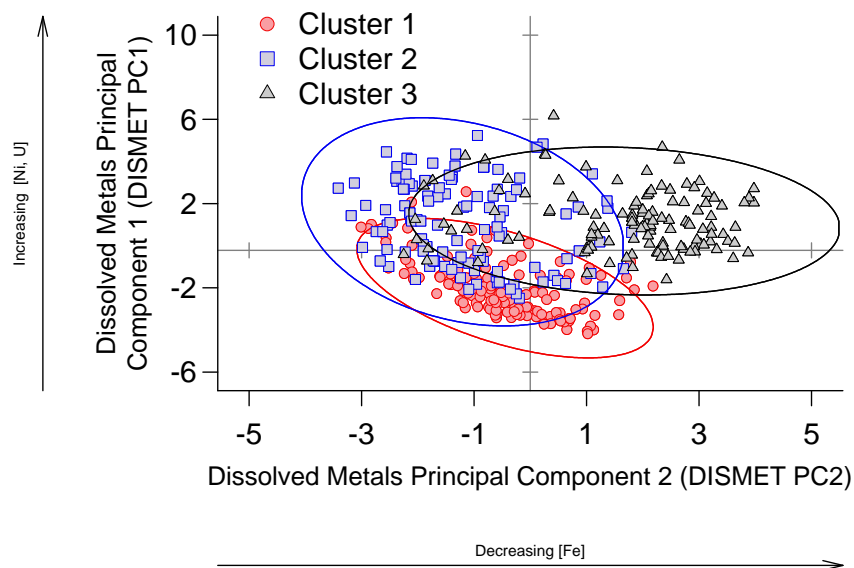


Figure D.1-2 Relationship total metals principal component 1 (TOTMET PC1) versus total metals principal component 2 (TOTMET PC2) for all sites with water quality data (1997-2008) with 95% confidence ellipses.

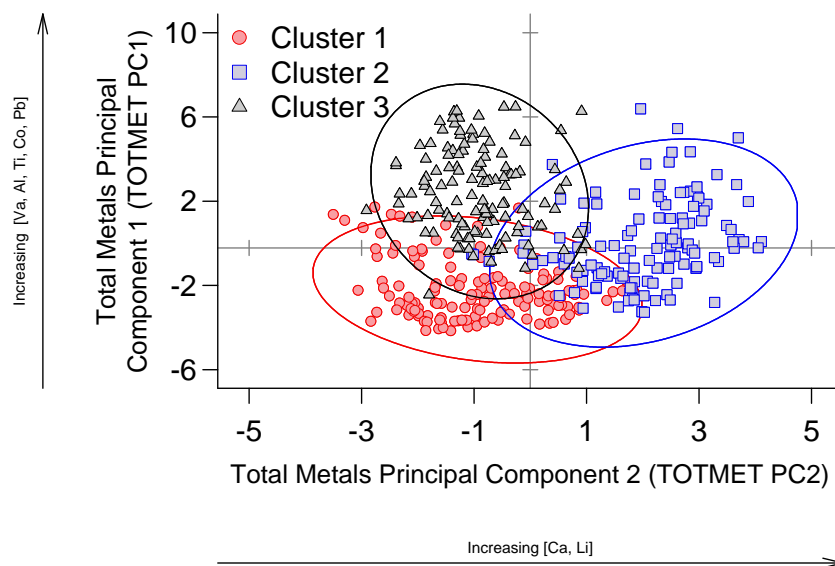
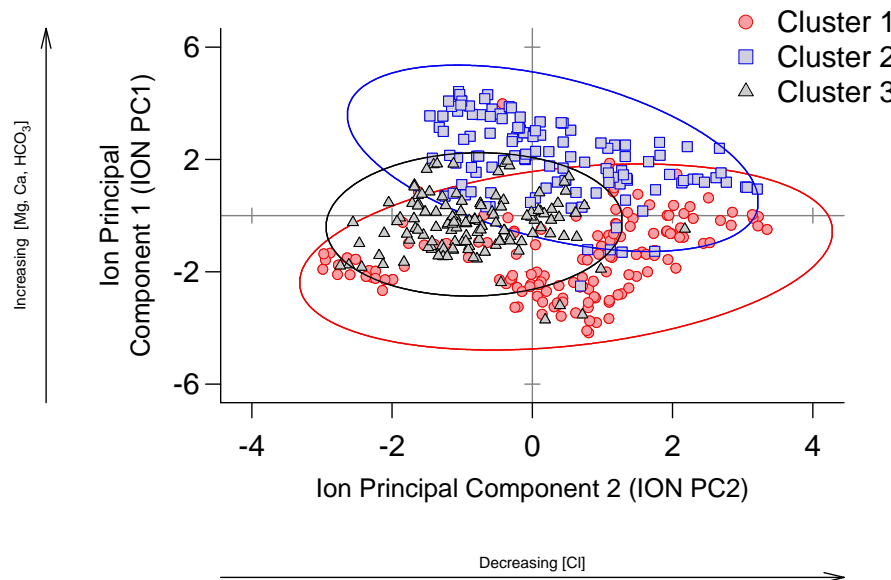


Figure D.1-3 Relationship ions principal component 1 (ION PC1) versus ions principal component 2 (ION PC2) for all sites with water quality data (1997-2008) with 95% confidence ellipses.



There are a total of 26 strong or moderate correlations between the principal components and the selected water quality variables. Of these 26, none were between either a general organic. Only three r_s values exceeded 0.50 for nutrients and the summary PCs; dissolved phosphorus, total Kjeldahl nitrogen, and total nitrogen were moderately correlated with DISMET PC2. The remainder of the strong to moderate correlations were found between the Conventional Variables and the principal components. ION PC1, DISMET PC2, TOTMET PC2, and TOTMET PC3 exhibited strong correlations with several of the conventional variables: ION PC1, which is driven by magnesium, calcium and bicarbonate ions, had correlation coefficients exceeding 0.806 with conductivity, hardness, total alkalinity and total dissolved solids. DISMET PC2, influenced by levels of iron, had a correlation of -0.762 with DOC. TOTMET PC2, driven by calcium and lithium, had a strong correlation with total alkalinity ($r_s=0.758$). TOTMET PC3, characterized by a moderate correlation with magnesium, had strong correlations with hardness and alkalinity.

Many input variables had strong correlations with each other (Table D.1-9). Notably, conductivity is strongly associated with bicarbonate, calcium, and magnesium ions and with total calcium. Hardness was also associated with dissolved calcium and bicarbonate, calcium, and magnesium ions. These relationships are largely due to known relationships between water quality variables such, conductivity and hardness and their component parts, dissolved metals.

Summary of Cluster Characteristics

Cluster 1 includes site/year combinations of the Firebag, Clearwater, and Steepbank Rivers, Jackpine Creek as well as Kearl and McClelland Lakes. These sites are

characterized by low to moderate concentrations of metals, and low ionic content. Other supporting variables, such as pH, hardness, and alkalinity show a range of values.

Cluster 2 includes site/year combinations of Fort, McLean, and Poplar creeks, among others. This cluster is characterized by moderate to high concentrations of total and dissolved metals, and ions. Relatively high levels of supporting environmental variables, such as hardness, alkalinity, and TDS were also observed at these sites.

Cluster 3 was composed almost exclusively of sites on the Athabasca River and the Athabasca River Delta. There were high concentrations of metals associated with TOTMET PC1 (vanadium and aluminum) and low concentrations of metals associated with TOTMET PC2 (lithium and calcium). Dissolved metals associated with DISMET PC2 were found at low concentrations (iron) and those associated with DISMET PC1 (nickel and uranium) were low. Ions were measured at low to moderate concentrations and alkalinity, hardness, and conductivity, were relatively low, while TSS was relatively high.

Table D.1-8 Rank correlations among conventional variables, general organics, nutrients and total metal principal components.

	DISMET PC1	DISMET PC2	DISMET PC3	ION PC1	ION PC2	ION PC3	TOTMET PC1	TOTMET PC2	TOTMET PC3
Conventional Variables									
Conductivity	0.422	-0.117	-0.559	0.939	-0.012	0.245	0.214	0.637	0.734
DOC	-0.085	-0.762	0.040	0.029	0.240	-0.612	-0.295	0.635	0.250
Hardness	0.281	-0.134	-0.638	0.897	0.352	0.277	0.035	0.669	0.767
pH	0.150	-0.080	-0.003	0.293	0.044	0.138	0.061	0.144	0.293
Total Alkalinity	0.224	-0.344	-0.620	0.844	0.422	0.089	-0.087	0.758	0.813
TDS	0.364	-0.360	-0.467	0.806	0.085	0.028	0.081	0.713	0.742
TOC	-0.071	-0.726	0.032	0.050	0.257	-0.602	-0.269	0.367	0.241
TSS	0.346	0.291	0.238	-0.069	-0.410	0.190	0.717	-0.305	-0.249
Total Colour	0.051	-0.605	0.368	-0.172	0.085	-0.534	-0.010	0.043	-0.011
General Organics									
Naphthenic Acids*	0.205	0.029	-0.210	0.202	-0.047	0.102	0.164	0.198	0.127
Total Phenolics	-0.075	-0.387	0.164	-0.035	0.176	-0.400	-0.154	0.085	0.100
Total Recoverable Hydrocarbons*	-0.060	-0.245	0.097	0.034	0.113	-0.239	-0.086	0.121	0.089
Nutrients									
Ammonia*	0.087	0.229	-0.258	0.060	0.103	0.149	0.101	0.064	0.017
BOD*	0.111	-0.035	-0.097	0.111	-0.027	-0.059	0.021	0.134	0.150
Nitrate-Nitrite*	-0.152	-0.290	0.186	0.038	0.005	-0.146	-0.196	-0.087	0.076
Dissolved Phosphorus	0.018	-0.512	0.354	-0.160	0.074	-0.395	-0.022	0.041	-0.034
Total Phosphorus	0.139	-0.069	0.121	0.089	-0.113	-0.075	0.192	-0.003	0.085
Total Kjeldahl Nitrogen	-0.005	-0.526	<0.001	0.126	0.165	-0.414	-0.166	0.302	0.284
Total Nitrogen	0.010	-0.544	-0.007	0.144	0.154	-0.406	-0.162	0.315	0.285

Bold values represent significant correlations where $|r_s| \geq |0.0986|$ for $n=396$.

Light shading indicates a moderate correlation ($|0.50| < r_s < |0.75|$) exists between variables.

Dark shading indicates a strong correlation ($r_s > |0.75|$) exists between variables.

* variables removed during screening.

Table D.1-9 Rank correlations of conventional variables, nutrients, and general organics with dissolved and total metals and major ions for the water quality dataset.

	Conventional Variables									General Organics			Nutrients						
	Conductivity	DOC	Hardness	pH	Alkalinity	TDS	TOC	TSS	Colour	Naphthenic Acids	Phenolics	Hydrocarbons	Ammonia	BOD	Nitrate + Nitrite	Dissolved Phosphorus	Total Phosphorus	Total Kjeldahl Nitrogen	Total Nitrogen
Dissolved Metals																			
Aluminum	-0.231	0.109	-0.27	-0.088	-0.262	-0.144	0.109	0.208	0.298	-0.036	0.133	0.09	0.001	<0.001	-0.068	0.25	0.104	0.109	0.083
Antimony	0.022	-0.123	-0.01	-0.012	-0.017	0.007	-0.114	0.011	-0.099	0.009	-0.109	-0.101	0.103	0.006	-0.007	-0.043	0.219	0.074	-0.012
Arsenic	0.094	0.238	-0.04	0.158	-0.005	0.146	0.225	0.133	0.336	0.002	0.12	0.123	-0.179	0.07	0.214	0.394	0.206	0.22	0.236
Barium	0.609	-0.429	0.642	0.231	0.476	0.415	-0.424	0.17	-0.405	0.134	-0.183	-0.114	0.119	-0.016	-0.052	-0.284	0.073	-0.232	-0.229
Boron	0.343	0.552	0.283	0.248	0.461	0.491	0.527	-0.201	0.24	0.113	0.16	0.165	-0.126	0.119	0.156	0.169	0.005	0.409	0.436
Chromium	0.245	0.092	0.173	0.033	0.189	0.306	0.074	0.062	0.067	0.185	0.058	0.027	-0.037	-0.003	0.05	-0.01	0.069	0.225	0.255
Cobalt	0.319	0.343	0.298	0.162	0.325	0.416	0.328	0.027	0.322	0.082	0.143	0.052	-0.069	0.052	0.119	0.198	0.11	0.256	0.297
Copper	0.138	-0.262	0.074	0.116	-0.02	0.054	-0.237	0.399	-0.099	0.153	-0.179	-0.123	0.159	-0.03	-0.077	-0.171	0.095	-0.112	-0.085
Iron	-0.155	0.553	-0.165	-0.057	-0.011	0.046	0.536	-0.128	0.709	-0.091	0.314	0.11	-0.259	-0.06	0.137	0.639	0.097	0.325	0.326
Lead	0.15	-0.16	0.042	-0.196	0.016	0.008	-0.125	0.145	-0.111	0.191	-0.318	-0.227	0.283	0.122	-0.298	0.031	-0.054	-0.07	-0.088
Lithium	0.476	0.45	0.457	0.242	0.586	0.564	0.431	-0.21	0.156	0.156	0.121	0.129	-0.106	0.091	0.087	0.121	0.028	0.37	0.389
Manganese	0.365	0.377	0.372	-0.099	0.46	0.496	0.381	-0.158	0.349	0.143	0.093	-0.079	0.022	-0.066	-0.073	0.433	0.071	0.229	0.236
Molybdenum	0.06	-0.4	-0.072	0.14	-0.198	-0.118	-0.395	0.354	-0.13	0.114	-0.17	-0.101	0.111	-0.031	-0.051	-0.01	0.038	-0.299	-0.275
Nickel	0.157	0.008	0.068	0.084	0.038	0.19	0.014	0.281	0.202	0.102	0.079	-0.029	0.077	-0.029	-0.109	0.078	0.197	0.058	0.081
Strontium	0.622	-0.298	0.527	0.295	0.387	0.412	-0.297	0.26	-0.273	0.147	-0.147	-0.111	0.039	0.048	0.005	-0.256	0.124	-0.134	-0.122
Titanium	-0.016	0.252	-0.047	0.186	0.024	0.157	0.24	0.118	0.381	-0.114	0.311	0.137	-0.351	0.013	0.266	0.309	0.2	0.231	0.233
Uranium	0.261	-0.405	0.153	0.173	-0.011	0.082	-0.401	0.36	-0.166	0.051	-0.171	-0.135	0.071	-0.026	0.063	-0.196	0.2	-0.222	-0.209
Vanadium	0.057	0.036	-0.153	-0.001	-0.17	0.034	0.04	0.374	0.197	0.066	-0.06	-0.057	-0.064	-0.003	0.021	0.154	0.162	0.103	0.131
Zinc	0.142	-0.18	0.071	-0.258	0.004	0.038	-0.159	0.108	-0.193	0.271	-0.292	-0.324	0.267	-0.022	-0.263	-0.093	-0.046	-0.07	-0.067

Bold values represent significant correlations where $|r_s| \geq |0.0986|$ for $n=396$.

Light shading indicates a moderate correlation ($|0.50| < r_s < |0.75|$) exists between variables.

Dark shading indicates a strong correlation ($r_s > |0.75|$) exists between variables.

Table D.1-9 (Cont'd.)

	Conventional Variables									General Organics			Nutrients						
	Conductivity	DOC	Hardness	pH	Alkalinity	TDS	TOC	TSS	Colour	Naphthenic Acids	Phenolics	Hydrocarbons	Ammonia	BOD	Nitrate + Nitrite	Dissolved Phosphorus	Total Phosphorus	Total Kjeldahl Nitrogen	Total Nitrogen
Total Metals																			
Aluminum	-0.08	-0.238	-0.269	0.081	-0.385	-0.216	-0.272	0.763	0.056	0.049	-0.144	-0.115	0.002	-0.08	-0.016	-0.011	0.132	-0.192	-0.187
Antimony	-0.012	-0.094	-0.046	-0.001	-0.048	-0.021	-0.083	0.06	-0.069	0.022	-0.092	-0.093	0.037	0.015	-0.018	-0.033	0.278	0.082	-0.022
Arsenic	-0.012	-0.094	-0.046	-0.001	-0.048	-0.021	-0.083	0.06	-0.069	0.022	-0.092	-0.093	0.037	0.015	-0.018	-0.033	0.278	0.082	-0.023
Barium	0.565	-0.418	0.562	0.252	0.386	0.384	-0.409	0.344	-0.349	0.138	-0.142	-0.06	0.063	-0.029	-0.032	-0.238	0.136	-0.214	-0.211
Boron	0.347	0.551	0.281	0.29	0.453	0.496	0.519	-0.196	0.243	0.101	0.18	0.176	-0.172	0.144	0.195	0.148	0.019	0.397	0.425
Calcium	0.834	0.015	0.916	0.281	0.849	0.755	0.028	-0.118	-0.136	0.2	0.002	0.014	0.083	0.011	0.002	-0.086	0.038	0.036	0.055
Cadmium	0.093	0.036	0.089	0.022	0.09	0.093	0.053	0.033	-0.004	0.2	-0.059	-0.043	0.094	-0.011	0.013	0.005	-0.015	0.092	0.09
Chromium	0.045	-0.182	-0.039	-0.036	-0.105	0.063	-0.148	0.526	0.01	0.133	-0.095	-0.053	0.061	-0.068	-0.185	-0.1	0.059	-0.055	-0.042
Copper	0.139	-0.306	0.03	0.001	-0.066	0.044	-0.267	0.477	-0.138	0.155	-0.258	-0.122	0.128	-0.026	-0.175	-0.212	0.184	-0.072	-0.068
Colbalt	0.103	-0.055	-0.039	0.031	-0.117	0.029	-0.045	0.658	0.171	0.116	0.018	0.058	0.069	-0.089	-0.09	0.072	0.228	-0.019	0.01
Iron	-0.013	0.18	-0.109	0.034	-0.101	0.048	0.183	0.543	0.459	0.062	0.12	0.066	-0.055	-0.149	-0.012	0.39	0.279	0.135	0.132
Lead	-0.009	-0.297	-0.129	-0.052	-0.226	-0.084	-0.259	0.623	-0.042	0.169	-0.234	-0.159	0.104	-0.015	-0.237	-0.111	0.165	-0.138	-0.167
Lithium	0.449	0.469	0.447	0.271	0.578	0.557	0.442	-0.213	0.214	0.147	0.152	0.12	-0.158	0.112	0.134	0.132	0.07	0.357	0.376
Manganese	0.253	0.129	0.141	0.128	0.103	0.258	0.125	0.469	0.239	0.069	0.146	0.105	-0.087	-0.069	0.114	0.266	0.306	0.138	0.143
Molybdenum	0.088	-0.416	-0.021	0.134	-0.154	-0.096	-0.404	0.303	-0.164	0.049	-0.165	-0.056	0.071	0.002	-0.003	-0.095	0.023	-0.282	-0.253
Nickel	0.091	-0.052	-0.024	0.041	-0.07	0.097	-0.044	0.436	0.144	0.107	-0.039	-0.032	0.092	-0.046	-0.194	0.027	0.233	-0.009	0.005
Strontium	0.635	-0.308	0.535	0.313	0.389	0.423	-0.306	0.256	-0.288	0.155	-0.14	-0.105	0.037	0.052	0.031	-0.265	0.106	-0.134	-0.122
Titanium	-0.035	-0.282	-0.219	0.116	-0.329	-0.172	-0.267	0.732	0.052	0.059	-0.091	-0.055	-0.034	-0.069	-0.009	0.026	0.176	-0.178	-0.173
Thallium	-0.051	-0.079	-0.083	0.044	-0.087	-0.061	-0.072	0.045	-0.054	0.027	-0.069	-0.051	-0.024	0.148	-0.022	0.015	0.237	0.049	-0.031
Uranium	0.175	-0.175	0.19	0.123	0.112	0.138	-0.177	0.732	-0.018	-0.063	0.026	-0.051	0.047	-0.035	0.138	-0.074	0.311	0.009	0.001
Vanadium	-0.022	-0.315	-0.172	0.028	-0.3	-0.147	-0.298	0.351	-0.01	0.071	-0.128	-0.103	0.078	-0.094	-0.06	-0.093	0.178	-0.17	-0.175
Zinc	0.207	-0.272	0.131	-0.248	0.052	0.108	-0.217	-0.115	-0.172	0.262	-0.337	-0.265	0.274	-0.029	-0.383	-0.126	0.123	-0.072	-0.069
Major Ions																			
Bicarbonate	0.823	0.259	0.933	0.341	>0.999	0.803	0.279	-0.312	-0.014	0.182	0.124	0.117	0.041	0.041	0.035	-0.015	0.018	0.245	0.259
Calcium	0.864	0.012	0.97	0.308	0.889	0.761	0.038	-0.161	-0.132	0.174	0.04	0.016	0.07	0.004	0.039	-0.086	0.044	0.047	0.067
Chloride	0.467	-0.155	0.145	0.05	0.068	0.305	-0.159	0.328	-0.13	0.177	-0.101	-0.09	-0.055	0.05	0.047	-0.044	0.132	-0.02	0.002
Magnesium	0.833	0.097	0.967	0.376	0.93	0.735	0.124	-0.247	-0.159	0.164	0.04	0.064	0.027	0.041	0.044	-0.112	0.022	0.165	0.183
Potassium	0.569	-0.078	0.493	0.203	0.437	0.432	-0.108	0.061	-0.282	0.17	-0.134	-0.017	-0.036	0.094	0.134	-0.238	0.171	0.045	0.066
Sodium	0.524	0.145	0.216	0.161	0.265	0.485	0.147	0.123	0.078	0.146	0.005	-0.01	-0.126	0.111	0.113	0.042	0.151	0.139	0.165
Sulphate	0.488	-0.381	0.332	0.117	0.148	0.292	-0.365	0.269	-0.302	0.108	-0.226	-0.111	0.094	0.107	-0.009	-0.224	0.159	-0.196	-0.181
Sulphide	0.166	0.458	0.161	-0.017	0.237	0.299	0.491	-0.158	0.386	-0.025	0.327	0.261	-0.078	0.096	0.087	0.189	0.09	0.383	0.378

Bold values represent significant correlations where $|r_s| \geq |0.0986|$ for $n=396$.

Light shading indicates a moderate correlation ($|0.50| < r_s < |0.75|$) exists between variables.

Dark shading indicates a strong correlation ($r_s > |0.75|$) exists between variables.

Table D.1-10 Summary of cluster membership and characteristics.

Cluster	Predominant Stations Present in Cluster	General Characteristics of Cluster			
		Total Metal Concentrations	Dissolved Metal Concentrations	Ion Concentrations	Other Variables
1	Firebag River Kearl Lake McClelland Lake Jackpine Creek Clearwater River Steepbank River	Low/moderate concentrations of metals	Variable metal concentrations	Low	Range of pH, hardness, TDS, Alkalinity, TP, etc.
2	McLean Creek Fort Creek Poplar Creek Isadore's Lake Shipyard Lake Muskeg River Calumet River Tar River	Moderate/high concentrations	High/moderate concentrations	Moderate concentrations	Relatively high hardness, alkalinity, TDS, TOC, TP
3	Athabasca River Athabasca River Delta	High concentrations of vanadium and aluminum; low concentrations of lithium and calcium.	Low concentrations	Low to moderate	Relatively low alkalinity, hardness, and conductivity; relatively high TSS levels.

Appendix E

**Benthic Invertebrate
Community Component**

E.0 BENTHIC INVERTEBRATE COMMUNITY COMPONENT

E.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, and the results of Quality Assurance/Quality Control (QA/QC). This appendix also documents the calculations used to estimate the normal ranges of variability for benthic invertebrate community measurement endpoints that were used in Section 5 as a measure against which to assess the significance of temporal trends in *test* reaches.

E.2 BENTHIC INVERTEBRATE SAMPLE PROCESSING PROCEDURES

E.2.1 Laboratory Methods

In preparation for laboratory processing, samples were checked upon arrival to the laboratory to ensure that they are adequately sealed, labeled and that the preservative has 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). 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 animals were further sub-sampled as per Figure E.2-1.

E.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.

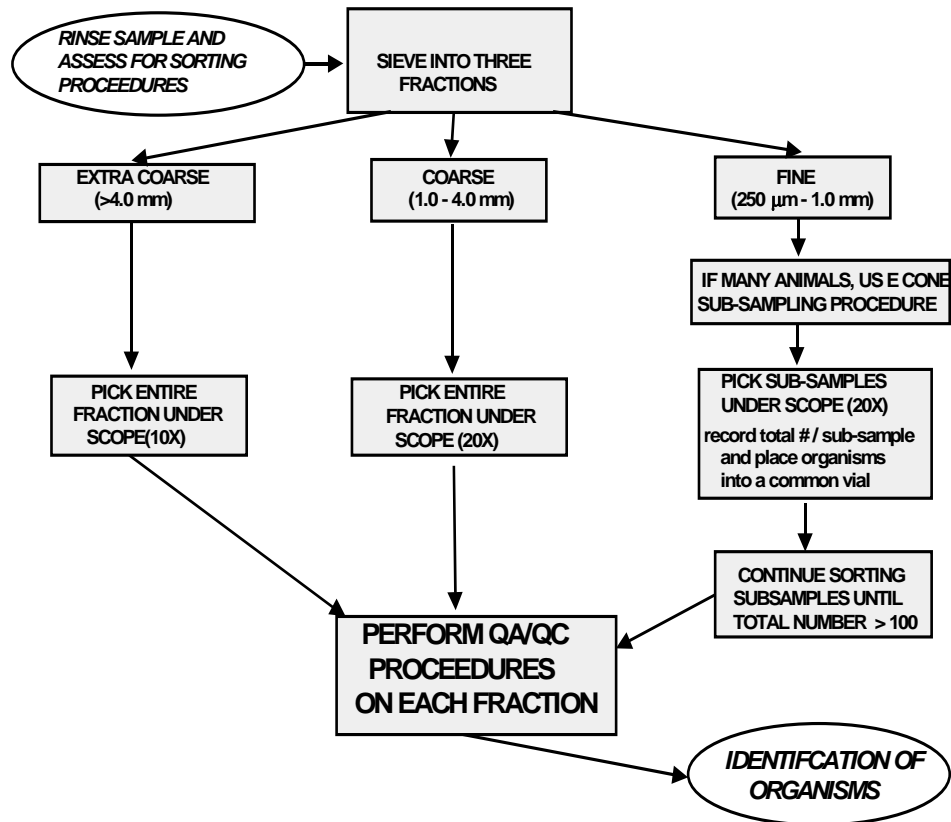
E.2.3 Fine Fraction

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 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.

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 $\frac{1}{4}$ 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 E.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 should be modified as necessary for station-specific samples.

E.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 1986; 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 (see Table E.2-1). Small, early-instar or damaged specimens were identified to the lowest level possible, generally to family.

Table E.2-1 Level of taxonomic identification.

Group	Level
Nematoda	Phylum
Oligochaeta	Family
Gastropoda	Genus/Species
Turbellaria	Family
Hirudinea	Species
Mollusca	Genus/Species
Hydracarina	Leave at this level
Cladocera	Leave at this level
Copepoda	Order
Ostracoda	Leave at this level
Amphipoda	Genus
Insecta	Genus/Species
Terrestrial	Leave at this level

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, Permount, 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.

E.3 CALCULATING 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 RAMP design has considerable statistical power, and thus the potential to detect effects that are negligible. The variability observed in regional *baseline* locations can be used to set observed effects into context, as per Kilgour *et al.* (1998). Here we classified watercourses as erosional or depositional river reaches, or a lake, and then calculated the "normal range of variability" for reference watercourses within each of those habitat types. Observed variations in *test* watercourses were then compared to the observed normal ranges for *baseline* watercourses.

As in the main text, the following measurement endpoints were calculated:

- Total abundance (No. individuals/m²);
- Richness (number of distinct taxa);
- Simpson's Diversity;
- Evenness; and
- % EPT (percent of the fauna as Ephemeroptera, Plecoptera and Trichoptera).

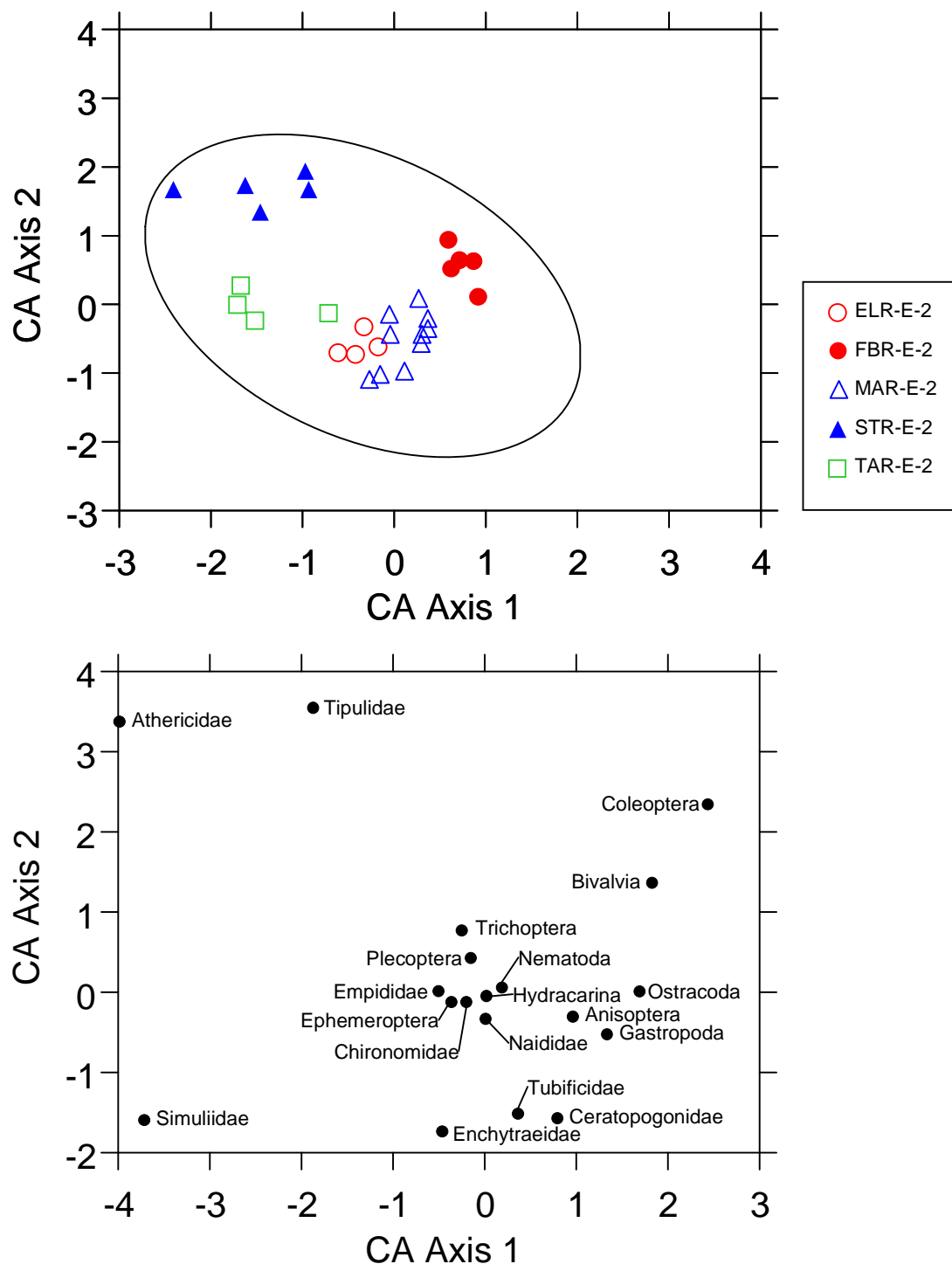
Baseline ranges for abundance, richness, diversity, evenness, and percent EPT were derived based on habitat type (erosional, depositional, lake) and are provided in the relevant figures for each reach or lake in the main body of the report. Regional *baseline* ranges were determined as the 5th and 95th percentile of reach (or lake) annual means.

We also used Correspondence Analysis (CA), a multivariate ordination procedure. CA orders such that a biplots of site scores represents the similarities among sites. Sites close together in the biplots have similar fauna, while sites far apart tend to have fewer similarities in their fauna. CA also orders the taxa, and a biplots of taxa can be overlain over the biplots of sites. The position of taxa in the biplots indicates, roughly, the samples in which taxa are their most abundant. The CA was generated using the data from both baseline and potentially affected watercourses. Separate analyses were performed for depositional river reaches, erosional river reaches, and for lakes, on the basis that those three habitat classes contained very different types of benthic invertebrates as determined from analyses from previous years. Differences in composition among those three basic habitat types were borne out again this year.

With CA, the configuration of ordination diagrams tends to be sensitive to rare taxa (Gauch, 1982). Therefore, the taxonomy was summarized to family level identifications and only those taxa (i.e., families) found in at least 10% of samples from a system were retained for the analysis. Taxa abundances were log-transformed prior to analysis. The CA was conducted using an Excel add-in (Biplot 1.1; Lipkovich and Smith 2002).

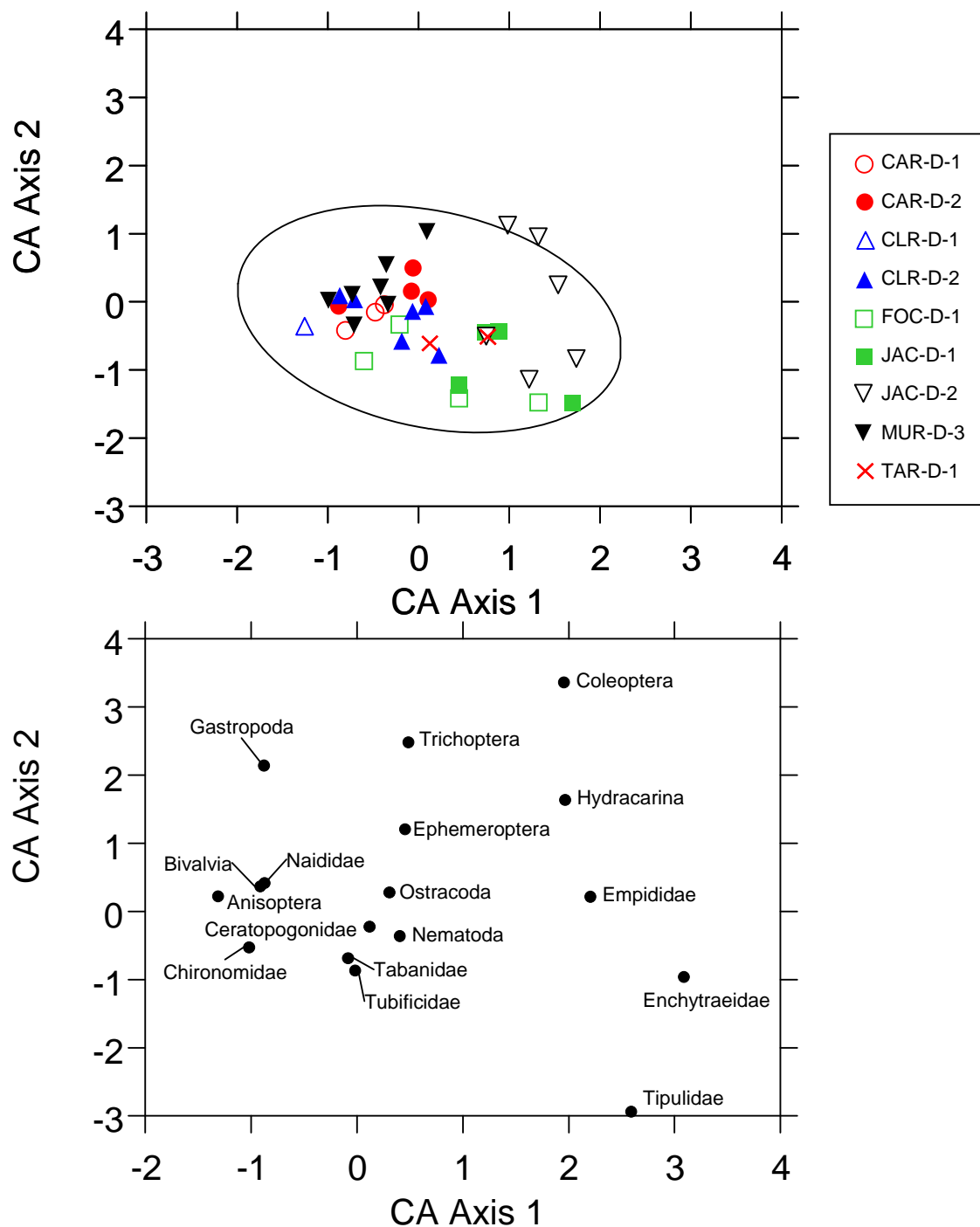
The ordination was carried out using data for all available samples. Average CA axis scores were then computed for each reach (or lake) – year combination. CA annual-average axis scores were illustrated in a biplot, with a 95% confidence ellipse around the baseline data. Sites that fall outside the ellipse for the baseline watercourses could be considered to be unusual, and that may be considered evidence of an effect (Kilgour *et al.*, 1998).

Figure E.3-1 Ordination (Correspondence Analysis) of erosional benthos samples showing RAMP baseline samples from 1998 to 2008.



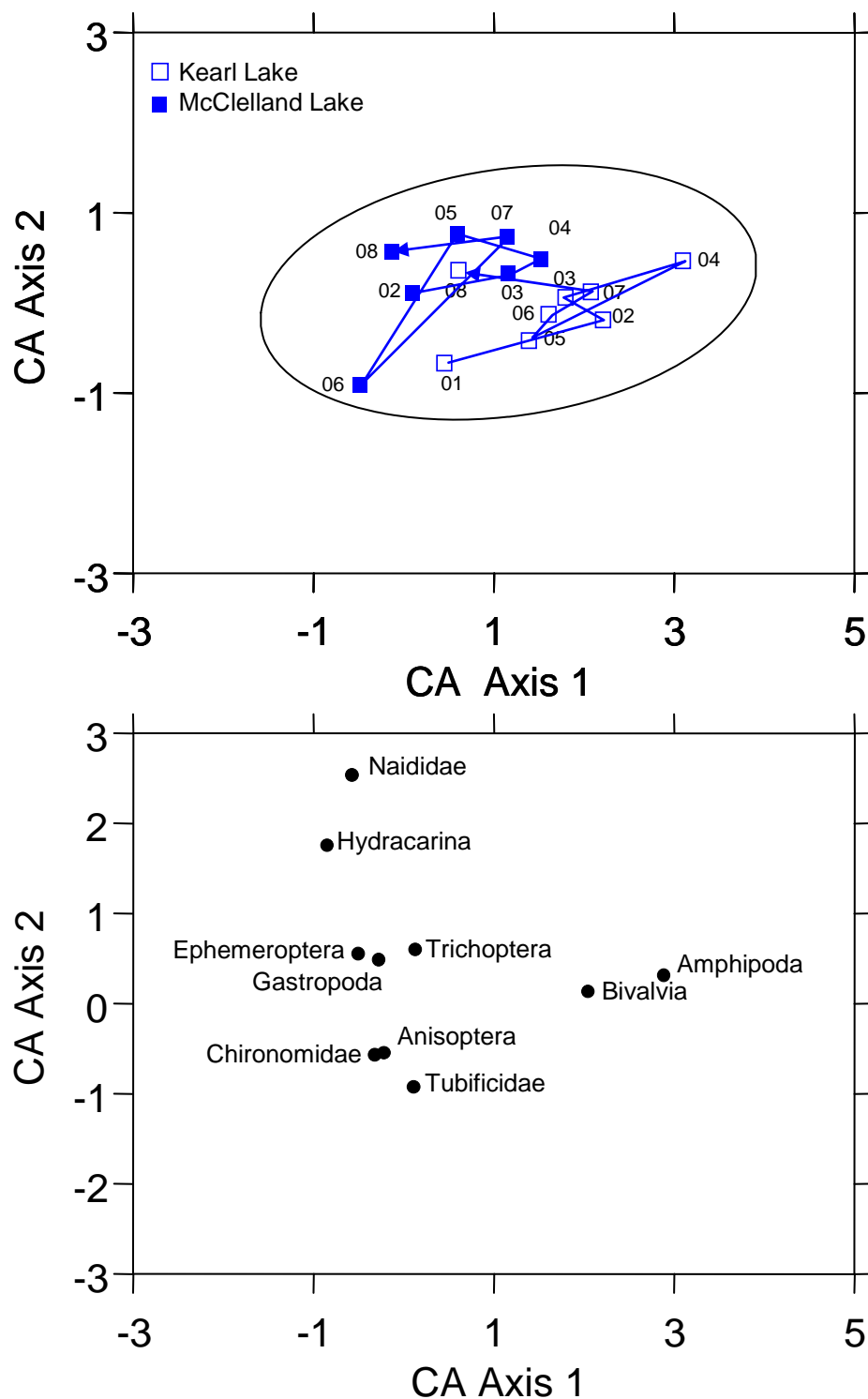
Note: upper panel is the scatterplot of sample scores while the lower panel is the scatterplot of taxa scores. The ellipse in the upper panel is for the baseline data.

Figure E.3-2 Ordination (Correspondence Analysis) of depositional benthos samples showing RAMP baseline samples from 1998 to 2008.



Note: upper panel is the scatterplot of sample scores while the lower panel is the scatterplot of taxa scores. The ellipse in the upper panel is for the baseline data.

Figure E.3-3 Ordination (Correspondence Analysis) of lake benthos samples showing RAMP baseline samples from 1998 to 2008.



Note: upper panel is the scatterplot of sample scores while the lower panel is the scatterplot of taxa scores. The ellipse in the upper panel is for the baseline data.

Appendix F

Principal Components Analysis and Spearman's Rank Correlation of Sediment Quality Data

F.0 PRINCIPAL COMPONENTS ANALYSIS AND SPEARMAN'S RANK CORRELATION OF SEDIMENT QUALITY DATA

F.1 INTRODUCTION

Sediment quality has potential to predict the benthic community because of the close association of the organisms and the substrate. The close association of organism to habitat suggests that degradation of habitat will lead to a measurable response in the organism (Griffith and Kravitz 2008), but the relationships are not always clear (Canfield *et al.* 1994) and can be influenced by other factors, such as trophic interactions with predators (Gilliam *et al.* 1989). Contaminants, such as PAHs, will often accumulate in sediments because of characteristics like hydrophobicity and adsorption to sediment particles desposited on the stream bed. Exposure of organisms to these contaminants, such as PAHs or high levels of metals and sediments associated with these contaminants can lead to mortality and sublethal impacts, such as reproductive or respiratory impairment (Scoggins *et al.* 2007, Peterson 2001, Kiffney and Clements 1994, Clements 1994). Measurements of invertebrate communities exposed to metals in field settings also show impaired states; lower abundance and reduced species richness (Clements *et al.* 1988, Clements *et al.* 1992). Commonly, impacts of contaminated sediments are estimated using lab bioassays (Faria *et al.* 2008), but impacts found during exposures may not translate accurately from lab to field settings (Griffith and Kravitz 2008; Paine *et al.* 1996, Krantzberg 1994) or from individual species to higher levels of biological organization (Kilgour *et al.* 2007). A lack of agreement between laboratory and field analyses may result from an absence of complex interactions of contaminants in lab tests that are found in field settings (Millward *et al.* 2004).

Often in field settings, natural environmental gradients, such as differences in flow rate, temperature and habitat features (i.e. erosional versus depositional) exert considerable influence on the resulting benthic community (Cover *et al.* 2008, Wetzel 2001). The relationships between benthos and physical habitat features (flow, temperature, substrate, etc.) can control distributions of organisms and create variability that may obscure any influence of sediment chemistry on the resulting benthic community.

F.2 METHODS

To assess relationships of sediment characteristics and benthos at RAMP sampling reaches, statistical comparisons of benthic community structure and physical/chemical characteristics of sediments was conducted for depositional reaches sampled by RAMP in 2006, 2007, and 2008. Samples from 2006 were collected from the Calumet, Christina, Ells, Firebag, Jackpine, Muskeg, Fort, and Tar Rivers and McClelland, Kearl, Shipyard, and Isadore's Lakes. In 2007, the Christina, Jackpine, Ells, Firebag, Fort, and Muskeg Rivers and McClelland, Kearl, Shipyard, and Isadore's Lakes were sampled. Additionally, samples of invertebrates and sediments were collected at several sites in Athabasca Delta, including Big Point, Fletcher, and Goose Island during 2007. In 2008, samples were collected from Clearwater, Muskeg, and Beaver Rivers, Big Point, Fletcher, and Goose Island Channels, Fort, Poplar, and Jackpine Creeks, and Isadore's, Shipyard, Kearl, and McClelland Lakes.

Relationships among endpoints of sediment quality and between sediment quality and indices of the benthic communities pooled over sample years were examined for strength and significance; they were assessed using Spearman's rank correlation analysis. Total metals were reduced to summary variables using Principal Components Analysis (PCA) to facilitate comparisons; all other sediment quality variables were included in the analyses independently.

Stepwise multiple regression analysis was undertaken, to explore whether relationships between benthic endpoints and sediment characteristics existed that were more complex than could be identified through simple correlation analysis.

F.2.1 Principal Components Analysis

Principle Components Analysis (PCA) was used to summarize the sediment chemistry dataset and to facilitate broad comparisons of sediment quality among stations; PCA was conducted on all total metals in the dataset, as well as on all sediment variables. Data were prepared and analyzed using the same methods used for the water quality dataset, as described in Appendix D.

F.2.2 Spearman's Rank Correlation Analysis

Spearman's Rank Correlations were used to determine the relationships between sediment quality endpoints and indices of the benthic invertebrate community (abundance, Simpson's Diversity, richness, evenness, and percent EPT). Two-tailed correlations ($\alpha=0.1$) were used in order to account for either positive or inverse relationships. Significance was determined by comparison to published correlation coefficients (r_s) beyond a critical threshold for a given sample size; if r_s of the analysis exceeded the critical $|r_s|$, then the correlation was significant. For the data set analyzed here, the critical value for a sample size of 48 is $|0.283|$. The strength of correlations, regardless of statistical significance, was assigned using the following criteria:

- Weak correlations: $r_s < |0.5|$,
- Moderate correlations: $|0.5| < r_s < |0.75|$,
- Strong correlations: $r_s > |0.75|$.

F.2.3 Stepwise Multiple Regression

Stepwise linear regression was used to explore the potential influence of physical and chemical variables on benthic community richness and abundance.

Before regression analysis was undertaken, some sediment quality variables were removed from the dataset that were strongly auto-correlated or clearly co-linear with one another. Examples include the following:

- Total Petroleum Hydrocarbons was used in the model instead of F2, F3 and F4 hydrocarbon fractions (which themselves comprise TPH);
- Total organic carbon (TOC) and Total Inorganic Carbon (TIC) were used instead of total combustible carbon, given these variables are co-linear; and
- %Fines (i.e., %clay + %silt) was used instead of %sand, %silt and %clay.

Given the strong correlation among nearly all metals in the sediment quality dataset (see Section F.3.1.1), metals principal component scores (PCs 1 and 2) were included to represent metals concentrations.

Stations having blank cells also were removed from the data set before regression analysis.

Physical and chemical variables included in the initial stepwise regression model included the following:

- % Fines;
- % Moisture;
- TIC;
- TOC;
- Metals PC1 (TOTMET PC1);
- Metals PC2 (TOTMET PC2);
- Total petroleum hydrocarbons;
- Total PAHs;
- Naphthalene;
- Retene; and
- Dibenzothiophenes.

Stepwise regression was performed on both raw data measurements as well as log-normalized data. Metals PC scores were not log-normalized, given several PC scores were negative.

Stepwise regression analyses were run forward and backward, with variables added or removed from models based on the significance of their correlation with the independent (benthos) variable. A significance level (P) of 0.05 was used to include/exclude dependant (sediment) variables from each model.

Given the high degree of auto-correlation within the sediment quality dataset (see Section F.3.2.2), an additional stepwise regression was run using input variables to the initial model that were themselves summarized using PCA; this approach eliminated problems of auto-correlation among dependant variables in the model, given all PCs generated through this data reduction were orthogonal.

F.3 RESULTS

F.3.1 Principal Components Analysis

F.3.1.1 Total Metals

Data Screening

Analytes with missing values for 15% or greater a variable or non-detectable values for over 50% of the observations were excluded from the data set. A number of metals had a high rate of non-detection (Table F.3-1), but none were deleted because of a high number of missing values. Non-detectable values that remained in the data were replaced with values at the detection limit for the remainder of the analyses.

Table F.3-1 Total metals removed from the dataset prior to analysis during initial screening.

Analyte	Percent Below Detection Limit (%)
Antimony	93.8
Bismuth	100
Mercury	87.5
Silver	95.8
Tin	91.7

Data Reduction

One PCA was conducted on the total metals that remained following the initial data screening. The total metals PCA (TOTMET) produced three principal components (PCs) which accounted for a total 87.55% of the variance in the dataset (74.26% PC1 and 13.29% for PC2 and PC3 combined; Table F.3-2).

Table F.3-2 Pearson correlations of input variables with output summary variables (i.e., principal components) for the total metals data set.

Input Variable	Summary Variable (Principle Components)		
	TOTMET PC1	TOTMET PC2	TOTMET PC3
Copper	0.98	-0.05	0.06
Nickel	0.98	0.00	0.07
Cobalt	0.97	0.16	0.09
Lead	0.96	0.12	0.15
Aluminum	0.95	0.19	0.10
Potassium	0.95	0.19	0.14
Vanadium	0.94	0.14	0.17
Uranium	0.93	0.12	0.20
Chromium	0.93	0.22	0.13
Arsenic	0.93	-0.02	0.16
Zinc	0.90	-0.31	0.06
Magnesium	0.90	0.25	-0.16
Beryllium	0.90	0.23	0.18
Thallium	0.90	0.18	0.13
Barium	0.86	0.08	-0.45
Iron	0.86	0.20	-0.15
Strontium	0.82	-0.26	-0.46
Calcium	0.79	-0.17	-0.53
Selenium	0.79	-0.44	0.19
Cadmium	0.75	-0.47	0.08
Molybdenum	0.74	-0.48	0.10
Sodium	0.73	-0.49	0.07
Manganese	0.71	0.33	-0.39
Boron	0.71	-0.44	-0.14
Titanium	0.45	0.58	-0.05

Light shading indicates a moderate correlation ($|0.50| < r < |0.75|$) between input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r > |0.75|$) between input variable and summary variable (i.e., PC).

TOTMET PC1 explained most of the variance in the dataset and, with the exception of titanium, was strongly or moderately correlated with all of the input variables. TOTMET PC2 exhibited a moderate correlation with titanium. Only calcium had a moderate correlation with TOTMET PC3. Because all metals (except titanium and boron) had a stronger correlation with TOTMET PC1, TOTMET PC2 and TOTMET PC3 were not used in the Spearman correlation analyses and because they accounted for a small portion of the variance in the dataset.

F.3.1.2 All Sediment Data

This second principal component analysis was run using all input variables to the stepwise regression model, as a means of eliminating auto-correlation among sediment-quality variables. Six PCs were created. PC1 accounted for nearly half (48.7%) of total variance in sediment quality; PC1 to PC3, combined, accounted for nearly 80% of variance in the sediment quality dataset (PC2=19.5%; PC3=10.7%). Subsequent PCs 4 to 6 each accounted for less than 5% of total variance in the dataset.

Most sediment-quality variables were moderately or strongly correlated with PC1, consistent with the high level of correlation within the sediment-quality dataset through correlation analysis.

F.3.2 Spearman's Rank Correlation Analysis

F.3.2.1 Data Screening

Analytes with missing values for 15% or greater of observations or non-detectable values for over 50% of observations were excluded from the data set prior to correlation analysis. Several variables were removed because they violated these criteria, including toxicity-test results and several organic compounds including toluene, xylene, and benzene. Non-detectable values that remained in the data were replaced with values at the detection limit for the remainder of the analyses.

F.3.2.2 Correlations

There were no strong correlations between any of the sediment quality endpoints and the benthic community metrics (Table F.3-3). Only one correlation exceeded 0.5: TOTMET PC1 had a moderate correlation ($r_s=0.529$) with abundance. However, several correlations were statistically significant: abundance had eleven significant relationships with sediment qualities (F3, % clay, % moisture, % sand, % silt, inorganic carbon, total organic carbon by combustion, total organic carbon, naphthalene, retene, and TOTMET PC1) and %EPT had four (% clay, % sand, % silt, and TOTMET PC1). Amongst sediment endpoints, % clay has the highest rate of significant correlation with the benthic metrics (3/5).

Spearman's rank correlations comparing the results among sediment quality endpoints had 73 of 120 (60%) statistically significant results (Table F.3-4). The strongest correlations were between TOC and TCC (0.982), F3 and F4 with total hydrocarbons ($r_s>0.947$), % clay with % sand (-0.908), % silt (0.779), and TOTMET PC1 (0.767); F3 and F4 were correlated with each other (0.880). Dibenzothiopenes was correlated with total PAHs (0.806) and % moisture was correlated with naphthalene (0.769), TCC (0.944), and TOC (0.929). Percent sand was correlated with % silt (-0.948) and TOTMET PC1 (-0.844); % silt was also correlated with TOTMET PC1 (0.870).

Table F.3-3 Spearman's Rank correlations between benthic invertebrate community indices and sediment quality endpoints.

Sediment Endpoint	Abundance	Richness	Evenness	Simpsons	%EPT
F2 (C10-C16)	-0.081	0.016	-0.128	-0.094	-0.037
F3 (C16-C34)	0.288	0.036	0.005	0.067	-0.012
F4 (C34-C50)	0.142	-0.001	-0.010	0.040	-0.015
Total Hydrocarbons (C6-C50)	0.197	0.064	0.094	0.149	0.080
% Clay	0.346	-0.307	-0.151	-0.215	-0.288
% Moisture	0.490	0.068	0.044	0.051	-0.060
% Sand	-0.426	0.220	0.144	0.191	0.325
% Silt	0.466	-0.171	-0.152	-0.199	-0.373
Inorganic Carbon	0.480	-0.058	-0.120	-0.091	-0.225
Total Carbon by Combustion	0.433	0.015	0.058	0.082	-0.023
Total Organic Carbon	0.382	0.037	0.053	0.079	0.003
Dibenzothiopenes	0.232	-0.043	-0.068	-0.035	-0.165
Naphthalene	0.477	-0.094	-0.067	-0.069	-0.082
Retene	0.354	0.127	0.238	0.306	0.173
TOTMET PC1	0.529	-0.276	-0.219	-0.262	-0.411

Critical value= |0.283|; n=48

Table F.3-4 Spearman's Rank Correlation Coefficients for the sediment quality endpoints

	Total PAH	% Clay	% Moisture	% Sand	% Silt	TOTMET PC1	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)	Naphthalene
Total PAH	1.000									
% Clay	0.094	1.000								
% Moisture	0.170	0.638	1.000							
% Sand	-0.186	-0.908	-0.659	1.000						
% Silt	0.232	0.779	0.564	-0.948	1.000					
TOTMET PC1	0.170	0.767	0.563	-0.844	0.870	1.000				
F2 (C10-C16)	0.325	-0.038	-0.039	-0.036	0.105	-0.111	1.000			
F3 (C16-C34)	0.532	0.349	0.636	-0.371	0.306	0.258	0.472	1.000		
F4 (C34-C50)	0.471	0.184	0.483	-0.195	0.163	0.054	0.535	0.880	1.000	
Naphthalene	0.091	0.603	0.769	-0.643	0.597	0.642	-0.282	0.317	0.093	1.000
Retene	0.633	0.181	0.499	-0.185	0.145	0.136	0.177	0.588	0.563	0.350
Total Hydrocarbons (C6-C50)	0.524	0.296	0.610	-0.312	0.247	0.154	0.486	0.964	0.947	0.257
Inorganic Carbon	0.055	0.409	0.392	-0.542	0.639	0.733	-0.069	0.070	-0.149	0.550
TCC	0.218	0.596	0.944	-0.638	0.548	0.519	-0.026	0.621	0.495	0.797
TOC	0.211	0.560	0.929	-0.593	0.493	0.448	-0.013	0.615	0.521	0.738
Dibenzothiopenes	0.806	0.158	0.069	-0.261	0.334	0.269	0.364	0.448	0.363	0.085

Critical value= |0.283|; n=48; IC=inorganic carbon; TCC=total carbon by combustion; TOC=total organic carbon.

Light shading indicates a moderate correlation ($|0.50| < r < |0.75|$) between input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r > |0.75|$) between input variable and summary variable (i.e., PC).

Table F.3-4 (Cont'd.)

	Retene	Total Hydrocarbons (C6-C50)	IC	TCC	TOC	Dibenzothiopenes
Total PAH						
% Clay						
% Moisture						
% Sand						
% Silt						
TOTMET PC1						
F2 (C10-C16)						
F3 (C16-C34)						
F4 (C34-C50)						
Naphthalene						
Retene	1.000					
Total Hydrocarbons (C6-C50)	0.646	1.000				
IC	0.088	-0.022	1.000			
TCC	0.626	0.618	0.368	1.000		
TOC	0.610	0.631	0.274	0.982	1.000	
Dibenzothiopenes	0.453	0.395	0.238	0.145	0.091	1.000

Critical value= |0.283|; n=48; IC=inorganic carbon; TCC=total carbon by combustion; TOC=total organic carbon

Light shading indicates a moderate correlation ($|0.50| < r < |0.75|$) between input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r > |0.75|$) between input variable and summary variable (i.e., PC).

F.3.3 Stepwise Regression Analysis

A meaningful multiple-regression model could not be developed relating benthic abundance to sediment-quality variables, because of too much autocorrelation between the physical and chemical variables, even with the obviously auto-correlated variables removed. On any forward run, once the first variable was added to the model, none of the remaining possible variables met the maximum P criteria for addition (0.05). The P criterion was increased from 0.05 to 0.15 and still no additional variables met the minimum criteria. The following variables individually were highly correlated with Abundance: %moisture, inorganic carbon and Metals PC1. However, these variables were also auto-correlated; therefore, it was not possible to attribute differences in benthic abundance to any one physical or chemical variable.

No model could be developed for richness as all, given none of the possible input variables were sufficiently correlated with richness to meet the model's significance criterion (i.e., <0.05). As with the abundance model, an increase (relaxing) of the significance level from 0.05 to 0.15 still did not allow addition of variables to the forward regression model.

Stepwise linear regression was re-run using the six PCs as possible independent variables. The model for abundance only contained PC1 and yielded a low R^2 of 0.16. All other input variables (PCs) exhibited poor correlation with abundance, typically well in excess of $P=0.05$ or 0.15, precluding their addition to the model. No PCs were sufficiently correlated with benthic richness to meet the model's significance criteria (either 0.05 or 0.15).

F.4 DISCUSSION

No distinct responses were detected between the sediment quality endpoints and the estimates of the benthic community, although several were statistically significant. Many indices of the benthic community were correlated with natural gradients, such as substrate size, supporting the importance of natural gradients in structuring benthic communities (Death 1995).

A large number of sediment quality endpoints had very strong correlations with one another. These results are not surprising and support that many of the sediment quality endpoints are known to correlate naturally, or were collinear (e.g., TOC and TCC, hydrocarbon fractions and total hydrocarbons).

Several of the correlations of abundance and evenness with sediment quality endpoints were not mutually exclusive; abundance was correlated with %-clay and %-moisture, but %-moisture and %-clay are also correlated.

Where significant correlations between key sediment-quality measurement endpoints (e.g., metals, PAHs and hydrocarbons) and benthic endpoints were observed, such correlations were generally positive (e.g., benthic abundance was positively related to both metals and specific PAHs and hydrocarbon fractions). This likely simply reflects strong autocorrelation within the dataset, given depositional benthos were positively correlated with %-fines and organic carbon, which also were positively with metals and hydrocarbon concentrations.

Additional exploration of relationships between benthic endpoints and sediment-quality variables using stepwise multiple regression also did not indicate that metals and hydrocarbons in sediments were drivers of benthic community composition. Although it is possible that auto-correlation among sediment-quality variables could have obscured subtle effects of these chemicals, such effects were not measurable within the dataset.

F.5 CONCLUSION

Benthic endpoints showed stronger relationships with physical sediment factors, such as substrate size and carbon content, which suggests that these components of habitat exert more control on benthic community composition than sediment chemistry. No specific relationships were indicated between benthic composition and concentrations of metals or hydrocarbons in sediments.

These results are consistent with toxicity tests undertaken by RAMP on a subset of these sediments, which showed similar or greater survival or growth of test organisms invertebrates in these sediments relative to laboratory controls.

Appendix G
Fish Population Component

G.0 FISH POPULATION COMPONENT

G.1 COMMON AND SCIENTIFIC NAMES FOR FISH SPECIES CAPTURED IN THE 2008 RAMP FISH POPULATION COMPONENT

Table G.1-1 Common and scientific names for fish species captured for the RAMP Fish Population component, 2008.

Common Name	Scientific Name	Code
arctic grayling	<i>Thymallus arcticus</i>	ARGR
Brassy minnow	<i>Hybognathus hankinsoni</i>	BRMN
brook stickleback	<i>Culaea inconstans</i>	BRST
burbot	<i>Lota lota</i>	BURB
cisco	<i>Coregonus artedii</i>	CISC
emerald shiner	<i>Notropis atherinoides</i>	EMSH
flathead chub	<i>Platygobio gracilis</i>	FLCH
goldeye	<i>Hiodon alsoides</i>	GOLD
lake chub	<i>Couesius plumbeus</i>	LKCH
lake whitefish	<i>Coregonus clupeaformis</i>	LKWH
lake trout	<i>Salvelinus namaycush</i>	LKTR
longnose dace	<i>Rhinichthys cataractae</i>	LNDC
longnose sucker	<i>Catostomus catostomus</i>	LNDC
mountain whitefish	<i>Prosopium williamsoni</i>	MNWH
ninespine stickleback	<i>Pungitius pungitius</i>	NNST
northern pike	<i>Esox lucius</i>	NRPK
pearl dace	<i>Semotilus 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

G.2 EXTERNAL HEALTH ASSESSMENT INDEX CODES FOR FISH EXAMINATION

Table G.2-1 External health assessment index (HAI) codes for fish examination.

Variable	Variable Condition	Code	HAI Value
eyes	no aberrations; good "clear" eye	N	0
	blind; an opaque eye (one or both)	B	30
	swollen, protruding eye (one or both)	E	30
	hemorrhaging or bleeding in the eye (one or both)	H	30
	missing one or both eyes	M	30
	other; any condition not covered above	OT	30
gills	normal; no apparent aberrations	N	0
	frayed; erosion of tips of gill lamellae resulting in "ragged" gills	F	30
	clubbed; swelling of the tips of gill lamellae	C	30
	marginate; gills with light, discoloured margin along tips the lamellae	M	30
	pale; very light in colour	P	30
	other; any condition not covered above	OT	30
pseudobranchs	normal; flat, containing no aberrations	N	0
	swollen; convex in aspect	S	30
	lithic; mineral deposits, white, somewhat amorphous spots	L	30
	inflamed; redness, hemorrhage, or other	I	30
	other; any condition not covered above	OT	30
thymus	no hemorrhage	0	0
	mild hemorrhage	1	10
	moderate hemorrhage	2	20
	severe hemorrhage	3	30
skin	normal; no skin aberrations	0	0
	mild skin aberrations	1	10
	moderate skin aberrations	2	20
	severe skin aberrations	3	30
fins	no active erosion	0	0
	light active erosion	1	10
	moderate active erosion with some hemorrhaging	2	20
	severe active erosion with hemorrhaging	3	30
opercle	no shortening	0	0
	mild shortening	1	30
	severe shortening	2	30
hindgut	normal; no inflammation or reddening	0	0
	slight inflammation or reddening	1	10
	moderate inflammation or reddening	2	20
	severe inflammation or reddening	3	30

Table G.2-1 (Cont'd.)

Variable	Variable Condition	Code	HAI Value
body deformities	none	none	0
	any deformity (provide details)	n/a	30
mesenteric fat	none	0	n/a
	< 50 % coverage of mesentery	1	n/a
	50 % coverage of mesentery	2	n/a
	> 50 % coverage of mesentery	3	n/a
	100% of mesentery covered	4	n/a
liver	normal; solid red or light red colour	A	0
	"fatty" liver; "coffee with cream" colour	C	30
	nodules in the liver; cysts or nodules	D	
	focal discolouration; distinct localized colour changes	E	30
	general discolouration; colour change in whole liver	F	30
	other; any condition not covered above	OT	30
spleen	normal; black, very dark red, or red	B	0
	granular; rough appearance of spleen	G	30
	nodular; containing fistulas or nodules of varying sizes	D	30
	enlarged; noticeable enlarged	E	30
	other; any condition not covered above	OT	30
gall bladder	normal	0	0
	enlarged	1	30
	parasites	2	n/a
kidney	normal; firm dark red colour, lying relatively flat along vertebral column	N	0
	swollen; enlarged or swollen wholly or in part	S	30
	mottled; gray discolouration	M	30
	granular; granular appearance and texture	G	30
	urolithiasis/nephrocalcinosis; white/cream mineral material in tubules	U	30
	other; any condition not covered above	OT	30
parasites	no observed parasites	0	0
	few observed parasites	1	10
	moderate parasite infestation	2	20
	numerous parasites	3	30

G.3 FISH DISTRIBUTION MAPPING

A fish species distribution mapping project was conducted in 2008 for the RAMP FSA using data from all studies historically conducted within the region. This project was the initial step in a continuing process to improve the RAMP fish component and gain a better understanding of the regional fish population distributions and the fish community assemblage within each watershed. A review of the RAMP fish program included the advantage of monitoring the whole fish community assemblage in tributaries adjacent and within focal project leases to assess changes in fish populations from focal projects. Based on these recommendations, there were two objectives to this project:

- Determine the resident species in each watershed to use as indicators of localized changes from focal projects upstream of the area; and
- Assess areas of higher species richness and the distribution of fish species in each watershed to determine locations to conduct fish community assemblage studies.

Fish inventory data was collected from the Fisheries Management Information System (FMIS) and additional sources including EIAs and baseline studies for the RAMP focus study area (FSA). Available data through these sources ranged from 1978 to 2008. Data was collected for all gear types, including minnow traps, angling, electrofishing, seining, creel surveys, and other nets, and in all watercourses and waterbodies within the RAMP FSA. Given the focus of the project are the smaller tributaries where localized changes in fish populations would be detected rather than the Athabasca River, where conditions are variable and changes not as easily evident in fish populations, data is presented for the tributaries and not discussed for the mainstem Athabasca River.

G.3.1 Fish Species Residency

To determine localized changes in the aquatic environment, resident species are a better indicator given they are present throughout the year relative to migratory species that occupy watercourses only at certain times of the year. Although resident fish species are mentioned in various sources, there are not many that actually define the term. Some sources indicate that all life history stages of a species must be present within a waterbody to be classified as resident or that all life history stages for a species should be present throughout a watershed to be classified as resident. These classifications could not be used for this study given the data collected through FMIS did not include, for most cases, life history stages of individuals captured. For the purpose of this study, the RAMP Fish Subgroup, therefore, defined a resident species of a watershed as any species found present in at least two consecutive years and in two seasons in a watershed. This classification could indicate consistent annual presence and presence during spawning, feeding or overwintering seasons indicating the use of the watershed across life history stages. Table G.3-1 displays the species in each watershed classified as resident.

Generally many species were classified as resident in the Athabasca, Clearwater and Steepbank rivers. The other tributaries had fewer resident species possibly indicating that these watercourses are only occupied during one season such as spring for spawning. However, the smaller number of resident species in the other tributaries could be attributed to infrequent sampling periods, only in some seasons and years and in some cases, not the most recent year. Despite these discrepancies in the data, the results still provide a general guide to the species composition within a watershed.

G.3.2 Species Richness

Species richness (# of species captured) was mapped in each watershed at the sampling location using data collected from all historical sampling programs (Figure G.3-1). The majority of watercourses exhibited five to ten species; the larger watercourses such as the Clearwater and Muskeg rivers exhibited greater than 10 species. The species richness for the Athabasca River was not included in this map given there was so many sampling locations. However, generally, the Athabasca River has between 15 and 20 species. The species richness in the Muskeg River near the mouth was high because data was collected from a fish fence program where capture success is much higher than with other gear types.

G.3.3 Relative Abundance

Species relative abundance was calculated using catch-per-unit-effort data from electrofishing sampling programs. Effort data for other gear types were inconsistent making it difficult to calculate a standardized catch-per-unit-effort and not easily comparable across gear types. Electrofishing data covered more than half of the dataset and could be comparable to fish studies conducted for RAMP which generally uses electrofishing for most programs. Relative abundance by species was calculated as the catch per 100 seconds of electrofishing. To note, the FMIS data did not differentiate between boat and backpack electrofishing; therefore all of the electrofishing data was combined. Relative abundance at each sampling location was mapped by season for large and small-bodied species for all years combined (Figure G.3-2 and Figure G.3-3). Relative abundance was not displayed for the Athabasca River given the large amount of sampling conducted in the waterbody.

Table G.3-1 Resident fish species classified based on RAMP Fish Subgroup criteria of at least two consecutive years and at least two seasons.

Species	Athabasca	Calumet	Clearwater	Ells	Firebag	Fort Creek	Horse	MacKay	McLean	Muskeg	Original Poplar	Steepbank	Tar	Upper Beaver
ARGR	X	X	X		X		X			X		X		X
BRMN														X
BRST	X		X		X		X			X	X	X	X	X
BULL														X
BURB	X		X											X
EMSH	X													
FLCH	X													
FNDC			X											
FTMN			X								X			
GOLD	X		X					X						
LKCH	X		X	X	X		X	X		X	X	X		
LKTR			X											
LKWH	X		X					X						
LNDC			X	X	X							X		
LNSC	X		X				X	X		X		X		
MNWH	X		X									X		
NRPK	X		X		X			X		X		X		
PRDC	X	X	X		X					X		X	X	
SLSC			X				X			X		X		
SPSC	X		X									X		
SPSH	X		X											
TRPR	X		X	X	X		X					X		
WALL	X		X		X		X	X				X		
WHSC	X		X	X	X		X	X		X	X	X	X	
YLPR	X		X											

Note: X denotes a resident species in specified watershed.

Figure G.3-1 Fish species richness in watercourses in the RAMP FSA for data collected from 1978 to 2008.

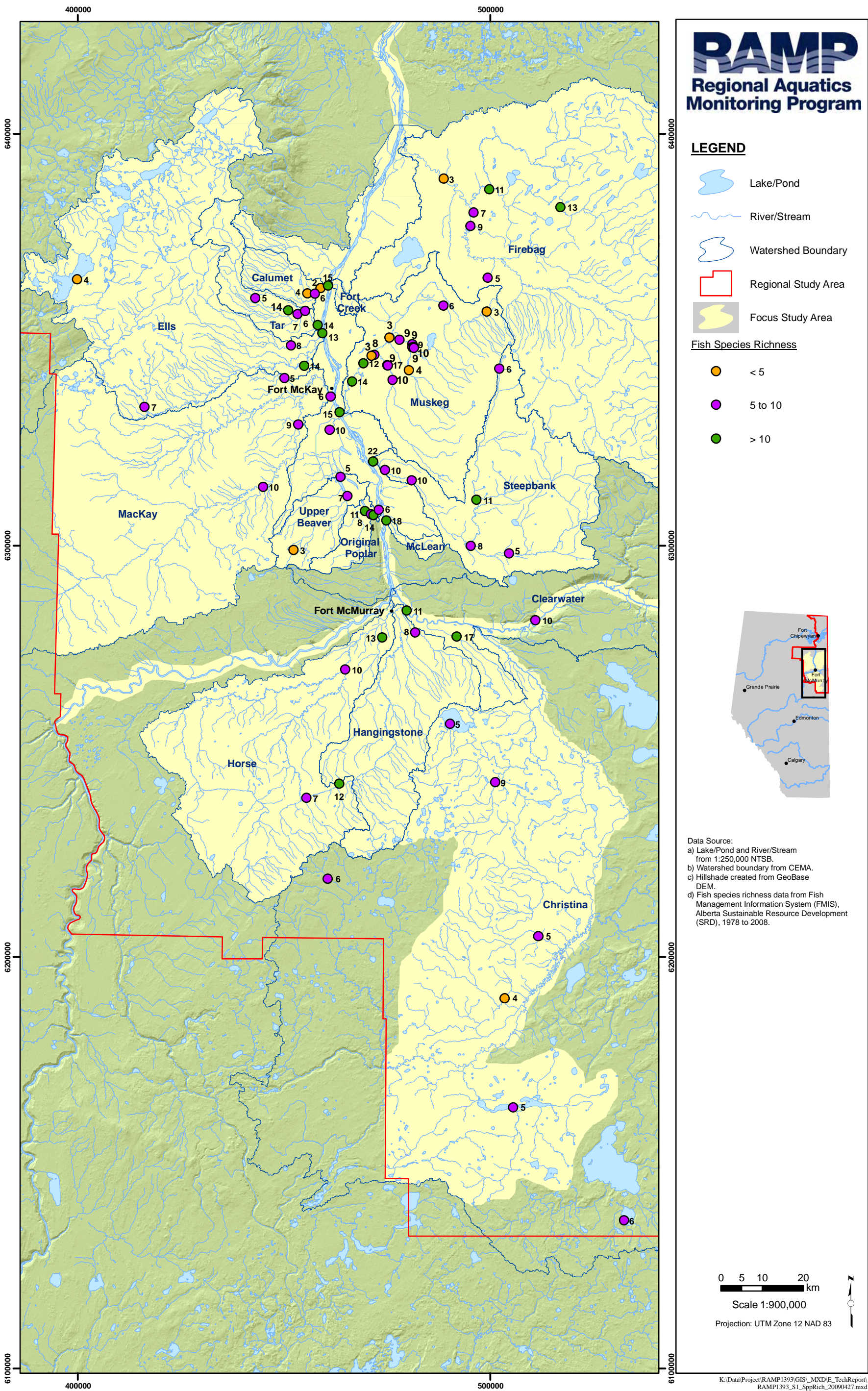


Figure G.3-2 Relative abundance (#/100 seconds of electrofishing) of all small-bodied fish species combined for spring, summer and fall data collected from 1978 to 2008.

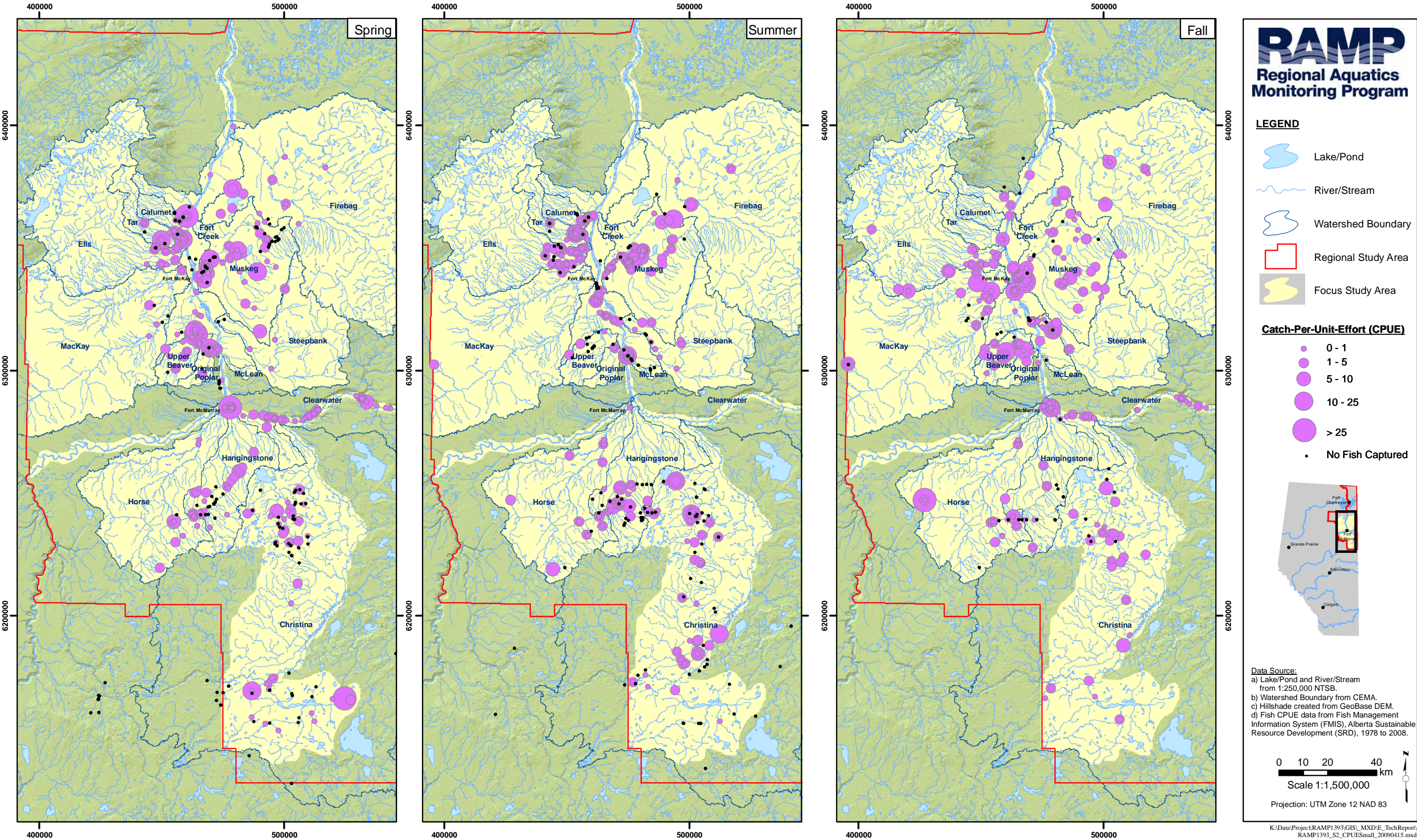
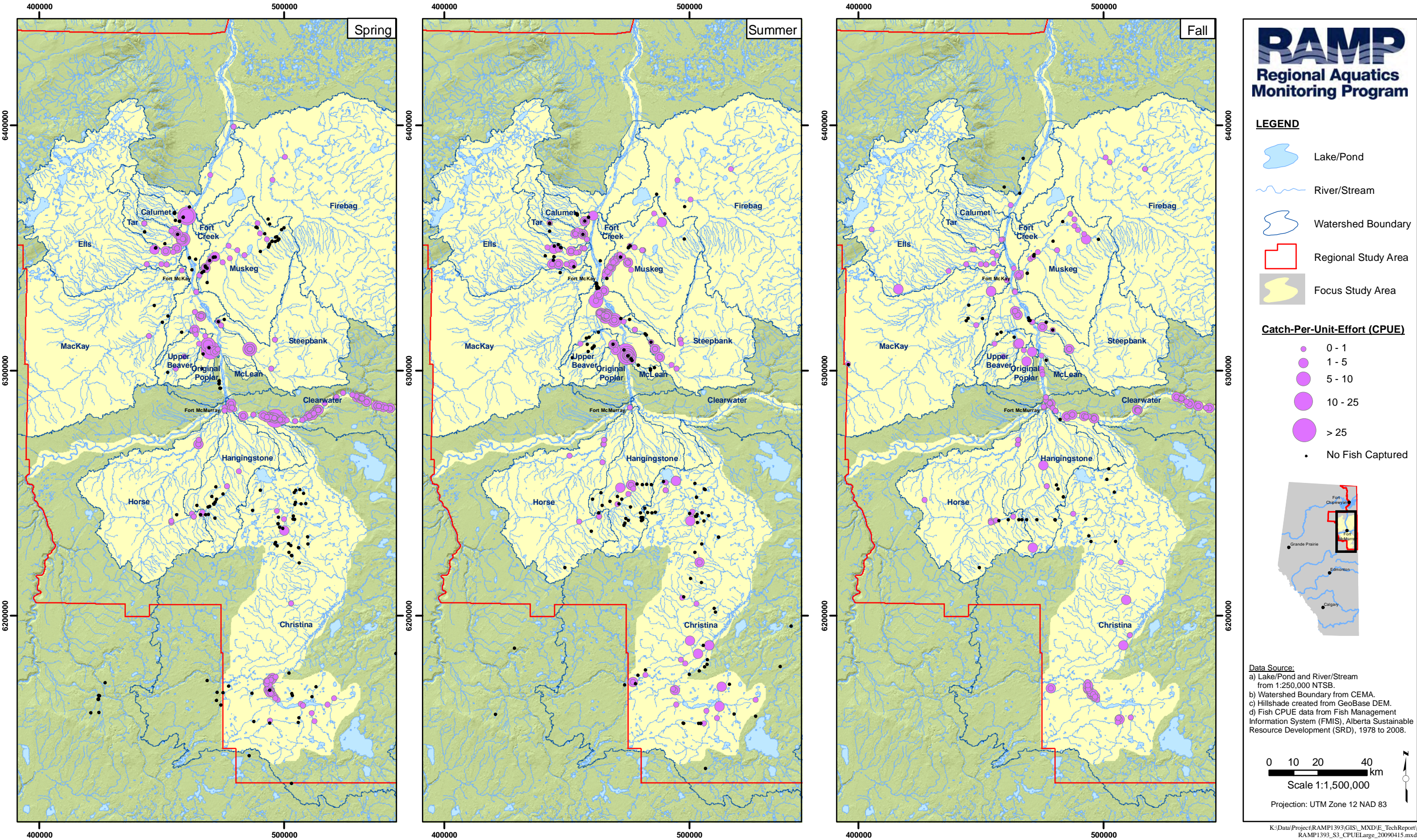


Figure G.3-3 Relative abundance (#/100 seconds of electrofishing) of all large-bodied fish species combined for spring, summer and fall data collected from 1978 to 2008.



G.3.4 Data Limitations and Assumptions

There were limitations to the data used for this study that should be taken into account when interpreting the results:

- Available data is not standardized given all studies had different objectives and were designed differently;
- Uncertainty of whether the historical studies targeted one species or all species;
- Data was only available from studies reported to ASRD but might not include all studies conducted within the RAMP FSA;
- All data from 2007-2009 had not yet been entered into FMIS for the region at the time of the project; and
- The infrequency of sampling and the absence of some years and seasons were not consistent.

The assumptions that were made during this study were as follows:

- Two or more seasons in two or more years is an accurate representation of residency patterns;
- If there was no season specified, assume at least one season when classifying residency status;
- Species identification was done correctly in all sampling programs;
- Areas of a watercourse where no fish were captured had unsuitable fish habitat and no fishing was conducted;
- The level of experience and ability in each sampling crew across all programs was consistent;
- Defined seasons were based on RAMP classifications; sampling that overlapped seasons were designated to one of the seasons; and
- If a species wasn't caught during a study then it is not present in that waterbody.

G.3.5 Conclusions

The information gained from this project will assist to identify the areas of each watershed where fish community studies can be conducted as a monitoring tool to detect change in fish populations from focal projects. Using the distribution of species diversity and relative abundance, the location of reaches in watercourses where whole fish community assemblages, including the majority of species reported in the RAMP FSA, can be defined and monitored over a long period of time.

Appendix H
Acid-Sensitive Lakes Component

H.0 ACID-SENSITIVE LAKES COMPONENT

Appendix H presents the descriptive portions of the Acid-Sensitive Lakes (ASL) component for 2008. Results of between-year comparisons of endpoint parameters, calculations of critical loads of acidity for each lake, and trend analyses on the ASL measurement endpoints can be found in Section 6.5. Appendix H covers the following:

- The chemical characteristics of the RAMP ASL lakes were reviewed in greater detail than in Section 6.5 with the addition of the 2008 data;
- The chemistry of the 50 ASL lakes in 2008 was compared to that in 450 lakes within the Oil Sands region reported by the NO_xSO_x Management Working Group (NSMWG);
- The ion chemistry of the ASL lakes in 2008 was characterized using Piper plots;
- Trace metal concentrations in the RAMP ASL lakes were summarized and relationships between metal concentrations, lake location and chemistry were noted; and
- Estimates of the seasonal variability in water quality parameters in ten of the ASL lakes were updated with the 2008 data and summary statistics were calculated.

H.1 SUMMARY STATISTICS

The chemical variables for the 50 RAMP ASL lakes, augmented with data from the 2008 field season, are contained in the RAMP database. Table H.1-1 presents the summary statistics for all data between 2002 and 2008 as well as for 2008 individually. As described in Section 6.5, the RAMP lakes cover a large range of lake types from softwater to hardwater. Historically, the pH of the lakes has ranged from 3.97 to 9.46 with a median value of 6.76. Gran alkalinity has ranged from negative values to 1802 µeq/L with a median of 193 µeq/L. Concentrations of sulphate are relatively low and range from non-detectable to 16.7 mg/L with a median concentration of 1.15 mg/L. By conventional standards, most of the RAMP lakes are considered humic with a median dissolved organic carbon (DOC) concentration of 21.4 mg/L (Korteleinen et al. 1989; Forsius 1992; Driscoll et al. 1991). Over 60% of the RAMP ASL lakes are considered to be highly sensitive or moderately sensitive to acidification by classifications based on pH, Gran alkalinity and Critical Load (Section 3.5.1). In general, nitrates are quite low (median 3 µg/L) although individual lakes may have nitrate concentrations two orders of magnitude greater than this. Total phosphorus covers a broad range of 3.6 µg/L to 341 µg/L with a median concentration of 39.9 µg/L.

In general, the mean concentrations (over all the RAMP lakes) of most parameters in 2008 were similar to those observed in previous years. This was tested statistically in the ANOVA reported in Section 6.5. Although not statistically significant, increases in 2008 are observed in TDS, sodium and sulphate.

Table H.1-1 Summary statistics for lakes sampled for the RAMP ASL component, 1999 to 2008.

Parameter	Minimum		Maximum		Mean		Median		5th Percentile 2008	95th Percentile 2008
	1999-2008	2008	1999-2008	2008	1999-2008	2008	1999-2008	2008		
Lab pH	3.97	4.12	9.46	8.34	6.55	6.55	6.76	6.66	4.75	7.91
Total Alkalinity (µeq/L)	0.00	0.00	1784	1727	311	316	214	208	21.2	1085
Gran Alkalinity (µeq/L)	-57.2	-44.2	1802	1720	298	295	193	187	-18.1	1073
Specific Cond. (µS/cm)	10.5	13.0	180	175	45.6	44.2	30.3	30.0	14.5	106.8
Total Dissolved Solids (mg/L)	0.02	0.02	219	214	67.4	71.1	61.3	59.0	28.2	142
Turbidity (NTU)	0.321	0.321	53.0	27.7	3.92	3.99	1.88	2.17	0.701	11.8
Colour (TCU)	8.00	9.30	948	476	151	163	123	133	21.1	384
Sodium (mg/L)	0.184	0.640	10.4	9.70	1.98	2.36	1.33	1.63	0.718	6.41
Potassium (mg/L)	0.000	0.120	2.40	2.11	0.518	0.578	0.44	0.43	0.17	1.232
Calcium (mg/L)	0.20	0.38	32.2	20.1	5.61	5.34	4.63	4.66	1.10	13.3
Magnesium (mg/L)	0.114	0.270	13.6	6.08	1.79	1.71	1.40	1.28	0.357	4.34
Bicarbonate (mg/L)	0.92	0.00	109	105	18.9	19.5	13.1	12.7	1.30	66.2
Chloride (mg/L)	0.02	0.07	2.64	2.39	0.363	0.334	0.196	0.220	0.074	1.27
Sulphate (mg/L)	0.175	0.430	16.7	16.4	2.28	2.71	1.15	1.30	0.554	11.2
Total Dissolved Nitrogen (µg/L)	105	332	2891	2270	848	808	698	740	394	1572
Ammonia (µg/L)	0.35	1.00	1509	69	39.3	15.0	15	10	1	39.6
Nitrate + Nitrite (µg/L)	0.02	0.5	733	271	20.5	13.5	3	3	0.7	30.8
Total Phosphate (µg/L)	3.60	6.00	341	166	55.3	46.4	39.9	33.9	12.1	121.4
Dissolved Phosphate (µg/L)	1.20	4.00	156	120	20.3	19.7	11.5	11.0	5	65
Dissolved Inorganic Carbon (mg/L)	0.0269	0.100	20.3	19.4	3.17	3.18	1.98	1.90	0.24	11.0
Dissolved Organic Carbon (mg/L)	6.80	7.30	81.2	52.1	22.8	23.1	21.4	20.1	9.88	39.5
Chlorophyll a (µg/L)	0.60	0.86	371	125	20.5	21.6	9.61	9.55	2.30	65.8
Iron (mg/L)	0.001	0.01	3.88	3.65	0.37	0.60	0.18	0.38	0.03	2.06
Total Nitrogen (µg/L)	274	324	6558	4300	1237	983	984	800	415	2244
Total Kjeldahl Nitrogen (µg/L)	273	323	6552	4296	1216	969	958	759	412	2243
Sum base cations (µeq/L)	38.19	78.3	2291	2005	556	535	439	428	143	1277
Dissolved Aluminum (µg/L)	0.10	0.47	681	422	70.84	70.2	24.90	38.8	0.95	284.8

Note: Shaded parameters represent significant differences between years as described in the text.

H.2 COMPARISON OF ASL LAKE CHEMISTRY IN 2008 TO REGIONAL LAKES

The 50 RAMP Lakes in 2008 displayed characteristics similar to lakes in a database of 432 lakes (RAMP lakes excluded) within the Oil Sands region reported by the NO_xSO_x Management Working Group (NSMWG), but with several distinct differences. The two populations are compared statistically in Table H.2-1 and selected variables are presented graphically in box plots (Figure H.2-1). Key results of this comparison are as follows:

- The RAMP ASL lakes covered a slightly narrower pH range (4.18 to 8.34 units) with a lower median value (6.66 vs. 7.69). The mean pH of the RAMP ASL lakes is significantly less than that of the NSMWG regional database ($P < 0.005$);
- Total alkalinity in the 2008 RAMP ASL lakes ranged from 0 µeq/L to 1,728 µeq/L with a median of 208 µeq/L, much lower than the regional median (1,020 µeq/L). Mean total alkalinity in the RAMP ASL lakes in 2008 was significantly less than that in the NSMWG database ($P < 0.05$);
- Conductivity was relatively low in the RAMP ASL lakes and ranged from 13.0 µS/cm to 175.4 µS/cm (median: 30.0 µS/cm). The regional median for conductivity was 125 µS/cm. The mean conductivity of the RAMP ASL lakes in 2008 was significantly less than that of the regional lakes;
- Consistent with the lower conductivity in the RAMP ASL lakes, the mean and median concentrations of the principal cations (calcium, magnesium, sodium and potassium) and the sum of base cations (SBC) were all less than the values in the NSMWG database. Median SBC in the RAMP ASL lakes in 2008 was 429 µeq/L compared to 1,247 µeq/L in the regional lakes. The mean values of these parameters were all significantly less in the RAMP ASL lakes ($P < 0.05$);
- The mean and medium concentrations of the major anions (chloride, sulphate and titration bicarbonate) were all less than those in the regional database;
- Total P was quite variable in the ASL and regional lake database with individual lakes attaining concentrations that would classify them as eutrophic (Wetzel 2001). The highest phosphorus concentration observed in the ASL lakes in 2008 was 166 µg/L in Lake 454 (L46) in the Birch Mountains. The highest phosphorus concentration in the regional lake database was 495 µg/L. The median phosphorus concentration in the ASL lakes was 33.9 µg/L compared with 49.0 µg/L in the regional lakes. There was no significant difference in Total P between the 2008 RAMP ASL lakes and the regional lakes; and
- Nitrate concentrations in the RAMP ASL lakes were generally low (median: 3.00 µg/L), although several lakes had values two orders of magnitude greater than the median (e.g., 271 µg/L in Lake 455/L47 in the Birch Mountains). Nitrate concentrations in the regional database were similarly variable with a median of only 2 µg/L and occasional lakes having concentrations as high as 1860 µg/L. There was no significant difference in nitrates between the ASL lakes and the regional lake database, although Total Nitrogen concentrations were significantly greater in the RAMP ASL lakes.

The chemical differences between the RAMP ASL lakes and the regional lakes reflect the bias in the selection process for the RAMP ASL component. The RAMP ASL lakes were selected for their acid sensitivity which, in practice, meant selecting lakes having the lowest pH, alkalinity and conductivity. These types of lakes are often the smallest lakes and are often located in the upland regions where catchments were dominated by fens.

Table H.2-1 Comparison between RAMP ASL lakes and 450 regional lakes in the NSMWG database.

Variable	Units	RAMP Lakes (2008)				Regional Lakes				
		Min	Max	Median	Mean	No.	Min	Max	Median	Mean
Lake Area	Km ²	0.031	43.4	1.3	2.86	431	0.01	214	1.6	6.26
Catchment Area	Km ²	0.70	224	15.3	28.1	432	0.08	1769	17.4	89.3
Drainage Ratio		0.22	88.6	10.1	15.7	431	1.43	1178	13.0	26.2
Runoff	m ³ /s	0.00	8.57	0.04	0.30	432	0.00	5	0.0	0.258
Lab pH		4.12	8.34	6.66	6.6	432	4.2	10	7.7	7.66
Total Alkalinity	µeq/L	0.00	1727	208	316	432	0	4797	1020	1241.2
Specific Conductivity	µS/cm	13.0	175.4	30.0	44.2	399	11	481	125	144.3
Dissolved Organic Carbon	mg/L	7.30	52.1	20.1	23.1	383	0.2	60	19.4	20.4
Sodium	mg/L	0.64	9.70	1.63	2.36	432	0.28	49	2.0	4.07
Potassium	mg/L	0.13	2.08	0.41	0.57	432	0.05	14	0.62	0.943
Calcium	mg/L	0.38	20.10	4.66	5.34	432	0.25	64	14.3	17.0
Magnesium	mg/L	0.17	6.88	1.45	1.85	432	0.05	28	4.3	5.34
Sum of Base Cations	µeq/L	78.3	2005	428	535	432	46	5770	1247	1487
Chloride	mg/L	0.07	2.39	0.22	0.33	429	0.01	18	0.49	1.09
Sulphate	mg/L	0.4	16.38	1.3	2.7	431	0.025	99	2.5	6.73
Nitrate + Nitrite	µg/L	0.50	271	3.00	13.5	329	0.02	1860	2.0	21.0
Ammonia	µg/L	1	69	10	15	320	0.22	650	11.4	31.8
Total Nitrogen	µg/L	324	4300	800	983	150	183	1904	861	869.47
Total Phosphate	µg/L	6.00	166	33.9	46.4	426	3	495	49.0	66.6

Shaded parameters represent significantly different means using a student's T test or non-parametric test when variances were non-homogenous (P<0.05).

Figure H.2-1 Box plots of selected chemical parameters for the RAMP ASL lakes in 2008 versus 450 regional lakes reported by the NSMWG (WRS 2004).

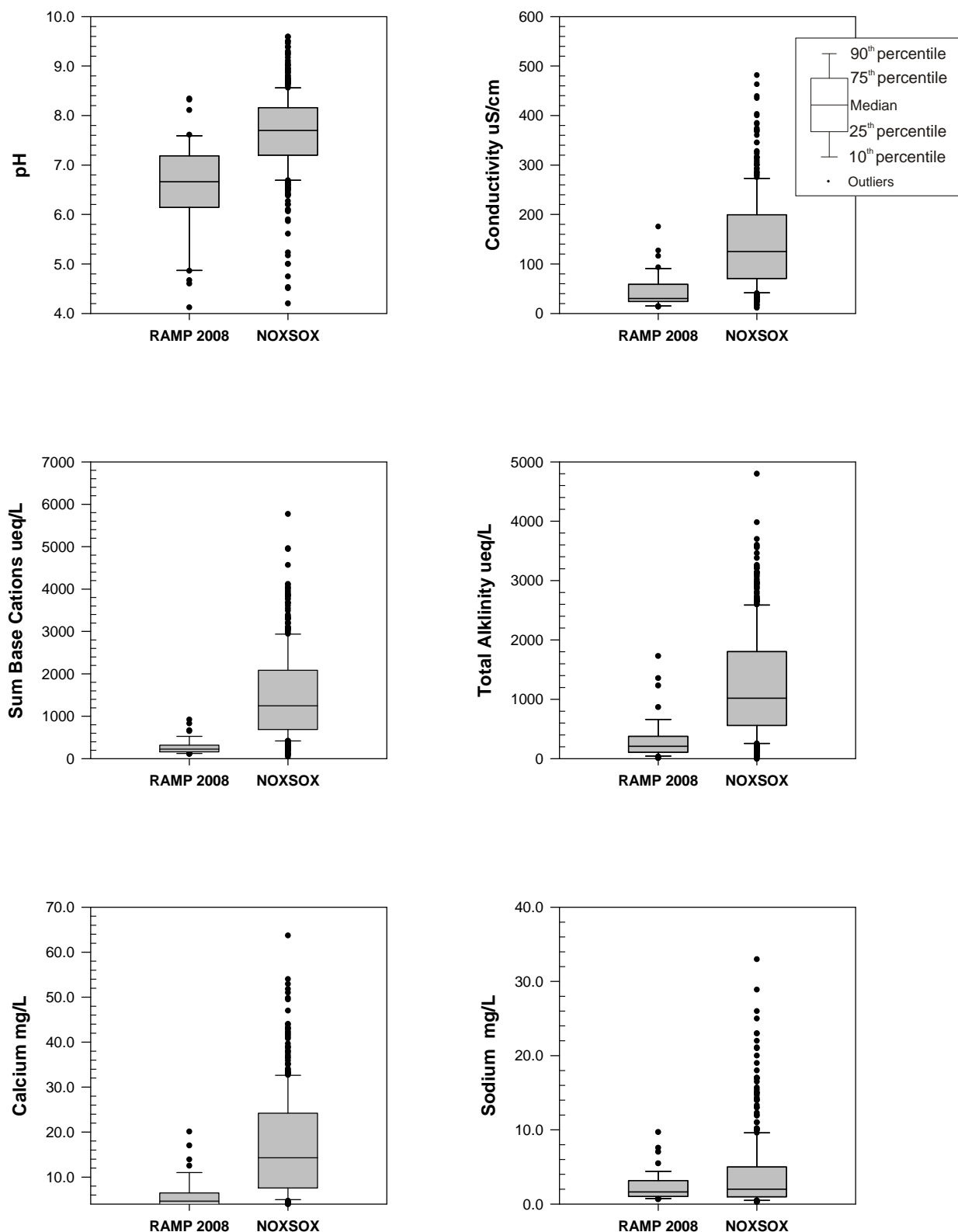
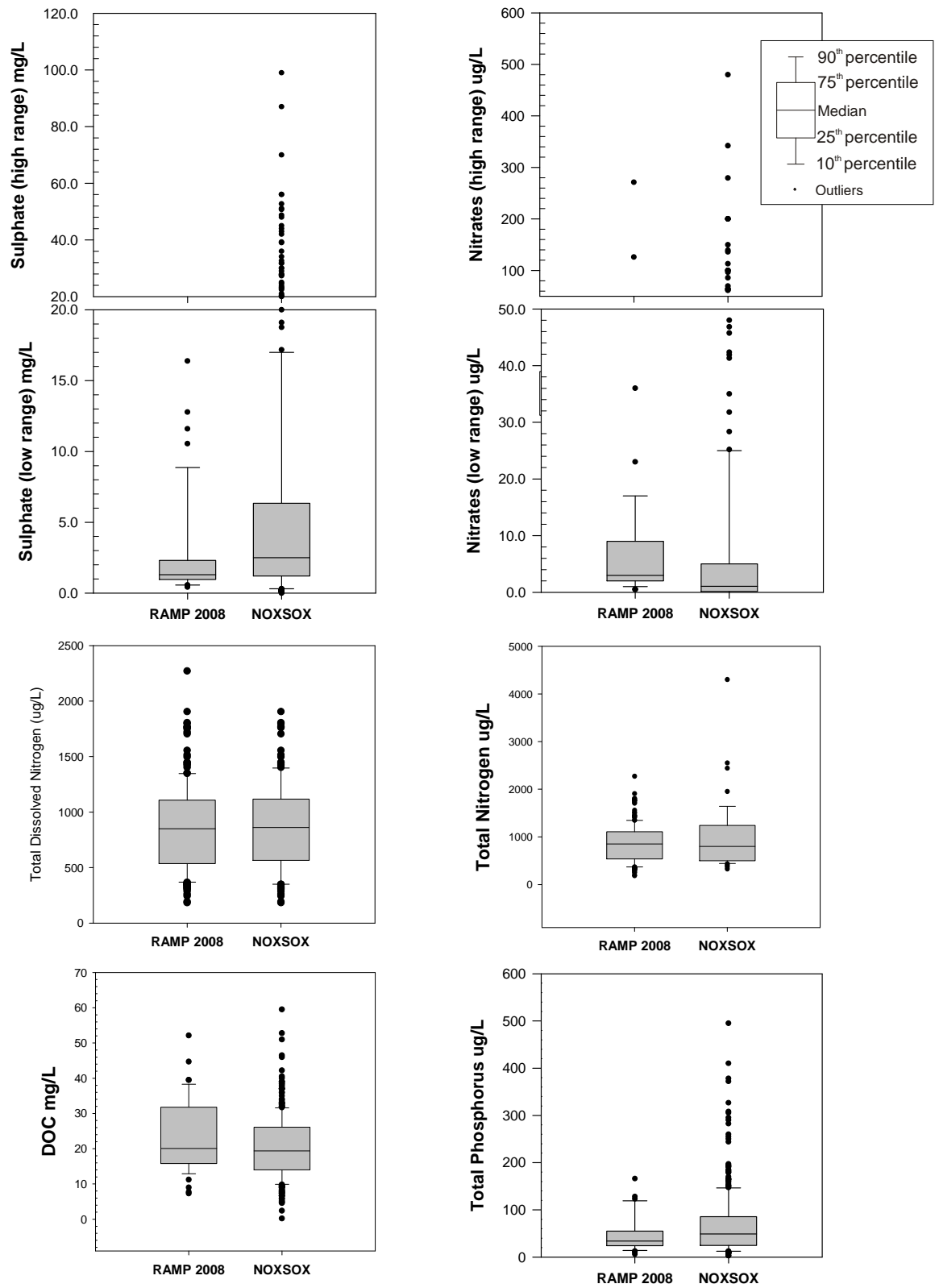


Figure H.2-1 (Cont'd.)



H.3 CHARACTERIZATION OF RAMP ASL LAKES BY ION CHEMISTRY

In order to characterize the waters in each RAMP ASL lake, the major anions and cations were displayed in Piper plots (Figure H.4-1). A Piper diagram is a multivariate graphical technique that is used to divide the lakes into four water types on the basis of major cation constituents (Guler *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-} .

The Piper diagrams, for the 2008 data, show that the majority of the lakes are of the Ca-Mg-Bicarbonate type (Type I). In 2008, nine lakes had greater than 40 % of the anion charge attributable to sulphate and chloride rather than bicarbonates and carbonates and tended towards the Type IV water type. These nine lakes are listed in Table H.3-1 with other relevant chemical characteristics. Most of these lakes are found in the Birch Mountains and Stony Mountains subregions and represent lakes that are small (in both area and volume), low in Gran alkalinity, pH, conductivity and relatively high in DOC. Five lakes in 2008 had over 40 % of the cationic charge attributable to sodium and potassium (Table H.3-2). These were largely the same set of lakes identified in Table H.3-1.

Table H.3-1 Key chemical characteristics of ten RAMP ASL lakes having greater than 40 % of anion charge attributable to sulphate and chloride (2008 data).

Lake	Original Name	pH	Gran Alkalinity ($\mu\text{eq/L}$)	Conductivity ($\mu\text{S/cm}$)	DOC (mg/L)	Lake Area (km^2)	Lake Volume (10^9m^3)
Stony Mountains Sub-Region							
168	A21	4.60	-15.00	17.83	21.9	1.38	0.24
169	A24	4.86	0.26	14.83	19.3	1.45	0.21
170	A26	5.35	15.10	14.34	15.5	2.78	0.14
287	25	4.67	-13.20	13.81	13.9	2.176	0.12
Birch Mountains Sub-Region							
448	L29	4.12	10.70	15.19	15.9	0.65	0.56
454	L46	6.66	32.50	62.30	26.1	1.2	
455	L47	6.54	28.30	60.60	22.3	4.31	0.27
457	L49	6.21	23.50	55.10	23.6	2.16	0.35
North-east of Fort McMurray Sub-Region							
471	L8	7.22	17.39	44.50	24.3	0.56	

Table H.3-2 Key chemical characteristics of ten RAMP ASL lakes having greater than 40 % of cation charge attributable to sodium and potassium (2008 data).

Lake	Original Name	pH	Gran Alkalinity (µeq/L)	Conductivity (µS/cm)	DOC (mg/L)	Lake Area (km ²)	Lake Volume (10 ⁹ m ³)
Stony Mountains Sub-Region							
170	A26	5.35	15.10	14.34	15.5	2.78	0.14
167	A29	5.83	38.20	12.97	23.7	1.05	
287	25	4.67	-13.20	13.81	13.9	2.176	0.12
Birch Mountains Sub-Region							
448	L29	4.12	10.70	15.19	15.9	0.65	0.56
Canadian Shield Sub-Region							
88	0-10	7.02	195.20	29.60	0.70	0.702	

H.4 ANALYSIS OF METALS IN THE RAMP LAKES

Metals, in particular, aluminum, can serve as important indicators of lake acidification. The results of the metals sampling in the RAMP ASL lakes over 6 years are contained in the RAMP database and are summarized in Table H.4-1 and H.4-2 for the total and dissolved fractions, respectively. Table H.4-3 presents the mean concentration of each trace metal for the lakes in each sub-region.

In general, most trace metals were quite low in concentration and many were less than detection limits. Differences were evident in the metal concentrations between sub regions. Table H.4-3 shows that the Birch Mountains had the highest concentrations of trace metals. In this sub-region, 45 individual metals over 11 lakes had mean concentrations greater than the 95th percentile for the entire lake population (Table H.4-4).

Lakes with the highest metals concentrations include those identified in the Piper plots (Figure H.4-1; Table H.3-1) as having more than 40% of the anionic charge attributable to chloride and sulphate rather than bicarbonates. The reasons for the high metals concentrations in the Birch Mountains are unclear. The mean pH of the Birch Mountain lakes was not significantly less than that in other regions and in fact exceeded the pH of the Stony Mountains which had only three lakes with metal concentrations exceeding the 95th percentile (Table H.4-44). The high levels of chlorides/sulphates as well as high levels of barium in the Birch Mountain lakes, suggest a potential groundwater source for these metals. The relatively high concentrations of metals in these lakes are natural in origin rather than the result of emissions from regional industry.

Figure H.4-1 Piper plots showing the proportion of major cations and anions in the 2008 RAMP ASL lakes.

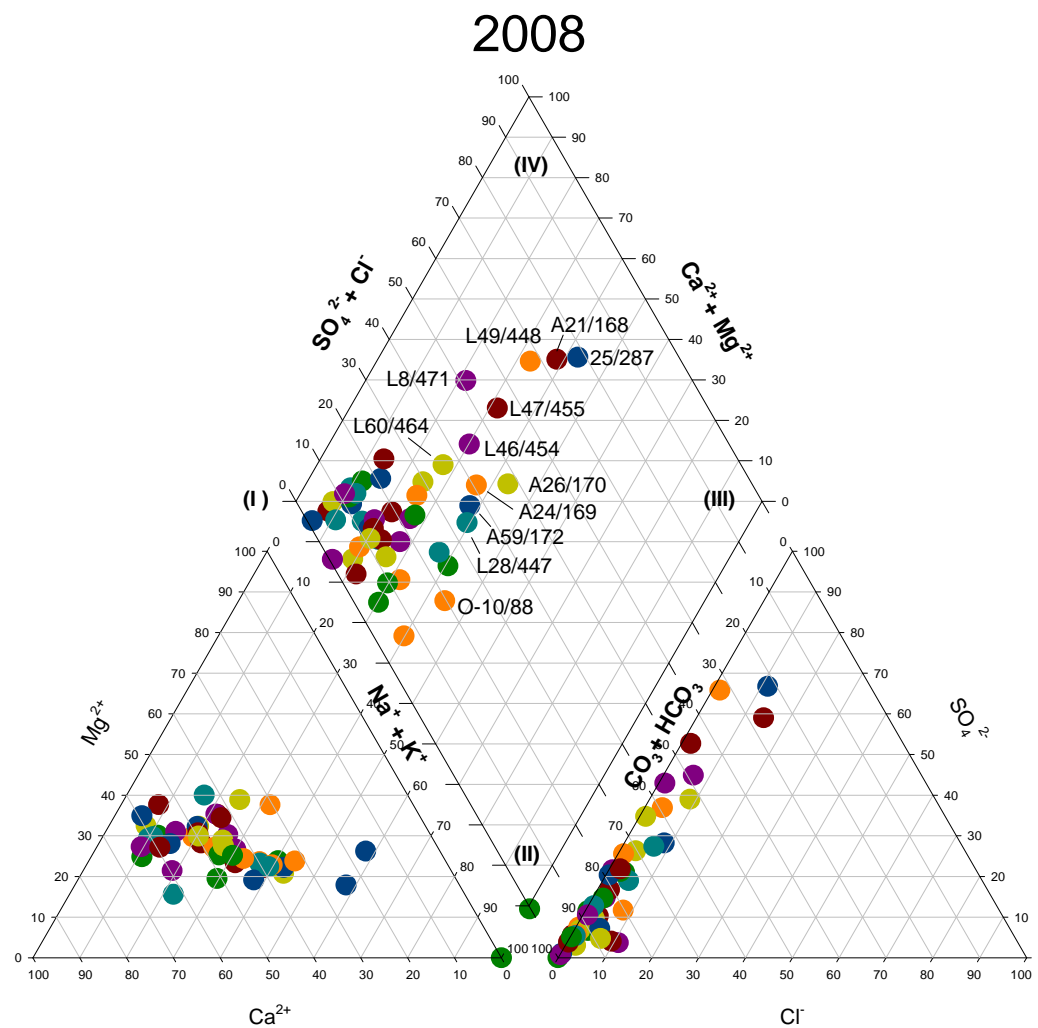


Table H.4-1 Statistical summary of total trace metals in the RAMP ASL lakes over all lakes and years.

Metal (µg/L)	All Years (2001-2008)					2008				
	Maximum	Minimum	Mean	Median	95th Percentile	Maximum	Minimum	Mean	Median	95th Percentile
Ag	0.042	0.00025	0.00418	0.0025	0.0168	0.0159	0.00025	0.00409	0.002	0.0141
Al	8694	0.25	227	64.1	816	730	3.96	122	62.4	581
As	2.9	0.13	0.509	0.405	1.231	1.93	0.148	0.505	0.414	1.19
Ba	83.2	3.55	14.9	12.1	34.2	35.5	4.19	13.9	11.5	34.5
Be	55.7	0.0015	1.88	0.019	11.6	0.0911	0.0015	0.0146	0.0073	0.0573
Bi	0.359	0.0005	0.00766	0.003	0.023	0.0298	0.0005	0.0057	0.004	0.0162
B	62	0.0005	10.2	6.95	28.4	50.9	2.89	11.9	7.78	29.3
Cd	9.94	0.001	0.0524	0.0128	0.0638	0.0865	0.001	0.0208	0.0157	0.053
Co	2.2	0.0005	0.168	0.0927	0.528	0.637	0.0038	0.152	0.0855	0.530
Cr	7.3	0.02	0.446	0.26	1.4	1.37	0.0683	0.322	0.239	0.975
Cu	15.8	0.025	0.690	0.358	2.2	1.55	0.0881	0.442	0.289	1.33
Fe	6528	2.37	630	375	2212	3650	5.15	601	379	2056
Hg	0.074	0.005	0.00823	0.005	0.0256					
Li	15.3	0.01	2.51	1.66	8.12	10.9	0.01	2.22	0.908	8.29
Mn	231	3.3	42.0	29.7	119	157	3.3	44.5	32.5	110
Mo	1.1	0.0019	0.13	0.0894	0.38	1.1	0.0019	0.128	0.0782	0.34
Ni	46	0.0025	0.837	0.354	3.31	4.19	0.0025	0.604	0.291	2.45
Pb	95.3	0.0079	0.543	0.16	0.782	1.26	0.018	0.222	0.167	0.519
Sb	0.2	0.002	0.0293	0.02	0.09	0.13	0.0081	0.030	0.0213	0.0774
Se	0.9	0.02	0.145	0.11	0.264	0.239	0.02	0.0864	0.0598	0.191
Si	4.93	0.0995	1.47	1.12	3.54					
Sn	3.02	0.015	0.141	0.015	1.15	0.0506	0.015	0.0179	0.015	0.0413
Sr	90	2.61	23.3	18.9	57.4	69.4	2.76	23.4	19.4	56.5
Th	0.72	0.00015	0.0338	0.0108	0.136	0.227	0.0012	0.0374	0.0162	0.168
Ti	79	0.1	3.46	1.1	13.9	15.3	0.153	2.16	1.15	9.56
Tl	0.077	0.00015	0.00397	0.002	0.014	0.0179	0.00015	0.00328	0.0022	0.0100
U	0.417	0.0009	0.0439	0.0143	0.19	0.417	0.0013	0.0405	0.0115	0.141
V	15.5	0.0025	0.840	0.378	3.19	3.58	0.0607	0.637	0.35	2.57
Zn	30.1	0.215	4.08	3.44	9.25	9.06	0.215	2.82	2.29	6.79

For the purposes 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 H.4-2 Statistical summary of dissolved trace metals in the RAMP ASL lakes over all lakes and years.

Metal (µg/L)	2003-2008					2008				
	Maximum	Minimum	Mean	Median	95th Percentile	Maximum	Minimum	Mean	Median	95th Percentile
Ag	0.012	0.00025	0.0015	0.00025	0.00623	0.0117	0.00025	0.00106	ND	0.00604
Al	681	0.1	71.4241	25.5	329	422	0.467	70.2	38.8	285
As	1.8	0.08	0.434	0.347	0.952	1.78	0.145	0.438	0.352	1.00
Ba	32.1	1.15	11.3	9.65	24.6	30.7	1.15	11.2	9.93	25.4
Be	0.3	0.0015	0.0185	0.0083	0.0626	0.0656	0.0015	0.0117	0.0071	0.0402
Bi	0.03	0.0005	0.00430	0.0025	0.014	0.03	0.0005	0.00493	0.0027	0.0154
B	62.3	1.8	10.9	7.16	26.1	48.2	2.76	10.5	6.47	27.7
Cd	5.82	0.001	0.0402	0.0073	0.0409	0.0464	0.001	0.0131	0.0106	0.0377
Co	0.679	0.0005	0.110	0.0424	0.393	0.565	0.0015	0.113	0.0365	0.367
Cr	1.88	0.02	0.240	0.17	0.700	0.894	0.02	0.232	0.176	0.577
Cu	2.13	0.025	0.459	0.292	1.52	1.52	0.087	0.390	0.28	1.27
Fe	3130	1	363	113	1538	3130	1	398	110	1564
Li	15.2	0.01	2.27	1.4	7.06	9.87	0.01	2.03	0.884	7.72
Mn	140	0.07	17.0	3.13	62.2	136	0.0824	20.1	3.18	89.5
Mo	1.43	0.0005	0.110	0.0716	0.340	0.498	0.0005	0.0896	0.0583	0.264
Ni	3.76	0.0025	0.507	0.22	2.57	3.76	0.0025	0.522	0.229	2.29
Pb	16.3	0.0005	0.184	0.0505	0.422	0.495	0.0025	0.106	0.0599	0.349
Sb	0.167	0.002	0.0276	0.019	0.0827	0.129	0.008	0.0293	0.0211	0.0767
Se	0.9	0.005	0.116	0.05	0.25	0.188	0.02	0.0699	0.05	0.166
Sn	0.065	0.015	0.0251	0.015	0.05	0.0381	0.015	0.0155	0.015	0.015
Sr	70	2.4	21.9	16	54.4	65.4	2.73	22.3	18.1	53.3
Th	0.196	0.00015	0.0253	0.0101	0.111	0.189	0.0007	0.033	0.0153	0.141
Ti	13.8	0.02	1.24	0.474	6.27	10.6	0.02	1.24	0.664	5.78
Tl	0.043	0.00015	0.0030	0.00155	0.00806	0.008	0.00015	0.00240	0.0019	0.0069
U	0.345	0.0004	0.0286	0.009	0.129	0.345	0.0009	0.0339	0.0093	0.132
V	3.03	0.011	0.3981	0.215	1.65	2.32	0.0347	0.391	0.22	1.46
Zn	12	0.213	3.27	2.74	7.34	8.41	0.213	2.51	1.69	6.49

For the purposes 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 H.4-3 Mean concentrations of total and dissolved trace metals in the RAMP ASL lakes in each sub-region (all years).

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	0.00125	0.00095	0.00094	0.00289	0.000875	0.00131	0.00420	0.00320	0.004	0.007	0.002	0.004
Al	79.9	19.7	34.0	151	17.4	58.2	322	53.7	66.6	516	35.3	145
As	0.330	0.335	0.402	0.685	0.194	0.4897	0.402	0.399	0.421	0.843	0.201	0.585
Ba	8.35	9.72	9.95	16.8	6.01	14.795	10.8	14.2	12.5	23.2	7.11	17.5
Be	0.0192	0.00559	0.0114	0.031	0.026	0.014	1.17	2.52	2.14	2.67	1.04	0.921
Bi	0.00375	0.00402	0.00393	0.005	0.003	0.006	0.007	0.00669	0.009	0.010	0.003	0.006
B	6.47	13.2	11.3	17.4	5.54	5.147	6.58	12.6	9.82	16.2	6.08	5.62
Cd	0.0209	0.0111	0.137	0.016	0.005	0.011	0.0311	0.020	0.158	0.027	0.008	0.021
Co	0.157	0.0506	0.0641	0.191	0.018	0.060	0.229	0.091	0.097	0.306	0.037	0.120
Cr	0.241	0.159	0.180	0.350	0.222	0.238	0.398	0.223	0.291	0.881	0.253	0.377
Cu	0.416	0.216	0.282	0.742	0.380	0.687	0.660	0.339	0.659	0.962	0.389	0.967
Fe	268	123	185	785	164	467	475	319	410	1237	330	735
Hg							0.005	0.005	0.008	0.005	0.005	0.025
Li	0.730	2.41	1.92	4.83	1.23	1.40	0.820	2.80	1.87	5.23	1.44	1.66
Mn	26.1	22.8	13.2	17.2	1.90	5.98	42.7	71.7	41.1	43.2	24.3	16.6
Mo	0.113	0.0511	0.0498	0.183	0.142	0.117	0.109	0.071	0.064	0.199	0.189	0.143
Ni	0.366	0.133	0.130	1.29	0.106	0.634	1.24	0.312	0.220	1.69	0.144	0.785
Pb	0.111	0.0794	0.411	0.204	0.0331	0.111	0.252	0.171	1.53	0.397	0.222	0.228
Sb	0.0229	0.0168	0.0165	0.052	0.0123	0.032	0.024	0.020	0.0173	0.057	0.0118	0.032
Se	0.114	0.0990	0.0998	0.144	0.116	0.112	0.146	0.116	0.130	0.189	0.124	0.138
Sn	0.0222	0.024	0.0267	0.025	0.0292	0.026	0.115	0.029	0.0795	0.191	0.236	0.262
Sr	9.42	32.7	25.4	25.7	29.5	12.3	9.94	34.5	24.9	27.5	31.5	13.1
Th	0.0212	0.00841	0.00972	0.054	0.0151	0.032	0.026	0.013	0.0101	0.084	0.0143	0.0315
Ti	1.09	0.403	0.531	2.91	0.443	0.946	3.29	1.24	1.232	8.618	0.816	2.40
Tl	0.00457	0.00161	0.00195	0.003	0.00395	0.002	0.00483	0.00240	0.00176	0.008	0.00231	0.00269
U	0.0127	0.00521	0.00603	0.045	0.0986	0.052	0.0243	0.00897	0.00848	0.067	0.135	0.0643
V	0.348	0.205	0.303	0.791	0.0958	0.298	0.723	0.389	0.499	1.935	0.159	0.596
Zn	3.70	3.24	2.96	4.10	1.16	2.64	4.46	3.74	3.97	5.306	1.46	3.75

SM = Stony Mountains, WFM = west of fort McMurray, NEFM = north east of Fort McMurray, BM = Birch Mountains, CS = Canadian Shield, CM = Caribou Mountains

For purposes of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory.

Table H.4-4 Number of lakes in each region having mean individual trace metal concentrations greater than the 95th percentile.

Sub-Region	No. of Lakes in Region	No. of Trace Metals Where Mean > 95 th Percentile ¹	Ratio of No. of Trace Metals > 95 th Percentile to No. of Lakes ²	Mean pH in Sub-Region (2008)
Stony Mountains	10	4	0.4	5.72
West of Fort McMurray	8	4	0.5	6.80
North-East of Fort McMurray	11	13	1.18	7.00
Birch Mountains	11	51	4.64	6.35
Canadian Shield	5	3	0.6	7.33
Caribou Mountains	5	2	0.4	6.55
Sum	50	68		

¹ Mean metal concentration for each lake calculated over all years; ² 95th percentile calculated for each metal over all lakes and years.

The number of exceedances of CCME Surface Water Quality Guidelines for Protection of Aquatic Life and the lakes in which these are found are indicated in Table H.4-5 for the 2008 data. Exceedances were observed for aluminum, cadmium, iron and lead. The guideline exceedances are scattered throughout the various sub-regions, with a large representation from lakes in the Birch Mountains and the Stony Mountains, consistent with the high metal concentrations found in lakes from these two regions. Cadmium was exceeded in 5 lakes. As the CCME guideline for cadmium (0.018 µg/L; hardness of 50 mg/L) is extremely low, exceedances of this metal occur occasionally in surface waters in the Athabasca oil sands region. The exceedances in Table H.4-5 are considered to be natural occurrences.

Table H.4-5 List of exceedances of CCME Surface Water Quality Guidelines for metals in 2008.

Metal	Number of Exceedances	Lakes with Exceedances
Al	13	168, 169, 170, 287, 470, 447, 448, 454, 455, 457, 146, 89, 91
Fe	27	168, 169, 170, 287, 165, 171, 172, 452, 470, 400, 185, 209, 442, 447, 448, 454, 455, 457, 464, 175, 84, 88, 146, 89, 97, 91, R1
Cd	5	223, 225, 436, 175, 457
Pb	1	84

H.5 SEASONAL VARIABILITY IN ASL MEASUREMENT ENDPOINTS

In order to detect chemical changes in the RAMP ASL lakes, it is necessary to determine the natural seasonal variation in endpoint parameters. Seasonal variations in six endpoints on ten of the ASL lakes are summarized in Table H.5-1 and Figure H.5-1 from data collected by Alberta Environment between 2004 and 2008. Figure H.5-1 also displays the seasonal data on three nutrient related variables: total phosphorus, ammonia chlorophyll a. The normalized variables in the figures allow comparison of the variability in a parameter between lakes on the same scale.

Distinct chemical changes occurred during the monitoring years in most of the lakes:

- There were large changes in pH over the seasons. These included seasonal ranges of 2.38 pH units in Lake 175 (P13), 2.20 units in Lake 271 and 1.13 units in Clayton Lake (448). An increase in pH was evident in most lakes during the summer months (July and August) while minima occurred in winter under ice. In several lakes, including Clayton Lake (Lake 448), the pH minima were observed during the early summer (June), perhaps the result of high photosynthetic activity at this time. Changes representing 2-3 standard deviations from the mean value were observed;
- Changes in Gran alkalinity over the seasons were very significant especially in some of the ponds. A seasonal range of 5,346 $\mu\text{eq/L}$ was observed in Lake 175 (P13), 2118 $\mu\text{eq/L}$ in Lake 223 (P94) and 2,072 $\mu\text{eq/L}$ in Lake 271. The seasonal range for Gran alkalinity in Kearn Lake was about 874 $\mu\text{eq/L}$ over the seasons. A very low value was observed in May 2008, which is believed to be an analytical error. In most lakes, the highest values of Gran Alkalinity were observed in April under ice representing winter conditions (e.g., Lake 271). Changes equivalent to 3 standard deviations from the mean values were observed (Figure H.5-1);
- Very large changes were observed in base cations over the seasons. Changes of 5,828 $\mu\text{eq/L}$, 2860 $\mu\text{eq/L}$ and 2,285 $\mu\text{eq/L}$ were observed in Lake 175 (P13), Lake 223 (P94) and Lake 271, respectively. Kearn Lake normally shows a SBC range of about 1000 $\mu\text{eq/L}$. A very high concentration of base cations was observed in July 2008 which is likely an analytical error. As with Gran alkalinity, the highest concentrations occurred in April under ice representing winter conditions;
- Seasonal changes in sulphate were measurable but relatively small compared to those for Gran alkalinity and base cations. The largest seasonal changes in sulphate occurred in Lake 223 (10.1 mg/L), Lake 271 (5.14 mg/L) and Clayton Lake (448) (4.48 mg/L). Peak values were observed in both summer and winter;
- Seasonal changes in DOC were also highly significant, especially in the ponds. The largest seasonal changes occurred in Lake 175 (P13) (149 mg/L), in Lake 223 (P 94) (77.6 mg/L) and Lake 271 (42.0 mg/L). Peaks in DOC occurred both in winter and in summer. Some of the highest values of DOC ever observed in the RAMP ASL lakes were recorded in these data, especially in the shallow ponds in April under ice; and
- Seasonal changes in nitrates were also extremely large. Nitrates increased by as much as three orders of magnitude during a season, peaking in winter. The largest changes occurred in Lake 271 (724 $\mu\text{g/L}$), Lake 166 (453 $\mu\text{g/L}$) Lake 175 (292 $\mu\text{g/L}$) and Clayton Lake (206 $\mu\text{g/L}$).

In summary, the results from the seasonal sampling program show that there are very significant changes in the chemistry of the RAMP ASL lakes between seasons. The shallow ponds, in particular Lakes 175 and 223, show extremely large decreases in pH, increases in base cations, Gran alkalinity, DOC and nitrates during the winter. These changes may be the result of the freezing of a large proportion of the water volume in these small water bodies during the winter. The large seasonal fluctuations in endpoint parameters must be accounted for in attempting to detect acidification of these lakes. This has been accomplished in the ASL program by sampling during the same time period each year (late summer-early fall).

Table H.5-1 Seasonal variability in ASL measurement endpoint parameters in ten lakes, 2004 to 2008 (AENV data).

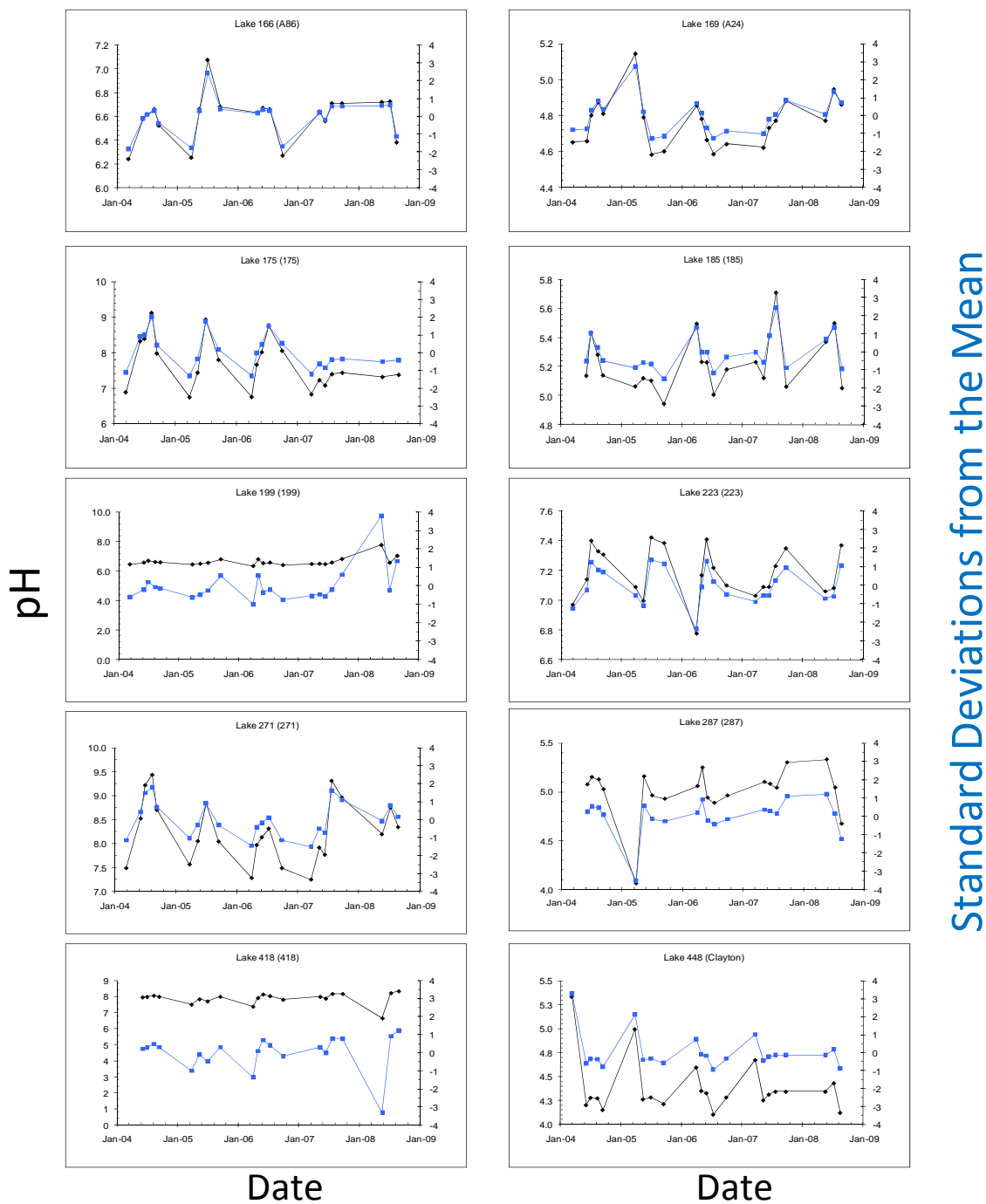
	Lake: Region ¹ :	166/A86 SM	169/A24 SM	287/25 SM	175/P13 BM	199/P49 BM	448/Clayton BM	223/P94 W. FtMc	271/6 N-E FtMc	185/P27 N-E FtMc	418/Kearl N-E FtMc
pH	Minimum	6.24	4.58	4.06	6.74	6.30	4.10	6.78	7.24	4.94	6.64
	Maximum	7.08	5.14	5.33	9.12	7.74	5.33	7.42	9.44	5.71	8.32
	Mean	6.60	4.76	5.01	7.69	6.60	4.38	7.18	8.25	5.23	7.87
	SD²	0.195	0.139	0.269	0.714	0.300	0.289	0.173	0.656	0.194	0.369
	CV (%)³	3.0	2.9	5.4	9.3	4.5	6.6	2.4	8.0	3.7	4.7
Gran Alkalinity (µeq/L)	Minimum	104	-50	-55	198	35	-50	549	745	16	180
	Maximum	202	202	38	5544	1432	52	2666	2818	140	2075
	Mean	140	4	-5	1253	236	-7	907	1360	52	1489
	SD²	30	51	26	1221	289	23	578	430	31	379
	CV (%)³	21	1247	-491	97	123	-346	64	32	60	25
Base Cations (µeq/L)	Minimum	277	86	93	349	227	52	863	905	165	1348
	Maximum	1103	564	435	6177	672	534	3723	3190	690	5584
	Mean	349	152	130	1630	351	123	1582	1576	292	1995
	SD²	180	105	73	1272	118	113	814	584	116	910
	CV (%)³	52	69	56	78	34	92	51	37	40	46
Sulphate (mg/L)	Minimum	1.51	0.64	0.723	1.12	0.46	0	0.77	0.02	0.39	1.991
	Maximum	2.47	1.874	1.978	4.7	2.47	4.48	10.87	5.16	1.43	4.84
	Mean	1.99	1.00	1.40	2.99	1.11	0.72	7.90	0.51	0.75	3.58
	SD²	0.28	0.34	0.32	1.02	0.46	1.03	2.39	1.06	0.28	0.62
	CV (%)³	14	34	23	34	42	142	30	208	37	17
Dissolved Organic Carbon (mg/L)	Minimum	13.2	14.7	10.3	14.2	14.0	12.3	29.9	11.6	15.4	19.6
	Maximum	29.0	48.6	44.1	163.6	28.5	34.9	107.6	53.6	49.4	41.5
	Mean	17.7	22.6	16.7	55.2	18.8	19.2	54.2	22.6	30.4	25.0
	SD²	3.5	9.5	8.7	34.0	3.7	6.1	16.9	9.5	7.7	4.7
	CV (%)³	20	42	52	62	20	32	31	42	25	19
Nitrates +Nitrite (µg/L)	Minimum	0.5	0	0.45	0.15	0	0.5	0.06	0	0.5	0.38
	Maximum	453	38	76	292	8	206	31	724	38	59
	Mean	117.7	4.6	14.0	19.0	2.2	16.7	7.7	40.1	5.6	6.2
	SD²	166.7	8.3	23.4	63.5	2.3	49.6	11.8	154.5	10.0	13.3
	CV (%)³	142	182	168	335	106	298	152	385	179	213

¹ Regions included Stony Mountains (SM), Birch Mountains (BM), West of Fort McMurray (W. FtMc), and North East of Fort McMurray (N-E FtMc).

² Standard deviation.

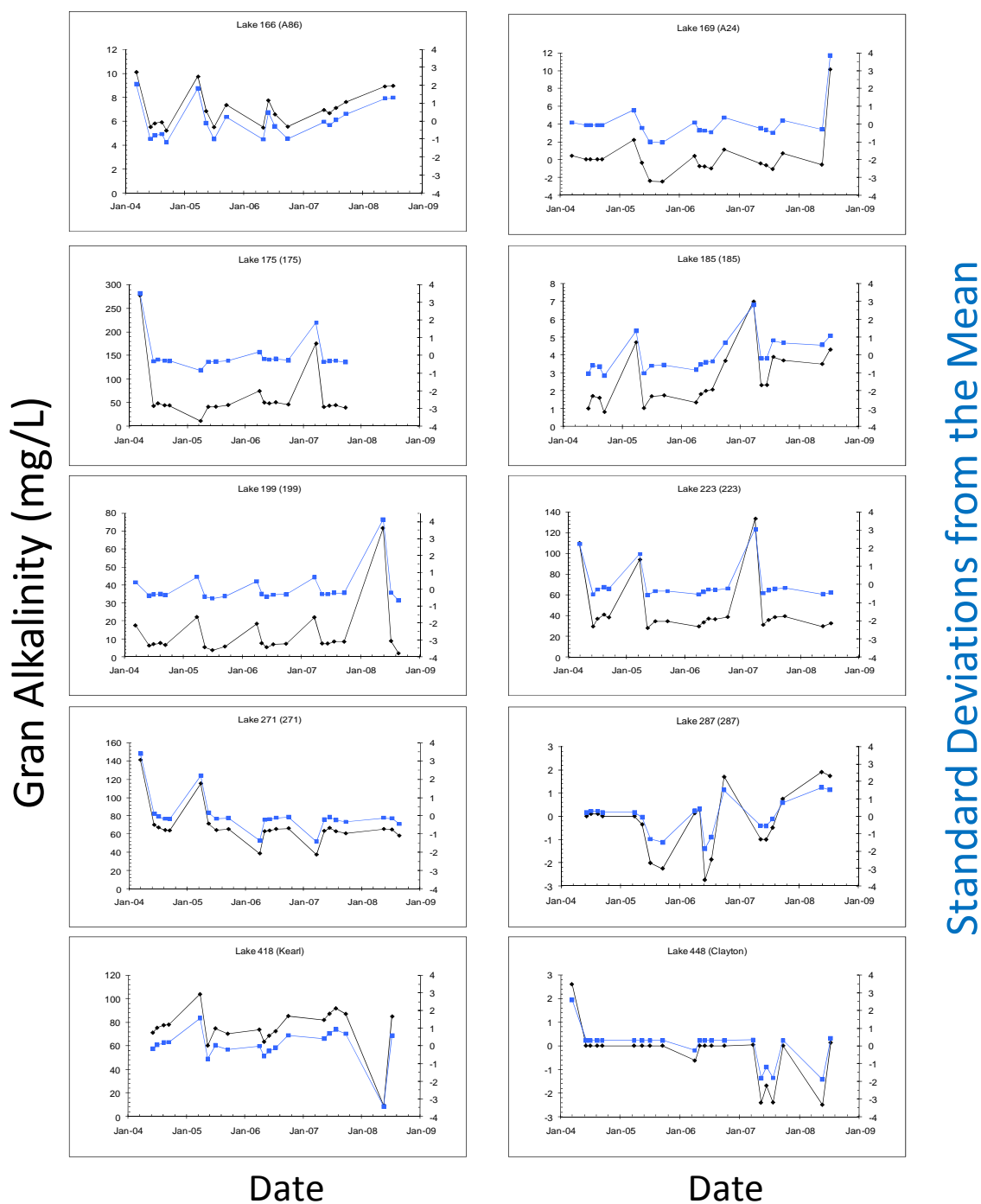
³ Coefficient of variation.

Figure H.5-1 Seasonal changes in chemical variables in ten RAMP ASL lakes.



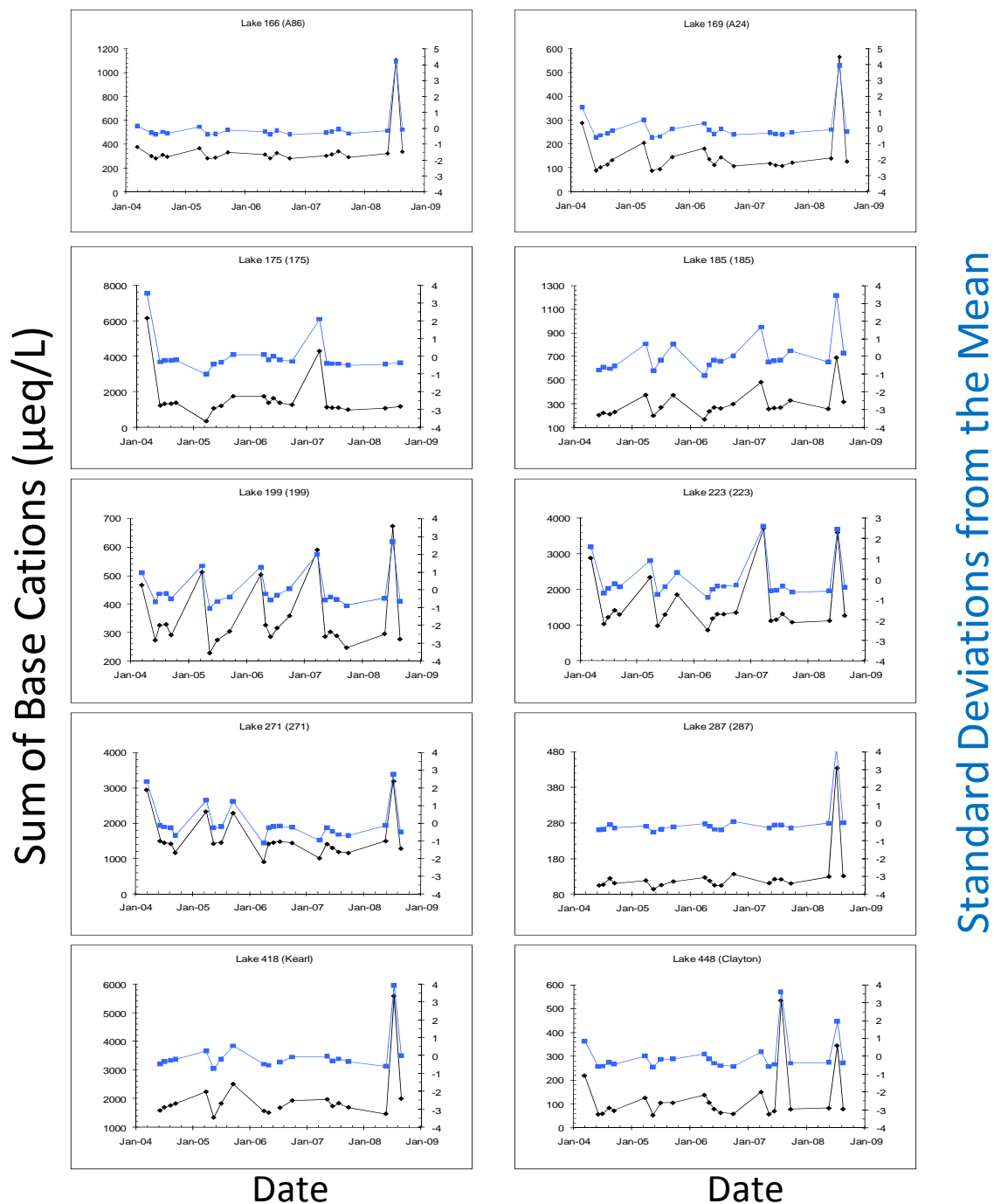
Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



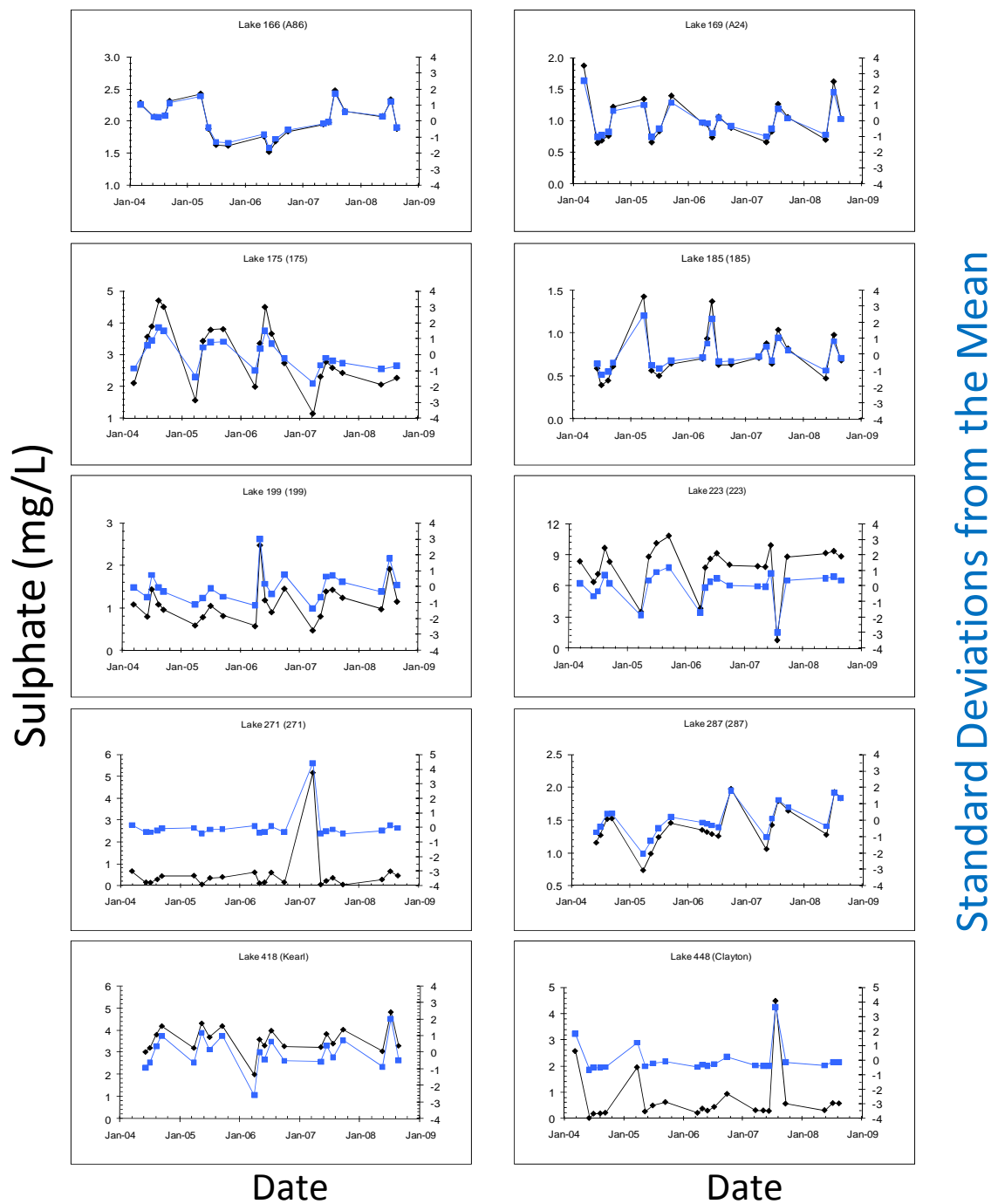
Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



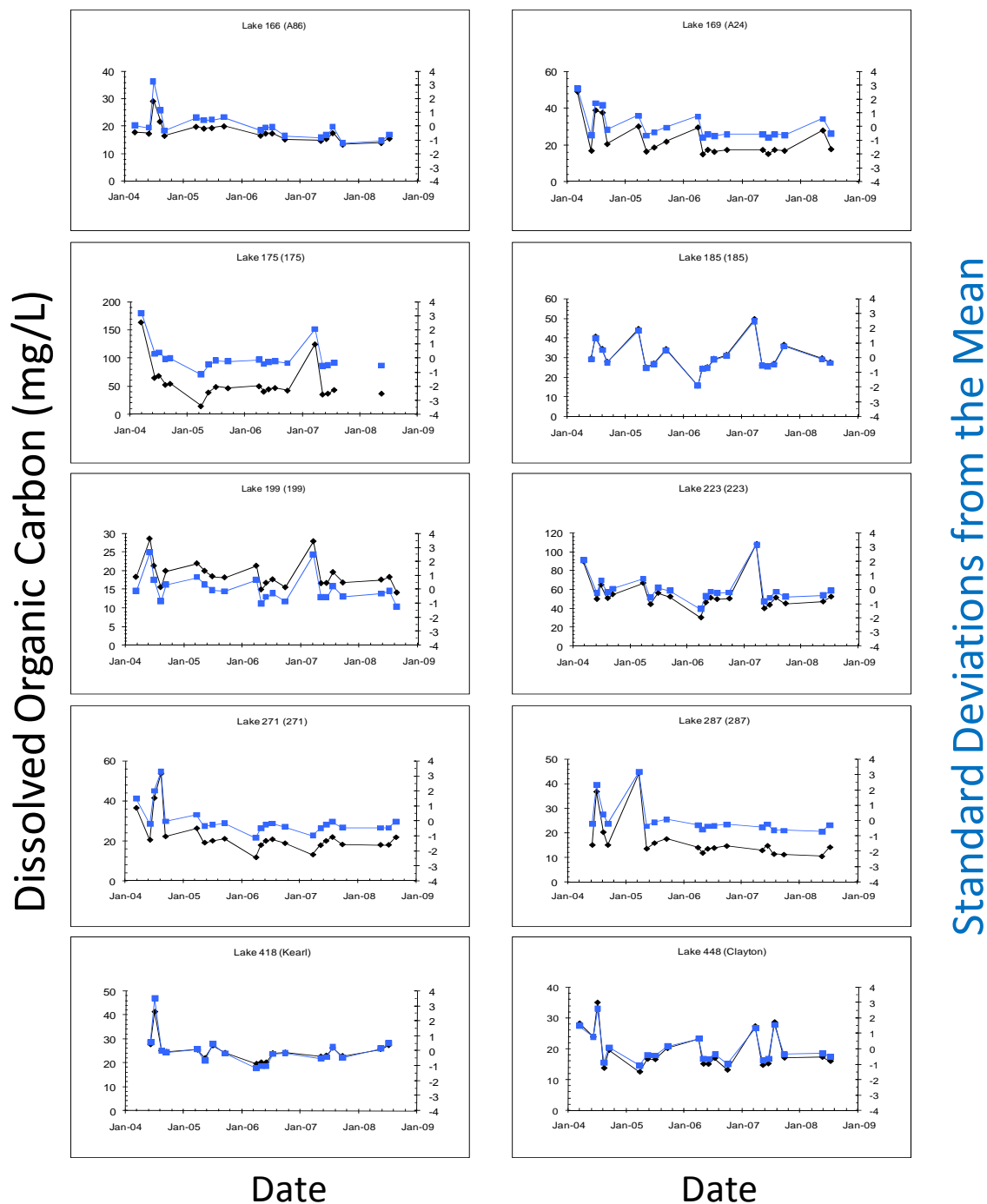
Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



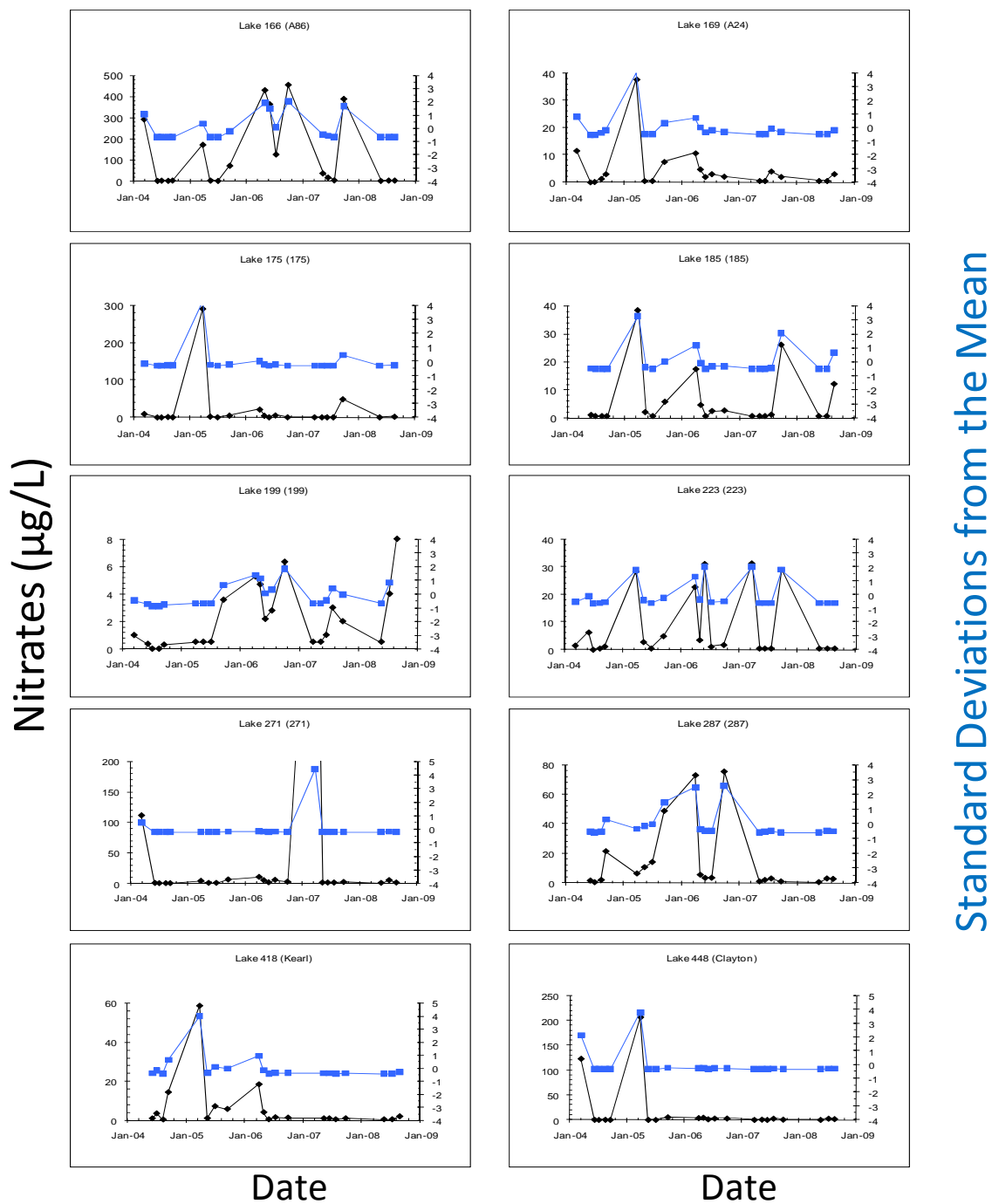
Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



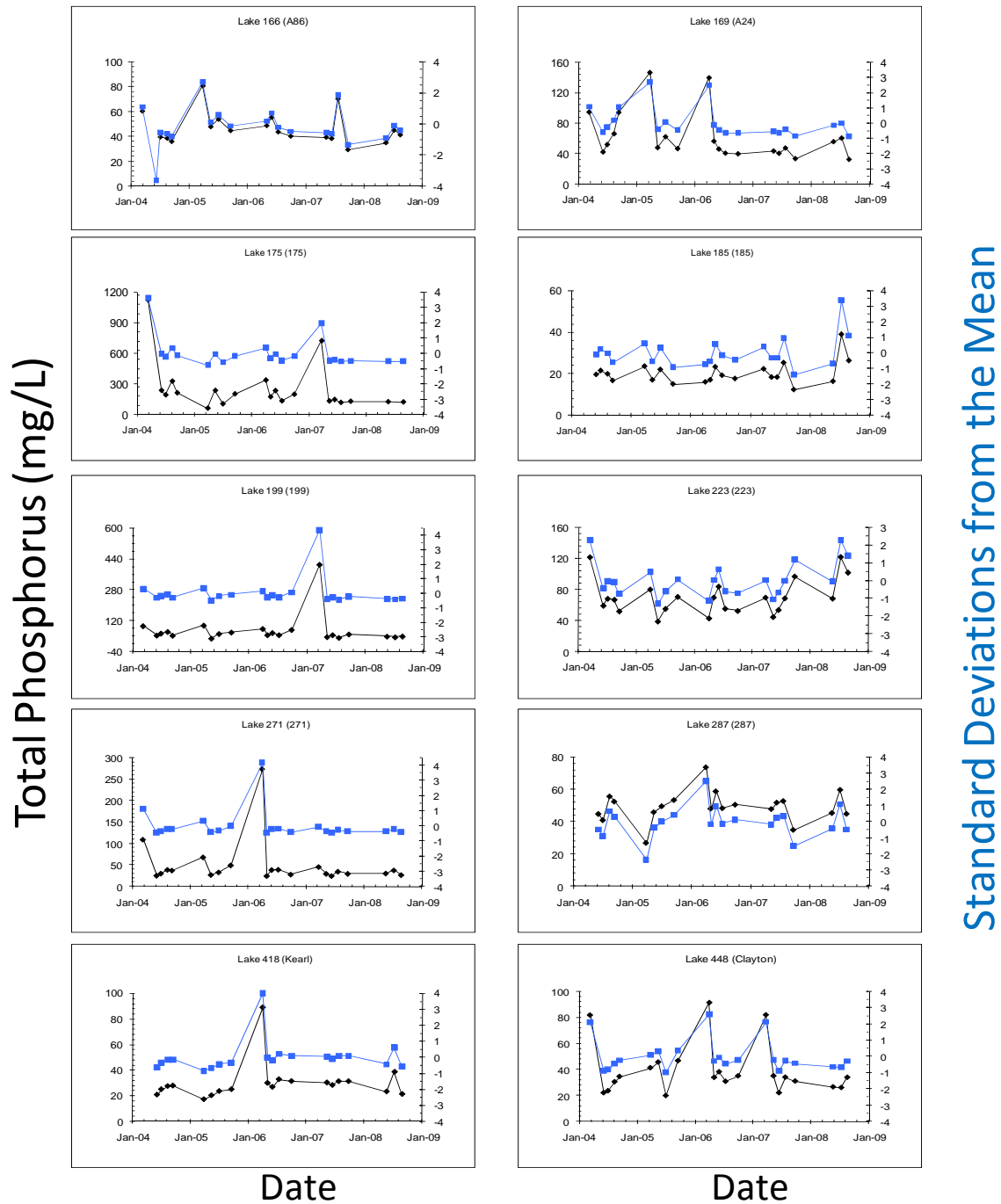
Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



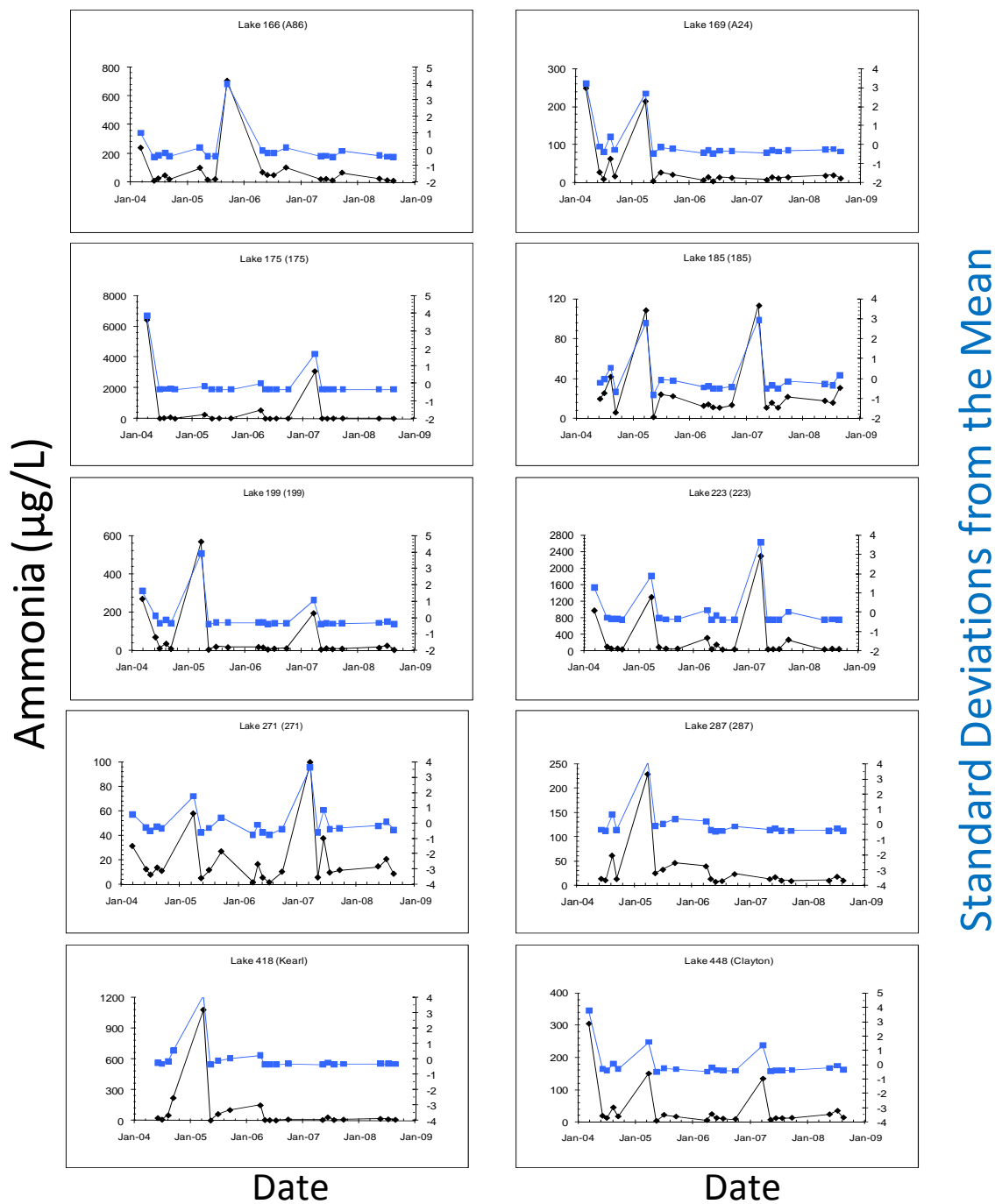
Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



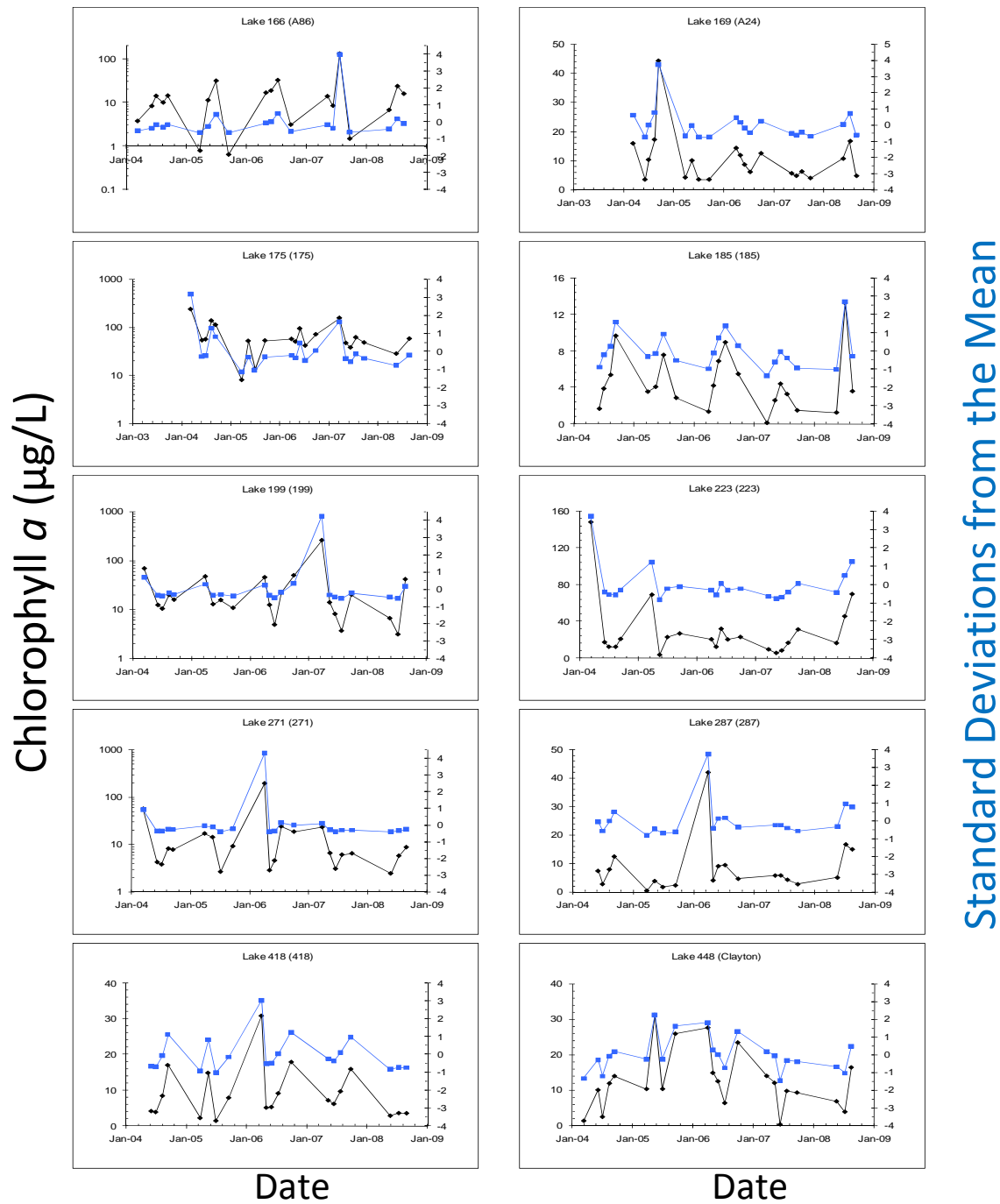
Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.