Sisson Project:

Baseline Aquatic Environment Technical Report

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1.0 INTRODUCTION

This document is the Baseline Aquatic Environment Technical Report prepared by Stantec Consulting Ltd. (Stantec) as background information for the Environmental Impact Assessment (EIA) of the Sisson Project (the Project), proposed by Northcliff Resources Ltd. (Northcliff).

The Project consists of a conventional open pit tungsten and molybdenum mine, an ore processing plant, and associated facilities and infrastructure located on provincial Crown land approximately 10 kilometres (km) southwest of the community of Napadogan, New Brunswick, and approximately 60 km directly northwest of the city of Fredericton (see Figure 1.1 for a map of the Project area).

1.1 PURPOSE OF THIS TECHNICAL REPORT

The Aquatic Environment is defined as the watercourses and water bodies that provide habitat for fish and other freshwater aquatic species, and includes fish, fish habitat, and other living organisms residing in that habitat. The Aquatic Environment has been identified as a valued environmental component (VEC) to be assessed as part of the EIA for the Project, due to its importance in supporting aquatic life in the area surrounding the Project. The purpose of this Technical Report is to describe the existing baseline conditions of the Aquatic Environment within the Project Development Area (PDA) and Study Area, as defined in Section 1.3 below.

The purpose of this work was two-fold, as follows.

- To characterize the Aquatic Environment presently existing within the PDA and in the broader Study Area. In addition to describing existing environmental conditions for the EIA report, this characterization is intended to support the quantification of any harmful alteration, disruption or destruction (HADD) of fish habitat that may arise as a consequence of the Project, in order that an appropriate fish habitat compensation agreement can be developed in consultation with the Department of Fisheries and Oceans (DFO).

- To gather baseline data to support the development of a long-term environmental effects monitoring (EEM) program for the Aquatic Environment, as may be required to meet follow-up or monitoring commitments arising from the EIA or conditions of approval pursuant to the EIA, or as may be required by the *Metal Mining Effluent Regulations* under the *Fisheries Act*.

This document summarizes the data and other information collected as part of the baseline Aquatic Environment work carried out for the Project. Further analysis and interpretation of the data will be presented in the EIA Report.

1.2 OVERVIEW OF APPROACH

To carry out the Aquatic Environment work in support of the EIA for the Project, existing information was reviewed, and field data were collected for water quality, sediment quality, stream morphology, fish habitat, fish populations, benthic invertebrate communities, and periphyton communities. Existing information and field data were primarily collected for this Technical Report during the summer of 2011, however, water quality and hydrological monitoring programs have been ongoing within the Study Area

since 2008. Following an identification of gaps in available aquatic information for the Project area, a work plan (Stantec 2011a) was developed to fill these data gaps and collect data representative of the Sisson PDA and Study Area (defined below).

Data were collected in several stages, as described below.

- Remote sensing and mapping of watercourses was conducted, to focus the field data collection for the Project.

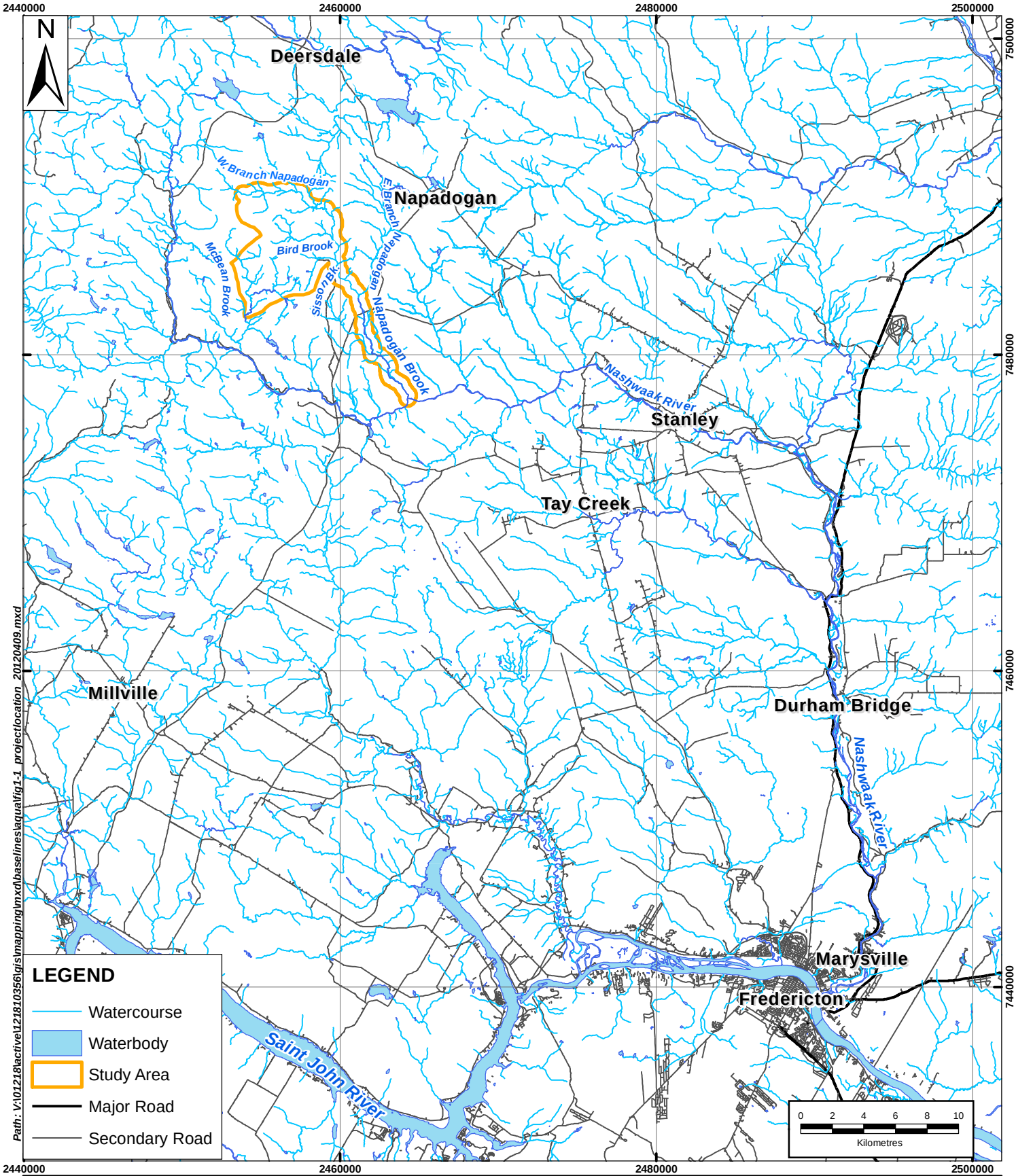
- A rapid fish habitat bio-assessment survey (Barbour 1999) was completed throughout the full length of all watercourses that, based on the current Project Description for the Sisson Project (Stantec 2011b), are expected to be directly affected by Project activities. A rapid fish habitat survey technique was employed and water quality measurements were collected in the field. Data collected were used to select the stations for the detailed qualitative survey that followed.

- Detailed fish habitat surveys were undertaken at 32 stations inside the PDA as well as elsewhere within the broader Study Area. These surveys involved the collection of surface water quality and sediment quality data (with measurements taken in the field as well as the collection of samples for subsequent laboratory analysis), a presence/absence fish population survey, and a detailed fish habitat survey using fish habitat survey forms as prescribed by DFO and the New Brunswick Department of Natural Resources (NBDNR) over 200 m reaches of each watercourse.

- Additional quantitative surveys were conducted at 10 stations selected from the 32 stations at which qualitative surveys were undertaken. Three of these stations were located inside the PDA, and seven stations were located outside of the PDA, in the broader Study Area. These surveys involved the collection of water quality and sediment quality data (with measurements taken in the field as well as the collection of samples for subsequent laboratory analysis), a quantitative fish community survey with collection of EEM endpoints for fish, fish tissue analysis, benthic community survey, and periphyton community survey.

- A detailed fish habitat survey was undertaken in Napadogan Brook, from the mouth of Bird Brook to the confluence of Napadogan Brook with the Nashwaak River. The detailed fish habitat survey involved the identification and characterization of distinct habitat units (*i.e.,* riffle, run, pool) using the DFO/NBDNR fish habitat survey forms. Water quality data was collected in the field to further characterize the habitat.

- Lastly, field surveys for aquatic species of conservation concern (defined later in this report) were conducted.



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Project Location Sisson Project: Baseline Aquatic Environment Technical Report Napadogan, N.B.	Scale: 1:325,000	Project No.: 121810356	Data Sources: ArcGIS World Topo NBDNR NHN	Fig. No.: 1.1	Stantec
Client: Northcliff Resources Ltd.	Date: (dd/mm/yyyy) 09/04/2012	Dwn. By: JAB	Appd. By: DM		

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Map: NAD83 CSRS NB Double Stereographic

1.3 SPATIAL BOUNDARIES FOR THE AQUATIC ENVIRONMENT

The spatial boundaries for the characterization of the existing conditions for the Aquatic Environment are based on the following terms.

- The **Project Development Area** (PDA, Figure 1.2) is the physical area within which most of the Project infrastructure will be located and where most of the Project activities will occur. The PDA typically represents the area of physical disturbance associated with the construction and operation of the Project. In the case of this EIA, the PDA comprises an area of approximately 1,200 hectares (ha) that includes the area of physical disturbance associated with the open pit, processing facility, storage areas, and tailings storage facility (TSF). Based on the current Project Description (Stantec 2011b), watercourses that are expected to be directly affected by the Project and where fish habitat loss is expected to occur include portions of Sisson Brook, Bird Brook, as well as the headwaters of some minor tributaries to McBean Brook that could be affected by changes to groundwater flow patterns caused by pit dewatering. Some minor tributaries to Napadogan Brook could also be affected by habitat loss in their headwaters.

- The **Study Area** (Figure 1.2), which encompasses the PDA as well as other potentially affected aquatic habitats and reference areas within an area of approximately 5,314 ha of land, includes the following watercourses:

    - the main stem of Napadogan Brook and portions of the main stem of West Branch Napadogan Brook where changes to stream flow or water chemistry may occur as a result of the Project;

    - tributaries to the West Branch Napadogan Brook where changes to stream flow or water chemistry may occur, or which may be treated as reference areas;

    - tributaries to McBean Brook where changes to stream flow or water chemistry may occur as a result of the Project;

    - Bird Brook and Sisson Brook where fish habitat will be destroyed as a result of the Project; and

    - selected stations on East Branch Napadogan Brook and the Nashwaak River which were selected as reference areas.

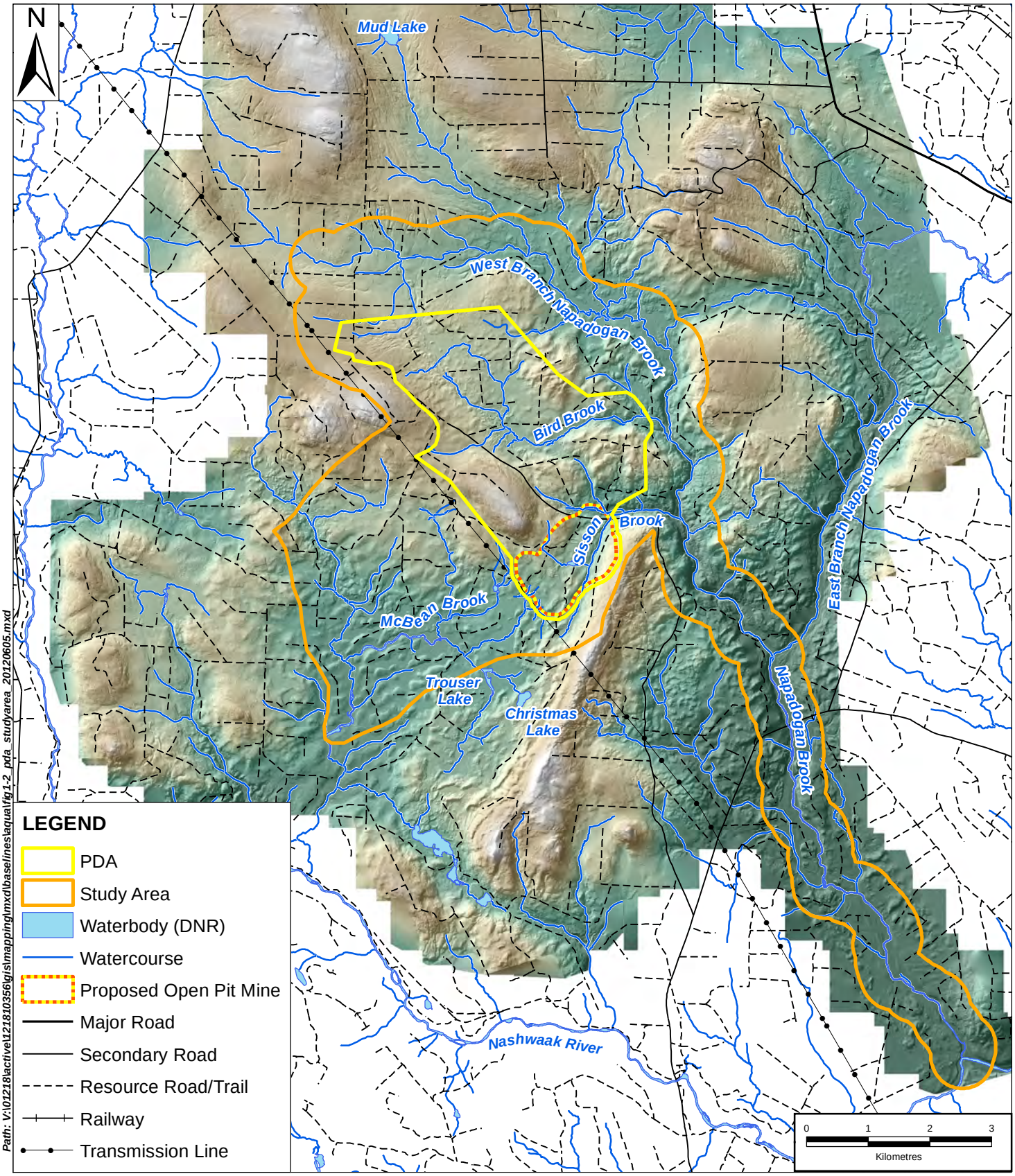
1.4 ORGANIZATION OF THIS TECHNICAL REPORT

The remainder of this Technical Report is presented in five major sections, as follows.

- Following this introduction, Section 2.0 summarizes the existing knowledge about the Aquatic Environment in and around the PDA, the Study Area, and more generally for the Nashwaak River watershed, as documented from literature resources, existing available studies, earlier Project field work, and other available resources. The data gaps to be filled by field studies specifically conducted for this Technical Report are identified.

- Section 3.0 outlines the methodology used to collect baseline data to describe the Aquatic Environment in support of the Project.
- Section 4.0 summarizes the results and analysis of the Aquatic Environment field studies undertaken in 2011 in support of the Project.
- Section 5.0 provides a brief discussion of the key results of the Aquatic Environment field studies.
- Section 6.0 provides references consulted as part of the work and personal communications.

Additional supporting documentation and collected field data are provided in the appendices to this Technical Report.



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Project Development Area and Study Area Sisson Project: Baseline Aquatic Environment Technical Report Napadogan, N.B.	Scale: 1:85,000	Project No.: 121810356	Data Sources: Leading Edge Geomatics NBDNR	Fig. No.: 1.2	Stantec
Client: Northcliff Resources Ltd.	Date: (dd/mm/yyyy) 04/06/2012	Dwn. By: JAB	Appd. By: DM		

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2.0 EXISTING KNOWLEDGE OF THE AQUATIC ENVIRONMENT IN THE STUDY AREA

This section provides an overview of existing information describing the freshwater Aquatic Environment of the Study Area. The review of existing information included available publications, reports, maps, air photos, and previously collected field data as identified through consultation undertaken with regulatory agencies and key stakeholders for the Project.

The *Fisheries Act* defines fish and fish habitat as follows.

> *"Fish includes (a) parts of fish, (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals."*
>
> *"Fish habitat is defined as spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes."*

In accordance with those definitions, components of the Aquatic Environment have been defined for this Technical Report to include:

- surface water quality;
- sediment quality;
- fish habitat quality;
- fish;
- aquatic species at risk (SAR), and aquatic species of conservation concern (SOCC);
- benthic invertebrate community; and
- periphyton community.

Surface water hydrology is not considered in this technical report, and will be described in a separate technical report being prepared by Knight Piésold for the Project.

Existing information was identified by the Study Team in consultation with government agencies, experts, and key stakeholders. In addition to providing helpful information in relation to available data and studies, this consultation provided a forum for discussion of issues and incorporating feedback and suggestions from these stakeholders and regulatory agencies into the EIA process.

To facilitate the identification of available data and the resulting dialogue with key stakeholders, the Study Team established two main working groups relating to the Aquatic Environment for the Sisson Project:

- A regulatory working group focusing on matters relating to fish, fish habitat, potential interactions between the Project and fish habitat (HADD), and options for the development of a habitat compensation plan in respect of HADD. Members of this group are representatives from regulatory agencies, including DFO, NBDNR, and the New Brunswick Department of Environment (NBENV, now the New Brunswick Department of Environment and Local Government or NBDELG).

- A stakeholder working group formed to solicit input from key stakeholders on the design of the Aquatic Environment work, and to provide stakeholders with information about the Project and the results of such work and its linkage to the EIA process. The stakeholder group is also helping to identify HADD compensation opportunities in the watershed. This group includes representatives from the Nashwaak Watershed Association Inc. (NWAI), the Atlantic Salmon Federation (ASF), and the Canadian Rivers Institute (CRI).

Existing information pertaining to the Nashwaak River and its tributaries was solicited from various resources including but not limited to DFO, NBENV, NBDNR, NWAI, ASF, and CRI. In addition, some information was available from previous aquatic environment work carried out for the Sisson Project EIA (*e.g.*, data collected by Rescan™ in 2008 and 2009). The Study Team reviewed the available existing information to develop an understanding of the Aquatic Environment present in the Study Area prior to undertaking field studies, and to identify data gaps which would be filled by the collection of specific field data in the Study Area to characterize existing environmental conditions for the EIA.

2.1 ECOREGION AND GEOGRAPHIC INFORMATION

The Study Area for the Sisson Project is located within the Napadogan Brook and McBean Brook watersheds. Napadogan Brook is a tributary to the Nashwaak River, which enters the Saint John River at Fredericton (Figure 1.1). The Study Area for the Aquatic Environment includes all watersheds within the PDA, all watercourses draining from the vicinity of the PDA to West Branch Napadogan Brook or McBean Brook, the main stem of Napadogan Brook to its confluence with the Nashwaak River, and selected reference stations on East Branch Napadogan Brook and the upper portion of the Nashwaak River (Figure 1.2).

The New Brunswick Ecological Land Classification (NBELC) is part of a national ELC system, which classifies ecological units at various spatial scales (NBDNR 2007). At the national scale, the Project is within the Atlantic Maritime Ecozone, which encompasses the Maritime Provinces of Canada and the Gaspé Peninsula and southeastern Quebec (Marshal *et al.* 1999).

The NBELC divides the province into seven ecoregions (Figure 2.1), which are defined primarily by climate, but are also differentiated by other features, such as geology and soils, forest cover and vegetation, and wetlands. Each of these ecoregions is further divided into ecodistricts, which are delineated by features such as elevation or rock types.

The Study Area for the Aquatic Environment is located completely within the Beadle Ecodistrict, in the southern portion of the Central Uplands Ecoregion. The Central Uplands Ecoregion includes two geographically separate but ecologically similar areas: the Madawaska Uplands in northwestern New Brunswick and the Caledonia Uplands in the southeast part of the province near the Bay of Fundy. The Study Area is located in the southern portion of the Madawaska Uplands. The plateaus of the southern part of the Madawaska Uplands differ from the steeper slopes found in the north of the ecoregion. Generally, watercourses in the northern part of this ecoregion flow into the Saint John River, whereas those in the southern part of the ecoregion primarily flow east and eventually into the Miramichi River. Rivers in the extreme south of the Madawaska Uplands are an exception; these flow into the Nashwaak River, which empties into the Saint John River. This ecoregion is at a relatively higher elevation than other ecoregions in New Brunswick, resulting in a slightly cooler climate that is mediated somewhat by primarily south-facing slopes. The higher elevation and cooler temperatures lead to a lower saturation vapour pressure and higher precipitation amounts than are generally found in neighbouring areas (NBDNR 2007).

Warmer south-facing slopes support some southern tree species not seen in nearby colder ecoregions, such as balsam fir (*Abies balsamea*); red, white, and black spruce (*Picea rubens, P. glauca, and P. mariana*); and tolerant hardwoods such as sugar maple (*Acer saccarum*), yellow birch (*Betula alleghaniensis*), and beech (*Fagus grandifolia*) (NBDNR 2007). Eastern white cedar (*Thuja occidentalis*) is common in calcareous soils, where they occur, in particular in the Little Main Restigouche and Grand River watersheds in the northern part of the Madawaska Uplands. Common understory shrub species include mountain maple (*A. spicatum*), striped maple (*A. pensylvanicum*), and hobblebush (*Viburnum lantanoides*).

The Madawaska Uplands Ecoregion contains many different wetland types, particularly in southern areas where the landscape is less constrained by steep slopes. Common wetland types include riparian shrub wetlands dominated by alder (*Alnus* spp.), open water wetlands, and peatlands (NBDNR 2007).

The Beadle Ecodistrict, which encompasses the Study Area, is characterized by broad valleys and rolling hills and contains many lakes. Like the Madawaska Uplands as a whole, the Beadle Ecodistrict has a cool, wet climate, and is dominated by south-facing slopes, the result of an elevation gradient ranging from 300 metres above sea level (masl) in the south to 600 masl in the north (NBDNR 2007).

Bedrock within the ecodistrict is primarily granitic, with relatively few fractures and low porosity causing poor drainage (Colpitts *et al.* 1995). This poor drainage has resulted in abundant lakes, ponds, and wetlands in the ecodistrict (NBDNR 2007). Watercourses in the north of the Beadle Ecodistrict generally flow eastward, eventually into the Miramichi River; those in the south generally flow southward into the Nashwaak and Saint John rivers.

Approximately 92% of the Beadle Ecodistrict is forested, including forested wetlands (NBDNR 2007). Forests in the ecodistrict transition from coniferous to tolerant hardwood stands. Granite-derived soils with imperfect to poor drainage are typically dominated by balsam fir and spruce; slopes and hilltops are dominated by sugar maple, yellow birch, and beech. Mixedwood stands are found in transition zones.

The geology of the Madawaska Uplands Ecoregion is characterized by Ordovician and Devonian metasedimentary rock. The surficial geology of the Study Area consists primarily of Wisconsinian and late Wisconsinian glaciofluvial sediments (*e.g.,* sand, gravel minor silt and till) (NBDNR 2007; Rampton 1984). The landscape within the Study Area is gently undulating with several peaks and ridgelines within and surrounding the Study Area. The hilly landscape, impermeable bedrock and thin soils, combined with forestry activities such as clear cutting and thinning of trees, results in surface water and watercourse levels that respond quickly to precipitation and snowmelt events.

The review of existing information revealed the presence of four main sub-watersheds in or near the Project location within the Study Area: Bird Brook, Sisson Brook, McBean Brook and West Branch Napadogan Brook. These watersheds may be directly affected by the Project, although these effects will be primarily concentrated within the Bird and Sisson brook watersheds. Bird, Sisson, and West Branch Napadogan brooks all contribute to Napadogan Brook, which flows generally southward to the Nashwaak River. McBean Brook lies west of the PDA, and flows generally west to the Nashwaak River.

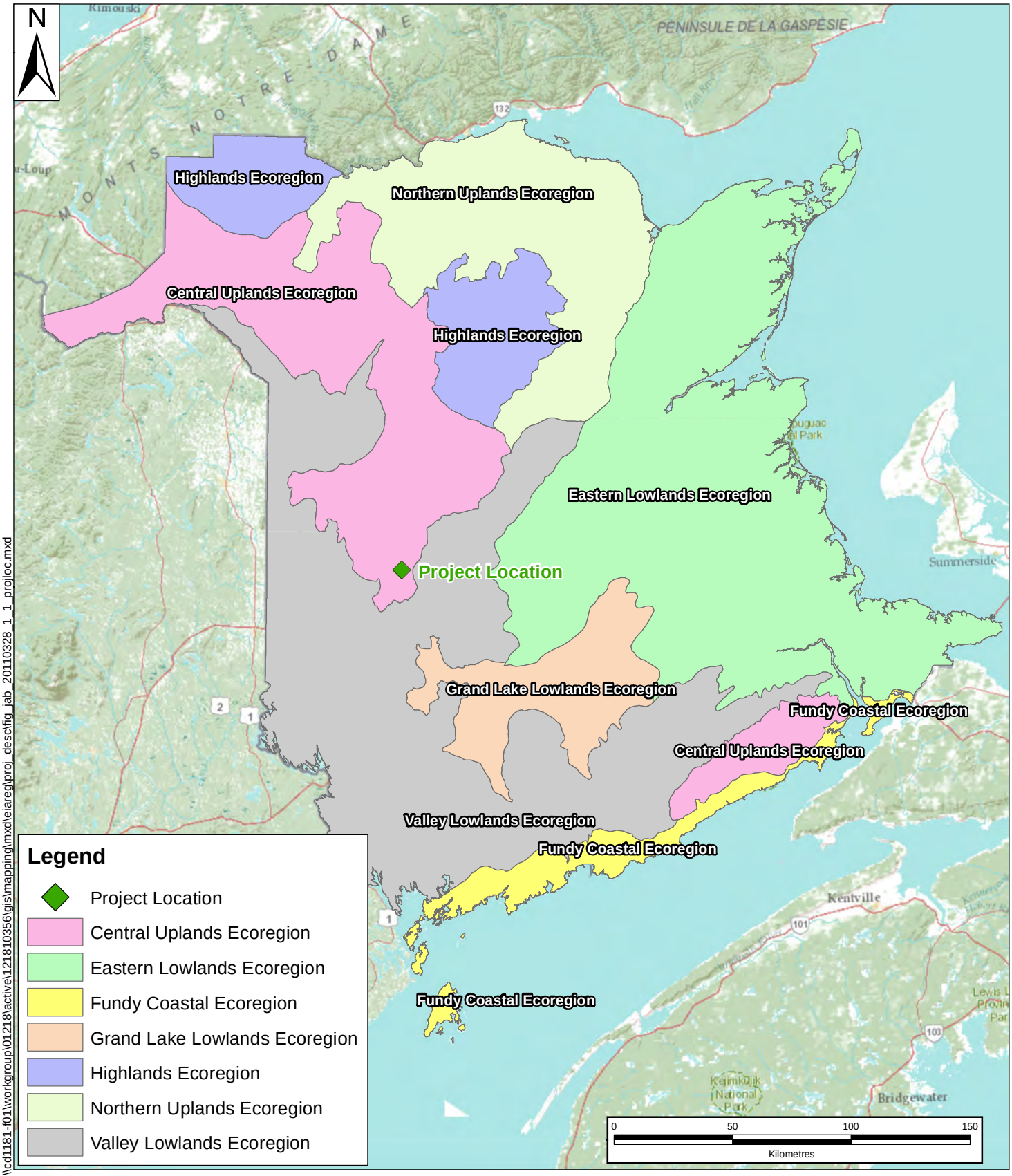
2.2 INFORMATION FROM THE NEW BRUNSWICK DEPARTMENT OF ENVIRONMENT

The NBENV has undertaken several programs to aid in the classification and protection of New Brunswick's groundwater, surface water and watercourses. Stantec consulted Dr. Don Fox, a water quality specialist with NBENV and Nelda Craig, a manager with NBENV (Fox, D. Personal communication, March 29 and 30, 2012; Craig, N. Personal communication, April 2, 2012). Dr. Fox, with the assistance of Ms. Craig provided location-specific information for the Project. Stantec also had access to the following resources from NBENV.

- **New Brunswick Watersheds Nashwaak River Fact Sheet (NBENV 2007).** This fact sheet provides general information on water quality, fish species, general geology and land use within the Nashwaak watershed. The fact sheet provides a general sense of the watershed and fish species found in the region, but does not provide specific information relating to the Study Area.

- **Water Classification Program.** The *Water Classification Regulation* under the New Brunswick *Clean Water Act* provides resources for local watershed groups to measure water quality. The NWAI has collected data to support the classification of water quality in the Nashwaak watershed (as discussed further below). For the Nashwaak River, these data are held by both NBENV and NWAI. According to these data, most of the watershed is considered to have good or excellent water quality. Approximately four percent of the stations sampled did not meet the recreational use guidelines for *E. coli* (NBENV 2007). Water classification information available is for the lower portions of the main stem of the Nashwaak River, but is not specific to the Study Area.

- **Watershed Protection Program (NBENV 2011a).** The Watershed Protection Program identifies and protects watersheds that are used as drinking water sources for downstream communities. The watershed protection program restricts development activities that could affect water quality within protected watersheds. The Study Team did not identify any protected watershed areas within the Study Area or downstream portions of the Nashwaak River.



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NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Ecoregions of New Brunswick Sisson Project: Baseline Aquatic Environment Technical Report Napadogan, N.B.	Scale: 1:2,200,000	Project No.: 121810356	Data Sources: SNB NRCAN, ESRI	Fig. No.: 2.1	Stantec
Client: Northcliff Resources Ltd.	Date: (dd/mm/yyyy) 10/04/2012	Dwn. By: JAB	Appd. By: DLM		

Stantec Consulting Ltd. © 2012

Map: NAD83 CSRS NB Double Stereographic

- **Wellfield Protection Program (NBENV 2011b).** The wellfield protection program has been developed to protect municipal groundwater supplies in New Brunswick. Protected wellfields are designated by the provincial government and some activities within these wellfields are restricted. No designated protected wellfields exist within the Study Area.

Taken overall, while the information available from NBENV provided good general background on overall conditions in the Nashwaak River watershed, very little information specific to the PDA or Study Area was available.

2.3 INFORMATION FROM THE NEW BRUNSWICK DEPARTMENT OF NATURAL RESOURCES

Stantec contacted Ms. Pam Seymour and Ms. Kathryn Collette, two fisheries biologists with NBDNR (Seymour, P. and Collette, K. Personal communication, March 29, 2012). General information was provided on local fish populations, and also concerning known barriers to fish passage within the Nashwaak River watershed. Staff of the NBDNR undertake regular index fishing to monitor brook trout (*Salvelinus fontinalis*) populations in New Brunswick, but none of these monitoring sites fall within the Study Area. Ms. Seymour and Ms. Collette also participated in consultation activities undertaken by the Study Team related to HADD and early discussions relating to the development of a fish habitat compensation plan. Data provided (along with other information available from NBDNR) included the following.

- **Geographic Information System (GIS) data.** These data included but were not limited to 1:10,000 scale mapping and associated GIS layers and aerial photographs. These resources provided detailed information on topography, land use, forest types, wetlands, watercourses and accessibility for both the PDA and the Study Area.

- **Fish 2012: A part of our Heritage (NBDNR 2012).** The Study Area is located within the Lower Saint John Recreational Fishery area that covers all water bodies of the Saint John River drainage downstream of Hartland. This guide identifies the presence of a recreational fishery in the Nashwaak watershed (NBDNR 2012). There is currently no open angling season for Atlantic salmon in the Lower Saint John Recreational Fishery area. The guide also provides the locations and timing of areas within the Nashwaak River that are closed to fishing.

There is also an extensive recreational sport fishery within the Nashwaak River and some of its tributaries. There is an open season for smallmouth bass from May 1 to October 15. Fishing is permitted for brook trout in most rivers, brooks and streams of New Brunswick, including the Nashwaak River and its tributaries, from April 15 to September 15. Fishing is also permitted for the following non-sport fish within the Lower Saint John Recreational Fishing Area (which includes the Nashwaak River and its tributaries) during periods of the year when there is a sport fishery open, should these species be present: burbot (*Lota lota*), American eel (*Anguilla rostrata*), gaspereau/alewife (*Alosa pseudoharengus*), brown bullhead (*Ictalurus nebulosus*), muskellunge (*Esox masquinongy*), chain pickerel (*Esox niger*), American shad (*Alosa sapidissima*), rainbow smelt (*Osmerus mordax*), striped bass (*Morone saxatilis*), white perch (*Morone americana*), whitefish (*Coregonus* sp.), yellow perch (*Perca flavescens*) and sturgeon (*Acipenser* spp.).

2.4 INFORMATION FROM THE DEPARTMENT OF FISHERIES AND OCEANS CANADA

Dr. Ross Jones of DFO (Jones, Dr. R. Personal communication, May 16, 2011, November 23 and 24, 2011) provided information regarding Atlantic salmon populations in the area, as well as ongoing, research and recovery efforts being undertaken by DFO. Dr. Jones is involved in the management of and data collection at a smolt wheel (usually located just above Durham Bridge), and a counting fence (located approximately 1 km downriver from Durham Bridge) operated by the Oromocto and Kingsclear First Nations with assistance from the NWAI. Dr. Jones the primary author of several DFO reports (below) that examine the status of Atlantic salmon in the Maritimes and specifically the Saint John River and its tributaries. Dr. Jones provided several DFO reports that provided information on parr densities within the Nashwaak River, including the following:

- **Status of Atlantic Salmon in Salmon Fishing Areas (SFAs) 19-21-23. Canadian Science Advisory Secretariat Science Response 2010/002 (DFO 2010).** This report provides scientific advice from DFO fisheries biologists for Outer Bay of Fundy (OBoF) Atlantic salmon. The Fisheries and Aquaculture Management Committee requested this information prior to the development of the 2010 recreational salmon fishing plan. This report provides general information on the numbers and status of salmon within the Nashwaak River.

- **Conservation Status Report, Atlantic Salmon in Atlantic Canada and Quebec: Part I – Species information. 2008. Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 2861 (DFO 2008).** This report provides detailed information on the biology, range, and habitat requirements of Atlantic salmon within the broad scope of the Maritimes and Quebec. Specific focus was also provided on Atlantic salmon belonging to the OBoF Conservation Unit 17 (CU17) within the Salmon Fishing Area 23. Salmon within the Study Area belong to CU17, which despite having slight improvements in returning salmon numbers, is unlikely to have enough returning fish to meet conservation requirements related to numbers of eggs laid.

- **Conservation Status Report Atlantic Salmon in Atlantic Canada and Quebec: Part II – Anthropogenic Considerations. 2009. Canadian Manuscript Report of Fisheries and Aquatic Sciences No 2870 (DFO 2009).** This report provides a concise review of threats and limiting factors to the recovery of Atlantic salmon stocks. The main threats identified in this report that are relevant to the Atlantic Salmon of the Nashwaak River are: 1) natural threats such as interspecies competition; and 2) anthropogenic effects such as fishing (recreational and Aboriginal), illegal harvesting, loss of habitat, dams and obstructions, water pollution (*e.g.,* waste water, sedimentation, industrial effluent), urbanization (leading to altered hydrology), infrastructure (*e.g.,* culverts), and invasive species. Threats are not mutually exclusive and will interact within the watershed to affect salmon populations. The report also addresses management measures (*e.g.,* closure of fisheries, stocking, habitat restoration), research needs (*e.g.,* remedy to threats, identify marine habitat), and recovery strategies.

- **Assessment of Atlantic Salmon Stocks in southwest New Brunswick, and update to 2003. 2004. R.A. Jones, L. Anderson and T. Goff. Canadian Science Advisory Secretariat, Research Document 2004/019 (DFO 2004).** This report focuses on the OBoF Atlantic salmon population in the Saint John River, with specific reference to the Atlantic salmon population of the Nashwaak River. Electrofishing for fry and parr was conducted at the following locations on the Nashwaak River: at Penniac Stream, above Durham Bridge, three stations on the Tay River, South Branch Tay River, Mackenzie Brook, Youngs Brook above Nashwaak Bridge, three stations on Cross Creek (above and below Stanley), Ryan Brook, Napadogan Stream, Cedar Bridge, two sites on Doughboy Brook, and below Gorby Gulch. The report provides estimates of the numbers of wild salmon in the overall Nashwaak River population. Estimates of adult fish are based on results obtained from operation of a salmon counting fence located 23 km upstream from the confluence of the Nashwaak River with the Saint John River. Estimates of wild smolt emigration are derived using mark and recapture of smolt collected in a rotary screw trap at Durham Bridge. Estimates of wild fry and parr are derived using mark and recapture at eighteen sites. For 2003, the estimated return of wild adult salmon totalled 287 (1 sea winter) and 109 (multi-sea winter), or approximately 7% of conservation requirements. Fry densities were 5.8 fry/100 m^2, and parr densities 6.5 fish/100 m^2, far below the historic 10 fry/100 m^2, and 38 parr/100 m^2. For 2003, the emigration of wild smolts was estimated as 9,000 individuals.

- **Assessment of Atlantic salmon stocks in southern and western New Brunswick (SFA 23) and update to 2005. 2006. R.A. Jones, L. Anderson, J.J Flanagan and T. Goff. Canadian Science Advisory Secretariat, Research Document 2006/025 (Jones 2005).** This report provides an update to the 2004 report above, and provides context to the number of salmon collected within the overall Nashwaak River system. In 2005, there were 427 1SW and 95 MSW salmon captured at the counting fence. Estimated returns were 697 1SW and 159 MSW for 2005. Fry densities were 7.7 fry/100 m^2 and parr densities were 6.0 fish/100 m^2. A total of 292 smolt were captured at the screw trap, on average fish were 15.4 cm long and predominantly 2 years old. In 2005 the Nashwaak attained 16% of its conservation requirements, an increase from previous years but still well below numbers required for a sustainable population.

- **Natural Fish Populations in Two Streams of the Nashwaak Experimental Watershed. 1980. J.D. Martin. Canadian Technical Report of Fisheries and Aquatic Sciences No. 982 (Martin 1980).** This study was conducted from 1972 to 1978 to understand the effects of different forest management practices on fish in three watercourses in the Nashwaak Watershed (Hayden Brook, Narrows Mountain Brook (two sites designated as lower and upper), and Lake Brook). Electrofishing conducted for seven years found brook trout, Atlantic salmon, American eel, slimy sculpin, and blacknose dace. Atlantic salmon and trout age classes were found to be bi-modal with overlap occurring between age 1 and 2 year fish. Atlantic salmon fry and parr were found in all brooks and entered the brooks in late May early June. Although Atlantic salmon were not observed spawning in the brooks, fry were found in these habitats in the spring, and had presumably emerged from redds nearby. Atlantic salmon parr were observed to move upstream into the brook habitat in May and June. Brook trout were also found in all three brooks and there was a migration of yearling fish upsteam noted in June. American eel were collected in all three watercourses and were most numerous in July, migrating out of the watercourses in the fall to overwinter. This report provided useful

information on the species present in the watershed and historic age length distributions for salmon and trout in some streams within the Nashwaak River system; however, the data collected is historical in nature, and does not refer to streams within the Study Area.

- **Outer Bay of Fundy Atlantic Salmon Status Report, Committee on the Status of Endangered Wildlife in Canada 2010 (COSEWIC 2010).** The status of the OBoF Atlantic salmon was reviewed by COSEWIC in November 2010. The status of OBoF Atlantic salmon was changed by COSEWIC to "Endangered" in response to continued declines in the adult portion of this population. Atlantic salmon within the Study Area are part of the overall OBoF Atlantic salmon population. To date, the OBoF salmon population has not gained standing as a species at risk under the federal *Species at Risk Act* (*SARA*).

2.5 INFORMATION FROM THE NASHWAAK WATERSHED ASSOCIATION INC. (NWAI)

The Study Team reviewed information provided by NWAI. The majority of this information focused on the lower Nashwaak watershed, closer to Fredericton; however, some of the information focused on watercourses found within the Napadogan Brook watershed. The availability of this information allowed Stantec to anticipate the expected water quality and fish species present within the Study Area. The Study Team also contacted Mr. Gary Spencer and Mr. Paul McLaughlin of NWAI, who provided valuable suggestions on field planning, feedback on the data collected in 2011, and suggestions for additional Aquatic Environment work. Stantec reviewed the following reports prepared by NWAI.

- **Nashwaak River Enhancement Project: Stream Survey and Habitat Assessment. Prepared for the Co-operational Agreement on Recreational Fisheries Development, January 1996 (Sturgeon 1996).** This report details stream habitat surveys conducted by NWAI during 1995, following the DFO/NBDNR survey protocol, in portions of the Nashwaak River and 13 tributaries (including Rocky Brook, McBean Brook, Ryan Brook, Manzer Brook, McKenzie Brook, Cross Creek, Five Mile Brook, Grand John Brook, Tay River, McClean Brook, Fisher Brook and McGivney Brook). The assessment was conducted to determine if suitable habitat for sea run brook trout was present. The survey found overall good stream condition (*i.e.,* good cover, little erosion, good substrate, and no major concerns). It was noted that at the time of the survey that algal mats were present for approximately 200 m below the Tay Falls fish farm. These could be problematic in terms of water quality in the watercourse (*e.g.,* nutrient loading, dissolved oxygen). The report provides a baseline for brook trout habitat available within some tributaries of the Nashwaak River; however, none of the watercourses surveyed were within the Study Area.

- **Report on Activities Funded in 1998 by the Nashwaak Watershed Association Inc., the Department of Fisheries and Oceans, the New Brunswick Department of Natural Resources and Energy and the New Brunswick Department of the Environment. Prepared for the New Brunswick Wildlife Trust Fund, March 1999.** This report provides the results of several studies conducted by NWAI in 1998. The NWAI built and tested the effectiveness of two satellite rearing stations for Atlantic salmon, conducted dissolved oxygen (DO) and temperature measurements at selected stations within the Nashwaak watershed, collected mapping and aerial photography information, conducted a benthic invertebrate community survey, conducted a redd count, characterized aquatic habitat, and undertook an

estimate of smolt production on the Nashwaak River. From this work, the NWAI identified a number of items from the research conducted in 1998 that warranted additional attention, as follows:

a) NWAI noted correlation between water discharge on the Nashwaak River and Atlantic salmon returns, and felt that this warranted further investigation; NWAI suggested using discharge manipulation using the dam below Lower Nashwaak Lake for this purpose;

b) NWAI felt that an examination of winter hydrology should be done as winter ice may be affecting egg survival;

c) NWAI wished to continue desktop assessment of air photos and mapping to determine if increased forestry activities coincide with a change in salmon returns;

d) NWAI also wished to investigate anecdotal evidence that fish poaching was occurring on the Nashwaak River; and

e) NWAI recommended a re-evaluation of escapement requirements as they had been met in only 4 out of 28 years.

The report provided valuable information in the context of existing conditions within the Nashwaak watershed, but did not contain specific information on watercourses within the Study Area.

- **Water Classification 1st Year Report: Report on Progress Towards Water Classification, 2001/2002 Nashwaak Watershed Drainage. Prepared for the New Brunswick Department of the Environment and Local Government, March 2002.** This report outlines the results of the NWAI's water quality sampling program that collected water quality at 17 sites within the Nashwaak watershed. The NWAI also collected benthic invertebrate community data from nine sites within the Nashwaak watershed. The collected data were intended to further efforts of the NWAI to have the Nashwaak River classified under New Brunswick's *Water Classification Regulation – Clean Water Act*. The data was entered into a GIS database along with land use, road cover, stream flow and precipitation information to get an overall picture of water quality within the watershed (presented as maps). This work also involved substantial outreach to the community within the Nashwaak watershed, as well as provincial and federal regulatory agencies. The report found good water quality throughout the watershed, likely a result of 94.9% of the watershed area being undeveloped.

- **Water Quality of the Nashwaak River. Prepared for the New Brunswick Department of the Environment, March 2003.** This report summarizes five years of water quality data collected by the NWAI. The report also suggests classifications for sections of the Nashwaak River based on the collected water quality data. The report provides a description of geology, ecology, land use and demographics within the Nashwaak watershed. Several water samples exceeded Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME 1997 and updates). Aluminum, cadmium, chromium, copper, iron, and zinc were all above CCME guidelines, which was attributed to the natural geology of the area. Elevated numbers of *E. coli* were found at Penniac Stream, Gorby Gulch, and Barkers Point. Penniac

Stream and Barkers Point both receive effluent from waste water treatment at Stanley and Fredericton, and a fish hatchery at Tay Falls may further influence the Penniac Stream water quality. Elevated *E. coli* at Gorby Gulch was assumed to be the result of camps with faulty or no septic systems. Based on the water quality sampling program, NWAI suggested a classification of "A" for the entire Nashwaak River system and tributaries under the *Water Classification Regulation*, with the exception of the main stem. The NWAI suggested a classification of "B" for the Nashwaak River from Durham to Marysville, and a classification of "C" for Penniac Stream and the Nashwaak River from Marysville to Barkers Point. The NWAI noted that improvements in waste water treatment could result in an improvement of water quality classification.

- **Assessment of Nashwaak River Smolt Survival. Prepared for the New Brunswick Wildlife Trust Fund 2004.** This report covers the 2002 tagging project that the NWAI along with DFO took part in as part SalarMAP, a large-scale Inner Bay of Fundy Atlantic salmon tracking program initiated by the ASF, and intended to study Atlantic salmon migration in and out of the Bay. NWAI was invited to participate in the existing program to understand smolt movement through the Nashwaak and Saint John Rivers (Outer Bay of Fundy stocks) to the Bay of Fundy. Smolts were tagged with ultrasonic tags that transmitted a unique signal and were tracked through the use of submersible receivers at eight locations throughout the Nashwaak River (5 receivers), Saint John River (2 receivers), and Bay of Fundy (1 receiver), as well as through active searches for signals. Tagged smolts were released into the Nashwaak River at Durham Bridge. It took smolts an average of 2.1 days to reach the mouth of the Nashwaak River from Durham Bridge, 4.8 days to reach Evandale, and 9.1 days to reach the mouth of the Saint John River. Only 23 of the 40 wild smolts released were detected at the mouth of the Saint John River. The report concluded that the highest mortality for salmon smolts from the Nashwaak River occurred in the area of the Saint John River between Westfield and Saint John. Apparent mortality may have been the result of predation, a delayed effect of tag implantation surgery, or could simply represent the failure to detect tag signals. The report provided information and context for the movements of Atlantic salmon smolts from the Nashwaak River to the Bay of Fundy.

2.6 INFORMATION FROM CANADIAN RIVERS INSTITUTE, UNIVERSITY OF NEW BRUNSWICK

Stantec consulted with Dr. Allen Curry and Dr. Kelly Munkittrick for general expertise in the local area and specific scientific expertise related to fish populations and Environmental Effects Monitoring (EEM) (Curry, A. and Munkittrick, K. Personal communications, May 24, 2011 and December 16, 2011). Dr. Curry and Dr. Munkittrick were also engaged by the Study Team in stakeholder meetings where the design and results of the 2011 field studies were discussed, and provided valuable feedback on study design and preliminary results of field surveys.

Dr. Donald Baird and Dr. Joseph Culp were contacted on several occasions in May 2011, prior to the initiation of field work; however, neither was available for consultation. Both Dr. Baird and Dr. Culp are experts on benthic invertebrate communities, and hold joint research and teaching positions through Environment Canada and University of New Brunswick.

2.7 INFORMATION FROM THE ATLANTIC SALMON FEDERATION

The Study Team consulted Mr. Geoff Giffin, Director of New Brunswick Programs for ASF. Mr. Giffin was engaged though participation in the stakeholder working group and provided expertise with regards to Atlantic salmon populations in the Nashwaak River (Giffin, G. Personal communication, May 24, 2011 and December 16, 2011). The ASF maintains an Atlas of current and historic Atlantic salmon rivers in Québec and the Maritime Provinces (ASF 2012). Stantec consulted the Atlas for information the status of Atlantic salmon in the Nashwaak River, Napadogan Brook, and Saint John River areas.

2.8 INFORMATION FROM PREVIOUS SISSON PROJECT WORK

Rescan™ Environmental Services Ltd. (Rescan™ 2010) carried out baseline environmental studies on behalf of Geodex Minerals in 2008-2009 to support the EIA for the Project (Rescan™ 2010). The Project footprint contemplated at that time covered a larger area than the current PDA, and hence the distribution of sampling stations included a focus on some areas that will no longer be affected by the Project. Despite the changes in the Project Description, the Rescan™ data were used to help plan the field program carried out in 2011.

2.9 AQUATIC SPECIES AT RISK AND SPECIES OF CONSERVATION CONCERN

The terms species at risk and species of conservation concern, referred to in this section, are defined as follows.

- Species at risk (abbreviated SAR) include species that are listed under Schedule 1 of the *Species at Risk Act (SARA)* as “Extirpated”, “Endangered”, or “Threatened” and/or listed under the New Brunswick *Endangered Species Act* (NB *ESA*) as “Endangered” or “Regionally Endangered”.

- Species of conservation concern (abbreviated SOCC) include those species that are listed by, but not currently under the protection of *SARA* (*i.e.,* species listed as “Special Concern” in Schedule 1 of *SARA*; listed in Schedule 2 or 3 of *SARA*; or listed as “Special Concern”, “Threatened” or “Endangered” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but not yet listed in Schedule 1 of *SARA*); or ranked as “S1”, “S2”, or “S3” in New Brunswick by the Atlantic Canada Conservation Data Centre (AC CDC); and/or ranked as “May Be At Risk” or “Sensitive” in New Brunswick by the Canadian Endangered Species Conservation Council (CESCC).

For the purposes of this Technical Report, aquatic SAR and SOCC are further limited to consideration of fishes, amphibians, aquatic invertebrates (including mollusks, arthropods, annelids, and other aquatic invertebrate phyla), and aquatic plants. Reptiles, birds, and mammals are not considered to be aquatic SAR or SOCC in this report, even if they use aquatic habitat, as they will be addressed as wildlife species, as applicable, in the Baseline Wildlife and Wildlife Habitat Technical Report prepared for the Project (Stantec 2012a).

A representative of DFO was consulted regarding aquatic SAR and SOCC. From the perspective of DFO, only those organisms that are considered to be fish (as defined in the *Fisheries Act*, including generally marine mammals, finfish, mollusks and crustaceans, in all of their parts and life stages) fall under the purview of DFO (Walmsley, J. Personal communication, October 21, 2011). This definition omits consideration of marine plants, as well as many freshwater invertebrate groups such as insects. In addition, the DFO website provides a list of SOCC by region in Canada. This list was cross-referenced with information from the *SARA* registry to confirm the most recent status of such species as provided in Table 2.1 below.

The AC CDC serves as a repository of information on the known occurrences of SAR in the Maritimes. A search of the AC CDC database (AC CDC 2012) was conducted in 2011 and updated in 2012 to identify known occurrences of any SAR within a 5 km radius of the PDA (Appendix B). Stantec also consulted with local experts (*i.e.,* DFO, NBDNR, CRI) for more information specific to the Study Area. From that search, there were no occurrences of SAR noted.

Notwithstanding the general paucity of scientific information regarding aquatic SAR, the Study Team identified the following SOCC species as having habitat or life history characteristics, as well as known distribution in New Brunswick, that could lead to their presence in or utilization of habitat within the PDA or Study Area:

- Outer Bay of Fundy (OBoF) Atlantic salmon (*Salmo salar*, a fish);
- American eel (*Anguilla rostrata*, a fish);
- pigmy snaketail (*Ophiogomphus howei*, a dragonfly);
- yellow lampmussel (*Lampsilis cariosa*, a mussel);
- brook floater (*Alasmidonta varicosa*, a mussel); and
- prototype quillwort (*Isoetes prototypus*, a plant).

Table 2.1 Aquatic Species at Risk and Species of Conservation Concern as Identified by DFO Maritimes Region, with Status as Identified by the *SARA* Registry

Species	Category	COSEWIC Status	*SARA* Status	Location	Relevance to Sisson Project
Grey Whale	Mammal	Extirpated	Extirpated	Marine	None.
Atlantic Walrus (northwest Atlantic population)	Mammal	Non-active	Extirpated	Marine	None.
Dwarf Wedgemussel	Mollusk	Extirpated	Extirpated	Freshwater	None – previously known only from Petitcodiac River drainage.
Blue Whale	Mammal	Endangered	Endangered	Marine	None.
Northern Bottlenose Whale (Scotian shelf population)	Mammal	Endangered	Endangered	Marine	None.
North Atlantic Right Whale	Mammal	Endangered	Endangered	Marine	None.
Leatherback Turtle	Reptile	Endangered	Endangered	Marine	None.
White Shark	Fish	Endangered	Endangered	Marine	None.
Atlantic salmon (inner Bay of Fundy population)	Fish	Endangered	Endangered	Anadromous	None – not present within the Saint John River drainage.
Atlantic Salmon (Outer Bay of Fundy population)	Fish	Endangered	None	Anadromous	High.
Atlantic Whitefish	Fish	Endangered	Endangered	Freshwater	None – found only in Nova Scotia.
Cusk	Fish	Threatened	None	Marine	None.
Rainbow Smelt (Lake Utopia small-bodied population)	Fish	Threatened	Threatened	Freshwater	None – found only in Lake Utopia.
Rainbow Smelt (Lake Utopia large-bodied population)	Fish	Threatened	None	Freshwater	None – found only in Lake Utopia.
Northern Wolffish	Fish	Threatened	Threatened	Marine	None.
Spotted Wolffish	Fish	Threatened	Threatened	Marine	None.
Shortfin Mako	Fish	Threatened	None	Marine	None.
Striped Bass (Bay of Fundy population)	Fish	Threatened	None	Anadromous	None – present in the Saint John River system, but not known to spawn in the Nashwaak River system.
Harbour Porpoise	Mammal	Special Concern	Schedule 2 Special Concern	Marine	None.
Fin Whale	Mammal	Special Concern	Special Concern	Marine	None.
Sowerby's Beaked Whale	Mammal	Special Concern	Special Concern	Marine	None.
Atlantic Wolffish	Fish	Special Concern	Special Concern	Marine	None.

Table 2.1 Aquatic Species at Risk and Species of Conservation Concern as Identified by DFO Maritimes Region, with Status as Identified by the *SARA* Registry

Species	Category	COSEWIC Status	*SARA* Status	Location	Relevance to Sisson Project
Shortnose Sturgeon	Fish	Special Concern	Special Concern	Freshwater	None – present in the Saint John. River system, but not known to spawn in the Nashwaak River system.
American Eel	Fish	Special Concern	None	Anadromous	High.
Yellow Lampmussel	Mollusk	Special Concern	Special Concern	Freshwater	Low – found in sandbar habitat in the Saint John River, but not likely to be found in the Nashwaak River system.

Source:
1. Data obtained from *SARA* registry (http://www.sararegistry.gc.ca/sar/index/default_e.cfm?stype=species&lng-=e&index=1&cosid=&common=lampmu&scientific=&population=&taxid=0&locid=0&desid=0&schid=0&desid2=0&) on March 31, 2012.
2. Data obtained from DFO (http://www.dfo-mpo.gc.ca/species-especes/search-location-recherche-endroit-eng.htm# MaritimesSpecies) on March 31, 2012.

Further details on these identified species are provided below.

The Atlantic salmon of the Nashwaak River system are part of the larger Saint John River stock, which itself is part of the OBoF Atlantic salmon population. The OBoF population was identified as "Endangered" by COSEWIC in November 2010 (COSEWIC 2010), although no such status has yet been identified under Schedule 1 of *SARA*. Watercourses within the PDA and Study Area provide habitat for Atlantic salmon. There is currently no open season for Atlantic salmon within the Nashwaak watershed. There is no known commercial fishery or Aboriginal fishery for Atlantic salmon on the Nashwaak River or its tributaries (DFO 2010). According to DFO, the Nashwaak River is the largest single salmon producing tributary to the Saint John River down-river of the Mactaquac hydroelectric dam at Kingsclear (DFO 2010). The Nashwaak River contains 28.5% of the Saint John River's total salmon production area down-river of the Mactaquac dam (DFO 2010).

American eel is listed by COSEWIC as "Special Concern", but as yet has no schedule or status under *SARA*. Watercourses within the PDA and Study Area provide habitat for the American eel (COSEWIC 2006). The American eel was designated by COSEWIC as "Special Concern" in April 2006, following a marked decline in abundance in the Upper St. Lawrence River and Lake Ontario. All American eels are believed to return to the Sargasso Sea to spawn, and larval eels drift back up the eastern seaboard of North America before ascending freshwater streams to grow to adulthood (a process that can take longer than 10 years). American eels are therefore treated as a single population, and eels from otherwise healthy populations are considered vital to the overall health and sustainability of this species. Thus, changes to the population in the Maritimes may impact the North American population (COSEWIC 2006).

The pigmy snaketail dragonfly is listed "Special Concern" by COSEWIC and is listed on Schedule 1 of *SARA* as "Special Concern". Pigmy snaketail occur only in Eastern North America, and the Saint John River in New Brunswick is one of the 12 known locales for the species (COSEWIC 2008). The pygmy snaketail occupies the forest canopy as an adult, making their capture and identification difficult. The final aquatic stage of the pigmy snaketail emerges from the water in late June, so that the adults can take flight, feed, and reproduce. The exuviae (moulted skins of the juveniles) can be used for specific identification (COSEWIC 2009). The distribution and preferred habitat of the pigmy snaketail in New Brunswick is not well known. Stantec therefore conducted a precautionary search for juvenile gomphid dragonflies and exuviae along watercourses of the PDA and Study Area in early June 2011, when this species was likely to be emerging.

Yellow lampmussel is a rare mussel (Unionidae) listed as "Special Concern" by both COSEWIC and in Schedule 1 of *SARA*. The distribution in New Brunswick lies solely within the Saint John River system. The nearly level bottom and tidal nature of the lower Saint John River have resulted in the formation of extensive sand bars which appear to offer excellent conditions for this species; however, the yellow lampmussel has occasionally been found on cobble substrates, and could therefore be present in the Nashwaak River system. Searches for unionid mussels were undertaken throughout the 2011 field program as there is no critical time period relating to the search for mussels.

The brook floater is a rare mussel (Unionidae) listed as "Special Concern" by COSEWIC but having no schedule or status under *SARA*. The AC CDC and COSEWIC have no record of brook floaters in the Saint John River system. However, several other watersheds in southern New Brunswick, including the Magaguadavic River and the Miramichi River, have records of their occurrence, making their presence

in the Nashwaak River system a possibility. In New Brunswick it has only been found in rivers. In Nova Scotia, although primarily occurring in rivers, this species is occasionally found in small sandy-bottomed lakes with no evident water flow. It usually prefers sand or fine gravel substrates but is occasionally found in pockets of sand within cobble and rocky bottom areas. Searches for unionid mussels were undertaken throughout the 2011 field program as there is no critical time period relating to the search for mussels.

The prototype quillwort is a plant, listed as "Special Concern" by COSEWIC and listed as Schedule 1 ("Special Concern") under *SARA*. The prototype quillwort is considered a "living fossil", having primitive characteristics that suggest that it represents a form ancestral to other species of *Isoetes*. The species is generally found rooted in lake sediments at a depth 1.5 to 2.5 m (COSEWIC 2005). The preferred habitat for prototype quillwort is nutrient-poor spring-fed lakes with soft oozy sediment over sand or gravel (COSEWIC 2005). Prototype quillwort is known from thirteen lakes in North America, three of which are in New Brunswick (COSEWIC 2005). This plant is most easily identified when mature, usually in early fall (September). Habitat suitable for prototype quillwort could be present in Christmas and Trouser Lakes. Although these lakes are outside of the PDA and Study Area Stantec adopted a precautionary approach and undertook surveys for prototype quillwort in the lakes in early September 2011. Explanation of the prototype quillwort survey and the results of the survey can also be found in the Baseline Vegetated and Wetland Environments Technical Report for the Sisson Project (Stantec 2012b).

2.10 IDENTIFIED GAPS IN DATA

Through the review of previous studies and existing information as detailed above, Stantec identified gaps in the existing knowledge of the Aquatic Environment within the Study Area. General information on the Aquatic Environment in the area of, and downstream of the Study Area, was available from several sources. Additionally, Rescan™ conducted aquatic surveys for Geodex that included stations within the PDA, as well as some portions of the Study Area, in 2008 (Rescan™ 2010). Rescan's surveys covered a broad area and were based on a Project description that has since been refined, as detailed in the Project Description for the Sisson Project, submitted to the Canadian Environmental Assessment Agency in April 2011 (Stantec 2011b). Geodex (and subsequently Northcliff) have also maintained a network of water quality monitoring stations within the Study Area, where regular and ongoing sampling has provided more than three years of surface water quality monitoring data. These data are being prepared and summarized separately by Knight Piésold, on behalf of Northcliff.

In addition to the routine surface water quality monitoring data collected at strategic locations within the drainage system, detailed information and data were also required on a finer scale to support the assessment of fish habitat quality for the PDA and Study Area. Specifically, information on local water quality, sediment quality, fish species (presence and abundance), and fish habitat quality and quantity for the watercourses expected to be directly or indirectly affected by the Project were required, and were not available from existing sources.

Based on available information reviewed, the following key program components were identified as being required to describe the existing environmental conditions for the Aquatic Environment in the PDA and Study Area:

- information on the type, quality and quantity of fish habitat present in watercourses;

- information on surface water and sediment quality in watercourses;
- information on fish species using habitat;
- information on the potential presence of aquatic SAR in watercourses;
- information on benthic invertebrate communities in watercourses; and
- information on periphyton communities in watercourses.

Further to these requirements, it was determined that baseline data upon which future follow-up or environmental effects monitoring (EEM) programs can be based should be collected. To this end, it was decided to implement a sampling program to collect data consistent with the requirements of an EEM program under the *Metal Mining Effluent Regulations* under the *Fisheries Act*. Such programs typically include the following components:

- a fish study, usually involving adult fish, with measurement of parameters that provide information on the survival, growth, and reproductive potential of fish that are either exposed, or not exposed to mine effluent;
- an evaluation of the "useability" of the fisheries resource, usually involving analysis of fish tissue for mercury to determine whether such tissues are suitable for human consumption;
- a benthic invertebrate study to determine the abundance, diversity, and other parameters describing this community, as an indicator of the overall health of fish habitat; and
- water and sediment quality sampling to aid in the interpretation of the fish and benthic invertebrate studies.

The above-noted components were therefore included in the Aquatic Environment study program.

Stantec developed a work plan to collect baseline data for the Aquatic Environment (Stantec 2011a) based on these data gaps, and follow-up studies were conceived and carried out in the 2011 field season to fill these data gaps. These included the collection of data in the PDA and Study Area for water quality, sediment quality, stream morphology, fish habitat, fish populations, benthic invertebrate communities, and periphyton communities. The methodologies and results of these field studies are described in the sections that follow.

3.0 2011 FIELD PROGRAM METHODOLOGY

This section describes the methodology that was used to design and conduct the field program for characterizing existing conditions for the Aquatic Environment in the Study Area in 2011, based on the identified gaps in available information described previously and to supplement existing information through other sources.

Due to the complexity of the Project and the size of the PDA and Study Area, the Study Team approached the field work in six planned stages. The staged approach was used to determine the extent, quality, and quantity of fish habitat present, as well as to lay a foundation for the future analysis of the potential environmental effects of the Project in the EIA Report. The six stages of work completed are described briefly here, and in more detail later in this section.

1) **Remote Sensing Surveys and Mapping of Watercourses.** A desktop mapping exercise was carried out, using LiDAR (light detection and ranging) data covering the entire Study Area collected specifically for the Sisson Project. LiDAR is an optical airborne sensing technology that can measure the distance to, and properties of the landscape using a laser scanning and receiving technology. Among the broad suite of environmental information that can be generated using LiDAR, the high resolution identification of watercourses prior to field surveys was one aspect of key importance to the mapping and assessment of the Aquatic Environment for the Sisson Project.

2) **Rapid Fish Habitat Bio-Assessment Surveys.** A rapid fish habitat bio-assessment survey was conducted to ground-truth the mapping generated from the LiDAR data, to characterize and quantify the habitat present within the PDA, and to identify key sampling stations for subsequent qualitative and quantitative investigations.

3) **Habitat Surveys with Qualitative Electrofishing.** Thirty-two stations distributed throughout the Study Area were identified for assessment of fish habitat and fish populations, including completion of DFO/NBDNR fish habitat data sheets and qualitative electrofishing (to evaluate fish species present, and to measure catch per unit effort as a function of electrofishing seconds). Water and sediment samples were also collected at each of these stations.

4) **Habitat Surveys with Quantitative Electrofishing and EEM Endpoints.** Ten stations from among the 32 qualitative stations, including three within the PDA and seven outside the PDA, were identified for quantitative assessment of fish populations and implementation of data collection following an EEM model. This work again included the completion of DFO/NBDNR fish habitat data sheets, as well as quantitative electrofishing of habitat isolated by barrier nets to quantify the number and biomass of fish per unit area of habitat, collection of EEM endpoints (such as length, weight, age, liver weight, gonad weight, and number of eggs per ovary for female fish). In addition, benthic invertebrate samples, periphyton samples, and water and sediment samples were collected.

5) **Detailed Fish Habitat Surveys for Napadogan Brook.** A detailed fish habitat survey on the lower portion of Napadogan Brook (*i.e.,* the main stem of West Branch Napadogan Brook and Napadogan Brook from Bird Brook to the confluence of Napadogan Brook and the Nashwaak River) was completed to aid in the assessment of potential HADD due to flow reductions that may arise as a result of the Project. The fish habitat survey included completion of DFO/NBDNR fish habitat survey forms for 114 individual reaches of habitat.

6) **Surveys for Aquatic Species of Conservation Concern.** Surveys intended to detect the presence of selected aquatic SOCC, should they be present within the Study Area, were conducted.

The methods used to complete these six surveys are detailed below.

3.1 REMOTE SENSING SURVEYS AND MAPPING OF WATERCOURSES

Leading Edge Geomatics Ltd. was retained by Northcliff to collect LiDAR data for the PDA and Study Area. The area including and surrounding the PDA was flown on December 18, 2010, and the corridor surrounding Napadogan Brook from Sisson Brook to its confluence with the Nashwaak River was flown on June 21, 2011. The LiDAR data were delivered to Stantec in a form suitable for importing into a geographic information system (GIS). The nominal topographic and spatial resolution of the LiDAR data was excellent (horizontal positional accuracy was 0.12 m; vertical positions accuracy was 0.32 m; ground point spacing was 1.5 m).

The LiDAR dataset for the PDA and Study Area was imported into ESRI ArcGIS, and a site-specific topographic model was developed. The topographic model was used to predict on-the-ground conditions for fish habitat. Parameters included in the model were stream gradient, sinuosity, and stream order. The LiDAR dataset was also used to identify potential waterfalls, steep sections impassable to fish, or barriers to navigation, for subsequent field verification. The topographic model was then used to define specific segments of the watercourses to be further characterized by field crews. Each stream segment was assigned a unique name, following a standardized naming convention. Using the verified data, additional parameters such as embeddedness, bankfull width, and bankfull depth were added to the model to aid in qualitative station selection. The combination of remote sensing data and field data verification ensured that a representative sample of habitat types was used in selecting subsequent survey stations. The results of the model can also be applied to predict the characteristics of un-surveyed habitat near the PDA. An explanation of the methods used to create the stream network model and define stream segments within the Study Area is provided below.

3.1.1 Stream Network Creation

A stream network was created using GIS-based analysis of stream habitat to assist in analyzing stream segments for gradient and sinuosity. Stream networks, gradients, and watershed delineations were created using ESRI ArcGIS software and supplemented by the Spatial Analyst, 3D Analyst, TauDEM and ArcHydro software extensions. The creation of the GIS-based stream network was based primarily on a digital elevation model (DEM) and flow direction and accumulation cell-based rasters produced from it. The following were developed.

- A 1 m DEM from LiDAR surveyed elevation data was constructed.

- Analysis and filling of all appropriate sinks in the DEM to ensure proper drainage throughout the Study Area.
- Creation of a flow direction grid such that each cell indicates the direction of the steepest descent from that cell.
- Creation of flow accumulation grid containing the accumulated number of upstream cells, for each cell in the flow direction grid.
- Creation of a stream raster using the flow accumulation and flow direction grids. A cell-based stream grid can be created where the number of accumulated cells meet a specified threshold and are deemed to be stream cells. The optimal threshold is determined by performing a stream drop test, which determines the smallest threshold value where the mean difference in elevation for the start and end of stream, between first order and higher order streams, is not significantly different. Using an appropriate threshold helps to ensure high drainage density in steeper elevation areas and limits spurious drainage paths in valleys.
- Determination of stream order using Strahler (1957) method.
- Conversion of raster-based stream grid to feature-based stream polyline.
- Creation of stream junction point layer to identify confluences between streams.

3.1.2 Stream Gradients

There are several methods for segmenting streams for determining gradient, including: splitting at contour intervals (*e.g.*, at every 5 or 10 m contour interval), equal intervals (*e.g.*, every 100 m along the watercourse), or at every stream junction or confluence. The method adopted for this work was to define stream segments based on contour lines, and to combine segments shorter than a specified length to capture significant changes in grade, while keeping parsimonious the overall number of identified stream segments. The process used was as follows.

- Break stream segments based on intersections with 5 m contours derived from the LiDAR DEM.
- Identify significant changes in gradient, defined as occurring where the difference in length of two adjacent stream segments is greater than the standard deviation for all the lengths of stream segments for that stream (line segments will remain broken where this is true, and combined where it is not).
- Calculate the elevation at each start (upstream) and end (downstream) point for each stream segment.
- Calculate the percent gradient for each stream segment, as the difference in elevation between the start and end of the segment, divided by the length of the segment.

- Calculate the sinuosity of each stream segment as the actual length of the stream centre line, divided by the straight-line distance between the upstream and downstream end points of the stream segment.

3.1.3 Watershed Delineations

Minimum catchment area polygons for the Study Area were created based on the flow accumulation and flow direction grids previously created for the stream network. These polygons were aggregated to create watersheds and sub-watersheds for specific streams from the stream network (Figure 3.1).

3.1.4 Reach Characterization and Naming

Each watercourse was divided into reaches based on grade, sinuosity, hydrology (*e.g.*, the entry of a tributary), or length. Determining significant change in grade or sinuosity was described above. Reaches were on average approximately 500 m in length; however, in some cases reaches of up to 1,000 m length were defined due to continuous characteristics. Watercourse reaches were assigned labels according to where the tributary entered the mainstream and location on the watercourse (*e.g.*, S1A1 for Sisson Brook, first order tributary, reach 1). Watercourse reaches were numbered from the headwaters moving downstream (*e.g.,* S1A2 names a particular reach in Sisson Brook, where "S" indicates Sisson Brook, "1" identifies the reach as first order stream, "A" is the name of the particular stream branch within Sisson Brook, and "2" which indicates where on the upstream-to-downstream continuum of the watercourse the reach is located within the branch. The stream reaches identified and named through the remote sensing and desktop exercise, and subsequently evaluated using a rapid fish habitat bio-assessment survey, are presented in Figure 3.2.

3.2 RAPID FISH HABITAT BIO-ASSESSMENT SURVEYS

The rapid fish habitat bio-assessments were conducted between June 13 and June 29, 2011. Two field crews, each consisting of an aquatic biologist and a field technician, walked all the GIS-delineated reaches within the PDA. A total of 35 km of stream habitat was surveyed, including all of Sisson Brook and Bird Brook, several tributaries to McBean Brook, and tributaries to the West Branch Napadogan Brook (Figure 3.2). Rapid bio-assessment forms were completed in each reach within the PDA, along with *in situ* water quality measurements. Photographs were also taken to document habitat characteristics.

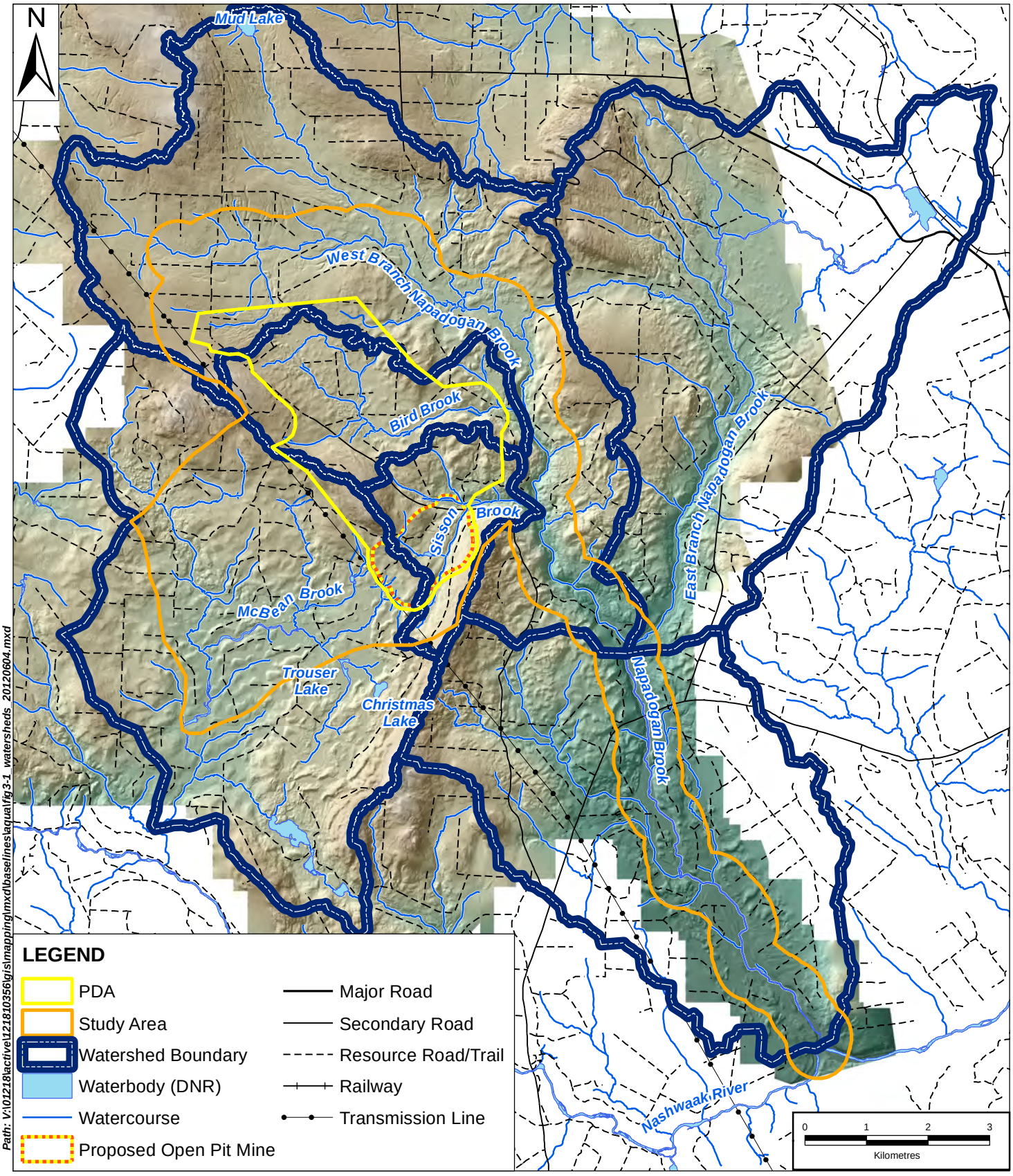
Stantec reviewed existing NBDNR provincial watershed boundaries and watersheds within the Study Area. Sub-watersheds in the Study Area were further defined using LiDAR data. Stream reaches were identified for the rapid bio-assessment surveys based upon the LiDAR data and other map sources (such as the 1:50,000 national topographic series data, and the 1:10,000 NBDNR map layer). The field investigations completed by Stantec were used to confirm reach breaks and to provide an overview of habitat conditions within stream reaches.

The rapid bio-assessment method used by the Study Team was based on the methodologies outlined in the United States Environmental Protection Agency (US EPA) publication "Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers" (Barbour *et al.*1999). The Study Team developed a standardized form based on the US EPA methodology (Barbour *et al.*1999) to capture the characteristics important to fish habitat. These characteristics, which are consistent with the

characteristics included in the standard DFO/NBDNR habitat classification method and data collection sheet (Hooper *et al.* 1995) include: substrate, amount of woody debris, embeddedness, stream characteristics (*e.g.,* bankfull depth and width) and any indicators of fluvial change (*e.g.,* braiding and sand on the stream channel banks). These characteristics suffice to determine the quantity of fish habitat present (as Units, where 1 Unit equals 100 m^2). The form also captured information on land use in the riparian zone (*e.g*., evidence of forestry, status of buffer vegetation).

The field team collected *in situ* water quality data including dissolved oxygen (DO), pH, specific conductivity and water temperature, and took photographs of each reach. Temperature, DO, and specific conductivity were measured using a YSI 85 water quality meter. The pH of the water was measured using a Hanna pH tester. Both instruments were calibrated daily, or more frequently, following manufacturer's instructions. Where the field team found conditions that were not suitable fish habitat, or conditions that could represent an obstruction to fish passage, these conditions were noted and locations were recorded using a global positioning system (GPS) instrument. Throughout the rapid bio-assessment survey, time was spent within each reach making collections of juvenile gomphid dragonflies (naiads), searching stream bank vegetation for dragonfly exuviae, and searching for evidence of unionid clams (either living clams or clam shells in bank-side debris). Exuvia were handpicked from grasses or rocks where the dragonflies had emerged and were stored dry in labelled vials for subsequent taxonomic evaluation. Dragonfly naiads were collected using a benthic kick net and were preserved in 75% non-denatured alcohol for identification. Mussel shells (no live mussels were collected) were collected in labelled plastic bags, and were likewise submitted to a taxonomist for identification.

Results of the rapid bio-assessment surveys were compiled in a database and used to characterize existing fish habitat within the PDA, and to select the 32 stations for the subsequent detailed qualitative survey.



LEGEND

- PDA
- Study Area
- Watershed Boundary
- Waterbody (DNR)
- Watercourse
- Proposed Open Pit Mine
- Major Road
- Secondary Road
- Resource Road/Trail
- Railway
- Transmission Line

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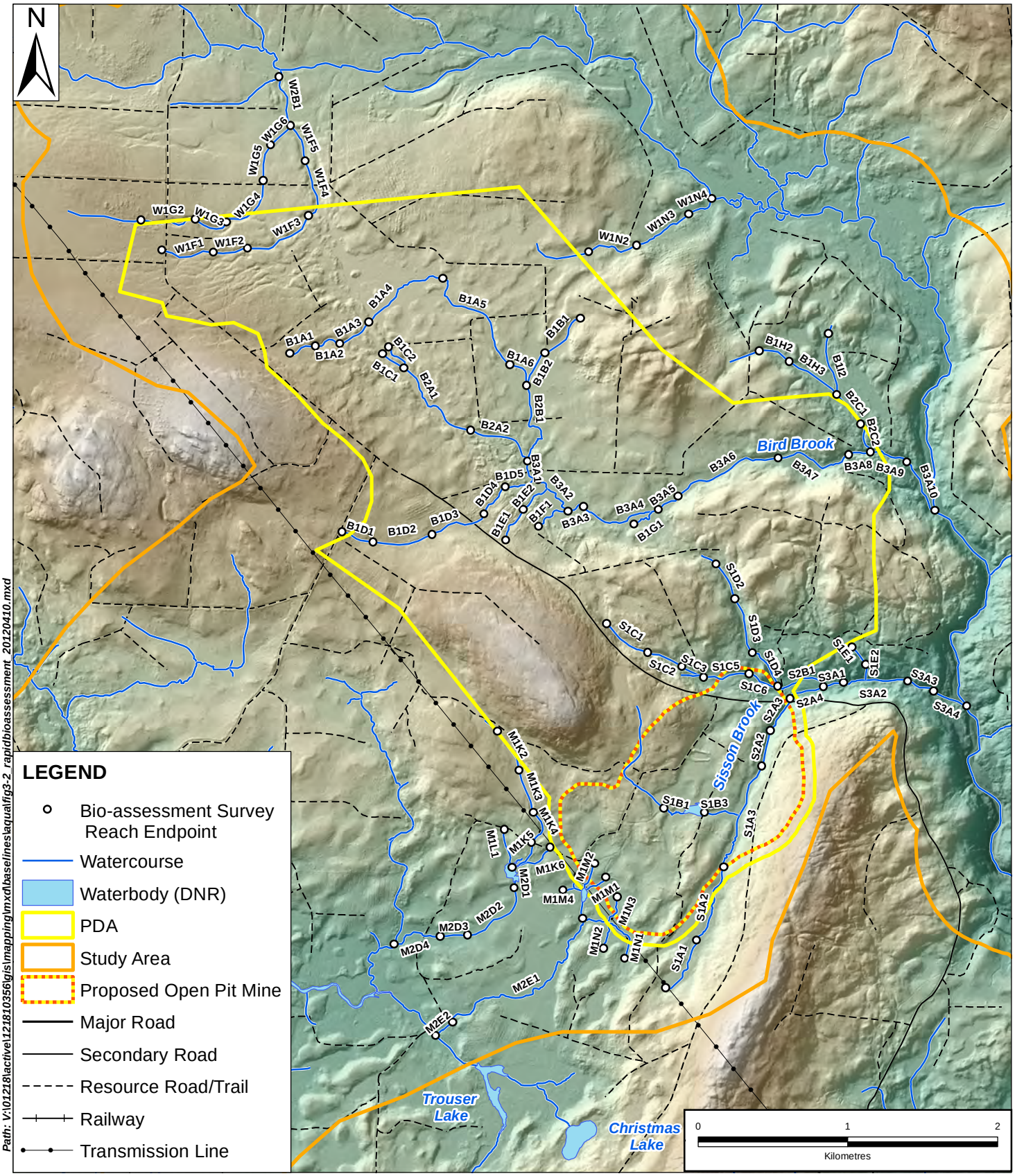
NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Watersheds within the Study Area Sisson Project: Baseline Aquatic Environment Technical Report Napadogan, N.B.	Scale: 1:85,000	Project No.: 121810356	Data Sources: Leading Edge Geomatics NBDNR NBADW	Fig. No.: 3.1	Stantec
Client: Northcliff Resources Ltd.	Date: (dd/mm/yyyy) 04/06/2012	Dwn. By: JAB	Appd. By: DM		

Stantec Consulting Ltd. © 2012

Map: NAD83 CSRS NB Double Stereographic



Path: V:\01218\active\121810356\gis\mapping\mxd\baselines\aquafig3-2_rapidbioassessment_20120410.mxd

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Stream Reaches Evaluated Using Rapid Bio-assessment Survey Sisson Project: Baseline Aquatic Environment Technical Report Napadogan, N.B. Client: Northcliff Resources Ltd.	Scale: 1:35,000	Project No.: 121810356	Data Sources: Leading Edge Geomatics NBDNR	Fig. No.: 3.2	Stantec
	Date: (dd/mm/yyyy) 10/04/2012	Dwn. By: JAB	Appd. By: DM		

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Map: NAD83 CSRS NB Double Stereographic

3.3 HABITAT SURVEYS WITH QUALITATIVE ELECTROFISHING

Stantec undertook detailed qualitative fish habitat surveys at 32 stations at locations inside and outside of the PDA (Figure 3.3). The Study Team performed the qualitative surveys between July 20 and August 9, 2011. *In situ* and laboratory water and sediment samples, DFO/NBDNR fish habitat survey, and fish community data were collected.

3.3.1 Sampling Station Selection

Qualitative stations were selected to represent all major aquatic habitat types present within the PDA and Study Area. Stations were located on each of the major watercourses potentially affected by the Project as well as at reference locations that will not likely be affected (Figure 3.3). Stations were selected in consideration of existing data (*e.g.*, locations previously sampled by Rescan), as well as where data was already being gathered (*e.g.*, existing hydrometric or water chemistry stations). First and foremost, qualitative sampling stations were located in order to provide broad and representative coverage of the general habitat within and proximal to the PDA, as identified in the rapid habitat bio-assessment survey. Stations were also located to confirm the presence of fish in particular stream reaches, or, where potential barriers to fish passage may limit access, to determine whether fish are present upstream of the barriers.

Survey stations for the qualitative habitat surveys were selected in consideration of the following criteria, based on information generated using the remote sensing data, or through the rapid bio-assessment survey:

- stream order, gradient, sinuosity;
- substrate embeddedness; and
- existence of previously collected data (*e.g.*, Rescan™ data) or ongoing collection of data relevant to the station (*e.g.*, hydrology and water quality stations).

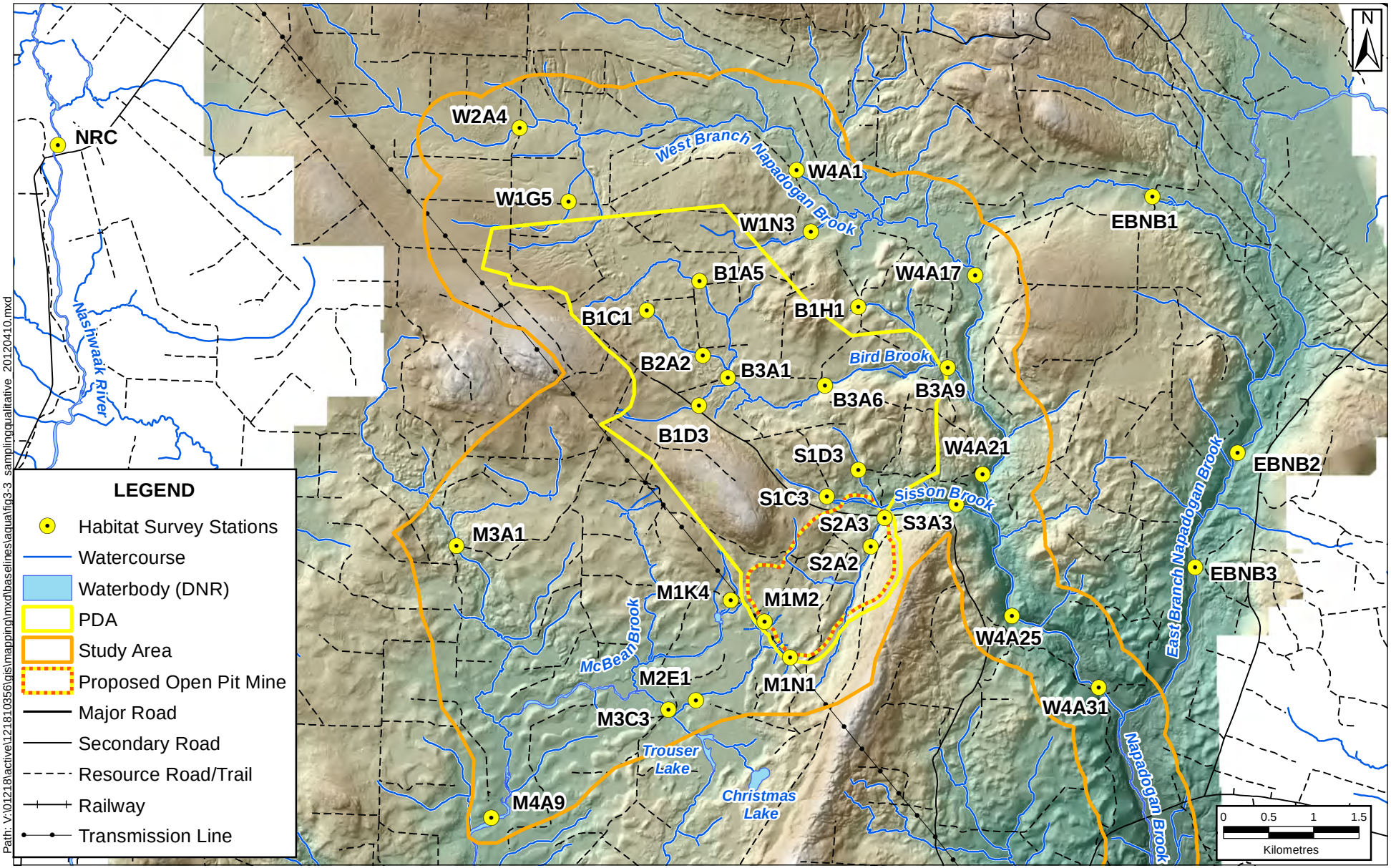
Reaches were ranked according to the above-noted characteristics and stations were selected to represent a broad range of characteristic habitat types. Initially, 31 stations were selected as follows:

- five stations within the Sisson Brook watershed (S1C3, S1D3, S2A2, S2A3, S3A3);
- eight stations within the Bird Brook watershed (B1A5, B1C1, B1D3, B1H1, B2A2, B3A1, B3A6, B3A9);
- seven stations within the McBean Brook watershed (M1K4, M1N2, M1N1, M2E1, M3A1, M3C3, M4A9); and
- eleven stations in the Napadogan Brook watershed (EBNB1, EBNB2, EBNB3, W1G5, W1N1, W2A4, W4A1, W4A17, W4A21, W4A25, W4A3).

One station on the upper Nashwaak River (NRC, Figure 3.3) was added during the field surveys to serve as reference location for Napadogan Brook in the baseline EEM program, making a total of 32 stations sampled.

3.3.2 Qualitative Electrofishing

A detailed habitat survey, including completion of DFO/NBDNR fish habitat assessment forms (Hooper *et al.* 1995), was undertaken at each station. A minimum section of watercourse at least 200 m long was surveyed and described at each of the 32 stations. The upstream and downstream survey limit locations were recorded in the field using a GPS instrument. Qualitative electrofishing was undertaken at all stations where fish habitat was identified using a Smith-Root Model LR-24 backpack electrofishing unit, and accepted survey protocols (Hooper *et al.* 1995) to determine fish species present at each station. Catch per unit effort was calculated based on the time spent fishing (*i.e.,* seconds of electrical current applied during the electrofishing effort). Collected fish were identified to species, and lengths were recorded. Photographs were also taken of representatives of each species collected.



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Habitat Survey Stations

Sisson Project:
Baseline Aquatic Environment Technical Report
Napadogan, N.B.

Client: Northcliff Resources Ltd.

Scale:	Project No.:	Data Sources:	Fig. No.:
1:60,000	121810356	Leading Edge Geomatics NBDNR	3.3

Date: (dd/mm/yyyy)	Dwn. By:	Appd. By:
10/04/2012	JAB	DM

Stantec

Stantec Consulting Ltd. © 2012

Map: NAD83 CSRS NB Double Stereographic

3.3.3 Water and Sediment Sampling

Water and sediment samples were collected at each of the detailed survey locations to help characterize habitat quality. *In situ* water quality measurements were again taken using field instruments as in the rapid bio-assessment survey, and included water temperature, DO, specific conductivity, and pH. Water samples were also collected and sent to the Research and Productivity Council (RPC) laboratory in Fredericton for analysis of general chemistry, trace elements, and total mercury. For QA/QC purposes, water samples were accompanied by one field duplicate, and one field blank sample for every ten true samples. Disposable powder-free nitrile gloves were worn during water and sediment sampling activities. Water samples were collected as "grab" samples by technicians standing in the flowing water, facing upstream. Sample bottles supplied by the laboratory were first labelled, and then carefully opened. Bottles and caps were rinsed three times with stream water, and then filled by submerging them in the current, facing upstream. When full, the bottles were lifted clear of the water and capped, excluding air bubbles. Samples were stored in coolers, on ice, until they could be delivered to the analytical laboratory, usually within 48 hours and no more than 96 hours after their collection.

Sediment samples (one composite fine-grained inorganic sediment sample, comprising five sub-samples from a depositional area or areas within the reach) were also collected at each qualitative survey location, held in coolers, and submitted to RPC for analysis of trace elements and mercury. At the laboratory, samples were air dried, sieved to remove large objects, and digested (US EPA Method 3050B) prior to trace element analysis by inductively coupled plasma atomic emission spectroscopy (ICP-AES) or inductively coupled plasma mass spectrometry (ICP-MS). For mercury, analysis was by cold vapour analysis. For quality assurance/quality control (QA/QC) purposes, sediment samples were accompanied by one field duplicate for every ten true samples.

3.4 HABITAT SURVEYS WITH QUANTITATIVE ELECTROFISHING AND EEM ENDPOINTS

3.4.1 Sampling Station Selection

The Study Team conducted additional fish habitat surveys with quantitative electrofishing between September 8 and September 29, 2011. Ten sampling stations (Figure 3.4) were selected from among the set of 32 stations previously sampled, three within the PDA and seven outside the PDA. The ten stations included B2A2 and B3A9 in Bird Brook; S3A3 and S2A2 in Sisson Brook; M3C3 in McBean Brook; W4A17, W4A21 and W4A31 in West Branch Napadogan Brook; EBNB1 in East Branch Napadogan Brook; and NRC in the upper Nashwaak River. Due to their location in relation to the current Project Description (Stantec 2011b), the three stations located within the PDA will be lost due to Project development, however, the data collected at these stations will provide quantitative data on the biomass of fish present in the selected study reaches.

Of the seven stations located outside of the PDA, three were selected to initiate data collection as potential "exposure" stations, and three were selected as potential "reference" stations for long-term monitoring following an EEM model. No further characterization of physical fish habitat was undertaken for the quantitative fish habitat survey, as the habitat units had been described previously.

3.4.2 Water and Sediment Sampling

In situ water quality data, as well as water and sediment samples for laboratory analysis, were also collected at each station as in the previous survey. Collection of water quality samples for laboratory analysis was undertaken prior to otherwise disturbing the station (*i.e.*, net placement and benthic community sampling).

Water samples were analyzed for:

- general chemistry as per the usual analytical suite provided by RPC;
- total organic carbon (TOC) and total inorganic carbon (TIC);
- total phosphorus (TP), and total Kjeldahl nitrogen (TKN); and
- trace elements including the usual suite provided by RPC, and in addition total mercury and tungsten.

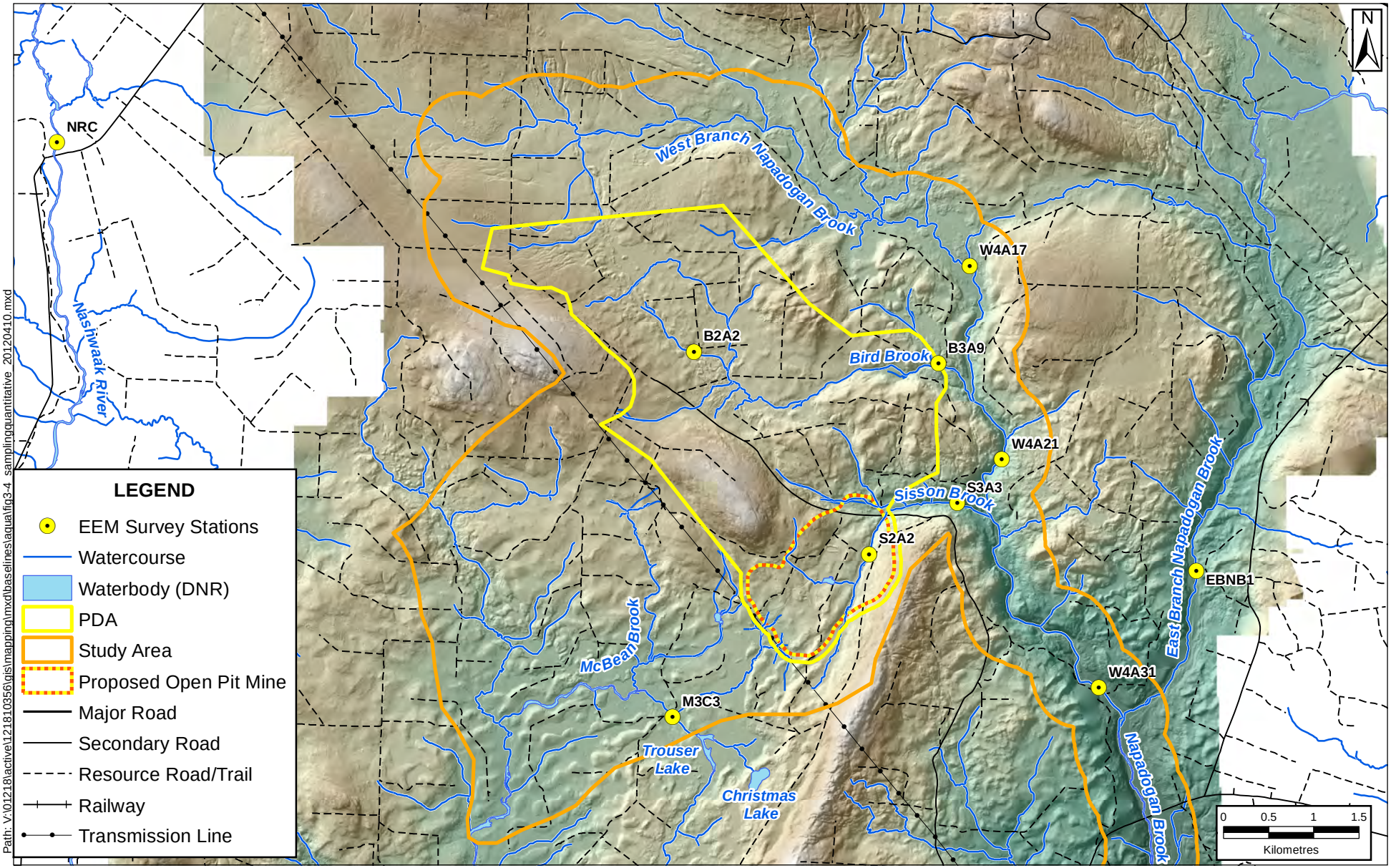
Sediment samples consisting of one composite fine-grained inorganic sediment sample from a depositional area or areas within the reach were also collected at every station.

Sediment samples were analyzed for trace elements including the usual suite provided by RPC, and in addition total mercury, tungsten, TIC, TOC, TP, TKN, and grain size.

3.4.3 Quantitative Electrofishing

Sampling for fish was carried out with three broad objectives, as follows.

- Quantitative electrofishing was undertaken using barrier nets to isolate an area of habitat at each station. Within this isolated area of habitat, electrofishing was undertaken as before, except that multiple "passes" through the habitat were completed, and the number and characteristics of fish collecting during each pass were recorded, so that quantitative fish population estimates (*i.e.,* number of fish per unit of habitat) could be calculated. The total seconds of electrofishing effort were also recorded. Collected fish were kept in aerated buckets until electrofishing was completed. All fish collected, with the exception of potentially mature brook trout, were identified, measured, and released unharmed to downstream habitat. Brook trout that appeared to be sexually mature were retained, as described below.



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NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

EEM Survey Stations

Sisson Project:
Baseline Aquatic Environment Technical Report
Napadogan, N.B.

Client: Northcliff Resources Ltd.

Scale:	Project No.:	Data Sources:	Fig. No.:
1:60,000	121810356	Leading Edge Geomatics NBDNR	3.4

Date: (dd/mm/yyyy)	Dwn. By:	Appd. By:
10/04/2012	JAB	DM

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Map: NAD83 CSRS NB Double Stereographic

- At each of the quantitative stations, brook trout and slimy sculpin (*Cottus cognatus*) were the key target species for collection, although all fish species were identified and measured. Brook trout were considered to be surrogate for juvenile Atlantic salmon (to avoid unnecessary take or handling of Atlantic salmon), and are also a valued sport fish in the Nashwaak River and Napadogan Brook systems. Slimy sculpin are also a preferred fish species for EEM purposes, having a high degree of site fidelity, and having been the subject of extensive research through the CRI in New Brunswick (Gray *et al.* 2002). Sampling took place throughout September when brook trout were coming into reproductive condition, and when young-of-year (YOY) slimy sculpin are completing their season of growth (having hatched in the early summer). However, the numbers of slimy sculpin that were collected throughout this work were insufficient to meet the sampling guidance for a non-lethal EEM model (*i.e*., 100 YOY fish per station).

- Brook trout that were captured during the quantitative electrofishing effort and which exhibited secondary characteristics that suggested sexual maturity were retained, with the objective of collecting 20 sexually mature male, and 20 sexually mature female fish to be used for EEM purposes. A minimum length of 95 mm was used as a cut off for the lethal sampling of fish as literature suggests that brook trout can reach sexual maturity at 88 mm (Scott and Crossman 1998). In addition, where insufficient numbers of brook trout were collected between the barrier nets, further qualitative electrofishing was undertaken in the area upstream of the barrier nets, to try to achieve the recommended number of sexually mature fish. All other fish that were captured were released unharmed. In general, it was found to be impractical to collect the required number of brook trout, and fewer fish were retained than had been requested under the terms of the license to fish.

Brook trout that were retained were killed, and were subsequently sampled at a field laboratory as follows:

- whole fish length (± 1 mm) and weight (± 0.1 g) were determined;

- a scale sample was taken for ageing purposes; fin clip samples were also taken, but not required, for ageing;

- an incision was made ventrally in the fish, from vent to gills, and the sex of the fish was determined;

- livers were removed from all fish, weighed (± 0.001 g), placed individually in clean and labelled sample containers, and frozen prior to being delivered to the RPC laboratory for trace metals analysis;

- gonads were removed from all fish and weighed (± 0.001 g), and ovaries were placed individually in clean and labelled sample containers, fixed with 5% formalin solution as preservative, and held refrigerated prior to being further dissected to count the number of eggs present;

- the remaining viscera of the fish (including head, gills, kidney, and other viscera) was removed, weighed (± 0.1 g), placed in a clean and labelled sample container, and frozen prior to being delivered to the RPC laboratory for trace metals analysis; and

- the remaining carcass of the fish (*i.e.,* the headless body, cleaned of kidney and other viscera, as it would typically be prepared for human consumption) was weighed (± 0.1 g), placed in a clean and labeled sample container, and frozen prior to being delivered to the RPC laboratory for trace metals analysis.

In this way, the scientific information requirements typical of an EEM program under the *Metal Mining Effluent Regulations* (*MMER*) were met, and in addition, information on the trace metal concentrations in brook trout livers, flesh suitable for human consumption, and "whole fish" (after the individual tissue results were combined following analysis) could be recorded for use in the future human health and ecological risk assessment work that will be required in support of the EIA.

3.4.4 Benthic Community Sampling

At each station, five replicate benthic community samples, each comprising a composite of three replicate sub-samples, were collected and sent to a taxonomist for identification. Benthic invertebrate samples were collected using a standard D-frame kick net with 0.5 mm mesh. A mesh size of 0.5 mm is required for EEM studies following Environment Canada (2011) technical guidance. Kick samples were collected by placing the bottom of the D-frame net firmly in contact with the stream bottom, and then systematically kicking and turning over the stream bottom in a one-square-foot (nominally 0.1 m^2) area immediately upstream of the net. The same individual collected all benthic samples to eliminate the possible introduction of variation caused by different sampling technicians. A standard time of one minute of sampling effort was applied for each sub-sample.

The collected sub-samples were combined in a wooden-framed sieve box, also with 0.5 mm mesh, and the samples were sieved to remove fines and reduce volume in the field. The sieved samples were stored in labelled wide-mouthed plastic sampling bottles, and preserved using 95% un-denatured ethanol. After three days, the ethanol was refreshed to ensure high quality preservation of the samples.

Benthic community samples were sent to a taxonomist for identification. Benthic samples were shipped to Stantec's benthic taxonomy laboratory in Guelph, Ontario, for sorting and identification consistent with or exceeding the requirements of EEM programs under the *MMER*. One hundred percent of each sample collected was sorted and identified for the benthic community analysis. A voucher collection was also compiled and sent to the Biodiversity Institute of Ontario at the Center for Biodiversity Genomics at the University of Guelph, Ontario, for DNA barcoding. The DNA barcoding analysis provides a fully independent means of confirming taxonomic identifications.

3.4.5 Periphyton Community Sampling

Periphyton analysis is not a routine component of EEM, but was undertaken during the quantitative surveys for this Project to provide information on the primary producer communities within the streams. At each station, three replicate samples were collected as follows.

- In the field, cobble-sized rocks were removed from the substrate, placed "right side up" in a plastic washtub, and photographed from above so that the surface area of the rocks could be estimated later by measuring the area of the dark rocks against the white plastic of the washtub. The washtub had a known area, and therefore provided a scale measure for reference.

- The rocks were then scraped and scrubbed to remove periphyton biomass, with all periphyton and rinsings being deposited in the washtub. The volume of the samples collected in this way was either reduced by settling, or made up to one litre (1 L) using stream water, as required. Samples collected were kept in dark containers on ice and transported back to the field laboratory.

- At the field laboratory, samples were homogenized using short pulses in a blender, and separated into two portions: a 50 mL portion was decanted and preserved with Lugol's solution for taxonomic analysis, and the remaining 950 mL portion was refrigerated and transported to the RPC laboratory in Fredericton for further analysis.

- At the RPC laboratory, samples were analysed for chlorophyll *a*, total suspended solids (TSS), and volatile solids (*i.e.,* solids lost when the suspended solids are ashed). The solids were reposted as mg/L, and these values were related back to the mass of periphyton per unit area (mg/m^2) through the known sample volume and area of rocks sampled.

3.5 DETAILED FISH HABITAT SURVEY FOR NAPADOGAN BROOK

Detailed fish habitat descriptions were collected in West Branch Napadogan Brook from the mouth of Bird Brook to the confluence with East Branch Napadogan Brook, and in Napadogan Brook from this confluence to the confluence of Napadogan Brook and the Nashwaak River (Figure 3.5). A total of 114 individual reaches were defined as discrete homogeneous units (*e.g.*, riffle, run, steady or pool) and were described using DFO/NBDNR fish habitat survey forms, and photographed. *In situ* water quality data was also collected periodically using field instruments as previously described. The start and end points of each habitat unit were recorded using a GPS instrument.

This information was collected to assist in the determination of potential HADD that may result as an environmental effect of water withholding due to Project activities in the Bird and Sisson brook drainages, which would result in overall flow reductions in portions of West Branch Napadogan Brook and Napadogan Brook.

3.6 SURVEYS FOR AQUATIC SPECIES AT RISK AND SPECIES OF CONSERVATION CONCERN

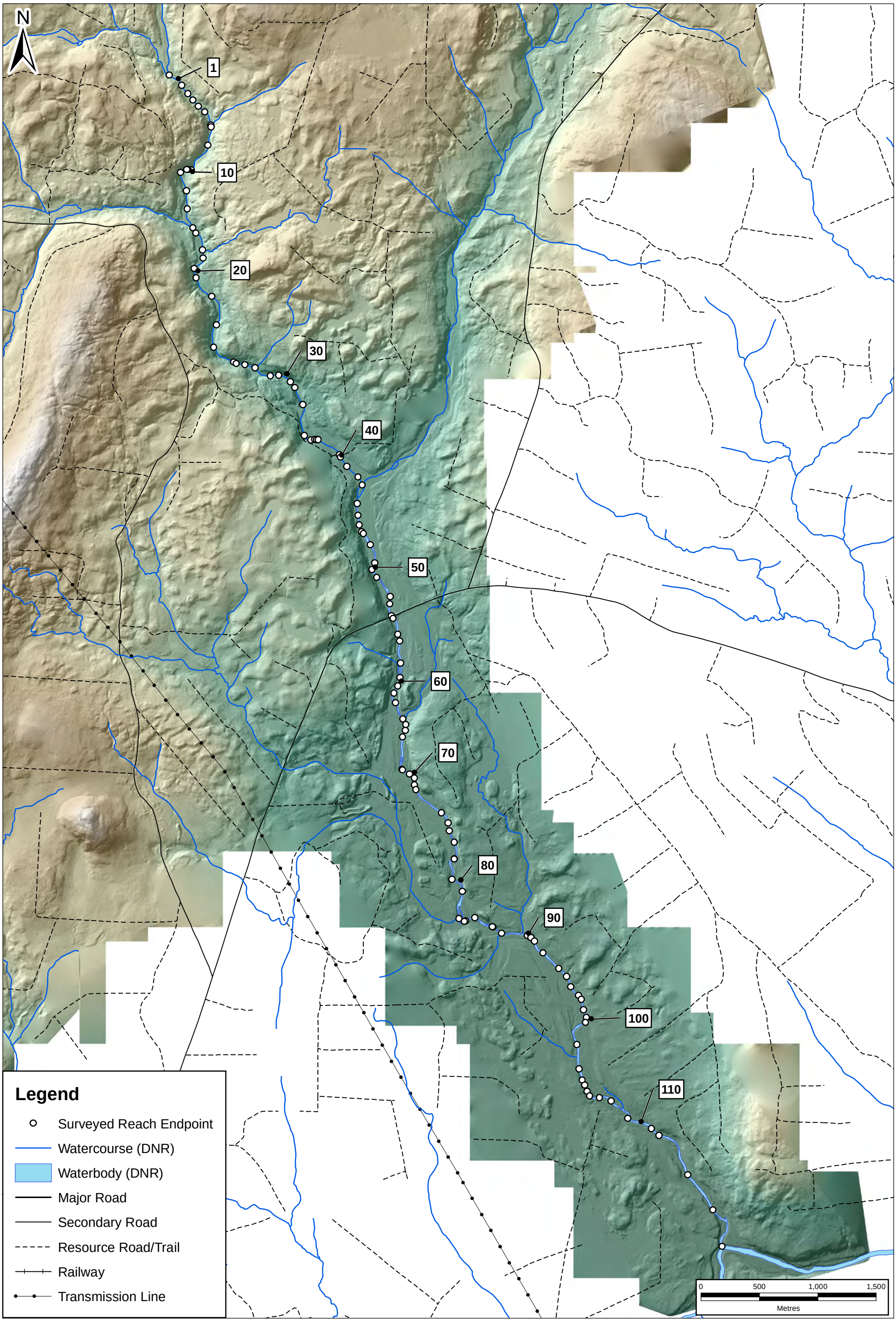
A search of AC CDC data, COSEWIC, and the *SARA* registries identified the potential presence of aquatic species at risk and species of conservation concern. Stantec also consulted with local experts (*i.e.,* DFO, NBDNR, CRI) for specific information relating to the Study Area. As noted previously in Section 2.9, several SOCC were identified as potentially being present in the Nashwaak River watershed (and thus potentially present in the Study Area), specifically: OBoF Atlantic salmon, American eel, the pigmy snaketail dragonfly, the brook floater, yellow lampmussel (bivalve mollusks), and the prototype quillwort (an aquatic plant).

The presence of juvenile Atlantic salmon and American eel was noted when they were encountered in electrofishing surveys. Adult Atlantic salmon were observed in the Napadogan Brook in the course of fieldwork, but were not captured during electrofishing surveys.

The pigmy snaketail dragonfly is typically found in larger streams than those existing within the PDA and Study Area. However, collections of gomphid dragonfly naiads were made during the rapid bio-assessment survey, and any cast exuviae left by dragonflies and found by field staff during searches of stream-bank vegetation were collected and identified by a taxomomist to determine whether *O. howei* could be confirmed to be present.

Searches for rare mussels, specifically brook floater and yellow lampmussel, were routinely carried out during field sampling efforts, however, most of the evidence collected came from mussel shells that had been cast up on the river bank as a result of a major flood event in December 2010, or by predatory animals. These shells were examined, and representative specimens were bagged and labeled for submission to a taxonomist for identification.

The prototype quillwort is typically found rooted to lake bottoms at 1.5 to 2.5 m depth, and is not characteristically found in stream habitat. The only aquatic habitat near the PDA or Study Area where prototype quillwort has the potential to be found would be in Christmas and/or Trouser Lakes. Stantec adapted a precautionary approach and undertook surveys for prototype quillwort in these lakes in early September 2011. A detailed explanation of the prototype quillwort survey and the results of the survey can be found in the Baseline Vegetated and Wetland Environments Technical Report (Stantec 2012b).



NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Stream Reaches Surveyed on West Branch Napadogan Brook and Napadogan Brook

Sisson Project:
Baseline Aquatic Environment Technical Report
Napadogan, N.B.

Client: Northcliff Resources Ltd.

Scale:	Project No.:	Data Sources:	Fig. No.:
1:30,000	121810356	NBDNR, Leading Edge Geomatics	3.5

Date: (dd/mm/yyyy)	Dwn. By:	Appd. By:
04/06/2012	JAB	DM

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Map: NAD83 CSRS NB Double Stereographic

4.0 RESULTS OF 2011 FIELD STUDIES

The results of the 2011 field studies carried out by Stantec to fill the information gaps for the Aquatic Environment in the Study Area, identified in Section 2.10, are provided in this section.

4.1 FISH HABITAT OVERVIEW

Fish habitat is defined in Section 34(1) of the *Fisheries Act* as "Spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes." Fish habitat is thus protected under the *Fisheries Act* and any harmful alteration, disruption or destruction (HADD) of fish habitat arising from a development is subject to authorization by the Minister of Fisheries and Oceans Canada under Section 35(2) of the *Fisheries Act.* A HADD compensation plan must be agreed to by DFO before such an authorization can be given.

The fish habitat overview of watercourses in the Study Area provided below establishes preliminary baseline fish habitat conditions for the entire length of all watercourses within the PDA and the Study Area, which was used to select representative habitat reaches for more detailed habitat assessment and qualitative electrofishing. The overview also provides background information at a sufficient level of detail to support the general environmental effects predictions that will be carried out in the EIA Report, including the approximation of the quantity and quality of habitat loss resulting from the Project. The latter information is necessary to comply with compensation requirements of authorization(s) that will be required under Section 35(2) of the *Fisheries Act*.

The fish habitat overview is based on information from the following tasks:

- approximation of fish habitat units (Note: 1 unit = 100 m^2 of fish habitat) within the PDA;
- completion of a rapid fish habitat bio-assessment of watercourses in the PDA (including Sisson Brook, Bird Brook, tributaries to McBean Brook, and unnamed tributaries to the West Branch Napadogan Brook); and
- completion of a standard DFO/NBDNR fish habitat survey of the Lower Napadogan Brook.

The methods for the rapid fish habitat bio-assessment, as well as the methods for the standard survey using DFO/NBDNR fish habitat assessment forms (Hooper *et al.* 1995), are described in Section 3.2.

4.1.1 Rapid Fish Habitat Bio-assessment Survey Results

The rapid fish habitat bio-assessment survey data are provided in Appendix C, and discussed for each watercourse in the following sub-sections. The raw results and selected representative photographs from each applicable reach are included in Appendix C.

The *in situ* water quality data provided below for each watercourse are interpreted using the Canadian Council of the Minister of Environment (CCME) “Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater)” (CCME 1999). The Canadian water quality guidelines for the lowest acceptable DO concentrations in cold water ecosystems are 9.5 mg/L for early life stages and 6.5 mg/L

for other life stages. The Canadian water quality guidelines for pH range from 6.5 to 9. Salmonid fishes can tolerate lower pH levels, although a pH below 5.0 is likely to harm the eggs and fry of salmonids and possibly adult fish when the water is soft (CCME 1987). Temperature conditions are considered in relation to the preferred ranges for native cold water species. In particular, brook trout prefer water temperatures from 14 to 16°C, and Atlantic salmon prefer temperatures from 15 to 17°C (Reid, J. Personal communication, March 22, 2012). The surface water quality results are reported in this section as the mean average of each reach within a watercourse segment. The results for each specific reach are included in Appendix C.

4.1.1.1 Sisson Brook

For Sisson Brook, 7.2 km of watercourse was surveyed within the PDA between June 14 and 21, 2011. This included five 1st order stream segments (tributaries), two 2nd order stream segments and one 3rd order stream segment. The rapid bio-assessment survey identified two barriers to fish passage. The first barrier is a 5 m waterfall in reach S3A3, a 3rd order reach near the mouth of Sisson Brook. The second barrier is a 10 to 15 m waterfall that flows from a beaver pond located in reach S1E2. The waterfall on S1E2 is a small high-gradient 1st order tributary that flows over bedrock down the valley wall into the main stem of Sisson Brook.

First order watercourses in Sisson Brook have an average bankfull width of 1.2 m. The substrate is dominated by fines and sand with low embeddedness (<20%). The surrounding forest is mostly uncut with small amounts of selective logging and a few buffered clear cuts. Channel banks within the first order watercourses are stable and vegetated with grasses and shrubs that provide 60 to 85% canopy cover. Most 1st order habitats in Sisson Brook are riffle-run.Some deposition is evident on the channel banks. Headwater areas are steep but level out quickly and in places are surrounded by wetland. Active beaver ponds are present in some 1st order segments, including S1B3 and S1E1. The average channel grade is 3.8%.

Second order watercourses in Sisson Brook have an average bankfull width of 3.2 m. The substrate is dominated by sand with little to no embeddedness. The surrounding forest is uncut forest or well buffered forest. Channel banks are stable and vegetated by grasses and trees that provide 55% canopy cover. Second order habitat is mainly riffle-run with and average gradient of 2.8%. The survey identified some braiding and over bank deposition throughout the 2nd order reaches. The average channel grade is 2.8%.

Third order watercourses in Sisson Brook have an average bankfull width of 3.8 m. The substrate is dominated by rubble, rock and bedrock with low embeddedness (<20%). The surrounding forest is 100% uncut forest. Channel banks are stable and vegetated by shrubs and trees. Third order habitat has lateral braiding and medial bars throughout the reaches showing evidence of mobility at high flows. The average channel grade is 3.4%.

The mean *in situ* measured water quality for each segment of Sisson Brook (Table 4.1) is generally good to excellent for cold water fish species (Appendix C). The DO concentration (range of 8.1-11.5 mg/L) exceeded the CCME (1999) lower limit of 9.5 mg/L for early stages in most reaches and is acceptable for other life stages in all reaches. The range of pH (5.1-6.7) is a little less than the CCME (1999) recommended range (6.5-9.0) for freshwater aquatic life, however, it is not so low (<5.0) as to cause harm to cold-water fish eggs or fry (CCME 1987). The range of water temperatures

(8.9-14.6°C) is considered cold for the time of year, and represents excellent summer conditions for brook trout.

Table 4.1 Mean Values for *In Situ* Water Quality Parameters for Each Watercourse Segment of Sisson Brook

Reach	Dissolved Oxygen (mg/L)	pH	Conductivity (µs/cm)	Temperature (°C)
S1A	9.6	6.1	19.7	14.6
S1B	8.8	5.1	15.4	13.9
S1C	10.5	6.1	18.4	8.9
S1D	10.1	6.2	14.4	9.2
S1E	8.1	6.2	16.0	15.5
S2A	10.1	6.2	20.0	13.9
S2B	10.7	6.7	21.3	10.0
S3A	11.5	6.7	21.9	10.4

Notes:
1) Values in **bold** are either stagnant headwater areas or areas that were wetland dominated and backwatered by beaver activities (also stagnant) and are not suitable for any life stage of warm or cold water fish species (CCME 1999).
2) Shaded cells indicates dissolved oxygen below CCME (1999) guidelines for other life stages (6.5 mg/L); or pH is below 5.0 (CCME 1987).

4.1.1.2 Bird Brook

For Bird Brook, 12.4 km of watercourse was surveyed within the PDA between June 15 and June 24, 2011. This included eight 1st order segments, three 2nd order segments and one 3rd order segment. The survey did not identify any barriers to fish passage. Unlike Sisson Brook, wetland is common throughout the 1st and 2nd order reaches of Bird Brook and beavers have formed several backwaters and pools in the upper reaches. The average gradient of Bird Brook is more moderate than Sisson Brook, with a range of 1.1%-1.3%, as compared to 2.8%-3.8% in Sisson Brook.

First order Bird Brook watercourses have an average bankfull width of 1.9 m and the substrate is dominated by fines and sand with embeddedness ranging from <20% to 30%. The surrounding forest is mostly uncut with small amounts of logging. Channel banks within the 1st order watercourse are stable and vegetated with grasses and shrubs that provide a 60% canopy cover. Channels have mostly steady flows with some riffle-run. Headwaters are disorganized and of a higher gradient. Mid- and lower-reaches have lower gradient and are surrounded by alder-dominated riparian wetland. The average channel grade is 1.1%.

Second order Bird Brook watercourses have an average bankfull width of 2.8 m and the substrate is dominated by sand with embeddedness ranging from <20% to 50%. The surrounding forest is either uncut or buffered clear cuts. Channel banks are stable and vegetated with alders and trees that provide a 60% canopy cover. Channels have mostly steady flow with some riffle-run. Braiding was evident throughout the surveyed reaches. The average channel grade is 1.3%.

Third order Bird Brook watercourses have an average bankfull width of 4.5 m and the substrate is dominated by rock, fines, sand and boulder with low embeddedness (<20%). The surrounding forest is mostly uncut forest with some buffered clearcuts. Channel banks are stable and vegetated by shrubs and trees that provide a 36% canopy cover. These reaches consist mainly of alternating riffle-run and

steady flows. There are depositional areas, but also evidence of substrate movement at high flows and large amounts of woody debris. The average channel grade is 1.5%.

The mean *in situ* measured water quality for the segments of Bird Brook (Table 4.2) is generally good for cold water fish species. The DO concentration (range of 7.1-9.5 mg/L) was less than the CCME (1999) minimum value of 9.5 mg/L for early life stages in most reaches, but acceptable for other life stages in all reaches. The range of pH (5.3-6.3) is less than the recommended range (6.5-9.0) for freshwater aquatic life, however it is not so low (<5.0) as to cause harm to cold-water fish eggs or fry (CCME 1987). The range of water temperature (9.7-13.6°C) is considered cold for the time of year, and represents excellent summer brook trout thermal refugia conditions.

Table 4.2 Mean Values for *In Situ* Water Quality Parameters for Each Watercourse Segment of Bird Brook

Reach	Dissolved Oxygen (mg/L)	pH	Conductivity (µs/cm)	Temperature (°C)
B1A	7.17	5.40	16.38	11.70
B1B	**4.61**	**4.70**	**19.50**	**11.90**
B1C	8.03	5.30	16.70	9.70
B1D	9.50	6.30	15.56	10.98
B1E	8.40	5.80	17.40	10.95
B1F	7.57	5.80	20.60	10.00
B1G	7.10	5.35	Not measured	10.95
B1H	7.17	6.20	23.00	11.80
B1I	7.63	5.60	17.30	13.20
B2A	9.80	5.90	16.90	10.30
B2B	**2.39**	**5.25**	**18.00**	**13.30**
B2C	9.10	6.05	20.00	10.40
B3A	8.78	6.22	16.90	13.63

Notes:
1) Values in **bold** are either stagnant headwater areas or areas that were wetland dominated and backwatered by beaver activities (also stagnant) and are not suitable for any life stage of warm or cold water fish species (CCME 1999).
2) Shaded cells indicates dissolved oxygen below CCME (1999) guidelines for other life stages (6.5 mg/L); or pH is below 5.0 (CCME 1987).

4.1.1.3 Tributaries to the West Branch Napadogan Brook

For the tributaries to the West Branch Napadogan Brook, 4.5 km of watercourse was surveyed within the PDA between June 27 and June 29, 2011. There were three 1st order and one 2nd order stream segments off of the main stem West Branch Napadogan Brook. The survey did not identify any barriers to fish passage.

First order watercourses of the tributaries to the West Branch Napadogan Brook have an average bankfull width of 1.4 m and the evenly mixed substrate is dominated by rubble and boulders with low embeddedness (20% in most reaches). Surrounding forest is mostly uncut forest with 5% clear cut forest. Channel banks are stable and vegetated by a mix of grasses, trees, and shrubs that provide a 67% canopy cover. Channel form is mostly riffle-run with some pools and some deadwater. The gradient on the first order reaches ranges from 0.7% to 4.1%. Channels are braided in the headwaters and there is evidence of beaver activity throughout.

Second order sections of watercourses of the tributaries to the West Branch Napadogan Brook have an average bankfull width of 2.0 m and the substrate is dominated by sand with embeddedness that ranged from 25 to 30%. The surrounding forestry was all uncut. Channel banks are stable and vegetated by grasses and shrubs that provide a 65% canopy cover. Channel form is low gradient (0.8%) consisting of steady flows with some riffles. There is evidence of depositional processes occurring (braiding and medial bars).

The *in situ* measured water quality of the tributaries to the West Branch Napadogan Brook (Table 4.3) is generally good for cold water fish species. The range of DO concentration was 8.04-10.5, and half of the stations had DO concentrations equal to or greater than the CCME Guideline value of 9.5 mg/L for early life stages (also acceptable for other life stages in all reaches). The range of pH (5.8-6.4) is less than the recommended range (6.5-9.0) for freshwater aquatic life, however, it is not so low (<5) as to cause harm to cold-water fish eggs or fry (CCME 1987). The range of water temperature (10.6-14.5°C) is considered cold for the time of year, and represents excellent summer brook trout thermal refugia conditions.

Table 4.3 Mean Values for *In Situ* Water Quality Parameters for Each Watercourse Segment of Tributaries of the West Branch Napadogan Brook within the PDA

Reach	Dissolved Oxygen (mg/L)	pH	Conductivity (µs/cm)	Temperature (°C)
W1F	10.5	6.2	23.9	10.6
W1G	9.3	6.1	20.3	11.4
W1N	8.04	5.8	18.93	14.5
W2B	9.5	6.4	21.7	12.8

Notes:
1) Values in **bold** are either stagnant headwater areas or areas that were wetland dominated and backwatered by beaver activities (also stagnant) and are not suitable for any life stage of warm or cold water fish species (CCME 1999).
2) Shaded cells indicates dissolved oxygen below CCME (1999) guidelines for other life stages (6.5 mg/L); or pH is below 5.0 (CCME 1987).

4.1.1.4 Tributaries to McBean Brook

For tributaries to McBean Brook, 5.5 km of watercourse within the PDA was surveyed between June 21 and June 30, 2011. This included three 1st order segments, and two 2nd order segments. The survey did not identify any barriers to fish passage.

First order reaches are surrounded by wetland and influenced by old and new beaver activity throughout. First order tributaries to McBean Brook watercourses have an average bankfull width of 0.95 m and the substrate is dominated by organic or organics/moss fines with low embeddedness (<20%). Surrounding land use and riparian area is primarily wetland and uncut forest. An electrical transmission line passed over several 1st order reaches surveyed. Channel banks are mostly moss and other wetland vegetation. Where structured, the channel banks are stable and vegetated by grass and shrubs that provide a 40% canopy cover. Channel form is mostly steady and riffle habitat. Channel gradient ranges from 0.3% to 3.3%.

Second order watercourses have an average bankfull width of 2.0 m and the substrate is dominated by fines and sand with low (<20%) embeddedness. The surrounding forest was 100% uncut. Channel banks are stable and vegetated with grasses and shrubs that provide a 46% canopy cover. Channel

form is highly influenced by beaver activity, consisting of 30% deadwater, 30% steady flow, 40% riffle and run. Channel gradient is relatively low (1%).

The mean *in situ* measured water quality of tributaries to McBean Brook (Table 4.4) is generally suitable for cold water fish species. The DO concentration (range of 6.2-8.7 mg/L) did not exceed the minimum value of 9.5 mg/L for early life stages in any reach, though was acceptable for other life stages in every reach except in reach M2D. The range of pH (5.5-6.4) is less than the recommended range (6.5-9.0) for freshwater aquatic life, however, it is not so low (<5.0) as to cause harm to cold-water fish eggs or fry (CCME 1987). The range of water temperature (12.1-17.4°C) is considered cold for the time of year, and represents excellent summer brook trout thermal refugia conditions.

Table 4.4 Mean Values for *In Situ* Water Quality Parameters for Each Watercourse Segment of Tributaries to McBean Brook within the PDA

Reach	Dissolved Oxygen (mg/L)	pH	Conductivity (µs/cm)	Temperature (°C)
M1K	8.2	5.9	15.5	13.0
M1L	8.70	6.4	23.6	12.1
M1M	8.1	6.1	28.7	13.2
M1N	8.3	5.1	22.7	16.3
M2D	6.2	5.9	22.4	17.4
M2E	8.57	5.5	17.6	14.1

Notes:
1) Values in **bold** are either stagnant headwater areas or areas that were wetland dominated and backwatered by beaver activities (also stagnant) and are not suitable for any life stage of warm or cold water fish species (CCME 1999).
2) Shaded cells indicates dissolved oxygen below CCME (1999) guidelines for other life stages (6.5 mg/L); or pH is below 5.0 (CCME 1987).

4.1.2 Lower Napadogan Brook Survey Results

The Lower Napadogan Brook is for convenience defined here as extending from the confluence of Bird Brook and the West Branch Napadogan Brook to the confluence of Napadogan Brook and the Nashwaak River (Figure 1.2). Approximately 14.6 km of watercourse was surveyed between August 16 and August 19, 2011. There were no obvious barriers to fish passage identified. There were 114 distinct reaches characterized using the DFO/NBDNR habitat method.

The Lower Napadogan Brook had an average bankfull width of 10 m that increased downstream nearing the confluence with the East Branch. The West Branch Napadogan Brook is approximately 85% riffle-run with channel substrate dominated by boulders and rock, with some bedrock, rubble and gravel and low (<20%) substrate embeddedness. Surrounding riparian vegetation is mostly grasses and shrubs that provide 15% canopy cover.

The main stem Napadogan Brook—below the confluence of the East and West Branches of the Napadogan Brook—has an average bankfull width of 25.6 m with approximately 87% riffle-run channels. Though the channel substrate has increased amounts of bedrock and boulders, it is still primarily rock and embeddedness remains low. Riparian vegetation is dominated by trees that provide an 11% canopy cover. There is evidence of ice scars and high flows in the lower reaches, suggesting some channel and substrate movement at high flows.

Overall, the survey found isolated areas of suitable spawning habitat for salmonids in the Lower Napadogan Brook. Large woody debris is prevalent throughout all surveyed reaches. The substrate is

predominantly rock and boulder with bedrock intrusions in the channel bed and banks. Although there are isolated areas of gravel substrate that appear suitable for salmonid spawning, the fish habitat of the Lower Napadogan Brook is best described as homogenous with minor occurrences of avulsion or depositional areas.

Water quality was measured *in situ* approximately every 500 to 1,000 m during the habitat survey of the Lower Napadogan Brook and is presented in Table 4.5. The *in situ* measured water quality of Lower Napadogan Brook is generally fair/good for cold water fish species given the time of year. The DO concentration (range of 8.4-10.15 mg/L) did not exceed the minimum value of 9.5 mg/L for early life stages of cold water species in any reach except for reach 57, though was acceptable for other life stages in every reach. The range of pH (6.5-7.6) is within the recommended range (6.5-9.0) for freshwater aquatic life. The range of water temperature (14.7-23°C) is considered typical for the time of year for a shallow and rocky watercourse of this size. Conductivity is generally static, though the levels are higher in the reaches of the main stem Napadogan Brook as compared to the West Branch Napadogan reaches above the confluence, suggesting that the East Branch Napadogan is contributing relatively greater concentrations of dissolved metals. The water temperature increases in the downstream direction primarily as a result of increased solar exposure as the channel widens and canopy cover decreases.

Table 4.5 Mean Values for *In Situ* Water Quality Parameters of Selected Reaches on the Lower Napadogan Brook

Reach	Dissolved Oxygen (mg/L)	pH	Conductivity (µs/cm)	Temperature (°C)
1	9.0	6.6	27.5	15.8
6	8.8	7.0	27.9	16.2
11	8.7	7.2	27.8	16.5
15	8.8	7.1	27.6	16.6
16	8.9	7.1	27.7	16.4
21	8.7	7.2	27.8	16.3
24	8.8	7.0	27.7	16.3
31	8.6	7.5	27.9	16.1
34	9.2	6.5	27.9	13.9
40	9.3	7.1	27.7	14.7
43*	9.0	7.3	29.7	15.7
48	9.0	7.4	31.3	16.9
52	8.7	7.1	31.7	18.0
57	10.15	6.9	31.3	14.2
62	9.0	7.3	31.9	15.0
67	9.1	7.3	31.9	15.9
73	8.4	7.4	32.0	18.0
79	8.4	7.5	31.9	19.4
84	9.0	6.9	34.0	16.0
92	9.4	7.3	33.3	23.0
99	9.1	7.5	33.1	19.5
105	8.8	7.6	32.9	21.0
113	8.4	7.5	32.7	21.8

Notes:
* the confluence of the West Branch Napadogan and East Branch Napadogan brooks. Reaches upstream of 43 are in the West Branch Napadogan River, while reaches downstream of 43 are in the main stem Napadogan Brook.

4.1.3 Summary of Results of the Fish Habitat Overview

The rapid fish habitat bio-assessment confirmed that the PDA includes 1st, 2nd, and 3rd order stream segments from four watersheds. The Sisson Brook and Bird Brook watersheds are located entirely within the PDA, while only a small portion of the McBean Brook and West Branch Napadogan Brook watersheds (up to further-order) are within the PDA.

Although there are small-scale differences in fish habitat characteristics and water quality between watercourses and watersheds within the PDA, they all share the common trait of providing good to excellent cold water fish species habitat. Each watercourse provided cold water, shade from dense and stable vegetation, varied substrate with low embeddedness, and primarily riffle-run stretches with some pools. This is consistent with the expectations of the Study Team given that the area is relatively undeveloped, located in the headwaters of each watershed, and in an area of dense vegetation and hilly terrain. Other watercourses of similar fish habitat characteristics to those in the PDA are commonly found throughout the Nashwaak River watershed.

The Lower Napadogan Brook, which is outside the PDA but within the Study Area, is a higher order stream that provides good habitat for cold water fish species, though water temperatures nearer to the confluence with the Nashwaak River may be on the high side for cold water fish during peak summer conditions. The channel and substrate are largely controlled by the presence of bedrock and a relatively steep slope. This watercourse provides abundant salmonid rearing habitat with some spawning habitat where gravel is present. Although the channel is wider with less vegetation overhang to provide cover, there are abundant rocks and boulders to provide refuge for small fish.

4.2 DETAILED FISH HABITAT AND QUALITATIVE FISH SURVEYS

4.2.1 Fish Habitat

As described in Section 3.5, detailed qualitative fish habitat surveys were completed from July 20 to August 9, 2011 at 32 stations. The complete fish habitat survey data, the raw results, and selected representative photographs from each station are included in Appendix C. Key habitat characteristics and *in situ* measured water quality data are provided and discussed for each watercourse in the sub-sections below. Where these differ substantially from those obtained through the rapid bio-assessment surveys (Section 4.1.1), attempts are made to characterize the extent of, and possible reasons for, these discrepancies. Although not reported in this section, discharge was calculated at each station following the DFO/NBDNR habitat form method and the results are included in Appendix C).

The *in situ* water quality data are interpreted in the same manner as they were for the rapid fish habitat bio-assessment and as described in Section 4.1.1.

Table 4.6 describes the location of each station relative to the PDA and Study Area. Twelve of the 32 stations are within the PDA, and therefore were previously surveyed during the rapid fish habitat bio-assessment surveys. Sixteen of the 32 stations are outside of the PDA but within the Study Area, and four of the stations are outside of the Study Area and intended as reference stations for EEM.

For those stations where information was collected as part of the rapid fish habitat bio-assessment surveys, a comparison of key characteristics at the station(s) and the average for the entire stream order watercourse segment is provided. The purpose of the comparison is to demonstrate the relative degree to which the station(s) represent the typical stream order habitat. This more holistic context for interpreting the station data is useful in providing confidence that the data from these stations does represent the larger watercourse, and is also useful in the selection of stations for the quantitative analysis (Section 4.3) and the EEM baseline (Section 4.5).

Table 4.6 Qualitative Fish Habitat Survey Stations and their Location Relative to the PDA and Study Area

Station	Within PDA	Within Study Area	Comment
B1A5	✓	✓	
B1C1	✓	✓	
B1D3	✓	✓	
B1H1		✓	Lying outside of the PDA on a tributary to Bird Brook.
B2A2	✓	✓	
B3A1	✓	✓	
B3A6	✓	✓	
B3A9		✓	Lying outside of the PDA on the main stem of Bird Brook.
S1C3	✓	✓	
S1D3	✓	✓	
S2A2	✓	✓	
S2A3	✓	✓	
S3A3		✓	Lying outside of the PDA on the main stem of Sisson Brook.
M1K4		✓	Lying outside of the PDA on a tributary to McBean Brook.
M1M2	✓	✓	
M1N1	✓	✓	
M2E1		✓	Lying outside of the PDA on a tributary to McBean Brook.
M3A1		✓	Lying outside of the PDA on a tributary to McBean Brook.
M3C3		✓	Lying outside of the PDA on a tributary to McBean Brook.
M4A9		✓	Lying outside of the PDA on the main stem of McBean Brook.
W1G5		✓	Lying outside of the PDA on a tributary to West Branch Napadogan Brook.
W1N3		✓	Lying outside of the PDA on West Branch Napadogan Brook.
W2A4		✓	
W4A1		✓	
W4A17		✓	
W4A21		✓	
W4A25		✓	
W4A31		✓	
EBNB3			Reference station.
EBNB2			Reference station.
EBNB1			Reference station.
NRC			Reference station.

4.2.1.1 Sisson Brook Stations

Table 4.7 includes a summary of some key habitat characteristics for the Sisson Brook stations as determined during the qualitative surveys (fish habitat).

Table 4.7 Key Habitat Characteristics of Sisson Brook Stations

Station Name	% Riffle-Run	% Pool	Bankfull Width (m)	Bankfull Depth (m)	Dominant Substrate	Embeddedness	% Cover	Overall Channel Condition
S1C3	100	0	0.9	0.5	Sand	1	80	Good.
S1D3	100	0	0.9	0.4	Fines	3	75	Good.
S2A2	100	0	3.3	0.5	Rock	1	60	Good to excellent.
S2A3	100	0	3.3	0.4	Rock/Rubble/ Gravel	1	65	Good, though there is a perched culvert at end of reach.
S3A3	70	30	7.0	0.4	Boulder/Mix	1	70	Good to excellent.

Legend:
Embeddedness: 1 = <20%, 2 = 20-35%, 3 = 35-50%, and 4 = >50%.

First order Sisson Brook stations (S1C3, S1D3) have an average bankfull width of 0.9 m, which is less than the average 1.2 m width observed for the entire length of 1st order watercourses during the rapid bio-assessment surveys. The substrate is similarly dominated by fines and sand with low embeddedness. Channel condition of these stations is good with banks comprising of stable grasses and shrubs that provide 75 to 80% canopy cover. These two stations represent riffle-run habitat only and provide good representation of typical 1st order Sisson Brook habitat.

Second order Sisson Brook stations (S2A2, S2A3) have an average bankfull width of 3.3 m, which is slightly more than the average 3.2 m width observed for the entire length of 2nd order watercourses during the rapid bio-assessment surveys. The substrate of these two stations is dominated by rock, rubble, and gravel, while a greater presence of sand was observed for the entire 2nd order station. Channel condition of these stations is good to excellent with banks comprising of stable grasses and trees that provide 60-65% canopy cover. These two stations represent riffle-run habitat only. There is a perched culvert present at S2A3 that may limit fish passage during low flow conditions and results in habitat characteristics that are different from the average for 2nd order Sisson Brook watercourses. S2A2 provides excellent representation of typical 2nd order Sisson Brook habitat.

The only third order Sisson Brook station (S3A3) has an average bankfull width of 7.0 m, which is considerably greater than the average 3.8 m width observed for the entire length of 3rd order watercourses during the rapid bio-assessment surveys. The substrate is similarly dominated by coarse materials including boulders and a mixture of rubble, rock and bedrock with low embeddedness. Channel condition of this station is good to excellent with banks comprising of stable shrubs and trees. This station is primarily riffle-run, though 30% is pool habitat. Station S3A3 provides fair representation of typical 3rd order Sisson Brook habitat.

The *in situ* measured water quality (Table 4.8) of the Sisson Brook stations as collected during the qualitative fish habitat surveys is generally good to excellent for all life stages of cold water species, as it was when measured during the rapid fish habitat bio-assessment survey (Section 4.1.1). The DO

concentration (range of 9.3-10.4 mg/L) exceeded the CCME (1999) recommended lower limit of 9.5 mg/L for early stages in most stations and is acceptable for other life stages in all stations. The range of pH (5.6-6.7) is a little less than the CCME (1999) recommended range (6.5-9.0) for the protection of freshwater aquatic life. The range of water temperature (10.6-14.3°C) is considered cold for the time of year, and represents excellent summer conditions for salmonids. There is no obvious relationship between stream order and water quality in Sisson Brook stations.

Table 4.8 Sisson Brook Water Quality by Station

Station	Dissolved Oxygen (mg/L)	pH	Conductivity (µS/cm)	Temperature (°C)
S1C3	9.3	5.6	21	12.0
S1D3	9.6	6.7	25	10.6
S2A2	10.0	6.1	28	13.9
S2A3	10.4	6.6	26	14.3
S3A2	9.6	6.4	29	13.1

Notes:
1) Values in **bold** are either stagnant headwater areas or areas that were wetland dominated and backwatered by beaver activities (also stagnant) and are not suitable for any life stage of warm or cold water fish species (CCME 1999).
2) Shaded cells indicates dissolved oxygen below CCME (1999) guidelines for other life stages (6.5 mg/L); or pH is below 5.0 (CCME 1987).

4.2.1.2 Bird Brook Stations

Table 4.9 includes a summary of some key habitat characteristics for the Bird Brook stations as determined during the qualitative fish habitat surveys.

Table 4.9 Key Habitat Characteristics of Bird Brook Stations

Station Name	% Riffle-Run	% Pool	Bankfull Width (m)	Bankfull Depth (m)	Dominant Substrate	Embeddedness	% Cover	Overall Channel Condition
B1A5	100	0	2.0	0.4	Sand/Fines	3	25	Good.
B1C1	100	0	0.5	0.4	Sand/Fines	3	75	Good.
B1D3	100	0	1.7	0.2	Sand	1	60	Good.
B1H1	100	0	0.4	0.1	Gravel/Sand	3	50	Headwater not fish habitat.
B2A2	100	0	3.9	0.2	Sand	1	55	Good, some braiding.
B3A1	70	30	4.5	0.3	Sand/Fines	2	50	Marginal in places, culvert washed out.
B3A6	100	0	5.3	0.8	Sand/Gravel/ Fines	3	45	Good to excellent.
B3A9	90	10	5.0	0.6	Rock/Rubble/ Gravel	1	40	Good to excellent.

First order Bird Brook stations (B1A5, B1C1, B1D3, B1H1) have an average bankfull width range of 0.4 to 2.0 m, which is less than the 1.9 m width observed for the entire length of 1st order watercourses during the rapid bio-assessment surveys. The substrate is similarly dominated by fines and sand with embeddedness. Channel conditions are good with banks comprising of stable grasses and shrubs that provide 25 to 75% canopy cover. Station B1H1 on Bird Brook is not suitable as a fish habitat because

the channel is not well-defined, flows from a hill side, and frequently flows under moss and rocks. The other three stations provide riffle-run habitat only and are representative of typical 1st order Bird Brook habitat.

The only second order Bird Brook station (B2A2) has an average bankfull width of 3.9 m, which is greater than the 2.8 m width observed for the entire length of 2nd order watercourses during the rapid bio-assessment surveys. The substrate is similarly dominated by sand with low embeddedness (<20%). Channel condition is good with some braiding and the banks are comprising of stable alders and trees that provide 55% canopy cover. This station provides riffle-run habitat only, and is a good representation of typical 2nd order Bird Brook habitat.

Third order Bird Brook stations (B3A1, B3A6, B3A9) have an average bankfull width ranging from 4.5 m to 5.3 m, which is similar to the 4.5 m width observed for the entire length of 3rd order watercourses during the rapid bio-assessment surveys. The substrate is similarly diverse with varied embeddedness. Channel condition is good to excellent and banks consist of stable shrubs and trees that provide 40-50% canopy cover. The stations are predominantly riffle-run, though pools are present in B3A1 and B3A9. Station B3A9 provides excellent representation of typical 3rd order Bird Brook habitat.

The *in situ* measured water quality (Table 4.10) of Bird Brook as collected during the qualitative fish habitat surveys is generally good for cold water fish species, as it was when measured during the rapid fish habitat bio-assessment survey (Section 4.1.1). The DO concentration (range of 6.7-9.7 mg/L) was less than the CCME (1999) recommended minimum value of 9.5 mg/L for early life stages in most stations, but acceptable for other life stages in all stations. The range of pH (5.4-7.0) is less than the CCME recommended range (6.5-9.0) for the protection of freshwater aquatic life. The range of water temperature (11.6-15.2°C) is considered cold for the time of year, and represents excellent summer conditions for salmonids. There is no obvious relationship between stream order and water quality in Bird Brook stations.

Table 4.10 Bird Brook Water Quality by Station

Station	Dissolved Oxygen (mg/L)	pH	Conductivity (µS/cm)	Temperature (°C)
B1A5	9.6	7.0	29	15.1
B1C1	7.8	5.4	23	11.6
B1D3	8.6	6.2	26	13.9
B1H1	6.7	5.9	29	15.2
B2A2	9.7	5.9	21	13.6
B3A1	8.1	5.9	26	12.4
B3A6	8.9	6.4	24	14.2
B3A9	8.8	5.7	25	12.8

Notes:
1) Values in **bold** are either stagnant headwater areas or areas that were wetland dominated and backwatered by beaver activities (also stagnant) and are not suitable for any life stage of warm or cold water fish species (CCME 1999).
2) Shaded cells indicates dissolved oxygen below CCME (1999) guidelines for other life stages (6.5 mg/L); or pH is below 5.0 (CCME 1987).

4.2.1.3 West Branch Napadogan Brook Stations

Table 4.11 includes a summary of some key habitat characteristics for the stations within the West Branch Napadogan Brook watershed as determined during the qualitative fish habitat surveys. The 1st and 2nd order stations are located on unnamed tributaries to the West Branch Napadogan Brook, within the PDA, and were included in the rapid fish habitat bio-assessment surveys. There were no 3rd order stations in the West Branch Napadogan Brook watershed. The 4th order stations (W4A1, W4A17, W4A21, W4A25, W4A31) are located on the main stem of the West Branch Napadogan Brook, are not located within the PDA, and were therefore not included in the rapid fish habitat bio-assessment surveys, although W4A2, W4A21, W4A25 and W4A31 were subsequently covered by the Lower Napadogan Brook survey.

Table 4.11 Key Habitat Characteristics of the West Branch Napadogan Brook Watershed Stations

Station Name	% Riffle-Run	% Pool	Bankfull Width (m)	Bankfull Depth (m)	Dominant Substrate	Embeddedness	% Cover	Overall channel Condition
W1G5	100	0	1.1	0.4	Sand/Fines/ Gravel	2	65	Good to excellent.
W1N3	100	0	2.5	0.4	Boulder/Rock	1	85	Good.
W2A4	100	0	4.7	0.6	Sand	2	40	Good.
W4A1	90	10	23.5	N/A	Sand/Fines/ Gravel	1	40	Good – beaver.
W4A17	95	5	5.0	80	Rubble/Sand	1	30	Good to excellent.
W4A21	85	15	8.3	150	Boulder	1	45	Good to excellent.
W4A25	100	0	15.5	135	Rock/Boulder/ Rubble	1	50	Good to excellent.
W4A31	100	0	10.0	70	Rubble/Rock	1	15	Good to excellent.

Legend:
Embeddedness: 1 = <20%, 2 = 20-35%, 3 = 35-50%, and 4 = >50%.

First order tributaries to the West Branch Napadogan Brook stations (W1G5, W1N3) have an average bankfull width ranging from 1.1 to 2.5 m, which is consistent with the 1.4 m width observed for the entire length of 1st order watercourses during the rapid bio-assessment surveys. The two stations represent different habitat types with fines and moderate embeddedness dominating W1G5, and rock and low embeddedness dominating W1N3. Channel condition is good to excellent with banks comprising of a stable mixture of grasses, trees, and shrubs that provide a 65 to 85% canopy cover. These stations provide riffle-run habitat only. W1N3 provides an excellent representation of typical 1st order tributaries to the West Branch Napadogan Brook habitat.

The only second order tributary to the West Branch Napadogan Brook station (W2A4) has an average bankfull width of 4.7 m, which is greater than the 2.0 m width observed for the entire length of 2nd order watercourses during the rapid bio-assessment surveys. The substrate is similarly dominated by sand with moderate embeddedness. Channel condition is good with banks comprising of stable grasses and shrubs that provide a 40% canopy cover. This station provides riffle-run habitat only and is a good representation of typical 2nd order tributaries to the West Branch Napadogan Brook habitat.

Fourth order West Branch Napadogan Brook stations (W4A1, W4A17, W4A21, W4A25, W4A31) have an average bankfull width ranging from 5.0 to 23.5 m. The substrate is generally coarse except for station W4A1, which has fine sediment deposits due to beaver activity. Channel condition is good to excellent with banks comprising of stable grasses, shrubs and trees that provide a 15-50% canopy cover. These stations provide mostly riffle-run habitat though some pools are present, some of which are associated with beaver activity.

The *in situ* measured water quality (Table 4.12) of West Branch Napadogan Brook watershed stations as measured during the qualitative fish habitat surveys is generally good for cold water fish species, as it was when measured during the rapid fish habitat bio-assessment survey (Section 4.1.1). The range of DO concentration (7.8-10.5) at more than half of the stations was equal to or greater than the CCME FAL Guideline value of 9.5 mg/L for early life stages and is acceptable for other life stages in all stations. The range of pH (5.3-7.0) is less than the CCME recommended range (6.5-9.0) for the protection of freshwater aquatic life. The range of water temperature (9.1-16.7°C) is considered cold for the time of year, and represents excellent summer conditions for salmonids. There is no obvious relationship between stream order and water quality in West Branch Napadogan Brook watershed stations.

Table 4.12 West Branch Napadogan Brook Watershed Water Quality by Station

Station	Dissolved Oxygen (mg/L)	pH	Conductivity (uS/cm)	Temperature (°C)
W1G5	10.5	7.0	31	9.1
W1N3	7.8	5.3	23	16.7
W2A4	8.9	6.3	27	13.3
W4A1	8.9	6.6	30	16.5
W4A17	9.9	6.9	26	15.3
W4A21	10.4	7.0	25	15.3
W4A25	9.7	6.7	25	16.7
W4A31	9.8	6.4	25	16.2

Notes:
1) Values in **bold** are either stagnant headwater areas or areas that were wetland dominated and backwatered by beaver activities (also stagnant) and are not suitable for any life stage of warm or cold water fish species (CCME 1999).
2) Shaded cells indicates dissolved oxygen below CCME (1999) guidelines for other life stages (6.5 mg/L); or pH is below 5.0 (CCME 1987).

4.2.1.4 McBean Brook Stations

Table 4.13 includes a summary of some key habitat characteristics for the McBean Brook watershed stations as determined during the qualitative surveys. The 1st and 2nd order stations (M1K4, M1M2, M1N1, M2E1) are located on unnamed tributaries to McBean Brook. M1M2 and M1N1 are within the PDA and were included in the rapid fish habitat bio-assessment surveys, while M1K4 is just outside of the PDA and was not included in the rapid bio-assessment surveys. The 3rd and 4th order stations (M3A1, M3C3, and M4A9) are located on the main stem of McBean Brook, are not located within the PDA, and were therefore not included in the rapid fish habitat bio-assessment surveys.

Table 4.13 Key Habitat Characteristics of Tributaries to McBean Brook Watershed Stations

Station Name	% Riffle-Run	% Pool	Bankfull Width (m)	Bankfull Depth (m)	Dominant Substrate	Embeddedness	% Cover	Overall Channel Condition
M1K4	100	0	1.0	0.3	Sand/Fines	2	70	Headwaters beaver pond.
M1M2	100	0	1.6	0.3	Fines	3	60	Headwaters, marginal.
M1N1	100	0	3.0	0.4	Fines	4	10	Headwaters, marginal.
M2E1	90	10	4.5	0.4	Fines/Sand	2	75	Good.
M3A1	100	0	2.6	0.4	Mixed	1	45	Good.
M3C3	85	15	5.0	0.7	Sand/Rubble	1	45	Good.
M4A9	0	100	40.0	N/A	Fines	4	5	Good- natural deadwater.

Legend:
Embeddedness: 1 = <20%, 2 = 20-35%, 3 = 35-50%, and 4 = >50%.

First order unnamed tributaries to McBean Brook stations (M1K4, M1M2, M1N1) have an average bankfull width ranging from 1.0 to 3.0 m, which is greater than the 0.95 m width observed for the entire length of 1st order watercourses during the rapid bio-assessment surveys. The substrate is similarly dominated by sand and fines with moderate to high embeddedness. Channel condition is marginal, largely as a result of beaver activity, and banks are mostly moss and other wetland vegetation. Where structured, the channel banks are stable and vegetated by grass and shrubs that provide 10 to 70% canopy cover. These stations provide low-energy, poor quality riffle-run habitat only and collectively provide an excellent representation of typical 1st order tributaries to the McBean Brook habitat, in proximity to the PDA.

The only 2nd order tributary to McBean Brook station (M2E1) has an average bankfull width of 4.5 m, which is greater than the 2.0 m width observed for the entire length of 2nd order watercourses during the rapid bio-assessment surveys. The substrate is dominated by fines and sand with moderate embeddedness. Channel condition is good, though recent beaver activity is evident, with stable banks vegetated with grasses and shrubs that provide a 75% canopy cover. This station provides primarily riffle-run habitat and is an excellent representation of typical 2nd order tributaries to the McBean Brook habitat.

Third order McBean Brook stations (M3A1, M3C3) have an average bankfull width ranging from 2.6 to 5.0. The substrate is a mixture of sand and gravel with coarser materials interspersed and low embeddedness. Channel condition is good, though there is evidence of human activity including a forest clear-cut and a road crossing that causes some ponding upstream of a bridge at M3A1 and widening upstream of a culvert at M3C3. The banks are stable and vegetated with grasses and shrubs that provide a 45% canopy cover. These stations provide mostly riffle-run habitat.

The only 4th order McBean Brook station (M4A9) has an average bankfull width of 40 m. This station is a natural deadwater. The substrate is 100% fines and the stable banks are vegetated with shrubs, grasses, and some trees that provide only 10% cover due to the open nature of a deadwater.

The *in situ* measured water quality (Table 4.14) of McBean Brook as determined during the qualitative surveys is generally good for cold water fish species, as it was when measured during the rapid fish habitat bio-assessment survey (Section 4.15). The DO concentration (range of 6.3-9.2 mg/L) did not exceed the CCME recommended minimum value of 9.5 mg/L for early life stages at any station, though was acceptable for other life stages at every station. The range of pH (5.2-6.7) is less than the CCME recommended range (6.5-9.0) for the protection of freshwater aquatic life. The range of water temperature (13.7-19.1°C) is considered cool for the time of year, and represents acceptable summer conditions for salmonids.

Table 4.14 McBean Brook Watershed Water Quality by Station

Station	Dissolved Oxygen (mg/L)	pH	Conductivity (uS/cm)	Temperature (°C)
M1K4	7.4	6.3	23	14.3
M1M2	6.7	6.5	42	15.5
M1N1	8.1	6.0	25	15.5
M2E1	6.3	5.2	21	15.4
M3A1	9.2	6.7	31	13.7
M3C3	8.0	6.3	28	19.1
M4A9	6.3	6.3	34	17.6

Notes:
1) Values in **bold** are either stagnant headwater areas or areas that were wetland dominated and backwatered by beaver activities (also stagnant) and are not suitable for any life stage of warm or cold water fish species (CCME 1999).
2) Shaded cells indicates dissolved oxygen below CCME (1999) guidelines for other life stages (6.5 mg/L); or pH is below 5.0 (CCME 1987).

4.2.1.5 East Branch Napadogan Brook Watershed and Nashwaak River Stations

Table 4.15 includes a summary of some key habitat characteristics for the East Branch Napadogan Brook and Nashwaak River stations as determined during the qualitative fish habitat surveys. These stations, intended as reference stations for the EEM, are located outside of the Study Area and were therefore not included in the rapid fish habitat bio-assessment surveys. The East Branch Napadogan Brook watershed stations include one 1st order station (EBNB3) on an unnamed tributary to the East Branch Napadogan Brook, and two 3rd order stations (EBNB2 and EBNB1) on the main stem of the East Branch Napadogan Brook. The Nashwaak River station (NRC) is on the main stem of the upper Nashwaak River and is a 4th order stream.

Table 4.15 Key Habitat Characteristics of the East Branch Napadogan Brook and Nashwaak River Stations

Station Name	% Riffle-Run	% Pool	Bankfull Width (m)	Bankfull Depth (m)	Dominant Substrate	Embeddedness	% Cover	Overall Channel Condition
EBNB3	100	0	1.4	0.7	Fines	2	40	Good - some braiding.
EBNB2	75	25	11.5	0.2	Coarse Mixture	1	10	Good – lacks structure.
EBNB1	75	25	11.0	0.8	Coarse Mixture	1	40	Good to excellent.
NRC	100	0	13.5	0.4	Gravel	1	10	Good to excellent.

Legend:
Embeddedness: 1 = <20%, 2 = 20-35%, 3 = 35-50%, and 4 = >50%.

The 1st order tributary to East Branch Napadogan Brook station (EBNB3) is a braided channel and the substrate is dominated by fines with moderate embeddedness. Channel condition is good, and the banks are stable and vegetated with grasses, shrubs and trees. Canopy cover is higher (40%) for the narrow braided channel of EBNB3. Habitat is limited to riffle-run in braided segments.

Third order East Branch Napadogan Brook stations (EBNB1, EBNB2) have an average bankfull width ranging from 11.0 to 11.5 m. The two stations have very similar physical characteristics, though there is comparatively more structure and greater depth of water at EBNB1. The substrate of both is a coarse mixture of gravel to boulder material with low embeddedness (<20%) and provides 75% riffle-run habitat and 25% pool habitat.

The 3rd order Nashwaak River station (NRC) has an average bankfull width of 13.5 m and the substrate is predominantly gravel mixed with rubble and sand and has low embeddedness. Channel condition is good to excellent, with stable banks vegetated with shrubs and grasses providing 10% canopy cover. This station provides riffle-run habitat only.

The *in situ* measured water quality (Table 4.16) of East Branch Napadogan Brook watershed stations as determined during the qualitative fish habitat surveys is generally good for cold water fish species. The DO concentration (range of 8.6-9.7 mg/L) exceeded the CCME recommended minimum value of 9.5 mg/L for early life stages at two stations, and was acceptable for other life stages in every station. The range of pH (6.1-7.0) is marginally within the CCME recommended range (6.5-9.0) for the protection of freshwater aquatic life. The range of water temperature (16.8-17.7°C) is considered cold for the time of year, and represents good summer conditions for salmonids.

The *in situ* measured water quality (Table 4.16) of the Nashwaak River station as determined during the qualitative fish habitat surveys is good to excellent for cold water fish species. The DO concentration (9.4 mg/L) is just under the CCME recommended minimum value of 9.5 mg/L for early life stages, and is acceptable for other life stages in every station. The pH (6.8) is within the CCME recommended range (6.5-9.0) for the protection of freshwater aquatic life. The water temperature (9.7°C) is considered very cold for the time of year, and represents excellent summer conditions for salmonids, possibly as thermal refugia.

Table 4.16 East Branch Napadogan Brook Watershed and Nashwaak River Water Quality by Station

Station	Dissolved Oxygen (mg/L)	pH	Conductivity (uS/cm)	Temperature (°C)
EBNB3	8.8	6.1	19	16.8
EBNB2	9.7	6.9	35	16.8
EBNB1	9.7	7.0	39	17.7
NRC	9.4	6.8	30	9.7

Notes:
1) Values in **bold** are either stagnant headwater areas or areas that were wetland dominated and backwatered by beaver activities (also stagnant) and are not suitable for any life stage of warm or cold water fish species (CCME 1999).
2) Shaded cells indicates dissolved oxygen below CCME (1999) guidelines for other life stages (6.5 mg/L); or pH is below 5.0 (CCME 1987).

4.2.2 Fish

The characterization of fish in the Study Area was accomplished mainly by qualitative fish surveys (discussed here) and quantitative electrofishing surveys (discussed in Section 4.3). In this section, the results of the qualitative fish surveys will be presented. Results of fish habitat characterization during these surveys were presented in Section 4.2.1. Results of other work completed at the same time (in particular, results for water and sediment quality collected during the qualitative electrofishing surveys) can be found in subsequent sections of this Technical Report.

The purpose of the qualitative fish surveys was to gain an understanding of the composition of fish communities, compare fish species distribution between stations and watercourses, and estimate the relative abundance of brook trout, Atlantic salmon, and all other fish species inhabiting watercourses within the Study Area. The qualitative fish surveys also provided an opportunity to look for the presence of SAR and SOCC. The methods for carrying out the qualitative fish surveys were detailed in Section 3.3 of the report. This section further elaborates on the methods used for these surveys, and presents the results of fish species distribution and estimated relative abundance as determined by these surveys. A discussion of SOCC is provided in Section 4.9.

The qualitative fish surveys were carried out from July 20 to August 9, 2011, using standard methods as described in Section 3.3. With the exception of those stations that were selected for quantitative electrofishing (Section 4.3), qualitative fish surveys at most stations were one-time sampling events, and represent a characterization of the fish species present at the time of the surveys. Qualitative fish surveys were conducted at 29 of 32 stations within the Study Area (Figure 3.3). Three stations were not surveyed for the following reasons:

- fish habitat at station B1H1 in Bird Brook was not suitable for fish due to the watercourse flowing below the surface, and was not surveyed;
- an equipment malfunction (further explanation provided below) prevented the survey of one of the four 4th order stations on the West Branch Napadogan Brook (W4A21); and
- the Nashwaak River station (NRC) station had not been selected as a reference station at the time of carrying out these surveys.

While attempting to survey station W4A21, the electrofisher would not operate due to previous exposure to rain earlier that day. The LR-24 electrofishing unit has an automatic shut-down feature when water is present in the machine to protect the user, and the unit could not be restarted after that point and the team departed from the field as it was near the end of the qualitative fish survey program. In order to get fish species information from station W4A21, the decision was made to make it one of the ten stations where quantitative fish surveys were undertaken, as described in Section 4.3.

The method of capture was backpack electrofishing for all stations, except for three McBean Brook stations (M1M2, M1N1, M4A9) where conditions were not suitable for backpack electrofishing due to water depth and/or soft substrate conditions in wetland or beaver impounded areas—at these stations, baited minnow traps were used instead of electrofishing. Minnow traps are considered to be an effective means of capturing the species likely to be present at these stations, though they can be size-selective and the results cannot reliably be used to estimate fish abundance. At each station, captured

fish were identified as to their species, and length was recorded. The complete results of the qualitative fish surveys can be found in Appendix C, and representative photographs of the fish species captured can be found in Appendix C.

4.2.2.1 Fish Species Distribution

The distribution of fish species collected during the qualitative fish surveys is presented in Table 4.17 for each station, grouped by watershed. Shaded cells indicate the presence of the selected family of fish at the individual station, and the initials in the shaded cells indicate fish species present. Unshaded cells indicate absence of a particular family at the station. A total of eleven different species were collected during the qualitative fish surveys, representing six families of fish.

Table 4.17 Fish Species Distribution as Determined by Qualitative Fish Surveys

Key: Present / Absent		Salmonidae	Cyprinidae	Other Families
		brook trout (bt) Atlantic salmon (as)	blacknose dace (bnd) pearl dace (pd) creek chub (cc) common shiner (cs)	Anguillidae [American eel (ae)]
				Catostomatidae [white sucker (ws)] [longnose sucker (ls)]
				Cottidae [slimy sculpin (ss)]
				Petromyzontidae [sea lamprey (sl)]
Station	**Watercourse Name**			
B1A5	Bird Brook	bt		
B1C1	Bird Brook	bt		
B1D3	Bird Brook	bt		
B2A2	Bird Brook	bt		ae, ss
B3A1	Bird Brook	bt		ae
B3A6	Bird Brook	bt		ae, ss
B3A9	Bird Brook	bt, as		ae, ss
S1C3	Sisson Brook	bt		
S1D3	Sisson Brook	bt		
S2A2	Sisson Brook	bt		
S2A3	Sisson Brook	bt		ae
S3A3	Sisson Brook	bt		ae
M1K4	McBean Brook	bt		
M1M2	McBean Brook		cc, pd	
M1N1	McBean Brook		cc, pd	
M2E1	McBean Brook	bt	bnd	ae
M3A1	McBean Brook	bt	bnd	sl
M3C3	McBean Brook	bt	bnd, cs, cc	ae, ls, sl
M4A9	McBean Brook		bnd, cs, cc	ae, ls
W1G5	West Branch Napadogan Brook	bt		
W1N3	West Branch Napadogan Brook	bt		ss
W2A4	West Branch Napadogan Brook	bt		sl, ss
W4A1	West Branch Napadogan Brook	bt, as		ae, sl, ss, ws

Table 4.17 Fish Species Distribution as Determined by Qualitative Fish Surveys

Key: Present / Absent		Salmonidae	Cyprinidae	Other Families
		brook trout (bt) Atlantic salmon (as)	blacknose dace (bnd) pearl dace (pd) creek chub (cc) common shiner (cs)	Anguillidae [American eel (ae)]
				Catostomatidae [white sucker (ws)] [longnose sucker (ls)]
				Cottidae [slimy sculpin (ss)]
				Petromyzontidae [sea lamprey (sl)]
W4A17	West Branch Napadogan Brook	bt, as		ae, ss
W4A25	West Branch Napadogan Brook	bt, as		ae, sl
W4A31	West Branch Napadogan Brook	bt, as	bnd	ae
EBNB3	East Branch Napadogan Brook	bt		
EBNB2	East Branch Napadogan Brook	bt, as	bnd	ae, sl, ws
EBNB1	East Branch Napadogan Brook	bt, as	bnd	ae

Bird Brook and Sisson Brook Watersheds

The fish species assemblages of the Bird and Sisson brooks watershed stations are consistent with the cold water fish species habitat provided in these headwater small order watersheds, as described in Sections 4.1 and 4.2.1. These stations had the least diverse species assemblages of the five watersheds, as was expected given their small size and low stream order types. Brook trout were present in all stations, and Atlantic salmon were present in the Bird Brook station nearest to its confluence with the West Branch Napadogan Brook. American eel were present in most of the 2nd and 3rd order stations of both brooks. Slimy sculpin were present in Bird Brook, but not Sisson Brook. Slimy sculpin distribution varies locally throughout New Brunswick, even within adjacent watersheds, thus it is not unusual in this case for sculpin not to be present in nearby Sisson Brook. It is possible that slimy sculpin favour the more moderate gradient and stream flow characteristics of Bird Brook.

McBean Brook Watershed

The fish species assemblage of the McBean Brook watershed stations is the most diverse of the five watersheds in terms of species presence, with 8 species present of the total of 11 species captured during the qualitative fish surveys. Of particular note is the absence of Atlantic salmon at all stations, and the presence of four cyprinid species (*i.e.,* common shiner, creek chub, pearl dace, and blacknose dace) and the longnose sucker, all of which favour more moderate stream gradients and warmer temperatures than do the salmonids. The presence of these warmer water species is consistent with the habitat present in McBean Brook watershed as described in Section 4.1 and 4.2.1, which demonstrate an abundance of natural and beaver-induced ponded areas of low flow and warmer water temperature.

West Branch and East Branch Napadogan Brook Watersheds

The fish species assemblages of the West Branch Napadogan and the East Branch Napadogan Brook watershed stations are similar to others surveyed, with diversity that is in-between that of the cold water Sisson and Bird brooks stations and that of the warmer water McBean Brook stations. Brook trout were present at all stations and Atlantic salmon and American eel were present in all of the 3rd and 4th order stations. The presence of the cyprinid family was limited to blacknose dace which was observed in the furthest downstream stations (EBNB1 and W4A31); its absence at other stations is likely due to cooler water temperatures and somewhat faster flowing waters at these stations as compared to those stations where cyprinids were more abundant. The slimy sculpin was present in the West Branch Napadogan Brook watershed but not in the East Branch Napadogan Brook watershed, though as stated previously, variations in distribution at the local level are not uncommon for this species.

4.2.2.2 Estimated Relative Abundance of Fish Species in the Qualitative Fish Survey Stations

The relative abundance of fish species (brook trout, Atlantic salmon, all species) was estimated as the catch per unit effort (CPUE) for each of the 26 qualitative electrofishing stations. CPUE is a calculated parameter that reflects the number of individual fish caught per unit of time spent electrofishing, and is indicative of the relative abundance of fish population per watercourse area. For the purpose of this Technical Report, CPUE is considered as a qualitative means of comparing the relative abundance of fish between stations and watersheds. Note that CPUE relates only to the 26 stations at which backpack electrofishing could be conducted, and excludes the three stations at which minnow traps were used to determine fish distribution.

The CPUE is first calculated for all fish species at each station, then for brook trout, and finally for Atlantic salmon. The CPUE of brook trout is calculated separately because of their importance to recreational anglers and other stakeholders, and the CPUE of Atlantic salmon is calculated separately because of its status as a SOCC.

All Fish Species

The relative abundance of all species combined was estimated for each station, and is presented by watershed in Table 4.18.

Table 4.18 Catch Per Unit Effort (CPUE) During Qualitative Electrofishing Surveys—All Fish Species

Station	Stream Order	Total Number of Captured Fish	Distance fished (m)	Electrofishing Effort (s)	All Species Catch per Unit Effort, CPUE (fish/100 s)
B1A5	1	46	80	651	7.07
B1C1	1	10	100	441	2.27
B1D3	1	21	30	630	3.33
B2A2	2	18	157	755	2.38
B3A1	3	31	100	824	3.76
B3A6	3	14	100	596	2.35
B3A9	3	27	150	855	3.16
S1C3	1	9	100	470	1.91
S1D3	1	11	90	468	2.35
S2A2	2	12	150	1344	0.89
S2A3	2	34	175	1524	2.23
S3A3	3	17	141	1420	1.20

Table 4.18 Catch Per Unit Effort (CPUE) During Qualitative Electrofishing Surveys—All Fish Species

Station	Stream Order	Total Number of Captured Fish	Distance fished (m)	Electrofishing Effort (s)	All Species Catch per Unit Effort, CPUE (fish/100 s)
M1K4	1	5	130	582	0.86
M2E1	2	12	150	633	1.90
M3A1	3	54	1732	1121	4.82
M3C3	3	47	170	1080	4.35
W1G5	1	54	120	749	7.21
W1N3	1	23	100	698	3.30
W3A4	3	45	160	821	5.48
W4A1	4	43	60	1831	2.35
W4A17	4	27	63	708	3.81
W4A25	4	20	100	847	2.36
W4A31	4	29	60	655	4.43
EBNB3	1	3	151	463	0.65
EBNB2	3	35	167	1147	3.05
EBNB1	3	34	139	758	4.49

In general, CPUE for all fish species varies widely between stations within a watershed, and between watersheds. There were no strong trends observed connecting CPUE with watershed size. For example, the CPUE of Bird Brook is generally higher for all stations as compared to the CPUE of the nearby and similar Sisson Brook stations, although Bird Brook is similar to West Branch Napadogan Brook stations.

There were no strong trends observed connecting CPUE with cold water or warmer water habitat types. For example, the CPUE of the Bird and West Branch Napadogan brooks stations generally decreases in the downstream direction as stream order increases, where the opposite trend is observed in the McBean Brook and East Branch Napadogan Brook stations. Finally, there were no strong trends observed connecting CPUE with fish species. For example, some of the greatest CPUE occurred in the first order stations of Bird (B1A5) and West Branch Napadogan brook (W1G5) stations where only brook trout were present, and in higher order McBean Brook stations (M3A1 and M3C3) where the greatest diversity of species were observed.

Brook Trout

Brook trout were captured at 25 of the 26 stations during the qualitative electrofishing surveys. Brook trout were not found at one station on the East Branch Napadogan River (EBNB2) which was likely the result of fast flow during electrofishing, as brook trout were found both upstream and downstream of this station. The relative abundance of brook trout was estimated for each station, and is presented by watershed in Table 4.19.

Table 4.19 Catch Per Unit Effort (CPUE) During Qualitative Electrofishing Surveys – Brook Trout

Station	Stream Order	Number of Captured Brook Trout	Distance fished (m)	Electrofishing Effort (s)	Brook Trout Catch per Unit Effort, CPUE (fish/100 s)
B1A5	1	46	80	651	7.07
B1C1	1	10	100	441	2.27
B1D3	1	21	30	630	3.33
B2A2	2	11	157	755	1.46
B3A1	3	30	100	824	3.64
B3A6	3	10	100	596	1.68
B3A9	3	15	150	855	1.75
M1K4	1	5	130	582	0.86
M2E1	2	9	150	633	1.42
M3A1	3	51	1732	1121	4.55
M3C3	3	1	170	1080	0.09
S1C3	1	9	100	470	1.91
S1D3	1	11	90	468	2.35
S2A2	2	12	150	1344	0.89
S2A3	2	32	175	1524	2.10
S3A3	3	16	141	1420	1.13
W1G5	1	54	120	749	7.21
W1N3	1	14	100	698	2.01
W2A4	2	12	160	821	1.46
W4A1	4	12	60	1831	0.66
W4A17	4	12	63	708	1.69
W4A25	4	8	100	847	0.94
W4A31	4	1	60	655	0.15
EBNB3	4	3	151	463	0.65
EBNB1	4	1	139	758	0.13

The CPUE for brook trout appears to respond weakly to stream order. First and second order stations in Bird and West Branch Napadogan brooks (particularly B1A5 and W1G5, have higher average CPUE values than the other watershed stations, suggesting that these stations provide the best conditions for brook trout of all qualitative fish survey stations. While brook trout are still present in third or fourth order streams, they are not particularly abundant in these habitats.

Atlantic Salmon

Atlantic salmon were captured at 7 of the 29 stations. All stations where Atlantic salmon were captured were main stem (third or fourth order) watercourses with fast flowing cold water. All captured salmon were juvenile (parr). The abundance of Atlantic salmon was estimated for each station, and is presented by watershed in Table 4.20.

Table 4.20 Catch Per Unit Effort (CPUE) During Qualitative Electrofishing Surveys – Atlantic Salmon

Station	Stream Order	Number of Captured Atlantic Salmon	Distance fished (m)	Electrofishing Effort (s)	Atlantic Salmon Catch per Unit Effort, CPUE (fish/100 s)
B3A9	3	1	150	855	0.12
W4A1	4	1	60	1831	0.05
W4A17	4	3	63	708	0.42
W4A25	4	8	100	847	0.94
W4A31	4	10	60	655	1.53
EBNB2	4	1	167	1147	0.09
EBNB1	4	13	139	758	1.72

West Branch Napadogan (W4A31) and East Branch Napadogan (EBNB1) brook watershed stations have the highest average CPUE values for Atlantic salmon, suggesting that these stations provide the best overall (though not unique) conditions for Atlantic salmon of all qualitative fish survey stations surveyed.

4.2.3 Summary of Qualitative Fish Surveys

The results of the qualitative fish surveys demonstrate fish assemblages that are consistent with the fish habitat type and quality, and with the stream order. In general, all of the sub-watersheds of the Napadogan Brook watershed—including Bird, Sisson, West Branch and East Branch Napadogan brooks—exhibited similar fish assemblages that are dominated by cold water species (*i.e.,* brook trout and Atlantic salmon). There is evidence for segregation of brook trout and Atlantic salmon within these watercourses, with brook trout tending to dominate the higher-order (first and second order) sections, and Atlantic salmon preferring the fourth order sections. The fish assemblages of McBean Brook have greater diversity of species and families, and a larger percentage composition of warmer water species, such as those of the family Cyprinidae. Overall, the fish assemblages found at all 29 stations are typical for similar watercourses throughout central New Brunswick.

The estimated relative abundance of all fish species, brook trout, and Atlantic salmon, demonstrated a general lack of relationship between CPUE and fish species, habitat type, watershed size, or stream order, though in general, the Bird and West Branch Napadogan Brook stations were found to have greater abundances of brook trout than the stations in the other watersheds.

4.3 QUANTITATIVE FISH POPULATION ASSESSMENT

Between September 8 and 29, 2011, Stantec conducted additional field investigations involving fish habitat. In this phase of the work 10 stations were selected (Figure 3.4) from the 32 stations previously surveyed during August, for follow-up fish habitat assessment involving quantitative electrofishing and collection of data for fish and benthic invertebrates following an EEM (Environment Canada 2011) model. In this section, the results of the quantitative electrofishing will be presented. Results of other work completed at the same time (including results for water and sediment quality, fish tissue analysis, fish EEM, and benthic invertebrate and periphyton communities) can be found in subsequent sections of this report.

For quantitative electrofishing, barrier nets were installed at upstream and downstream ends of a selected unit of habitat at the identified survey station, representing a reach of watercourse approximately 20 m long, ranging from 15 to 60 m. Some units of habitat were larger than others due to stream width. Methods for the quantitative habitat survey were outlined in Section 3.4. No further characterization of physical fish habitat was undertaken at the time of the quantitative electrofishing survey, as it had been described previously in August as part of the qualitative electrofishing surveys. Photographs of each station can be found in Appendix E. Stations were selected based on overall similarity of habitat characteristics, taking into consideration the changes in scale that are introduced by increasing stream order; and for the presence of target fish species (particularly brook trout, Atlantic salmon, and slimy sculpin).

4.3.1 Habitat

The area (m^2) of watercourse isolated using barrier nets, and the habitat type enclosed by the barrier nets (*e.g.*, pool riffle, run) during the quantitative survey, are presented in Table 4.21. Detailed habitat data for each of the stations can be found in Appendix D. Where insufficient numbers of fish (brook trout or slimy sculpin) were collected between the barrier nets to meet concurrent EEM study requirements, an additional area was fished in a qualitative manner, upstream of the barrier nets, until the target number of fish was collected, or until it was determined that the target number of fish could not be achieved without imposing an unacceptable level of stress on other fish species not being actively sought (such as Atlantic salmon parr). Because these fish were not captured within the barrier nets as part of the quantitative electrofishing effort, they are not included among the data presented here, but are listed with other fish data in Appendix E.

Table 4.21 Key Habitat Characteristics of the 10 Stations Sampled Quantitatively for Fish Population Estimates

Station	% Riffle	% Run	% Pool	Area Electrofished Between Barrier Nets (m^2)	Additional Area Electrofished Outside Barrier Nets (m^2)
B2A2	10	80	10	96	77
B3A9	40	40	10	76	215
S2A2	40	50	0	112	300
S3A3	30	40	30	200	830
M3C3	30	60	10	100	489
W4A17	30	55	15	100	600
W4A21	30	55	15	105	763
W4A31	40	55	5	300	1200
EBNB1	30	50	20	98	700
NRC	30	65	5	112	420

4.3.2 Quantitative Electrofishing Results

Nine different fish species were collected during the quantitative electrofishing surveys (see Table 4.22). Detailed results for the fish species collected, along with their weights and lengths, can be found in Appendix E. The majority of Atlantic salmon collected were parr, although some were close to smoltification. No adult Atlantic salmon were collected or encountered during this phase of the work.

Quantitative estimates of overall fish abundance (Table 4.22) were calculated using the method of Hayne (1949), based on the total number of fish captured between barrier nets at a particular station. Where possible, the numbers of brook trout and Atlantic salmon were also estimated.

Table 4.22 Quantitative Stations and Fish Species Collected through Quantitative Electrofishing, September 8-29, 2011

Station	Fish Species Collected	Number	Area Fished (m^2)	Total Catch Per Electrofishing Pass (all fish) (1st / 2nd / 3rd pass)	Density (all fish) (fish /100 m^2)*
B2A2	Brook Trout Slimy Sculpin	73 7	96	44 / 20 / 16	98.6 (90.8 – 106.3)
B3A9	American Eel Atlantic Salmon Brook Trout Slimy Sculpin	2 1 18 15	76	20 / 10 / 6	55.5 (54.1 – 56.6)
S2A2	Brook Trout	25	112	14 / 5 / 6	25.6 (21.4 – 30.0)
S3A3	American Eel Brook Trout	2 12	200	9 / 4 / 1	6.9 (5.9 – 7.9)
M3C3	American Eel Atlantic Salmon Blacknose Dace Blacknose Shiner Brook Trout Common Shiner Sea Lamprey White Sucker	6 2 37 11 10 3 5 2	100	39 / 18 / 16	89.3 (81.0 - 97.5)
W4A17	American Eel Atlantic Salmon Brook Trout Slimy Sculpin Sea Lamprey	2 15 17 10 3	100	24 / 15 / 10	66.4 (65.8 - 67.0)
W4A21	American Eel Atlantic Salmon Brook Trout White Sucker	3 12 3 0	105	13 / 1 / 4	>18
W4A31	Atlantic Salmon Blacknose Dace Brook Trout Sea Lamprey Slimy Sculpin White Sucker	54 13 3 3 3 1	300	42 / 27 / 8	30.1 (27.1 – 33.1)
EBNB1	American Eel Atlantic Salmon Blacknose Dace Brook Trout White Sucker	1 2 6 3 4	98	15 / 1 / 0	>15

Table 4.22 Quantitative Stations and Fish Species Collected through Quantitative Electrofishing, September 8-29, 2011

Station	Fish Species Collected	Number	Area Fished (m^2)	Total Catch Per Electrofishing Pass (all fish) (1st / 2nd / 3rd pass)	Density (all fish) (fish /100 m^2)*
NRC	American Eel Atlantic Salmon Blacknose Dace Creek Chub Common Shiner Sea Lamprey White Sucker	2 14 25 0 0 2 0	112	25 / 11 / 7	43.3 (41.2 – 45.3)

Notes:
1) Species reported as absent from the reach confined by barrier nets were occasionally captured upstream of the barrier nets during additional qualitative electrofishing effort. These species are identified in the first column of the table, but the number captured between the barrier nets is given as 0.
2) Scientific names of species caught are as follows: American eel (*Anguilla rostrata*), Atlantic salmon (*Salmo salar*), brook trout (*Salvelinus fontinalis*), blacknose dace (*Rhinichthys atratulus*), blacknose shiner (*Notropis heterolepis*), common shiner (*Notropis cornutus*), creek chub (*Semotilus atromaculatus*), sea lamprey (*Petromyzon marinus*), slimy sculpin (*Cottus cognatus*), and white sucker (*Catostomus commersoni*).

Further details for brook trout, Atlantic salmon, and slimy sculpin (*i.e.,* the three most abundant species caught overall) are provided below. Other species were not caught with sufficient frequency to justify quantitative analysis.

Brook Trout

With the exception of station NRC on the Nashwaak River, brook trout were found at all sampling stations. Brook trout densities (fish/100 m^2) were highest at stations B2A2 and S2A2 (Table 4.23), and within Bird and Sisson brooks overall; station W4A17 on the West Branch Napadogan Brook upstream of the confluence with Bird Brook also supported a high density of brook trout. However, brook trout were generally less abundant at the higher-order stream stations. These densities compare favourably to existing data on brook trout densities on other tributaries of the Nashwaak River. Brook trout densities measured between 1972 and 1978 in Hayden Brook and two sites on Narrows Mountain Brook were found to range from 11.9 to 26.5 fish/100 m^2 in Hayden Brook, from 8.4 to 19.2 fish/100 m^2 at Narrows Mountain Brook lower site, and from 46.4 to 97.8 fish/100 m^2 at Narrows Mountain Brook upper site (Martin 1980).

Table 4.23 Estimated Abundance of Brook Trout

Station	Area Fished (m^2)	Total Catch Per Electrofishing Pass (1st / 2nd / 3rd pass)	Estimated Brook Trout Density (fish/100 m^2)	Confidence Interval
B2A2	96	42 / 19 / 12	86.4	82.5 – 90.2
B3A9	76	8 / 6 / 4	33.4	32.0 – 34.8
S2A2	112	14 / 5 / 6	25.7	21.4 – 30.0
S3A3	200	8 / 3 / 1	6.3	6.2 – 6.4
M3C3	100	6 / 0 / 2	>8	--
W4A17	100	7 / 7 / 3	26.8	23.6 – 30.0
W4A21	105	2 / 0 / 1	>3	--
W4A31	300	2 / 1 / 0	1.1	0.9 – 1.25
EBNB1	98	3 / 0 / 0	>3	--

The weights and lengths of brook trout captured during the quantitative electrofishing survey are summarized in Table 4.24. The weight and length ranges of brook trout caught were broadly similar throughout the Study Area.

Table 4.24 Weight and Length Ranges of Brook Trout Captured During the Quantitative Electrofishing Survey

Station	Date of Sampling	Number of Brook Trout Caught	Length Range (mm)	Weight Range (g)
B2A2	September 8, 2011	73	41 to 168	6.6 to 51.5
B3A9	September 14, 2011	18	49 to 147	1.4 to 39.2
S2A2	September 12, 2011	25	49 to 183	1.1 to 64.1
S3A3	September 26, 2011	12	57 to 129	2.2 to 20.9
M3C3	September 13, 2011	8	100 to 165	9.9 to 50.6
EBNB1	September 19, 2011	3	72 to 140	3.5 to 25.9
W4A17	September 29, 2011	17	63 to 156	2.8 to 37.7
W4A 21	September 27, 2011	3	107 to 145	11.7 to 32.3
W4A31	September 15, 2011	3	119 to 160	15.0 to 42.6

Atlantic Salmon

Atlantic salmon parr were captured at 7 out of 10 stations during the quantitative electrofishing surveys (Table 4.25). No mature fish were caught. Atlantic salmon densities were very low (usually absent) in Bird, Sisson and McBean brooks, becoming more abundant in the fourth order stream habitat of Napadogan Brook (East and West branches), and at the station in the upper Nashwaak River (NRC). These densities compare favourably to existing data on Atlantic salmon densities on other tributaries of the Nashwaak River. Atlantic salmon densities measured between 1972 and 1978 in Hayden Brook and two sites on Narrows Mountain Brook were found to range from 0.5 to 5.9 fish/100 m^2 in Hayden Brook, and from 0.8 to 18.9 fish/100 m^2 at Narrows Mountain Brook lower site. Atlantic salmon were not reported from the Narrows Mountain upper site (Martin 1980).

Parr density reported by DFO workers over a period of several years in the main stem of the Nashwaak River were 7.7 parr/100 m^2 for age 0+ fish, and 5.1 age 1+ and older parr/100 m^2 (Jones *et al.* 2006). Densities are also similar to values reported for several tributaries to the Northwest Miramichi watershed, but much lower than densities calculated for the Sevogle, Little Southwest, and Cains Rivers within the same watershed (Reid 2010).

Table 4.25 Estimated Abundance of Atlantic Salmon

Station	Area Fished (m^2)	Total Catch Per Electrofishing Pass (1st / 2nd / 3rd pass)	Estimated Atlantic Salmon Density (fish/100 m^2)	Confidence Interval
B3A9	76	1 / 0 / 0	1.3	--
M3C3	100	2 / 0 / 0	2	--
W4A17	100	7 / 6 / 2	19.9	17.2 – 22.6
W4A21	105	9 / 1 / 2	>12	--
W4A31	300	29 / 17 / 8	21.6	21.0 – 22.3
EBNB1	98	2 / 0 / 0	2	--
NRC	112	7 / 5 / 2	15.9	14.6 – 17.2

The weights and lengths of Atlantic salmon captured during the quantitative electrofishing survey are summarized in Table 4.26. The weight and length ranges of Atlantic salmon caught were broadly similar throughout the Study Area.

Table 4.26 Weight and Length Ranges of Atlantic Salmon Captured During the Quantitative Electrofishing Surveys

Station	Date of sampling	Number of Atlantic Salmon Caught	Length Range (mm)	Weight Range (g)
B3A9	September 14, 2011	1	119	17.1
M3C3	September 13, 2011	2	147 to 133	21.7 to 38.8
W4A17	September 29, 2011	15	71 to 164	4.2 to 36.0
W4A21	September 27, 2011	12	95 to 143	9.3 to 31.6
W4A31	September 15, 2011	54	50 to 136	1.4 to 28.8
EBNB1	September 19, 2011	2	103 to 137	13.3 to 25.9
NRC	September 28, 2011	14	61 to 120	2.7 to 16.4

Slimy Sculpin

Slimy sculpin were collected at 4 out of 10 stations during the quantitative electrofishing surveys. Slimy sculpin raw densities (fish/100 m^2) at stations where they were captured ranged from 1 to 19.7 fish/100 m^2. These densities compare favourably to existing data on slimy sculpin densities on other tributaries of the Nashwaak River. Slimy sculpin densities measured between 1972 and 1978 in Hayden Brook and two sites on Narrows Mountain Brook were found to range from 0 to 1.2 fish/100 m^2 at Narrows Mountain Brook lower site, and from 13.7 to 41.3 fish/100 m^2 at Narrows Mountain upper site. Slimy sculpin were not reported from the site on Hayden Brook (Martin 1980).

The range of weights and lengths of slimy sculpin captured during the quantitative electrofishing surveys are provided in (Table 4.27).

Table 4.27 Weight and Length Ranges of Slimy Sculpin Captured During the Quantitative Electrofishing Surveys

Station	Date of Sampling	Number of Slimy Sculpin Caught	Length Range (mm)	Weight Range (g)
B2A2	September 8, 2011	7	50 to 85	1.2 to 5.9
B3A9	September 14, 2011	15	28 to 77	0.2 to 5.9
W4A17	September 29, 2011	10	38 to101	0.8 to 12.5
W4A31	September 15, 2011	3	40 to 87	0.8 to 7.7

Other Species

Observations with respect to other species caught during the quantitative survey are provided below.

- American eel was collected at seven out of the 10 stations (Table 4.22). American eel were found in third order and higher watercourses that, for the most part, had diverse habitat and fish communities. The numbers of American eel captured (fish/100 m^2) ranged from 1 to 6 fish/100 m^2. These densities compare favourably to existing data on American eel densities

on other tributaries of the Nashwaak River. American eel densities measured between 1972 and 1978 in Hayden Brook and two sites on Narrows Mountain Brook were found to range from 2.4 to 6.0 fish/100 m^2 in Hayden Brook, from 0.8 to 9.1 fish/100 m^2 at Narrows Mountain Brook lower site, and from 0 to 0.5 fish/100 m^2 at Narrows Mountain Brook upper site (Martin 1980).

- Blacknose dace were collected at four stations (M3C3, W4A31, EBNB1, and NRC) which all tend to be larger and warmer watercourses. The raw density of blacknose dace ranged from 4.3 to 37 fish/100 m^2.

- Common shiner were collected at M3C3, and at NRC but outside of the area enclosed by barrier nets. The raw density of common shiner at M3C3 was 3 fish/100 m^2.

- Blacknose shiner were collected only at M3C3. The raw density of blacknose shiner at M3C3 was 11 fish/100 m^2.

- Creek chub were collected only at NRC, but outside of the area enclosed by barrier nets. No density was calculated.

- White sucker were collected from between the barrier nets at three stations (M3C3, 2 fish/100 m^2; W4A31, 0.33 fish/100 m^2; and EBNB1, 4.1 fish/100 m^2), and from outside the barrier nets at two stations (W4A21 and NRC). White sucker collected were small in size (ranging from 42 to 145 mm) and were likely YOY and one year old fish. Adult suckers range in size from 500 to 700 mm (Scott and Crossman 1998).

- Sea lamprey were collected at M3C3 (5/100 m^2), W4A31 (1/100 m^2) and NRC (1.8/100 m^2). Sea lamprey collected were in the immature ammocoete larva stage, and were often captured in depositional areas where they had burrowed into the silt.

4.3.3 Summary of Quantitative Fish Population Assessment

Ten fish species were identified within and near the Study Area during the quantitative electrofishing surveys. Estimates of total fish abundance ranged from 6.9 to 98.6 fish/100 m^2, but no clear pattern in relative abundance was established that could relate abundance to stream order. The abundance of brook trout and Atlantic salmon was also evaluated quantitatively. Brook trout were present at nine out 10 stations sampled, and abundance ranged from 1.1 to 86.4 fish/100 m^2. Brook trout were most abundant in second- and third order streams. Atlantic salmon (mainly parr) were present at seven out of 10 stations sampled, and abundance ranged from 1.3 to 21.6 fish/100 m^2. Atlantic salmon were most abundant in fourth order streams.

The abundance of fish in the Study Area, and in particular brook trout, Atlantic salmon, American eel and slimy sculpin, was consistent with the results of fish surveys carried out previously in parts of the Nashwaak River watershed. In this respect, the fish populations of the Study Area appear to be quite typical of other brooks that are tributaries to the Nashwaak River.

4.4 SURFACE WATER AND SEDIMENT QUALITY

The Canadian Council of Ministers of the Environment (CCME 1999) has established Water Quality Guidelines (WQG) and Sediment Quality Guidelines (SQG) for the Protection of Freshwater Aquatic

Life for a variety of water and sediment quality parameters. The WQG or the probable effects level (PEL) SQG will be referred to as necessary to provide context to or interpretation of water and sediment quality data collected from the PDA and Study Area.

Surface water and sediment samples for laboratory analysis were collected at the 32 stations (Figure 3.3) where habitat descriptions were compiled and qualitative electrofishing was undertaken, and at the 10 stations (Figure 3.4) where quantitative electrofishing was undertaken, along with collection of benthic invertebrates and periphyton.

During field surveys, *in situ* water quality data was again recorded at each station in addition to having been recorded during the rapid fish habitat bio-assessment surveys (discussed in Section 4.1). The *in situ* water quality parameters included field-measured pH, water temperature, dissolved oxygen, and specific conductivity. These data were reported in earlier sub-sections in the context of the fish habitat assessments. However, some of the same parameters (*i.e.*, pH and specific conductivity) were also measured by the analytical laboratory (the RPC laboratory in Fredericton). The laboratory measured data for those parameters will be reported in this section, along with other laboratory measured data.

While not detailed in this Technical Report, it is important to note that Northcliff has also been operating a water quality monitoring network in streams within and beyond the boundaries of the Study Area since 2008. Water quality samples have been collected at 15 sampling stations, most of which are located in the Napadogan Brook and upper Nashwaak River watersheds, with a monthly or quarterly sampling frequency. Samples have been submitted to the RPC laboratory since the inception of that program. The results of that ongoing monitoring will be provided in a separate Technical Report.

4.4.1 Surface Water Quality

Stantec collected surface water samples for laboratory analysis during the qualitative habitat surveys (32 stations) and quantitative EEM surveys (10 stations selected from the previous set of 32 stations). The qualitative electrofishing and detailed habitat surveys were conducted between July 20 and August 9, 2011, and the quantitative electrofishing surveys were conducted between September 8 and 29, 2011.

Summaries of the water quality data, as well as the original analytical data reports from RPC, can be found in Appendix D for the initial habitat surveys, and in Appendix E for the stations sampled for baseline EEM purposes. However, in this review of water quality, data from both sampling campaigns will be combined and treated together.

Water quality results are presented graphically as box-and-whisker plots (box plots) in Figure 4.1. Box plots provide a means to convey information about data that is independent of the statistical distribution to which the data conform. Box plots consist of a central “box” representing the 25th and 75th percentile values for the data represented. A horizontal bar across the middle of the box represents the 50th percentile (median) value. “Whiskers” extending vertically up and down from the central box extend to the 5th and 95th percentile values. Points outside of these boundaries are considered to be “outliers”. Stars mark points that lie between the 95th and 99th percentile values, and circles denote extreme outliers that are beyond the expected 99th percentile value for the sample represented. For simplicity, the analysis will focus both on the “typical range” of values represented as lying between the 25th and 75th percentile values, and on the outlier points (either above or below the typical range).

Figure 4.1 Trace Metal Concentrations in Water

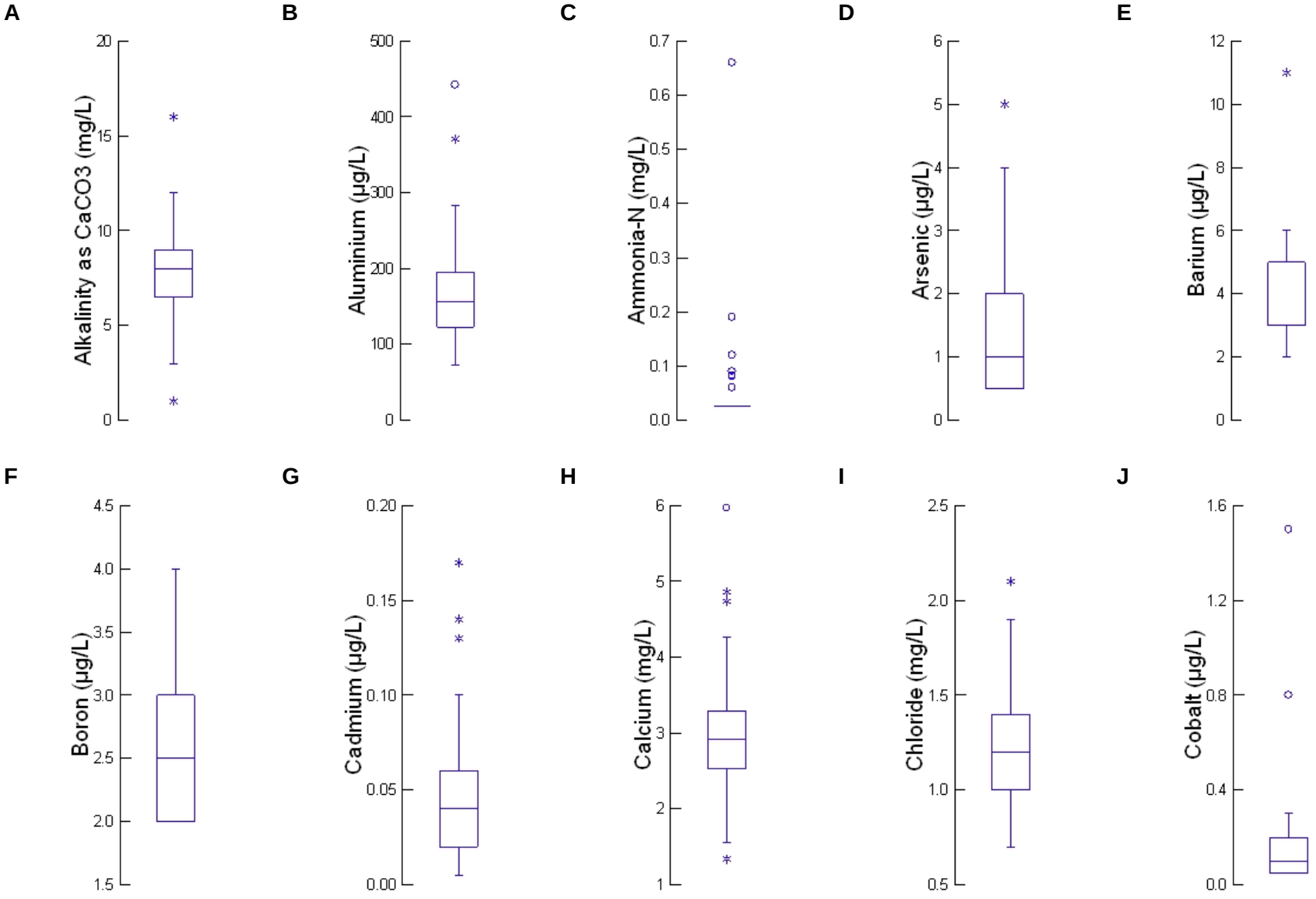

Figure 4.1 Trace Metal Concentrations in Water

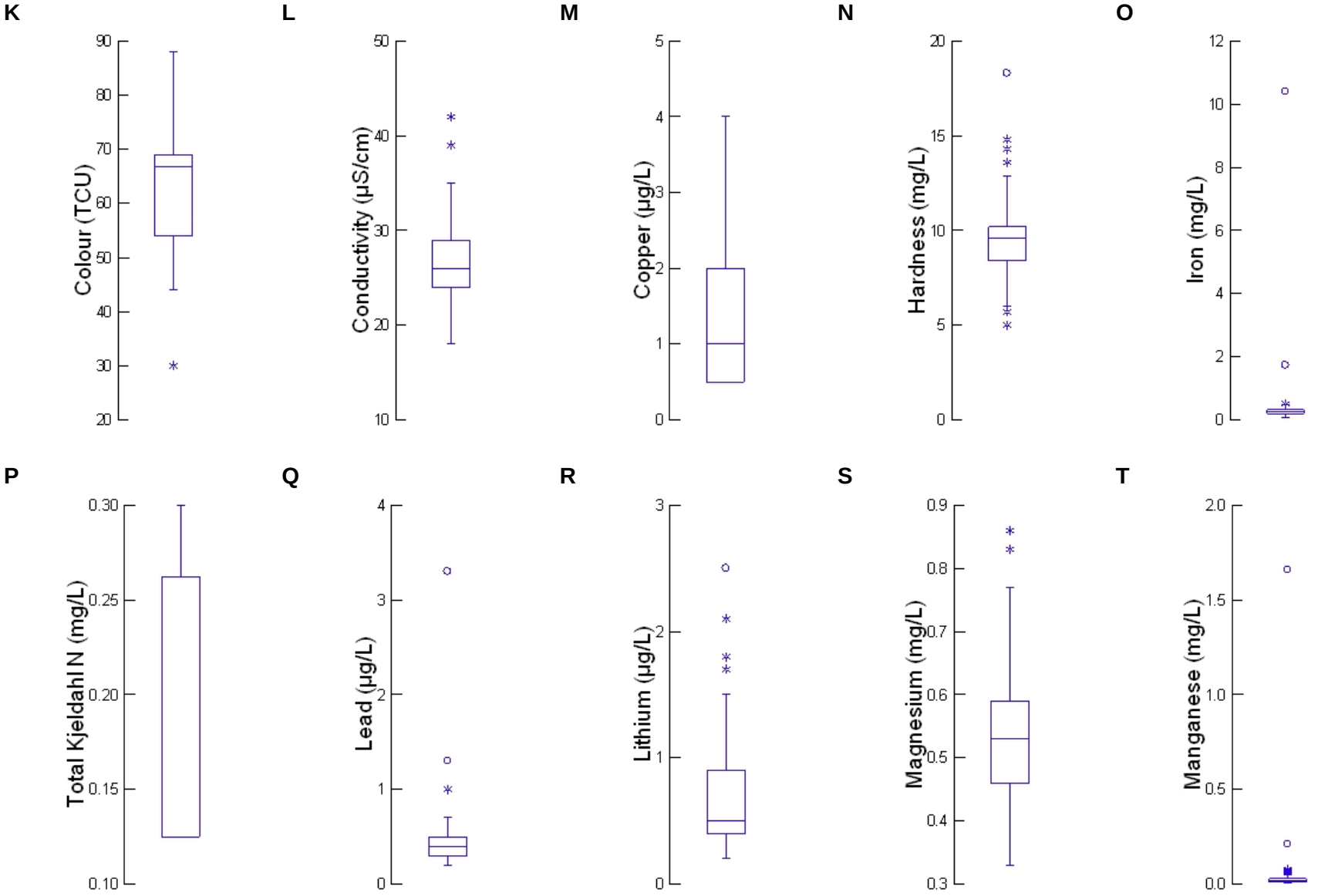

Figure 4.1 Trace Metal Concentrations in Water

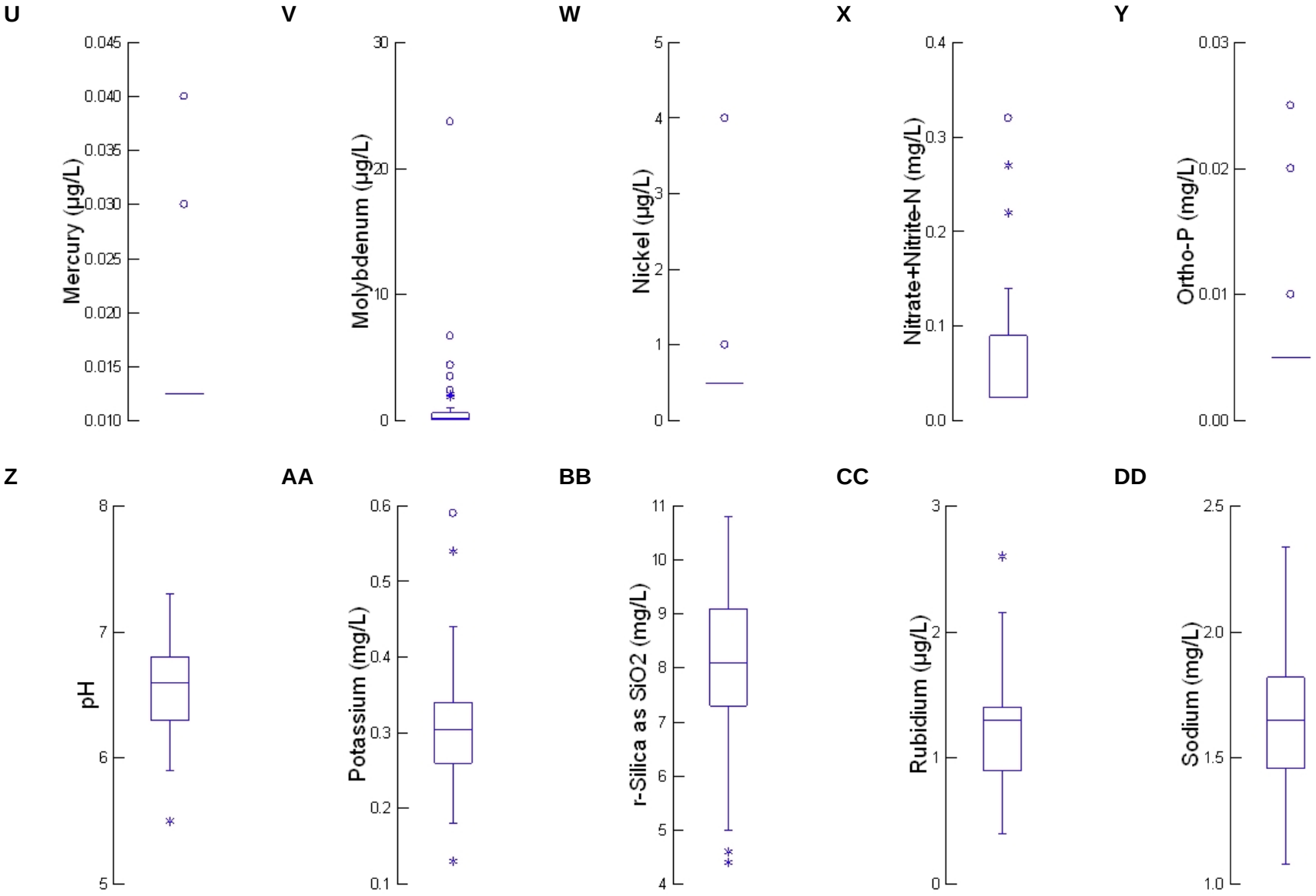

Figure 4.1 Trace Metal Concentrations in Water

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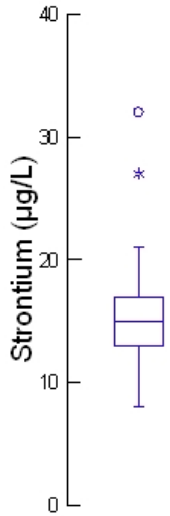

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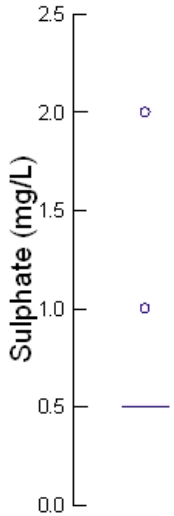

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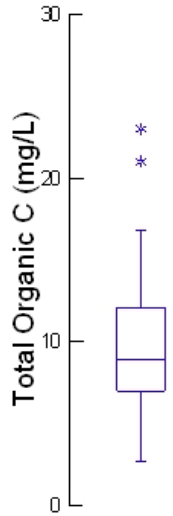

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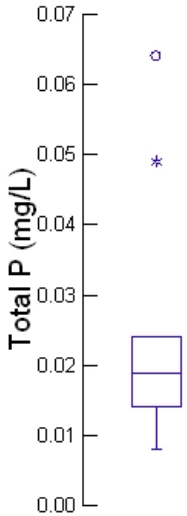

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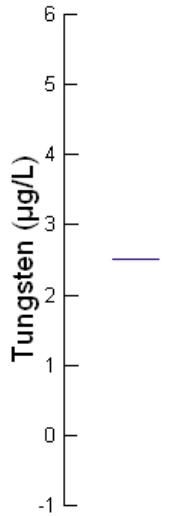

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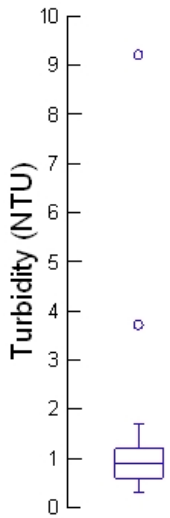

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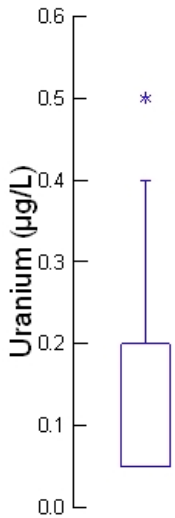

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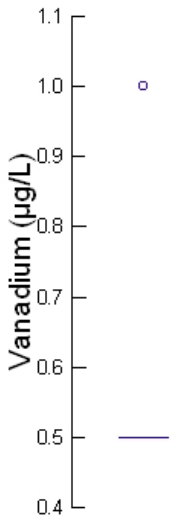

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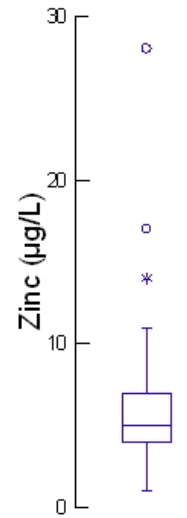


In general, the surface water in the Study Area is generally very soft, containing low concentrations of dissolved minerals, and often having low pH. Box plots show most laboratory measured pH values falling between 6.0 and 7.0, with a low outlier value of about 5.5. Field measured pH values were frequently lower than the laboratory measured values, and should be considered more reliably indicative of field conditions as the pH of very soft waters is prone to drift during holding. Alkalinity values were typically between 7 and 9 mg/L as $CaCO_3$, and both hardness (8 to 10 mg/L as $CaCO_3$) and conductivity (typically 24 to 29 µS/cm, but with some outlier values above 38 µS/cm) were very low. Calcium (generally 2.5 to 3.3 mg/L) and magnesium (0.47 to 0.59 mg/L) concentrations (contributing to hardness) were also low, as were the other major cations, sodium (1.4 to 1.8 mg/L) and potassium (0.25 to 0.34 mg/L). Major anions include alkalinity, chloride, and sulphate. Sulphate concentrations were frequently non-detectable in the laboratory analysis (<1 mg/L), and chloride concentrations were typically between 1.0 and 1.4 mg/L. Organic carbon in water can also act as an anion or an organic acid, and total organic carbon (TOC) concentrations were fairly high, typically ranging from 7 to 12 mg/L. Overall, the major ion analyses reflect the general absence of paved and salted roads in the Study Area, as well as the generally thin soils and high resistance of underlying bedrock to weathering (including low weathering associated with naturally occurring sulphide minerals, if present), although the presence of fairly extensive wetlands in some parts of the Study Area results in naturally slightly acidic drainage.

The water was typically clear, as indicated by generally non-detectable total suspended solids (TSS) concentrations (<5 mg/L), and low turbidity (usually around 1 NTU, although two samples were outliers indicating a trace of turbidity).

Nutrient concentrations in surface water in the Study Area were also generally very low, as expected given the rural and undeveloped nature of the Study Area. Phosphorus and nitrogen are the conventional nutrients for plant growth (including algae), although silica is also required to support the growth of diatoms, which are the predominant group of algae present in the stream-bed periphyton. Total phosphorus values were generally less than 0.024 mg/L, and all values were less than 0.065 mg/L. Ortho-phosphate (or “free” phosphorus) was generally non-detectable, less than 0.01 mg/L. Ammonia, a source of nitrogen, was generally non-detectable (<0.1 mg/L as N), and nitrate+nitrite nitrogen was generally less than 0.1 mg/L. Total Kjeldahl nitrogen (representing reduced nitrogen, including ammonia and organic forms of nitrogen) was generally between 0.012 and 0.027 mg/L. Reactive silica concentrations were relatively high (generally between 7.2 and 9.1 mg/L), indicating good support for diatom growth.

For convenience, the suite of measured trace elements will be referred to as “trace metals”, although it is recognized that several of the elements reported, such as arsenic and selenium, are not truly metals. Trace metal concentrations in water were generally very low. Samples were collected for “total” metal analysis, which means that metals sorbed to suspended matter in solution may be released and measured in the laboratory. However, where turbidity and TSS are low, as in the present case, the difference between total and dissolved metals concentrations is often negligible.

The following trace metals were non-detectable in all, or most, surface water samples collected and analyzed: antimony, beryllium, bismuth, chromium, iron, manganese, mercury, nickel, selenium, silver, tellurium, thallium, tin, tungsten, and vanadium. Notwithstanding the generally low concentrations of these trace metals recorded, some individual values for iron and mercury did exceed the CCME freshwater aquatic life (FAL) guidelines. The CCME FAL Guideline for iron is 0.3 mg/L, which was

substantially exceeded at two locations, with one value (from EBNB3) being greater than 10 mg/L, and the second highest (from M1M2) being close to the ore body. The CCME FAL Guideline for mercury is 0.026 µg/L, which was exceeded at three locations with values between 0.03 and 0.04 µg/L. The high mercury values were obtained in samples from the East Branch Napadogan Brook (EBNB2 and EBNB3) and at W4A17.

The following trace metals were generally detected in the collected surface water samples in the Study Area.

- Aluminum concentrations in water were typically between 120 and 200 µg/L, and all values were less than 450 µg/L. Aluminum can be toxic to aquatic life, and the CCME have established CCME FAL Guideline values of 5 µg/L where pH is <6.5, and 100 µg/L where pH is >6.5. Aluminum is commonly found as in association with suspended matter in water, and proper determination of potential for aluminum toxicity requires measurement of inorganic monomeric aluminum concentrations in water. However, total aluminum concentrations and pH values measured in the Study Area, it is unlikely that aluminum is a threat to the health of the aquatic ecosystem.

- Arsenic concentrations were low, typically less than 2 µg/L. The CCME FAL Guideline value for arsenic is 5 µg/L. One outlier value was observed at this concentration (5 µg/L).

- Barium concentrations were generally less than 5 µg/L. There is no CCME FAL Guideline for barium.

- Boron concentrations were generally less than 3 µg/L. The CCME FAL Guideline value for boron is 1,500 µg/L.

- Cadmium concentrations were generally between 0.04 and 0.06 µg/L; however, these values were all above the hardness adjusted CCME FAL Guideline values (generally less than 0.017 µg/L due to the low hardness values). It is unlikely that the true cadmium concentrations in the Study Area are as high as the values reported here. Cadmium concentrations are extremely difficult to measure without introducing some trace level of contamination. The CCME guideline value is also extremely conservative. The measured values, even if correct, are not sufficiently high to pose a risk to aquatic life.

- Cobalt concentrations were generally less than 0.2 µg/L. There is no CCME FAL Guideline for cobalt.

- Copper concentrations were generally less than 2 µg/L, and the highest value was 4 µg/L. The CCME FAL Guideline value for copper is 2 µg/L at low hardness levels.

- Lead concentrations were generally less than 0.5 µg/L. The CCME FAL Guideline for lead at low hardness values is 1 µg/L.

- Lithium concentrations were generally less than 1 µg/L. There is no CCME FAL Guideline for lithium.

- Molybdenum concentrations were usually non-detectable, although detections did appear at some locations, with most values less than 10 µg/L, and one value at 24 µg/L (from station M1M2, close to the ore body). The CCME FAL Guideline for molybdenum is 73 µg/L.

- Rubidium concentrations were generally between 0.9 and 1.4 µg/L. There is no CCME FAL Guideline for rubidium.

- Strontium concentrations were generally between 13 and 18 µg/L. There is no CCME FAL Guideline for strontium.

- Uranium concentrations were generally less than 0.2 µg/L. The CCME FAL Guideline for uranium is 15 µg/L.

- Zinc concentrations were generally less than 7 µg/L, and all values were less than 30 µg/L. The CCME FAL Guideline for zinc is 30 µg/L.

Taken overall, the water quality results are indicative of high water quality, as would be expected for this relatively rural and undeveloped area in central New Brunswick. The exceptions to the CCME FAL Guidelines are generally few and minor, and in some cases attributable to proximity to the ore body (where some elevated trace metal concentrations in water would be expected). High iron and mercury concentrations were detected at stations in the East Branch Napadogan Brook (not within the PDA) and at stations W4A17 West Branch Napadogan Brook. Elevated iron and molybdenum concentrations were observed at station M1M2, in proximity to the ore body. The generally low pH of water at many stations is likely a function of low natural buffering capacity, combined with wetland areas that tend to generate organic acids and release dissolved organic carbon to the water.

4.4.2 Sediment Quality

Stantec collected composite fine-grained sediment samples from depositional areas for laboratory analysis during the qualitative electrofishing and detailed habitat surveys (32 stations) and baseline EEM surveys (10 stations selected from the previous set of 32 stations).

Summaries of the sediment quality data, as well as the original analytical data reports from RPC, can be found in Appendix D for the initial habitat surveys, and in Appendix E for the stations sampled for baseline EEM purposes. However, in this review of sediment quality, data from both sampling campaigns will be combined and treated together.

Sediment quality results are presented graphically as box plots in Figure 4.2. This analysis will focus both on the “typical range” of values represented as lying between the 25th and 75th percentile values, and on the outlier points (either above or below the typical range). The sediments reported here are the result of a process of finding locations within study reaches where fine-grained (*i.e.,* fine gravel, sand or silt) sediments are present. In the laboratory, the sediments were further screened (2 mm sieve) after air-drying to homogenize the sample and remove coarse particles that would strongly bias results, followed by digestion using nitric acid. All sediment results are reported on a dry-weight basis. As a result of these selection processes, it must be understood that the sediment samples may not necessarily be representative of the majority of benthic substrates at many sites, particularly where those substrates were predominantly cobble, boulder or bedrock.

Figure 4.2 Trace Metal Concentrations in Sediment

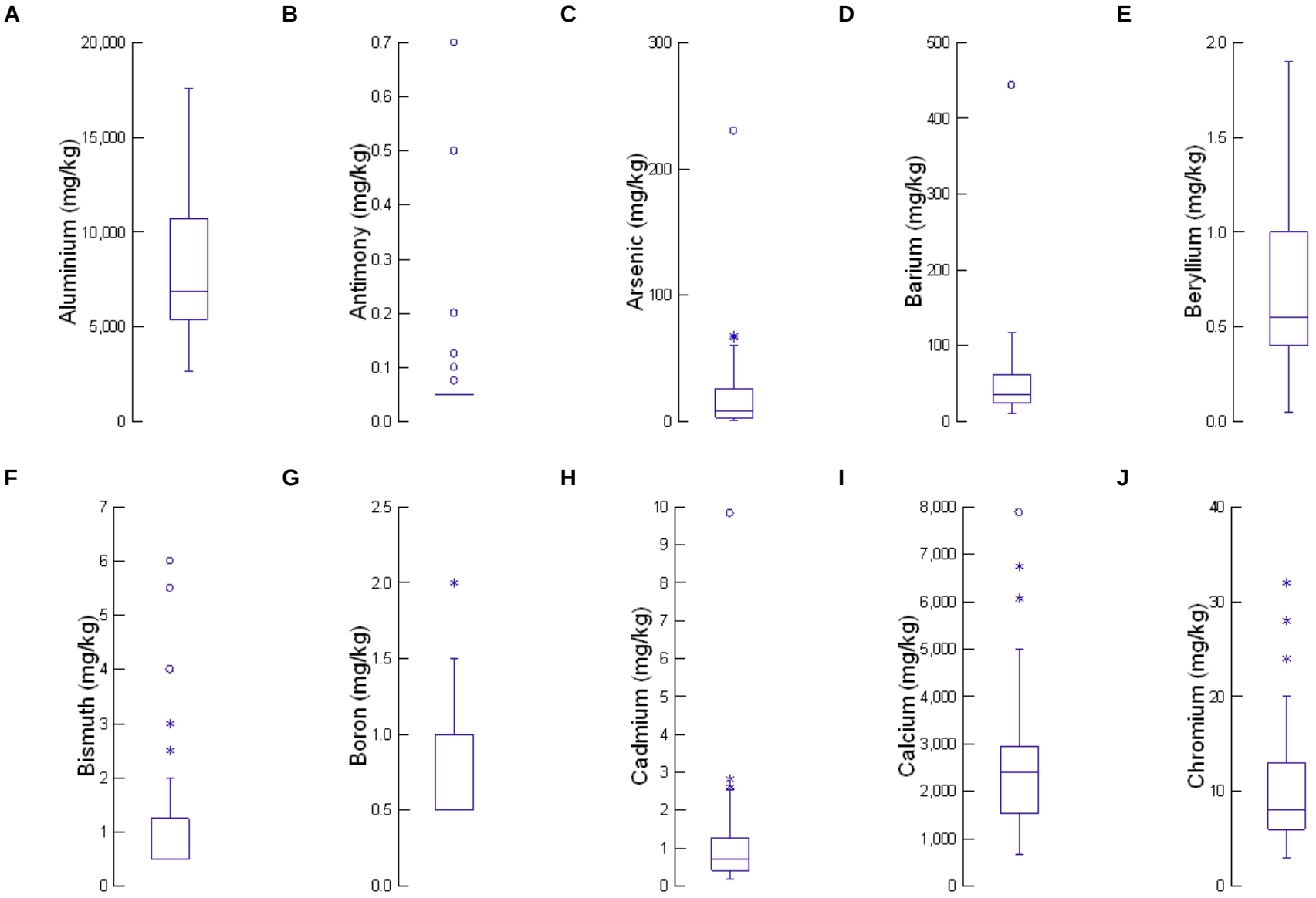


Figure 4.2 Trace Metal Concentrations in Sediment

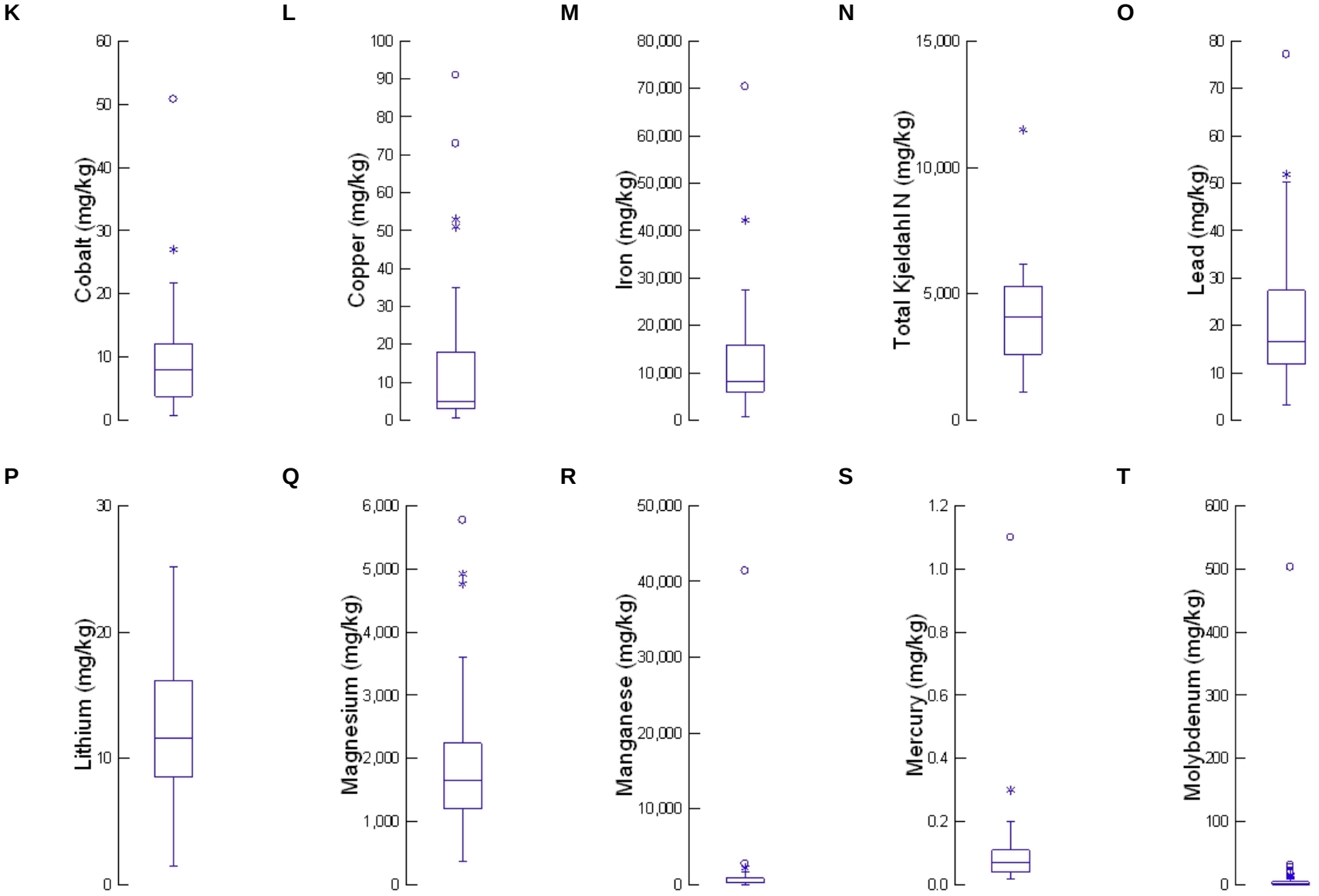
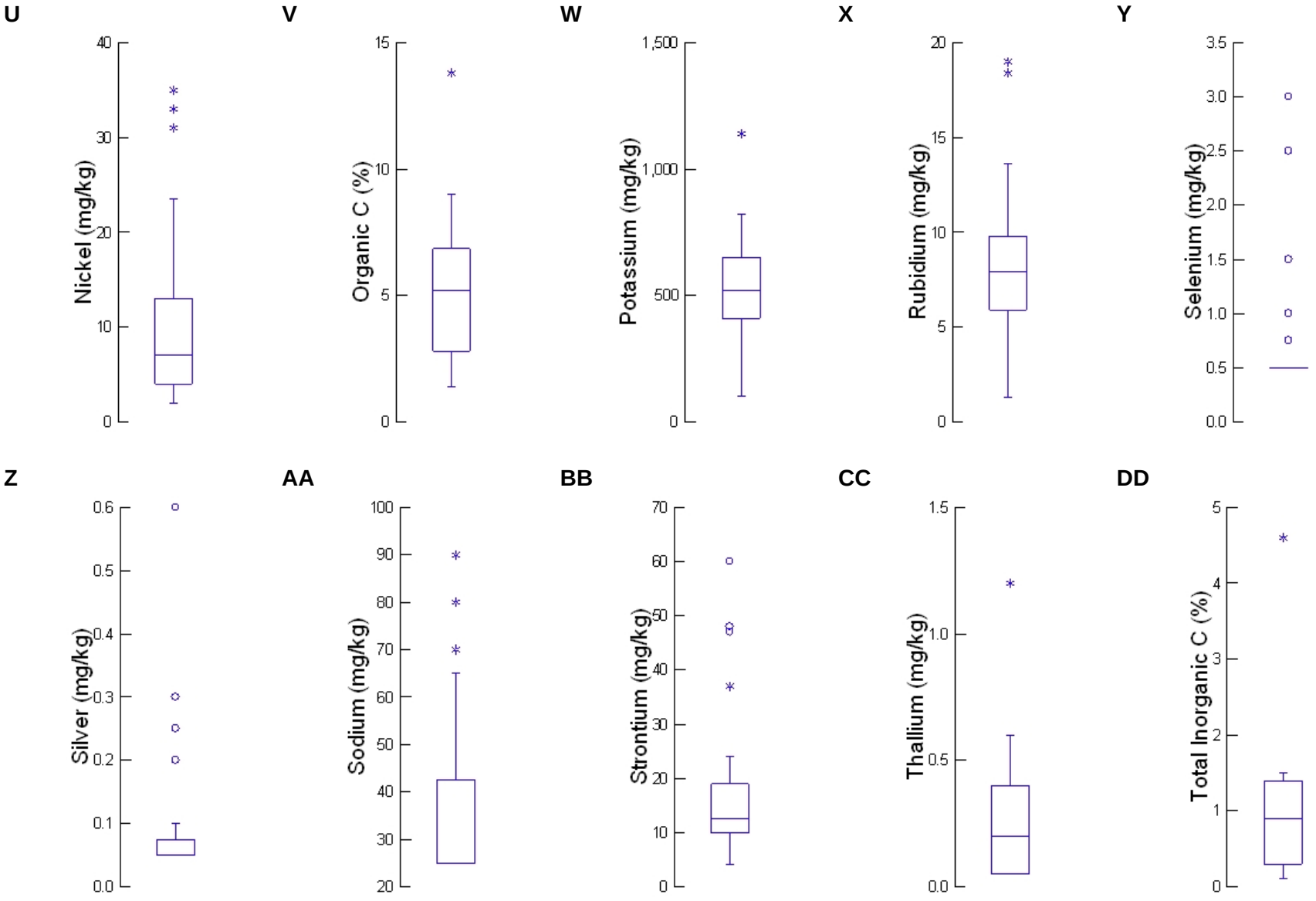


Figure 4.2 Trace Metal Concentrations in Sediment



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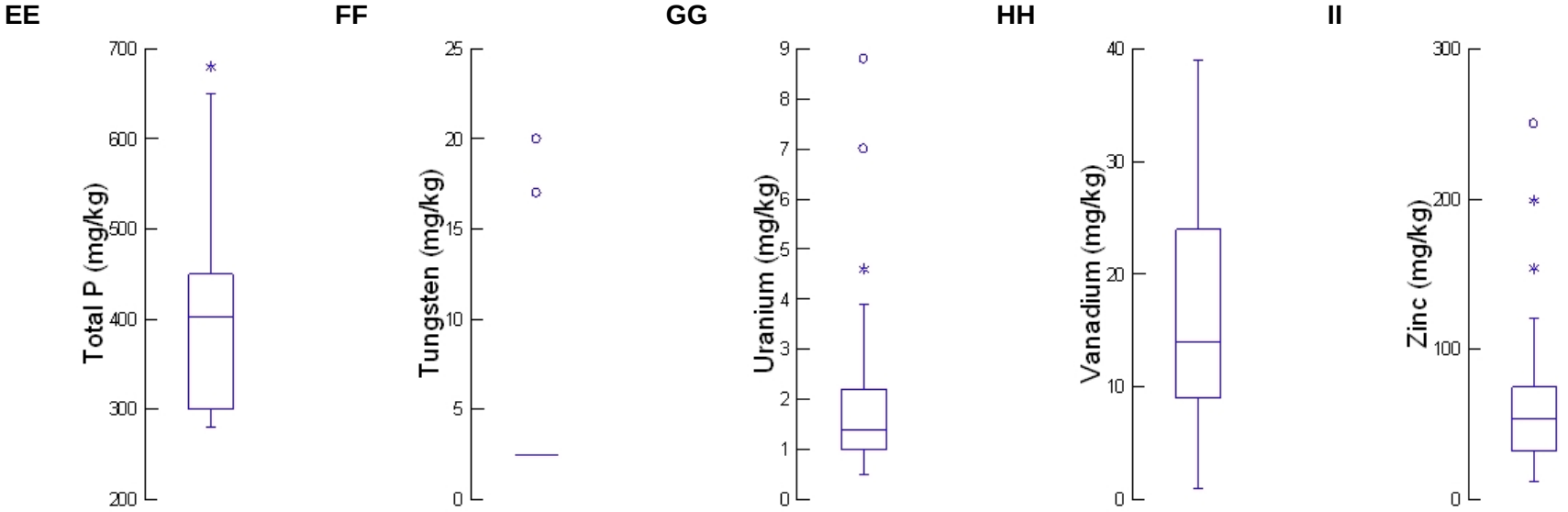

In general, sediment samples collected in the Study Area had moderate organic content, typically from 2.5 to 7% organic carbon by weight. The total inorganic carbon content of sediments was lower, typically from 0.2 to 1.4% by weight. The total Kjeldahl nitrogen content of sediment typically ranged from 2,500 to 5,100 mg/kg (*i.e.*, up to about 0.5% by weight). Total phosphorus concentrations were typically between 360 and 460 mg/kg.

The predominant extractable metals present in sediment collected in the Study Area, also considered to be primary mineral-forming elements, were:

- aluminum, typically 5,000 to 11,000 mg/kg, but with values as high as 17,600 mg/kg;
- calcium, typically 1,400 to 3,000 mg/kg, but with some values approaching 8,000 mg/kg;
- magnesium, typically 1,100 to 2,200 mg/kg, but with some values approaching 6,000 mg/kg;
- iron, typically 6,000 to 16,000 mg/kg, but with some values approaching 30,000 mg/kg, and one outlier value over 70,000 mg/kg; and
- manganese, typically less than 2,000 mg/kg, but with one extreme outlier value at 41,400 mg/kg.

Higher than usual or “outlier” concentrations of the above extractable metals were found at the following stations of the Study Area (Figure 3.3):

- B1C1 and B1H1 (high calcium);
- M1M2 (high aluminum, calcium, iron, and manganese);
- EBNB1 (high iron and magnesium);
- EBNB2 (high magnesium); and
- W4A21 (high iron).

A suite of trace metals was also determined analytically. The following trace metals were generally non-detectable in sediments collected in the Study Area, although some outlier values were noteworthy as follows.

- Antimony was typically less than 0.1 mg/kg, but with outlier values up to 0.7 mg/kg. There is no CCME SQG for antimony.
- Molybdenum was typically less than 5 mg/kg, but with outlier values up to 503 mg/kg at station M1M2. There is no CCME SQG for molybdenum.
- Selenium was typically less than 1 mg/kg, but with modest outliers up to 3 mg/kg. There is no CCME SQG for selenium.
- Sodium was typically less than 50 mg/kg. There is no CCME SQG for sodium.

- Tellurium was not detected (<0.1 mg/kg) in any sample.
- Tin was not detected (<1.0 mg/kg) in any sample.
- Tungsten was typically not detected (<5 mg/kg), but with outliers of 17 mg/kg at station S2A2 and 20 mg/kg at S3A3. There is no CCME SQG for tungsten.

The following trace metals in sediment in the Study Area were generally detected, with typical concentrations as follows.

- Arsenic concentrations were typically less than 25 mg/kg, but with several outliers between 50 and 100 mg/kg, and ranging up to 230 mg/kg. The CCME SQG (PEL) for arsenic is 17 mg/kg, and this value was exceeded in 17 out of 32 sediment samples processed from the Study Area. Arsenic values above the PEL were found in East Branch Napadogan Brook, Bird Brook, Sisson Brook, McBean Brook, and West Branch Napadogan Brook; however, the most extreme outlier was found at Sisson Brook station S2A2, in proximity to the ore body.
- Beryllium concentrations were typically between 0.4 and 1 mg/kg, and ranging up to almost 2 mg/kg without distinct outlier values. There is no CCME SQG for beryllium.
- Bismuth concentrations were typically between 0.4 and 1.3 mg/kg, but with outlier values between 2 and 6 mg/kg. There is no CCME SQG for bismuth.
- Boron concentrations were typically between 0.5 and 1 mg/kg, but with an outlier value at 2 mg/kg. There is no CCME SQG for boron.
- Cadmium concentrations were typically between 0.3 and 1.3 mg/kg, with outliers to 3 mg/kg, and an extreme outlier approaching 10 mg/kg. The CCME SQG (PEL) for cadmium is 3.5 mg/kg. This value was exceeded only by a single extreme outlier having a value of 9.83 mg/kg. This value was reported from station M1K4 in McBean Brook.
- Chromium concentrations were typically between 6 and 13 mg/kg, but with outliers between 20 and 35 mg/kg. The CCME SQG (PEL) value of 90 mg/kg was not exceeded.
- Cobalt concentrations were typically between 4 and 12 mg/kg, but with outliers between 20 and 51 mg/kg. The high cobalt value was found in association with high iron and manganese values at station M1M2 in McBean Brook. There is no CCME SQG for cobalt.
- Copper concentrations were typically less than 20 mg/kg, but with outliers between 40 and 100 mg/kg. The CCME SQG (PEL) value of 197 mg/kg was not exceeded.
- Lead concentrations were typically between 11 and 28 mg/kg, but with outliers between 50 and 80 mg/kg. The CCME SQG (PEL) for lead of 91.3 mg/kg was not exceeded.
- Lithium concentrations were typically between 8 and 17 mg/kg, but ranging up to 26 mg/kg without distinct outliers. There is no CCME SQG for lithium.

- Mercury concentrations were typically less than 0.1 mg/kg, but with outliers between 0.2 and 1.1 mg/kg. The CCME SQG (PEL) for mercury (0.486 mg/kg) was exceeded only by a single outlier value at 1.1 mg/kg. This outlier was found at station EBNB3 in East Branch Napadogan Brook.

- Nickel concentrations were typically between 4 and 13 mg/kg, but ranging up to 24 mg/kg and with outliers over 30 mg/kg associated with stations EBNB1 and EBNB2 in East Branch Napadogan Brook. There is no CCME SQG for nickel.

- Potassium concentrations were typically between 400 and 700 mg/kg, but with an outlier at 1,140 mg/kg. There is no CCME SQG for potassium.

- Rubidium concentrations were typically between 6 and 10 mg/kg, but with outliers approaching 20 mg/kg. There is no CCME SQG for rubidium.

- Silver concentrations were typically less than 0.1 mg/kg, but with outliers ranging between 0.2 and 0.6 mg/kg. There is no CCME SQG for silver.

- Strontium concentrations were typically between 9 and 20 mg/kg, but with outliers between 35 and 60 mg/kg. There is no CCME SQG for strontium.

- Thallium concentrations were typically below 0.5 mg/kg, but with an outlier at 1.2 mg/kg. There is no CCME SQG for thallium.

- Uranium concentrations were typically between 1 and 2.1 mg/kg, but ranging up to 4 mg/kg, and with outliers between 4 and 8.8 mg/kg. There is no CCME SQG for uranium. High uranium concentrations are often associated with West Branch Napadogan Brook, and the highest concentration occurs in sediment from a headwater station, W4A1.

- Vanadium concentrations were typically between 9 and 24 mg/kg, but ranging up to 40 mg/kg without distinct outliers. There is no CCME SQG for vanadium.

- Zinc concentrations were typically between 30 and 80 mg/kg, but with outliers between 150 and 250 mg/kg. The CCME SQG (PEL) value of 315 mg/kg was not exceeded.

4.4.3 Summary of Surface Water and Sediment Quality

Several trends emerge from comparison of the surface water and sediment quality results. First, stations in proximity to the ore body (*i.e.,* stations in Sisson and McBean Brooks) show naturally elevated concentrations of several trace metals in sediment as expected, including arsenic, molybdenum, and tungsten, as well as iron and manganese in McBean Brook. Stations in the West Branch Napadogan Brook flow system show elevated concentrations of uranium, and stations in the East Branch Napadogan Brook system show elevated concentrations of magnesium and mercury. In many cases, the sediment mineralization is also reflected by concentrations in water. On this basis, it is likely that biological tissue quality also varies in response to variation in bioavailable metals concentrations within the Study Area.

4.5 FISH TISSUE ANALYSIS

The *MMER* considers effects of mine effluent on fish tissue, and in particular on the potential for bioaccumulation of mercury in fish. Technical guidance on EEM from Environment Canada (2011) notes that biological monitoring studies may need to include a study respecting fish tissue if, during effluent characterization, a concentration of total mercury in the effluent is identified that is equal to or greater than 0.10 µg/L. Further the *MMER* (Schedule 5, s. 9(c)) identifies an "effect on fish tissue" as measurements of total mercury that exceed 0.45 mg/kg wet weight in fish tissue taken in an exposure area, that are statistically different from the measurements of total mercury in fish tissue taken in a reference area. Though it is not known if the Project will release effluent, or if such effluent will contain mercury in excess of the *MMER* concentrations, baseline information on trace metal concentrations in fish tissue from the Study Area was identified as being important both to the completion of the EIA (as information required to support an assessment of potential health risk to human and wildlife receptors), and to potential future follow-up or EEM requirements. Brook trout was identified as the primary species of interest from the perspective of human consumers of fish, as it is the only species for which a significant consumptive fishery may exist within the Study Area. Brook trout was also considered to be a representative species for ecological receptors which could consume this species as well as juvenile Atlantic salmon, slimy sculpin, or American eel, or cyprinids such as dace or chub (each of which is broadly distributed within the Study Area). No other species were lethally sampled for this purpose as part of the field programs for the Project.

The following streams and stations (see Figure 3.4) were sampled to provide brook trout tissues for trace metals analysis:

- Bird Brook, stations B2A2 (10 fish) and B3A9 (10 fish);
- Sisson Brook, stations S2A2 (10 fish) and S3A3 (10 fish);
- Tributary to McBean Brook, station M3C3 (10 fish);
- West Branch Napadogan Brook, stations W4A17 (10 fish) and W4A21 (10 fish) and W4A31 (9 fish); and
- East Branch Napadogan Brook, station EBNB1 (3 fish).

Although the target number of fish tissue samples was 10 per station for each tissue type, at some stations fewer fish were captured through quantitative electrofishing or additional qualitative electrofishing upstream from the barrier net (discussed in Section 4.3), and therefore fewer fish were submitted for trace metals analysis. In addition, some very small fish were collected, and in some cases a composite sample was submitted by pooling tissues from two or more similar-sized fish from the same station in order to provide sufficient mass of tissue for analysis. No brook trout were captured at the upper Nashwaak River reference station (NRC).

Three key tissue types were identified as relevant in the evaluation of baseline trace metals concentrations:

- liver, since this organ functions to regulate levels of many essential trace elements in the body, and in addition can function to store or detoxify metals that would otherwise be toxic;
- carcass (which is defined as the whole fish minus the head and remaining internal organs, which are collectively referred to as viscera), since this is the portion normally consumed by humans; and
- whole fish, since this is the portion normally consumed by wildlife receptors.

To accommodate these data requirements, fish for trace metals analysis were selected from brook trout that were dissected as part of the baseline EEM program. The dissection process was as follows.

- Livers were harvested from individual fish and weighed, as required for the baseline EEM program. The livers were then placed in clean plastic vials, labeled, and frozen prior to being delivered to the RPC laboratory for trace metals analysis.
- The head, gills, guts, and kidneys of the fish (viscera) were removed, weighed, and placed in clean plastic bags, labeled and frozen prior to being delivered to the RPC laboratory for trace metals analysis. In sexually mature fish, the testes were included with the viscera after being weighed for EEM purposes, and were submitted with the viscera for trace metals analysis by the RPC laboratory. However, the ovaries were required for egg counts, and could not be included with the viscera. Due to the small size of ovaries in relation to overall body size, this was assumed to have a negligible effect on the overall mean trace metals concentrations calculated in mature female fish.
- The remaining carcasses (headless and gutted as it would typically be prepared by an angler prior to cooking) were also weighed and placed in clean plastic bags, labeled and frozen prior to being delivered to the RPC laboratory for trace metals analysis. Brook trout collected in the course of this work were too small (*i.e.,* generally less than 15 cm) to contemplate removal of fillet samples.
- Whole fish trace metal concentrations were subsequently calculated for individual fish as the weighted average of trace metal concentrations in liver, viscera and carcass.

Raw data for each of the fish tissue samples submitted can be found in Appendix E. Results for carcass samples (such as could be consumed by humans) and whole fish (such as could be consumed by ecological receptors) will be presented here.

Measured concentrations of several trace metals in fish tissue were routinely below levels that could be detected by the analytical laboratory. These non-detectable results are summarized in Table 4.28. At one extreme, tellurium was not detected in any of the fish liver, carcass or viscera samples and boron was not detected in liver or carcass, and was detected in only 9% of viscera samples. On this basis, elements such as beryllium, boron, silver, tellurium and vanadium were not detected in any fish carcass

sample, and bismuth, nickel and uranium were detected in less than 5% of samples submitted. These elements will not be discussed further.

Evaluation of trace metal concentrations in whole fish is complicated by the fact that the whole fish concentrations were reconstructed from liver, carcass and viscera samples. In some cases (*e.g.,* silver) an element that was not detected in any carcass sample was simultaneously detected in all of the submitted liver samples. To reconstruct whole fish concentrations, trace element concentrations that were not detected in a particular tissue sample were replaced with a synthetic value equal to one half of the laboratory detection limit. The whole fish concentration was then estimated as the weighted average (by weight) of the measured and estimated trace metal concentrations in the three tissue types. On this basis, the high frequency of non-detected values for several elements in liver, carcass, and viscera results in very low, but not fully reliable estimated whole fish trace metal concentrations. These metals include antimony, beryllium, bismuth, boron, nickel, tellurium, uranium and vanadium. These trace metals will not be discussed further, although the supporting data can be found in Appendix E.

Table 4.28 Trace Metals Present at Low Concentration, and Frequently Not Detected in Fish Tissue Samples

Metal	Units	Liver		Carcass		Viscera		Whole Fish*
		RL	Non Detects %	RL	Non Detects %	RL	Non Detects %	Non Detects %
Antimony	mg/kg	0.01	92	0.005	84	0.005	71	83
Arsenic	mg/kg	0.1	91	0.05	18	0.05	3	37
Barium	mg/kg	0.1	100	0.05	0	0.05	0	33
Beryllium	mg/kg	0.01	100	0.005	100	0.005	82	94
Bismuth	mg/kg	0.1	97	0.05	96	0.05	91	94
Boron	mg/kg	0.1	100	0.05	100	0.05	91	97
Chromium	mg/kg	0.1	99	0.05	91	0.05	27	72
Lead	mg/kg	0.01	83	0.005	12	0.005	0	32
Lithium	mg/kg	0.01	98	0.005	23	0.005	0	40
Molybdenum	mg/kg	0.01	0	0.005	34	0.005	0	11
Nickel	mg/kg	0.1	100	0.05	98	0.05	53	84
Silver	mg/kg	0.01	0	0.005	100	0.005	9	36
Strontium	mg/kg	0.1	82	0.05	0	0.05	0	27
Tellurium	mg/kg	0.01	100	0.005	100	0.005	100	100
Tin	mg/kg	0.01	78	0.005	33	0.005	16	42
Tungsten	mg/kg	0.01	81	0.005	61	0.005	9	50
Uranium	mg/kg	0.01	99	0.005	99	0.005	49	82
Vanadium	mg/kg	0.1	99	0.05	100	0.05	59	86

Notes:
* Percentage of non-detects in whole fish was determined by how frequently non-detects were detected in the liver, carcass and viscera

The trace metal concentrations in brook trout tissue will be presented in two formats. For brook trout carcass and whole fish samples, trace metal results will presented graphically as box plots. This analysis will focus both on the "typical range" of values represented as lying between the 25th and 75th percentile values, and on the outlier points (either above or below the typical range). This analysis will

provide baseline information on the Study Area with respect to existing conditions for consumption of fish by human and ecological receptors.

For the liver samples, in which trace metal concentrations tend to be naturally concentrated, Analysis of Variance (ANOVA) will be used to determine whether there are differences in brook trout liver metal concentrations between stations within streams, and then between streams. This analysis will help to determine whether there are pre-existing differences between streams with respect to baseline trace metals concentrations and/or bioavailability of metals to fish. This information is expected to be taken into consideration when any required follow-up or EEM studies are implemented as the mine is developed.

4.5.1 Results for Brook Trout Carcass

Figure 4.3 provides box plots for metals that were commonly detected in brook trout tissue (carcass) samples. Typical ranges for trace metals concentrations in brook trout carcasses from the Study Area are described below.

- Aluminum concentrations in brook trout carcass were generally less than 1 mg/kg, although several outlier values between 2.5 and 14 mg/kg were noted.
- Antimony concentrations were generally not detectable (<0.005 mg/kg), however, some outlier concentrations between 0.005 and 0.02 mg/kg were recorded.
- Arsenic concentrations were generally less than 0.25 mg/kg. Outlier values for arsenic ranged from approximately 0.5 to 1.8 mg/kg.
- Barium concentrations ranged from approximately 0.25 to 0.41 mg/kg, with an outlier value at 0.7 mg/kg.
- Bismuth concentrations were generally not detectable (<0.05 mg/kg), although a few outlier values between 0.2 and 0.28 mg/kg were noted.
- Cadmium concentrations were typically between 0.005 and 0.014 mg/kg, although outlier values up to 0.03 mg/kg were noted.
- Calcium concentrations were typically between 3,300 and 4,800 mg/kg, with an outlier value above 7,000 mg/kg.
- Chromium concentrations were generally not detectable (<0.05 mg/kg), although outlier values between 0.05 and 0.15 mg/kg were noted.
- Cobalt concentrations were generally between 0.02 and 0.05 mg/kg, with outlier values between 0.08 and 0.16 mg/kg.
- Copper concentrations were generally between 0.32 and 0.41 mg/kg, with outlier values between 0.5 and 0.6 mg/kg.

- Iron concentrations were typically less than 5 mg/kg, although one outlier value greater than 60 mg/kg was recorded. This sample, identified as W4A21-BT1, was also an outlier for aluminum, and it seems likely that the spurious value represents some form of sample contamination.

- Lead concentrations were generally between 0.009 and 0.02 mg/kg, with outlier values between 0.04 and 0.09 mg/kg.

- Lithium concentrations were typically between 0.005 and 0.01 mg/kg, with outlier values between 0.02 and 0.025 mg/kg.

- Magnesium concentrations were generally between 320 and 345 mg/kg, with no notable outliers.

- Manganese concentrations were generally between 2.0 and 3.6 mg/kg, with outliers between 6 and 10 mg/kg.

- Mercury concentrations were typically between 0.09 and 0.15 mg/kg, with an outlier value at approximately 0.27 mg/kg. The higher values tended to come from Bird Brook, Sisson Brook, and from stations W4A17 and W4A21 on West Branch Napadogan Brook. However, these values are well below the value of 0.45 mg/kg identified by Environment Canada as affecting the useability of the fisheries resource.

- Molybdenum concentrations were typically below 0.008 mg/kg, with outlier values between 0.017 and 0.026 mg/kg.

- Nickel concentrations were generally non-detectable (<0.05 mg/kg) with an outlier value at 0.06 mg/kg.

- Potassium concentrations were generally between 3,900 and 4,150 mg/kg, without any notable outlier values.

- Rubidium concentrations were generally between 11 and 15 mg/kg, without any notable outlier values.

- Selenium concentrations were generally between 0.22 and 0.39 mg/kg, with outlier values falling in the range of 0.6 to 1.0 mg/kg. The higher values tended to come from East Branch Napadogan Brook and station W4A31 on West Branch Napadogan Brook.

- Sodium concentrations were generally between 580 and 650 mg/kg, with an outlier value at approximately 840 mg/kg.

- Strontium concentrations were typically between 6 and 10 mg/kg, with an outlier value approaching 16 mg/kg.

- Thallium concentrations were generally between 0.008 and 0.015 mg/kg, with outlier values between 0.025 and 0.05 mg/kg.

- Tin concentrations were often non-detectable, and usually less than 0.01 mg/kg. An extreme outlier value of approximately 0.46 mg/kg was noted.
- Tungsten concentrations were often non-detectable, and usually less than 0.03 mg/kg, although outlier values between 0.07 and 0.13 mg/kg were noted.
- Uranium concentrations were generally non-detectable (<0.005 mg/kg), although one outlier value of 0.007 mg/kg was noted.
- Zinc concentrations were generally between 12 and 17 mg/kg, with a few outlier values between 20 and 25 mg/kg.

Figure 4.3 Trace Metal Concentrations in Brook Trout Carcass

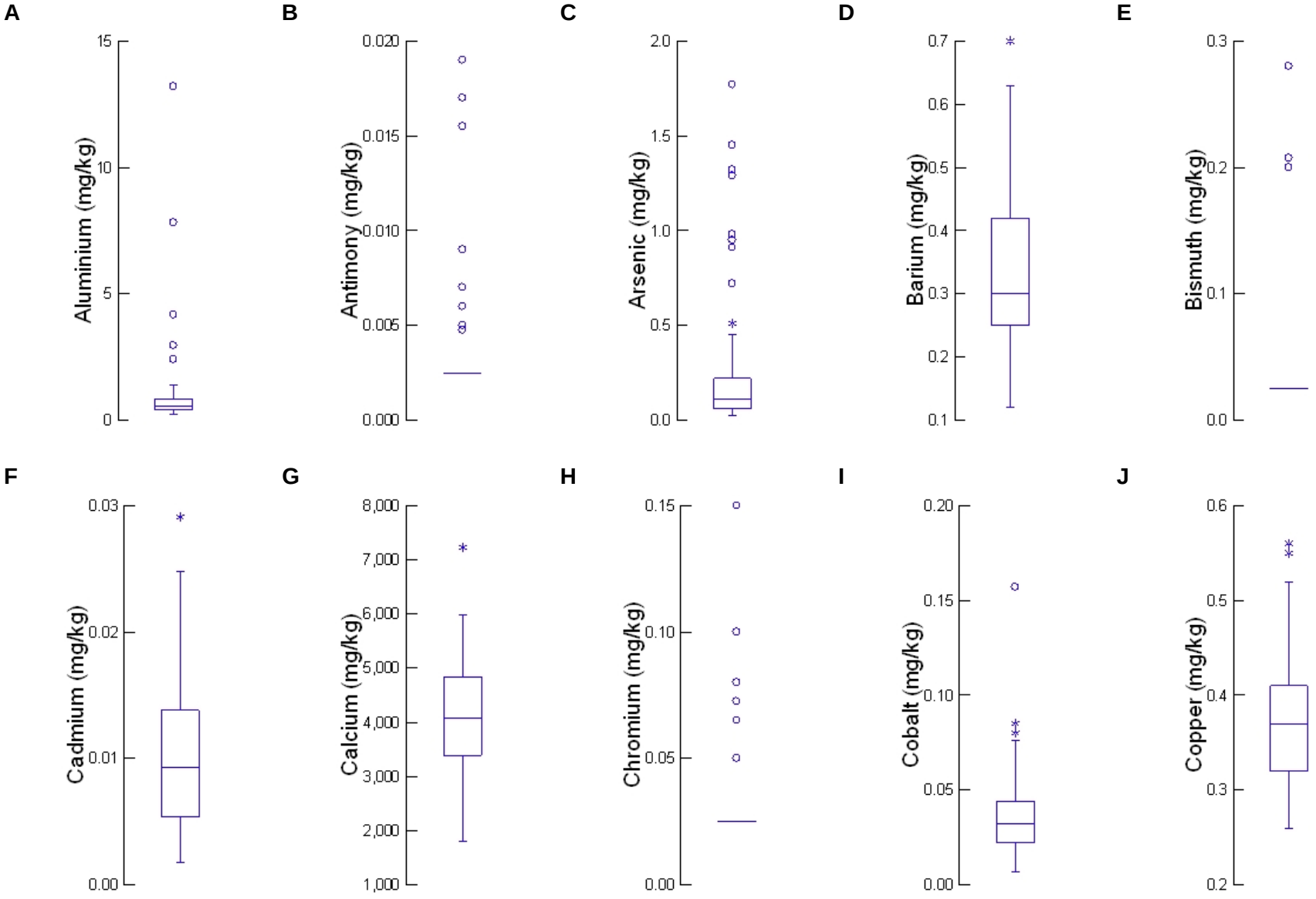

Figure 4.3 Trace Metal Concentrations in Brook Trout Carcass

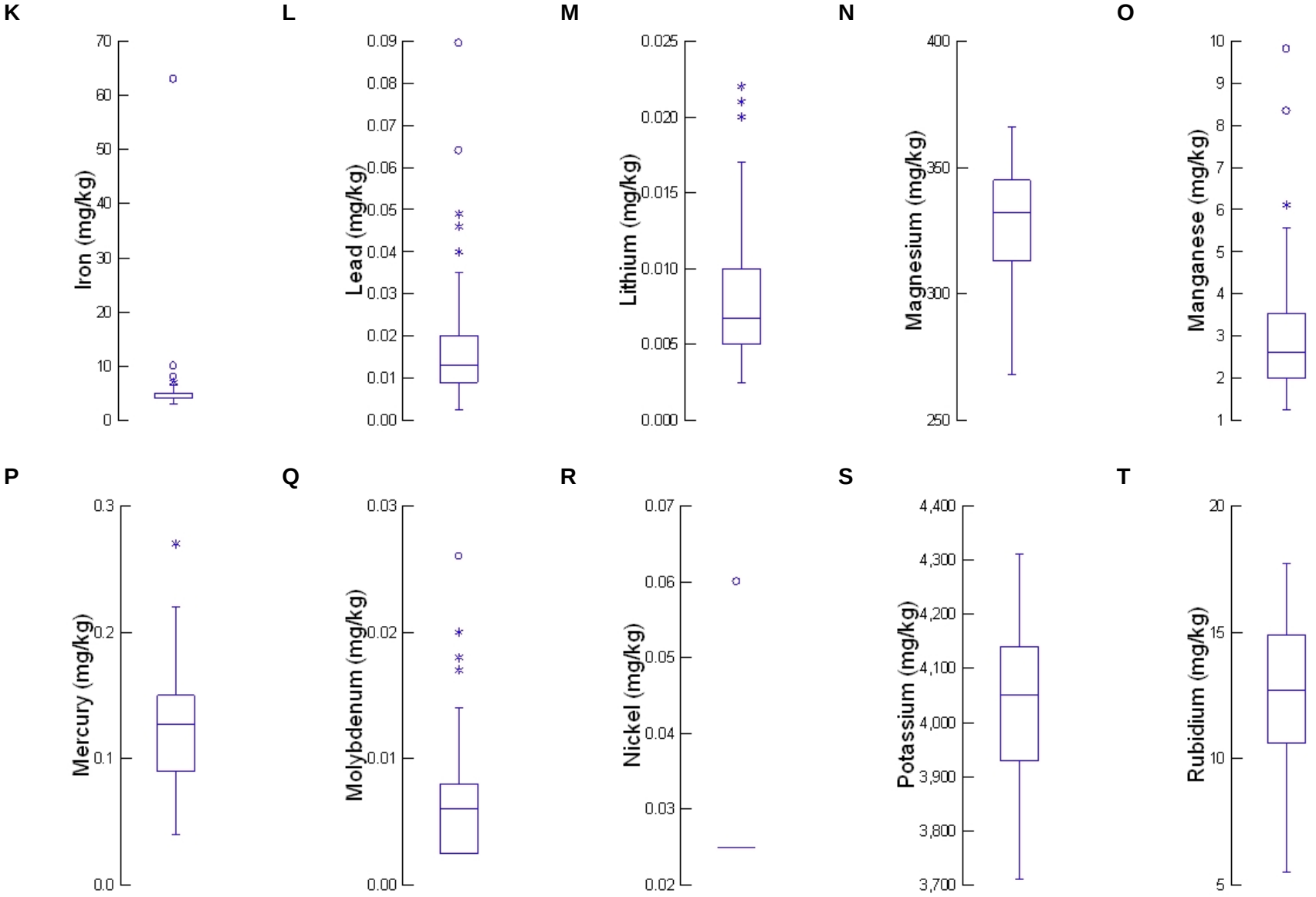

Figure 4.3 Trace Metal Concentrations in Brook Trout Carcass

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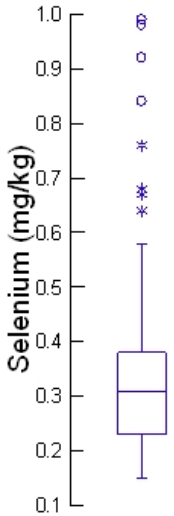

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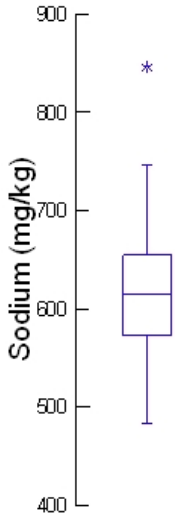

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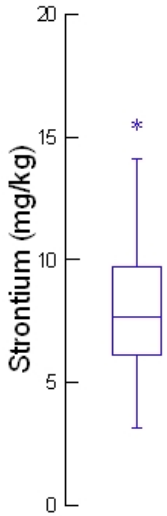

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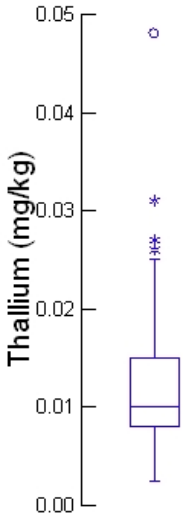

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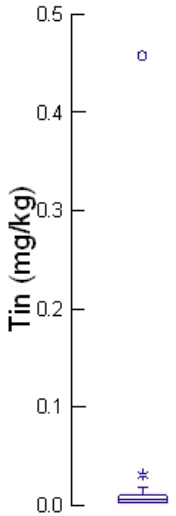

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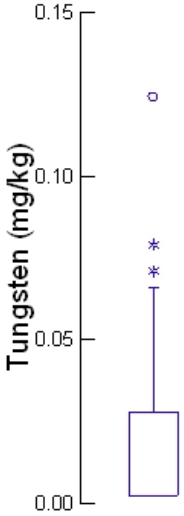

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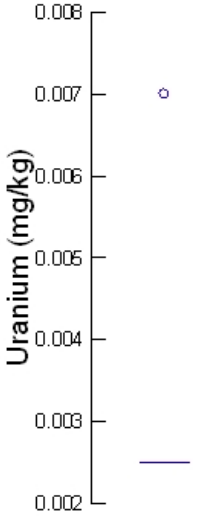
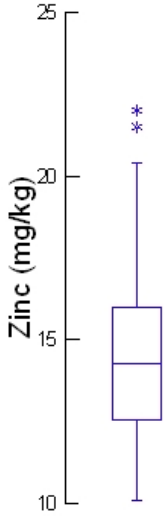


BB



These fish tissue (carcass) results provide information that will help to establish baseline values for health risk assessment for human receptors as part of the EIA. Of the trace metals reported, only mercury has relevant tissue guideline values available, specifically the value of 0.45 mg/kg identified by Environment Canada (2011) and in the *MMER*.

The Ontario Ministry of the Environment (OMOE) also provides advisories regarding consumption of fish containing mercury, based on Health Canada guidance. The OMOE (2011) suggests that for women of child bearing age, and children under 15, consumption should be restricted (fewer than 8 meals per month) where fish tissue mercury concentrations exceed 0.26 mg/kg, with total restriction of consumption at fish tissue concentrations greater than 0.52 mg/kg. For the general population, the OMOE guidance regarding restricted consumption begins at 0.61 mg/kg (no more than 8 meals per month), with total restriction of fish consumption at concentrations greater than 1.84 mg/kg. Only a single brook trout carcass sample with a mercury concentration of 0.27 mg/kg, out of 82 samples analyzed, exceeded the lowest OMOE recommended restriction level of 0.26 mg/kg. On this basis, it would appear that brook trout in the overall Napadogan Brook system and tributaries are suitable for human consumption without restriction.

4.5.2 Results for Whole Brook Trout

Figure 4.4 provides box plots for metals that were commonly detected in reconstructed “whole” brook trout. Typical ranges for these trace metals in whole brook trout in the Study Area are described below.

- Aluminum concentrations in whole brook trout were generally less than 15 mg/kg, although several outlier values between 30 and 100 mg/kg were noted. One extreme outlier value approached 300 mg/kg. This fish, from Sisson Brook station S3A3, was an outlier for several other metals including iron, magnesium, molybdenum, nickel, thallium and vanadium. Since the whole fish samples include gut contents along with the viscera, it is likely that this fish contained sediment as part of the gut contents.

- Arsenic concentrations were generally less than 0.25 mg/kg. Outlier values for arsenic ranged from approximately 0.7 to 1.8 mg/kg.

- Barium concentrations ranged from approximately 0.4 to 0.7 mg/kg, with an outlier value at about 1.2 mg/kg.

- Cadmium concentrations were typically between 0.03 and 0.08 mg/kg, although an outlier value close to 0.21 mg/kg was noted.

- Calcium concentrations were typically between 5,800 and 6,900 mg/kg, with a low outlier value at about 3,100 mg/kg.

- Chromium concentrations were generally less than 0.1 mg/kg, although outlier values ranging from 0.2 to just over 1.0 mg/kg were noted.

- Cobalt concentrations were generally less than 0.1 mg/kg, with an outlier value slightly higher than 0.5 mg/kg.

- Copper concentrations were generally between 0.6 and 0.8 mg/kg, with outlier values between 1.3 and 1.8 mg/kg.
- Iron concentrations were typically less than 15 mg/kg, with outliers ranging from about 30 mg/kg to 600 mg/kg.
- Lead concentrations were generally less than 0.04 mg/kg, with outlier values between 0.09 and 0.26 mg/kg.
- Lithium concentrations were generally less than 0.03 mg/kg, with outlier values between 0.07 and 0.14 mg/kg, and an extreme outlier approaching 0.29 mg/kg.
- Magnesium concentrations were generally between 310 and 340 mg/kg, with one outlier at about 430 mg/kg.
- Manganese concentrations were generally between 4 and 7 mg/kg, with outliers between 12 and 24 mg/kg.
- Mercury concentrations were typically between 0.08 and 0.14 mg/kg, with an outlier value at approximately 0.24 mg/kg. The higher values tended to come from Bird Brook, Sisson Brook, and from stations W4A17 and W4A21 on West Branch Napadogan Brook. These values are very similar to the carcass values, and well below the value of 0.45 mg/kg identified by Environment Canada as affecting the useability of the fisheries resource.
- Molybdenum concentrations were typically below 0.025 mg/kg, with outlier values between 0.05 and 0.27 mg/kg.
- Potassium concentrations were generally between 3,400 and 3,600 mg/kg, without any notable outlier values.
- Rubidium concentrations were generally between 9 and 13 mg/kg, without any notable outlier values.
- Selenium concentrations were generally between 0.25 and 0.4 mg/kg, with outlier values falling in the range of 0.7 to 1.4 mg/kg. The higher values tended to come from East Branch Napadogan Brook and station W4A31 on West Branch Napadogan Brook.
- Silver concentrations were generally between 0.009 mg/kg and 0.017 mg/kg, with outlier values between 0.03 and 0.041 mg/kg.
- Sodium concentrations were generally between 910 and 1,010 mg/kg, with an outlier value at approximately 1,190 mg/kg.
- Strontium concentrations were typically between 9.5 and 14 mg/kg, with an outlier value at approximately 21 mg/kg.
- Thallium concentrations were generally between 0.01 and 0.019 mg/kg, with outlier values between 0.037 and 0.061 mg/kg.

- Tin concentrations were usually less than 0.02 mg/kg, with outliers between 0.025 mg/kg and 0.05 mg/kg. An extreme outlier value approaching 0.3 mg/kg was, however, noted. This fish, from Sisson Brook station S3A3, was not otherwise associated with outlier points, and it is unclear why tin was elevated in this sample.

- Tungsten concentrations were usually less than 0.5 mg/kg, although outlier values between 0.12 and 0.52 mg/kg were noted.

- Zinc concentrations were generally between 22 and 27 mg/kg, with one outlier value at about 33 mg/kg.

Figure 4.4 Trace Metal Concentrations in Whole Brook Trout

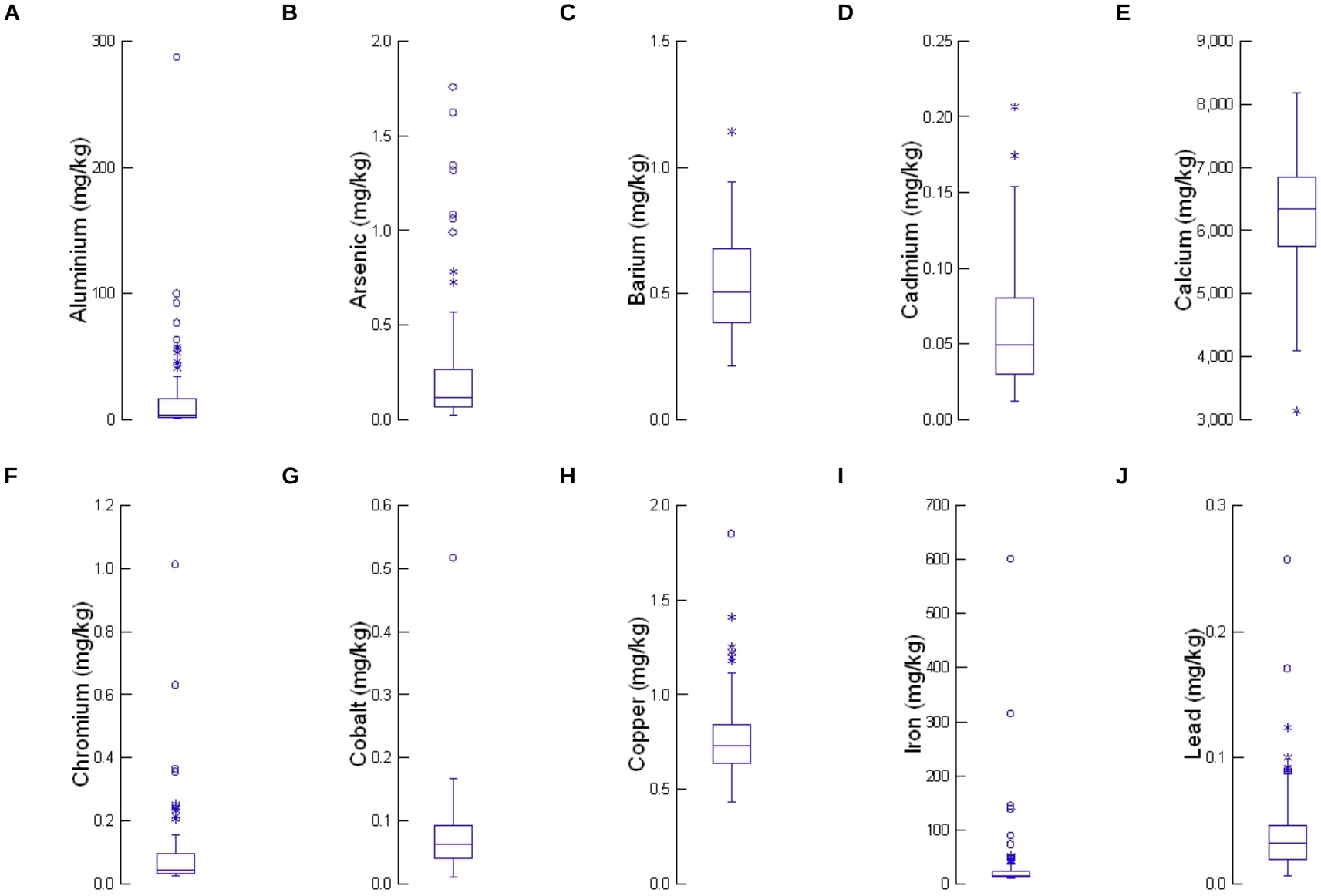


Figure 4.4 Trace Metal Concentrations in Whole Brook Trout

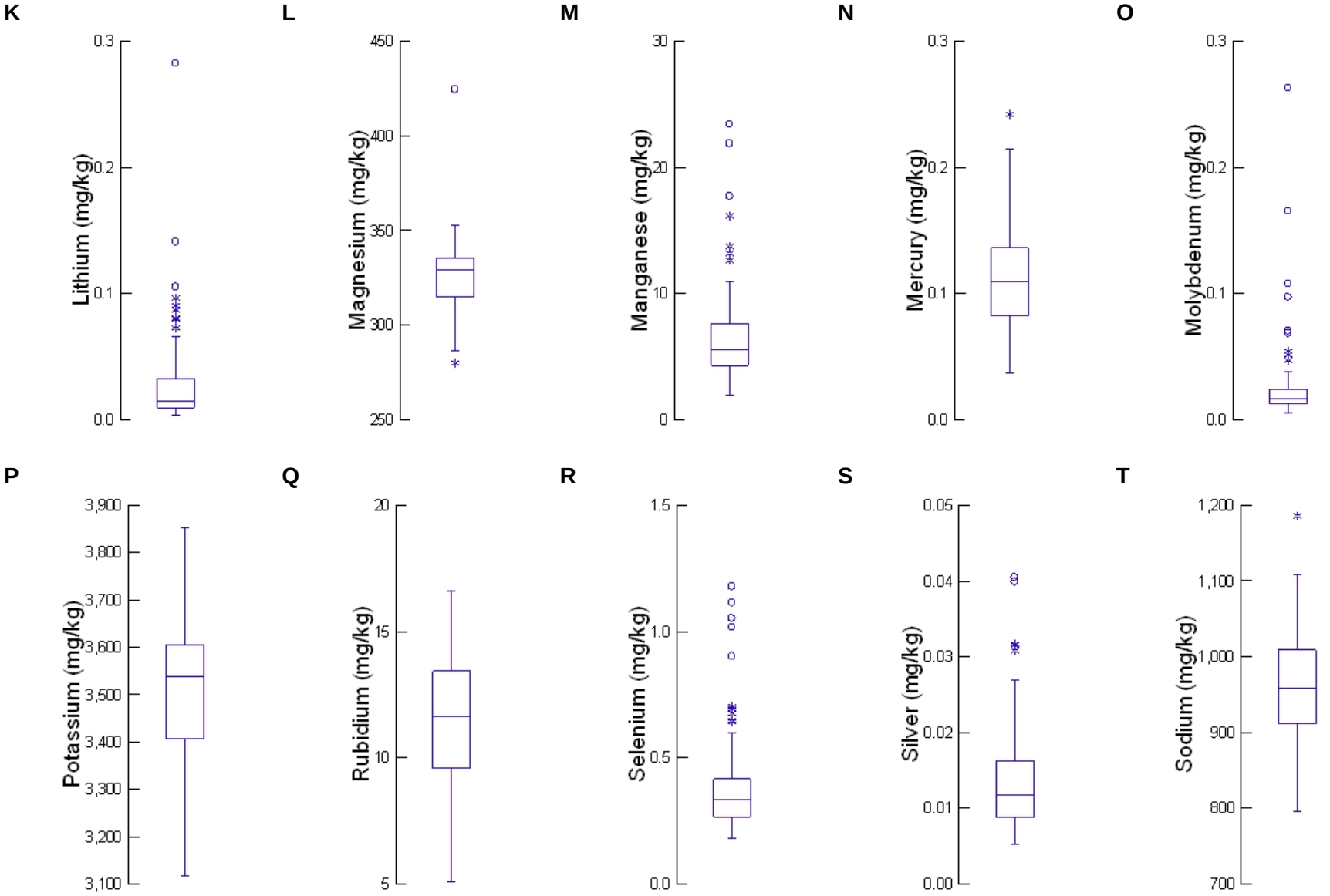
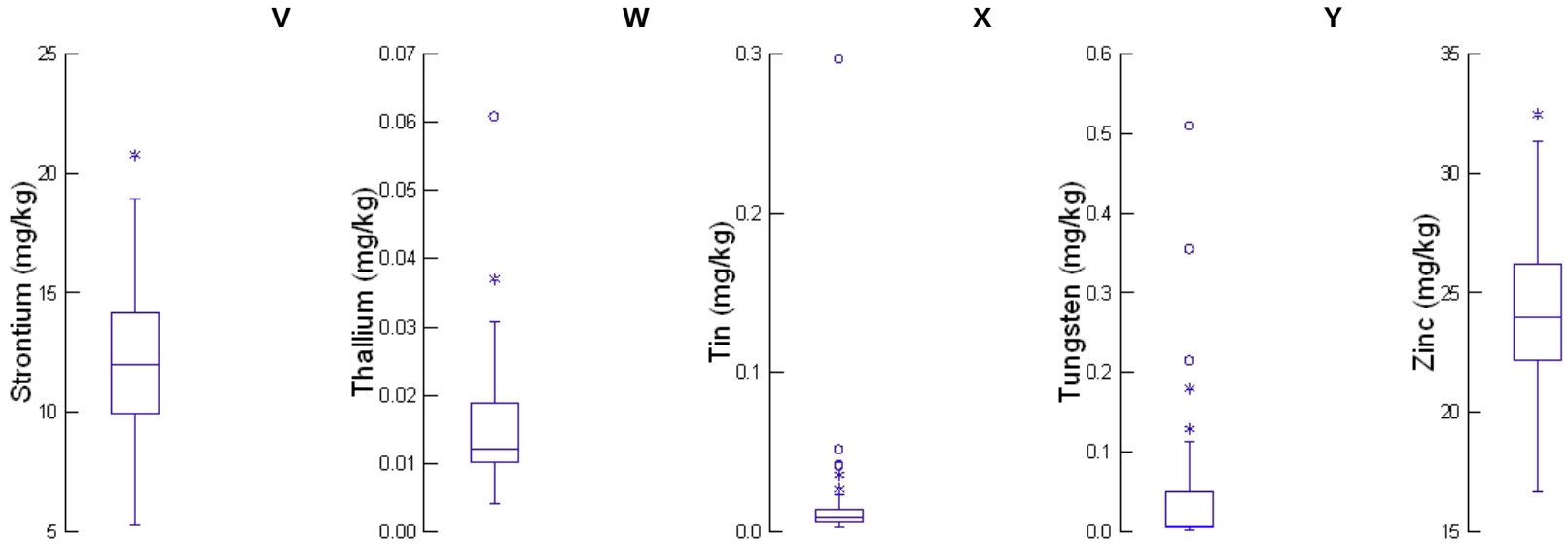


Figure 4.4 Trace Metal Concentrations in Whole Brook Trout



These brook trout tissue (whole fish) results provide information that will help to establish baseline values for health risk assessment for ecological receptors to be conducted in support of the EIA. Of the trace metals reported, only mercury has relevant tissue guideline values available, specifically a tissue residue environmental quality guideline published for the protection of wildlife consumers of fish by CCME (http://st-ts.ccme.ca/). This guideline value, for methyl mercury, is established at a value of 0.033 mg/kg. Assuming that brook trout total mercury concentrations are predominantly present as methyl mercury (a reasonable yet conservative assumption), then it would appear that the baseline mercury concentrations in brook trout within the Study Area are 3 to 4 times the CCME guideline value. There is no immediate explanation as to why this would be the case. This may or may not represent a credible risk to ecological receptors, as the CCME guidelines generally incorporate substantial safety factors, and are intended to be broadly protective.

4.5.3 Results for Brook Trout Liver

Brook trout liver trace metals concentrations are not particularly meaningful taken as an aggregate, since the liver is a very small tissue, and liver metal concentrations become insignificant at the level of consumers of fish tissue. However, as noted above, the liver tends to concentrate metals so that metals that would otherwise be present at very low concentrations may be reliably detected. The liver tissue therefore provides an appropriate tissue upon which to base comparisons of differential exposure to, or bioavailability of, metals in different streams or parts of streams.

Brook trout liver tissue data can be found in Appendix E. For this analysis, liver tissue concentrations were first log transformed (base 10). Comparisons then proceeded as follows.

- The trace metals aluminum, cadmium, calcium, cobalt, copper, iron, magnesium, manganese, mercury, molybdenum, potassium, rubidium, selenium, silver, sodium, thallium and zinc were detected in brook trout liver with sufficient frequency to support comparison tests. The detection frequency of other trace metals including but not limited to arsenic, chromium, lead, nickel, tin, tungsten, uranium, and vanadium (as summarized in Table 4.28) was insufficient in brook trout livers frequently to support this analysis.

- ANOVA was used to compare individual trace metal concentrations in brook trout liver from stations within a given stream (*e.g.,* stations within Bird Brook were compared; stations within Sisson Brook were compared; and stations located on the main stem of West Branch Napadogan Brook were compared—but no comparisons between stations in different watercourses were carried out). Where there was only a single station on a particular watercourse (as in the case of McBean Brook and East Branch Napadogan Brook), comparisons of this type were not made. Statistical summaries of these comparisons are presented in Table 4.28, under the heading “Test Within Streams”.

- If the Test Within Streams found a statistically significant difference for a particular trace metal, then it was concluded that there was a significant difference in brook trout liver concentrations for that trace metal, and the sampling stations were different. The data for stations within that stream could not be pooled, and further comparisons continued following a “Test All Stations” approach, as described below.

- If the Test Within Streams found no statistically significant difference for a particular trace metal, then it was concluded that there was not a significant difference in brook trout liver concentrations for that trace metal, and the sampling stations were not different. If this was found to be the case for all streams with multiple stations, the data for the streams were individually combined (pooled), and the further comparisons continued following a "Test Among Streams" approach, as described below.

- Following the Test All Stations approach, the data for individual streams were not pooled (where prior analysis had shown that there were significant differences within streams), and ANOVA was used to determine whether trace metal concentrations differed between any of the individual stations on Bird, Sisson, McBean, West Branch Napadogan, East Branch Napadogan brooks. Statistical summaries of these comparisons are presented in Table 4.29, under the heading "Test All Stations".

- Following the Test Among Streams approach, the data for individual streams were pooled (where prior analysis had shown that there were no significant differences within streams), and ANOVA was used to determine whether trace metal concentrations differed between Bird, Sisson, McBean, West Branch Napadogan, East Branch Napadogan brooks. Statistical summaries of these comparisons are presented in Table 4.29, under the heading "Test Among Streams".

- The last two analytical steps were mutually exclusive. Where the initial ANOVA had shown that data for stations could be pooled, only the Test Among Streams test was performed; where the initial ANOVA showed that the data could not be pooled, only the Test All Stations test was performed.

- In some cases, evaluation of the underlying statistical distribution of data suggested that the assumption of normality was not met, and that parametric statistical tests (*i.e.,* ANOVA) were not recommended. In these cases the non-parametric equivalent to the ANOVA test (Kruskal Wallace test) was used, as indicated in Table 4.29.

- Post-hoc comparisons (Tukey's HSD test) were performed to identify the particular station or stream combinations leading to a conclusion of significant difference.

Table 4.29 Statistical Summary for Analysis of Trace Metal Concentrations in Brook Trout Liver

Metals	Test Within Streams									Test All Stations			Test Among Streams		
	Run 1									Run 2			Run 3		
	Bird Brook			Sisson Brook			Napadogan Brook								
	Test	P-value	Pool (Y/N)	Test	P-value	Pool (Y/N)	Test	P-value	Pool (Y/N)	Test	P-value	Post-Hoc Comparisons	Test	P-value	Post-Hoc Comparisons
Aluminum	ANOVA	0.044	N	K-W	0.019	N	K-W	0.083	Y	ANOVA	0.005	B2 < S3 MB < S3 N2 < S3			
Cadmium	ANOVA	0.000	N	K-W	0.000	N	ANOVA	0.000	N	ANOVA	0.000	B2 < B3, MB, N3, S2, S3 B3 > EB, N1, N2 B3 < S3 EB < N3, S3 MB > N1 MB < S3 N1 < N2, N3, S2, S3 N2 < N3, S3 N3 < S3 S2 < S3			
Calcium	ANOVA	0.609	Y	ANOVA	0.214	Y	ANOVA	0.384	Y				ANOVA	0.647	No Differences
Cobalt	ANOVA	0.174	Y	ANOVA	0.000	N	ANOVA	0.012	N	ANOVA	0.000	B2 > S2 B2 < S3 B3 < S3 EB > S2 MB < S3 N1 < S3 N2 < S3 N3 > S2 S2 < S3			
Copper	ANOVA	0.566	Y	ANOVA	0.580	Y	ANOVA	0.485	Y				ANOVA	0.043	Napadogan < Sisson
Iron	ANOVA	0.856	Y	ANOVA	0.106	Y	ANOVA	0.333	Y				ANOVA	0.057	No Differences
Magnesium	ANOVA	0.463	Y	ANOVA	0.688	Y	K-W	0.166	Y				ANOVA	0.588	No Differences
Manganese	ANOVA	0.046	N	ANOVA	0.592	Y	K-W	0.158	Y	ANOVA	0.012	B2 > N2			
Mercury	ANOVA	0.147	Y	ANOVA	0.768	Y	ANOVA	0.000	N	ANOVA	0.000	B2 > EB, MB, N1, N2, N3 B3 > EB, N3 EB < MB, N1, N2, S2, S3 MB > N3 N1 > N3 N2 > N3 N3 < S2, S3			
Molybdenum	ANOVA	0.440	Y	ANOVA	0.419	Y	ANOVA	0.384	Y				ANOVA	0.001	Bird < Sisson Napadogan < Sisson
Potassium	ANOVA	0.627	Y	ANOVA	0.371	Y	K-W	0.206	Y				ANOVA	0.024	Napadogan > Sisson
Rubidium	ANOVA	0.013	N	ANOVA	0.118	Y	K-W	0.242	Y	ANOVA*	0.000	B2 < B3, N1, N3			
Selenium	ANOVA	0.526	Y	K-W	0.010	N	ANOVA	0.000	N	ANOVA	0.000	B2 < EB, N3, S3 B3 < EB, N3 EB > MB, N1, N2, S2, S3 MB < N3, S3 N1 < N3,S3 N2 < N3 N3 > S2, S3			

Table 4.29 Statistical Summary for Analysis of Trace Metal Concentrations in Brook Trout Liver

Metals	Test Within Streams									Test All Stations			Test Among Streams		
	Run 1									Run 2			Run 3		
	Bird Brook			Sisson Brook			Napadogan Brook								
	Test	P-value	Pool (Y/N)	Test	P-value	Pool (Y/N)	Test	P-value	Pool (Y/N)	Test	P-value	Post-Hoc Comparisons	Test	P-value	Post-Hoc Comparisons
Silver	ANOVA	0.714	Y	ANOVA	0.829	Y	ANOVA	0.360	Y				ANOVA	0.039	Bird > Napadogan
Sodium	ANOVA	0.279	Y	ANOVA	0.520	Y	ANOVA	0.950	Y				ANOVA	0.008	Napadogan < Sisson
Thallium	ANOVA	0.034	N	ANOVA	0.001	N	ANOVA	0.007	N	ANOVA	0.000	B2 < EB, N3, S3 B3 < EB, S3 EB > MB, N1, N2, S2 MB < S3 N1 < N3, S2, S3 N2 < S3 S2 < S3			
Zinc	ANOVA	0.789	Y	ANOVA	0.442	Y	ANOVA	0.996	Y				ANOVA	0.146	No Differences

Notes:
* ANOVA was used in this analysis based on the assumption that it is robust, despite failure of the Levene's test.

Legend:
ANOVA - One-Way Analysis of Variance Test
K-W - Kruskal-Wallis Test
B2 - B2A2 (Bird Brook)
B3 - B3A9 (Bird Brook)
EB - EBNB1 (East Branch Napadogan Brook)
MB - M3C3 (McBean Brook)
N1 - W4A17 (West Branch Napadogan Brook)
N2 - W4A21 (West Branch Napadogan Brook)
N3 - W4A31 (West Branch Napadogan Brook)
S2 - S2A2 (Sisson Brook)
S3 - S3A3 (Sisson Brook)

Test Within Streams

The Test Within Streams process (Table 4.29) provided the following key results for sampling stations within Bird, Sisson and West Branch Napadogan brooks.

- It was legitimate to pool station-within-stream data for calcium, copper, iron, magnesium, molybdenum, potassium, silver, sodium and zinc. All of these elements except silver are considered to be essential to the physiology of vertebrates, and are subject to strong physiological regulation, and the liver may play a role in that regulation. Therefore, it is reasonable that concentrations in brook trout liver at different stations within a stream should be similar.

- It was not legitimate to pool station-within-stream data for one or more streams (*i.e.,* there were differences identified within one or more streams) for aluminum, cadmium, cobalt, manganese, mercury, rubidium, selenium and thallium. Some of these elements, including cobalt, manganese, and selenium are considered to be essential, whereas aluminum, cadmium, mercury and thallium have no known essential function in vertebrate physiology.

Test All Stations

At least one significant difference was found for each of these elements, as summarized under the Test All Stations heading in Table 4.29. Key features of these results are as follows.

- Brook trout liver trace metal concentrations were frequently higher at station S3A3 on Sisson Brook than at one or more other stations. This was the case for aluminum, cadmium, cobalt, mercury and thallium at S3A3, but not for S2A2. This appears to indicate higher availability of these elements in the Sisson Brook watershed than in other watersheds, which could be a reflection of underlying mineralization.

- Despite being identified as having higher concentrations of mercury in water and sediment (see Section 4.4 of this Technical Report), brook trout liver mercury concentrations from East Branch Napadogan Brook were generally lower than at other stations. This seemingly counter-intuitive result may be explained by the fact that selenium concentrations in brook trout liver from East Branch Napadogan Brook were simultaneously higher than at several other stations. Selenium has a well-known antagonistic effect on mercury bioaccumulation, and appears to be preventing the bioaccumulation of mercury in brook trout livers from East Branch Napadogan Brook.

Test Among Streams

For calcium, copper, iron, magnesium, molybdenum, potassium, silver, sodium and zinc, the Test Among Streams procedure was followed (*i.e.,* the data for the streams were individually pooled), using ANOVA to compare all possible pairs of streams (where it had previously been found that there were no significant differences between stations within the streams) to determine whether significant differences were present between streams. Key features of these results are as follows (see also Table 4.29).

- No significant differences were found in brook trout liver metal concentrations when comparing streams for calcium, iron, magnesium, or zinc. As noted earlier, these are all physiologically essential elements, under active physiological regulation, and a consistency of results between streams is not unexpected.

- Significant differences were found in brook trout liver metal concentrations when comparing streams for copper, molybdenum, potassium, silver and sodium (see Table 4.29). These differences are further detailed below.

    - Copper – concentrations in brook trout liver were higher in fish from Sisson Brook than in fish from West Branch Napadogan Brook.

    - Molybdenum – concentrations in brook trout liver were higher in fish from Sisson Brook than in fish from Bird or West Branch Napadogan brooks.

    - Potassium – concentrations in brook trout liver were higher in fish from West Branch Napadogan Brook than in fish from Sisson Brook.

    - Silver – concentrations in brook trout liver were higher in fish from Bird Brook than in fish from West Branch Napadogan Brook.

    - Sodium – concentrations in brook trout liver were higher in fish from Sisson Brook than in fish from West Branch Napadogan Brook.

Again, the pattern indicates that trace metal availability (including copper, molybdenum, and sodium) appears to be higher in Sisson Brook than in some other brooks within the Study Area. This result presumably reflects local mineralization within the Sisson Brook watershed.

4.5.4 Summary of Fish Tissue Analysis

The fish tissue analysis provides a baseline for trace metal concentrations in brook trout tissues from West Branch Napadogan Brook and its tributaries. Key conclusions from this baseline analysis are as follows.

- Mercury concentrations in brook trout carcass samples are below thresholds established by Environment Canada and OMOE to protect human health.

- Assuming that total mercury is predominantly present in the form of methyl mercury (a conservative assumption), concentrations in brook trout whole fish samples are above a threshold established by CCME to protect wildlife consumers of fish. However, since the threshold value is designed to be highly protective, this does not necessarily indicate that wildlife consumers of brook trout will experience adverse health effects.

- Analysis of brook trout liver samples shows that many trace metals are subject to physiological regulation, and are present at concentrations that do not vary significantly between stations in the Napadogan Brook system.

- Several trace metals in liver were found to vary significantly within the Napadogan Brook system. These metals included:
  - Aluminum, cadmium, cobalt, copper, mercury, molybdenum, sodium and thallium, which were generally elevated in brook trout livers from Sisson Brook;
  - Silver concentrations, which were higher in brook trout livers from Bird Brook than in West Branch Napadogan Brook;
  - Potassium, which was lower in brook trout livers from Sisson Brook than in West Branch Napadogan Brook; and
  - Mercury concentrations in brook trout livers representing three fish from East Branch Napadogan Brook were generally lower than at other stations, in spite of higher measured mercury concentrations in water and sediment from East Branch Napadogan Brook. However, selenium concentrations in the livers of these fish were concurrently higher than usual in other streams. Selenium acts in an antagonistic manner with respect to mercury bioaccumulation by fish, and this appears to be the case in East Branch Napadogan Brook.

4.6 FISH ENVIRONMENTAL EFFECTS MONITORING

As detailed in the Terms of Reference for the Sisson Project (Stantec 2012c), brook trout and slimy sculpin were selected as potential sentinel species for baseline EEM work in support of the EIA. Brook trout was selected to act as a surrogate for salmonids including Atlantic salmon, whereas slimy sculpin was selected because it is a widely distributed but largely sedentary fish species that has been identified as being suitable for EEM programs (Environment Canada 2011).

The *MMER* technical guidance (Environment Canada 2011) identifies a hierarchy of preference with respect to completing a fish study for metal mines, as follows.

“Some receiving environments do not support adequate numbers of fish for sampling. In situations where it has been determined that fisheries resources may be impacted by a destructive fish survey, non-lethal sampling techniques may be used. In environments that do not support adequate numbers of fish to meet the recommended sample sizes or where there are not two suitable fish species for monitoring, the following options, in order of preference, may be considered” (Environment Canada 2011):

- one sexually mature fish species and one sexually immature fish species;
- two sexually immature fish species;
- one sexually mature fish species; or
- one sexually immature fish species.

Where sexually mature fish are lethally sampled the minimum recommended sample size, when there are insufficient data to calculate sample size by power analysis, is 20 sexually mature males and 20 sexually mature females of 2 fish species, in each sampling area (Environment Canada 2011). The

rationale for using 20 fish of each sex for lethal sampling is that there is little change in the 95% confidence limits with increasing sample size beyond 20 fish.

Environment Canada (2011) states that lethal sampling of adult fish is preferred, where possible, and that non-lethal sampling should only be used in situations where it is warranted (*i.e.,* where there is a concern about the potential effects of sampling on small fish populations). Such concerns were raised with respect to sampling of brook trout by representatives of NBDNR during the planning phase of this work. If the only option for a facility is to do a non-lethal sampling of fish in order to evaluate the effects of effluents on the fish populations, Environment Canada (2011) recommends sampling a minimum of 100 fish older than YOY at each station. The YOY acquired during the collection for the 100 non-YOY fish should also be retained and sampled (measured). The rapid growth of YOY slimy sculpin in the spring can cause some overlap with the 1+ age-class, making resolution difficult (Gray *et al.* 2002). Therefore, the preferred timing for work with slimy sculpin is the late summer and early fall, when the YOY should be easiest to distinguish. This timing overlaps well with the preferred timing for adult brook trout (*i.e.,* early fall when gonads are ripening, but prior to spawning).

Based on qualitative electrofishing carried out in mid-summer 2012, Stantec identified the potential to collect adult brook trout for lethal sampling, and slimy sculpin for non-lethal sampling, at many of the sampling stations. Although juvenile Atlantic salmon were also present at some stations, it was considered most appropriate to seek alternative fish species, if at all possible, for EEM purposes, and to minimize the stress imposed on Atlantic salmon. In addition, brook trout were considered to be a reasonable surrogate for Atlantic salmon (*i.e.,* effects of mine effluent on brook trout would also be expected to accrue to juvenile Atlantic salmon).

Ten sampling stations were selected based on the previous habitat surveys and qualitative electrofishing results. Three stations were located within the PDA, and seven stations were located outside of the PDA but within the Study Area (Figure 3.4). Stantec conducted sampling at the 10 quantitative electrofishing stations between September 12 and 29, 2011. The three stations within the PDA provide quantitative data on the biomass of fish present and characterize the assemblage of fish present in selected study reaches. These stations represent baseline existing conditions, but are not candidates for long-term EEM as these three stations will be lost due to Project development. The seven stations outside of the PDA but within the Study Area represent potential reference and exposure monitoring stations as required under *MMER* (Environment Canada 2011). Stations were selected based on the results of the qualitative sampling.

4.6.1 Brook Trout

Brook trout were found at all quantitative sampling stations, with the exception of station NRC (Gorby Gulch) on the upper Nashwaak River where only juvenile Atlantic salmon were captured. Brook trout densities (#/m^2) were highest at stations B2A2, and S2A2, and in Bird Brook and Sisson Brook overall. This may simply represent a habitat preference at the time of sampling for low (*i.e.,* 2nd and 3rd) order streams, in contrast to Atlantic salmon which tended to be more abundant in higher order streams.

Using the results of the qualitative electrofishing, it was determined that YOY brook trout were those that were less than 70 mm in length. Brook trout that were aged 1+ years were between 70 and 110 mm in length, and brook trout that were 2+ years or more were greater than 110 mm in length. These results are consistent with the literature (Scott and Crossman 1998; Bonney 2006). There were

relatively large numbers of YOY brook trout present at the stations sampled, but few mature brook trout (greater than 95 mm) at most stations.

The ages of brook trout lethally sampled during quantitative electrofishing were confirmed using scale samples. Scale ages were compared to weight-length distributions of brook trout from all stations sampled (Figure 4.5). Using a 95% probability ellipse, two fish were identified as potential outliers due to having recorded weights that fell significantly outside the probability ellipse (*i.e.,* a female brook trout having a length of 136 mm, and a male brook trout having a length of 166 mm, both from station B3A9). These brook trout were removed from further analysis involving length or weight. Age distributions determined during the qualitative survey were confirmed: YOY (age 0+ years) brook trout were found to be less than 80 mm in length in September, brook trout between 80 mm and 95 mm were considered immature (age 1+ years), and brook trout over 95 mm were considered mature (age 2+ years and older). Very few brook trout aged 3+ years or more were identified.

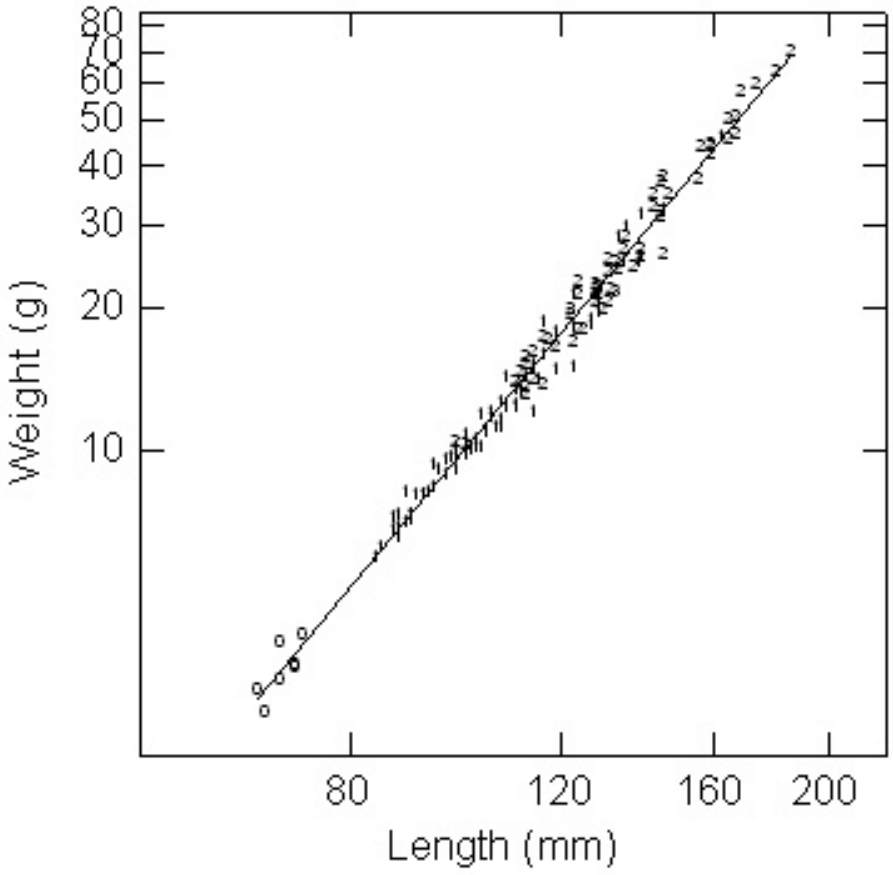


Figure 4.5 Body Weight (g) of Brook Trout as a Function of Body Length (mm); Age of Individual Brook Trout Based on Scale Reading is Coded 0 (0+), 1 (1+), 2 (2+) or 3 (3+)

Age estimates were used to select reproductively mature brook trout for measurement of fecundity. A target of 40 (*i.e.,* 20 male and 20 female) brook trout over 90 mm in length was set for collection at each station. Reproductive maturity was further confirmed by lethally sampling brook trout smaller than 90 mm (Appendix E). These brook trout were also used for analysis of trace metals in tissues. Insufficient numbers of brook trout greater than 90 mm were present at each station to meet targets for a standard EEM fish study with lethal sampling as required by *MMER* (see brook trout male and brook trout female columns in Table 4.30).

Table 4.30 Summary of Collected Brook Trout for EEM Baseline Sampling

Site	Total Number of Brook Trout Lethally Sampled	Number of Male Brook Trout Sampled	Number of Female Brook Trout Sampled	Number of Brook Trout with Indeterminate Sex	Number of Immature Brook Trout (<95mm) Rejected from Lethal Sampling	Total Brook Trout Captured (Lethally Sampled and Rejected)
B2A2	20	10	7	3	108	128
B3A9	20	2	7	11	9	29
S2A2	25	10	13	2	50	75
S3A3	28	4	11	13	34	62
M3C3	10	3	3	4	0	10
W4A17	24	0	12	12	11	35
W4A21	13	1	3	9	0	13
W4A31	10	0	4	6	0	10
EBNB1	3	0	1	2	0	3
NRC	0	0	0	0	0	0
Totals	**153**	**30**	**61**	**62**	**212**	**365**

A total of 153 brook trout were lethally sampled from nine stations within the Study Area. Measures of total weight, fork length, gonad weight, liver weight, viscera weight and carcass weight for sacrificed fish were collected and can be found in Appendix E. Tissues from many of these fish were also submitted for trace metals analysis.

Weight-length relationships were plotted for all 153 brook trout (Figure 4.6). The weights and lengths for male and female brook trout were overlapping. Since sex was determined for many female brook trout greater than 90 mm in length, it appears likely that brook trout greater than 90 mm long in which sex was indeterminate (I) were probably male brook trout. A few brook trout less than 80 mm long were 1+ year aged brook trout and truly immature, whereas all brook trout greater than 90 mm long were aged 2+ years or greater. There was no obvious difference between the weight-at-length for male or female brook trout (*i.e.,* the scatterplot for both sexes was fully overlapping), and there were no obvious differences between sampling stations, except among larger brook trout where examination of residuals suggested that trout from Bird and Sisson brooks tended to be of above-average weight, whereas trout from West Branch Napadogan and Napadogan brooks tended to be below average weight. This difference was not observed among smaller brook trout, and could be an artifact of small sample numbers.

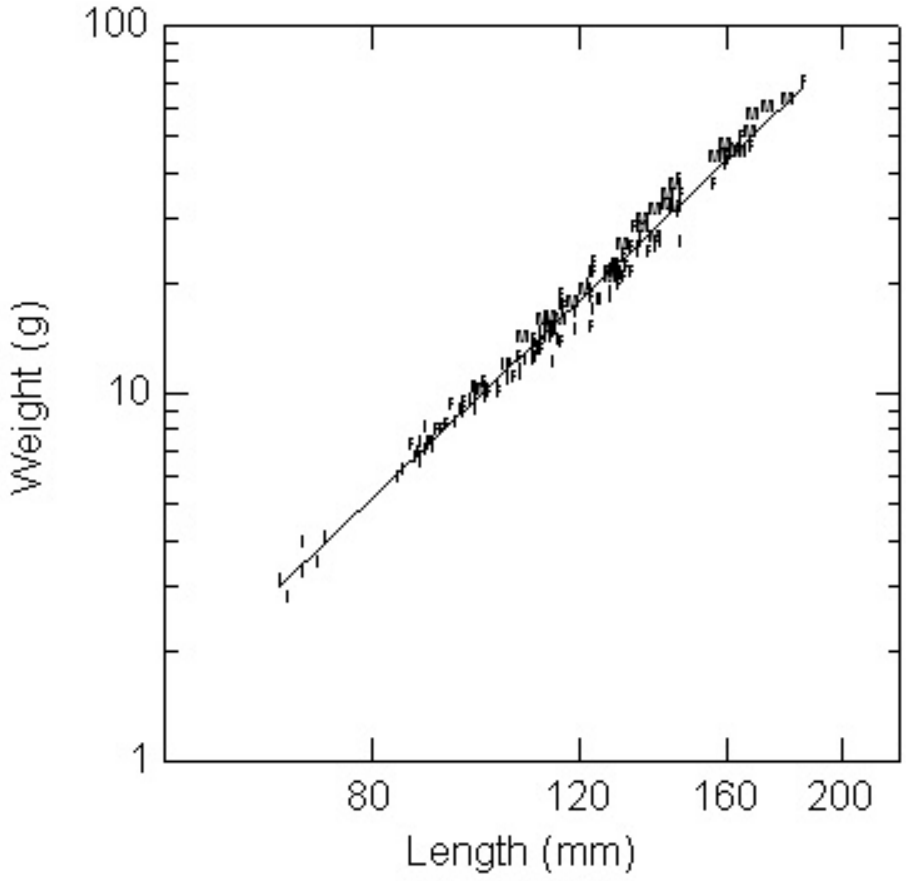


Figure 4.6 Body Weight (g) of Brook Trout as a Function of Body Length (mm); Gonad Development for Individual Brook Trout is Coded Indeterminate (I), Female (F) or Male (M)

Liver weights of lethally sampled brook trout were plotted for all stations as a function of body length and body weight (Figures 4.7 and 4.8). Slopes of regression lines for immature and male brook trout were similar; however, there was a clear separation between adult female brook trout and adult male trout (*i.e.,* fish greater than approximately 10 g weight or 95 mm length), such that female trout had distinctly heavier livers than male trout. There was no evidence that these differences were related to sampling stations (*i.e.,* streams).

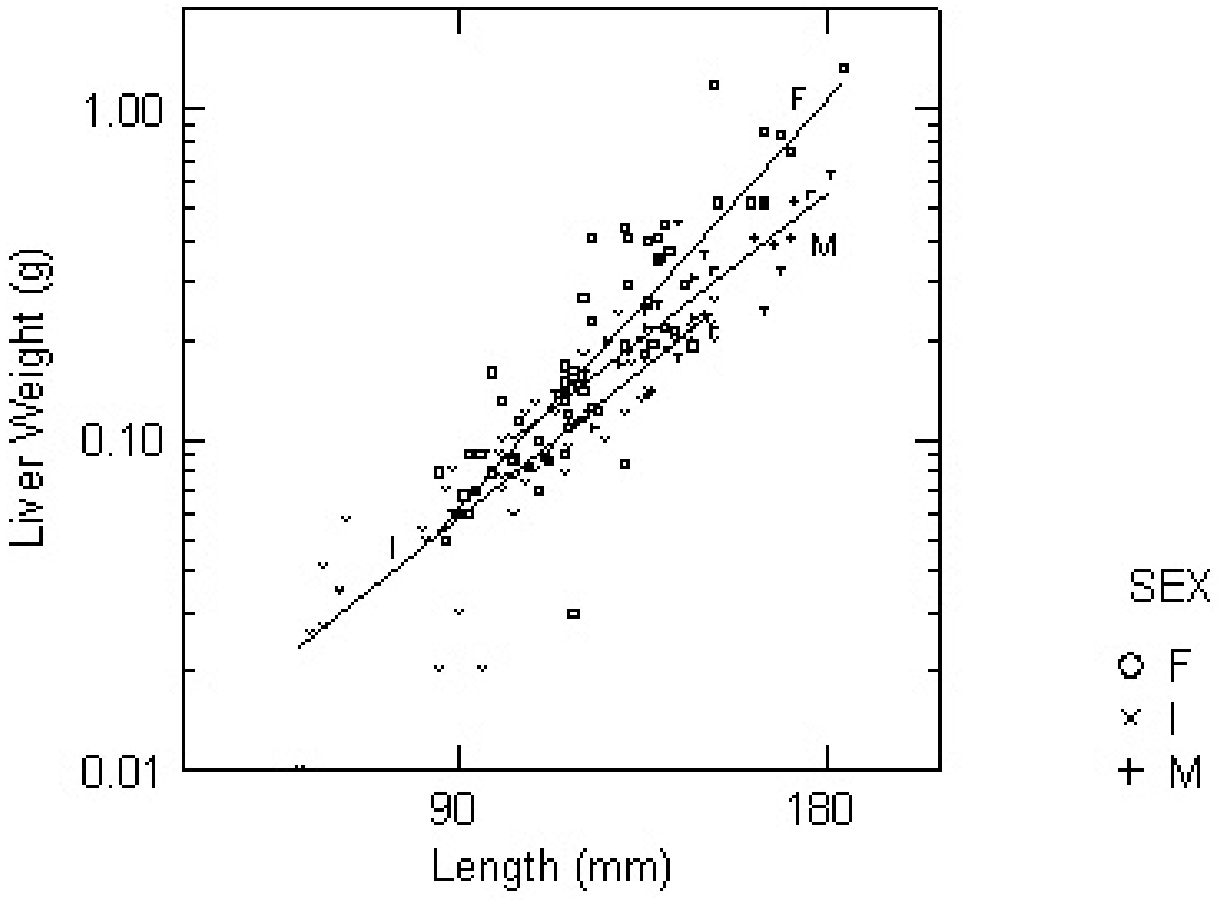


Figure 4.7 Liver Weight (g) of Brook Trout as a Function of Body Length (mm); Results for Female, Male and Indeterminate Brook Trout are Plotted Separately

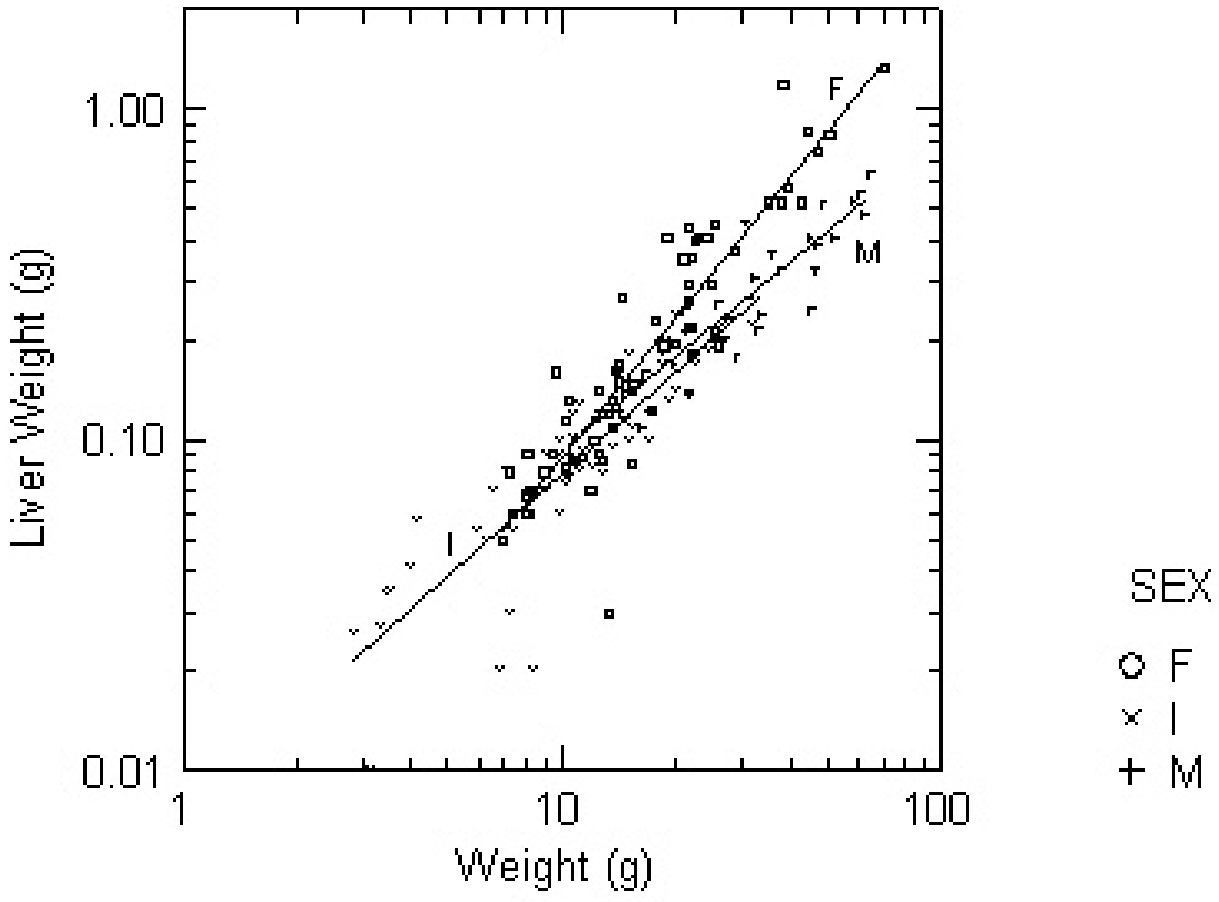


Figure 4.8 Liver Weight (g) of Brook Trout as a Function of Body Weight (g); Results for Female, Male and Indeterminate Brook Trout are Plotted Separately

Gonad weights for all lethally sampled brook trout were plotted in relation to sex (Figures 4.9 and 4.10). Immature brook trout were not included in these plots. There was a clear separation between male and female brook trout, with two groups of female brook trout (apparently corresponding to 1+ and 2+ year aged fish), but only a single group of confirmed male brook trout (corresponding to 2+ year aged fish). Although the trend line of gonad weight to body weight was steeper for female trout (trending through both groups of female fish), the trend line for aged 2+ years female trout would have a similar slope to the trend line for male trout, although the ovaries would be significantly heavier than the testes for fish of similar length. No trends related to sampling stations (*i.e.,* streams) were identified.

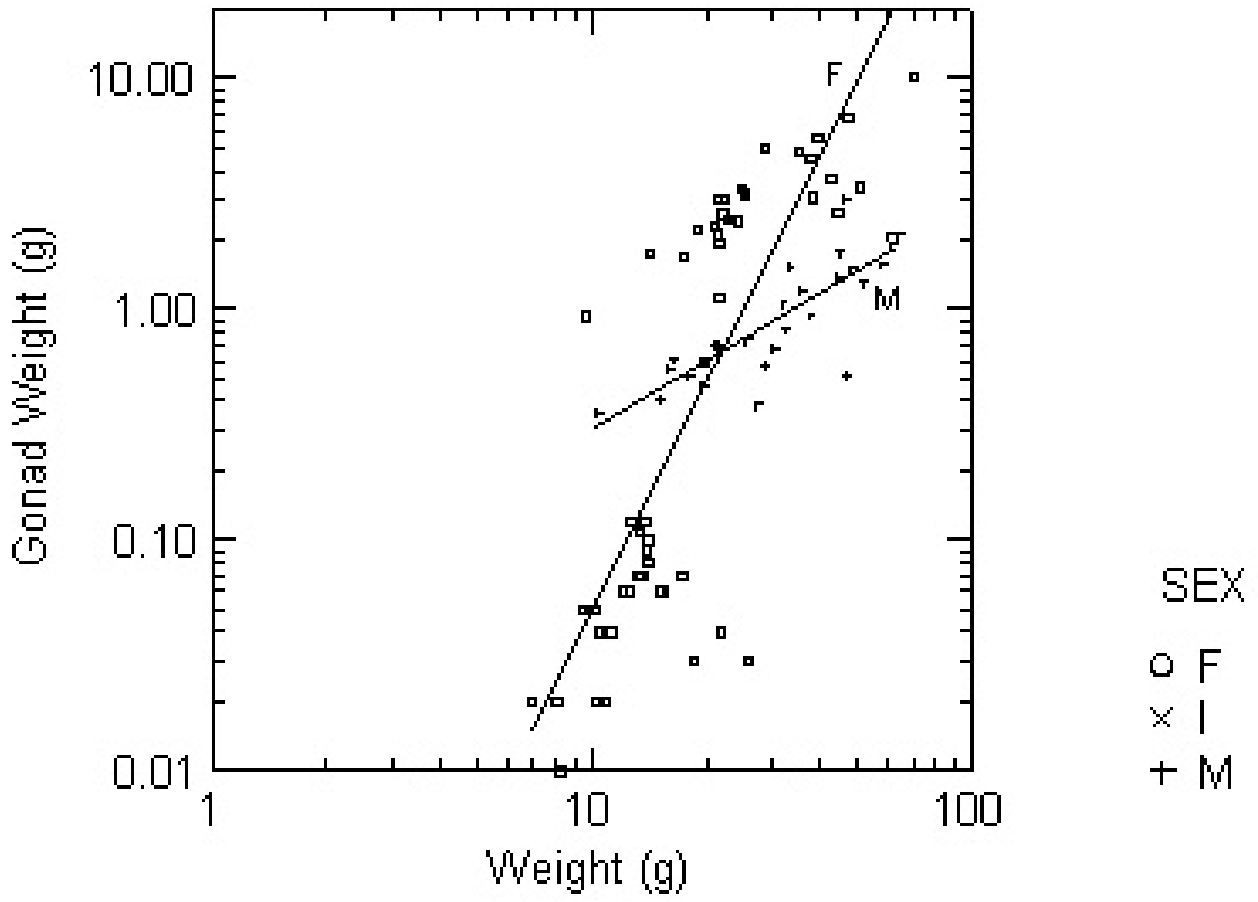


Figure 4.9 Gonad Weight (g) of Brook Trout as a Function of Body Length (mm); Results for Female and Male Brook Trout are Plotted Separately

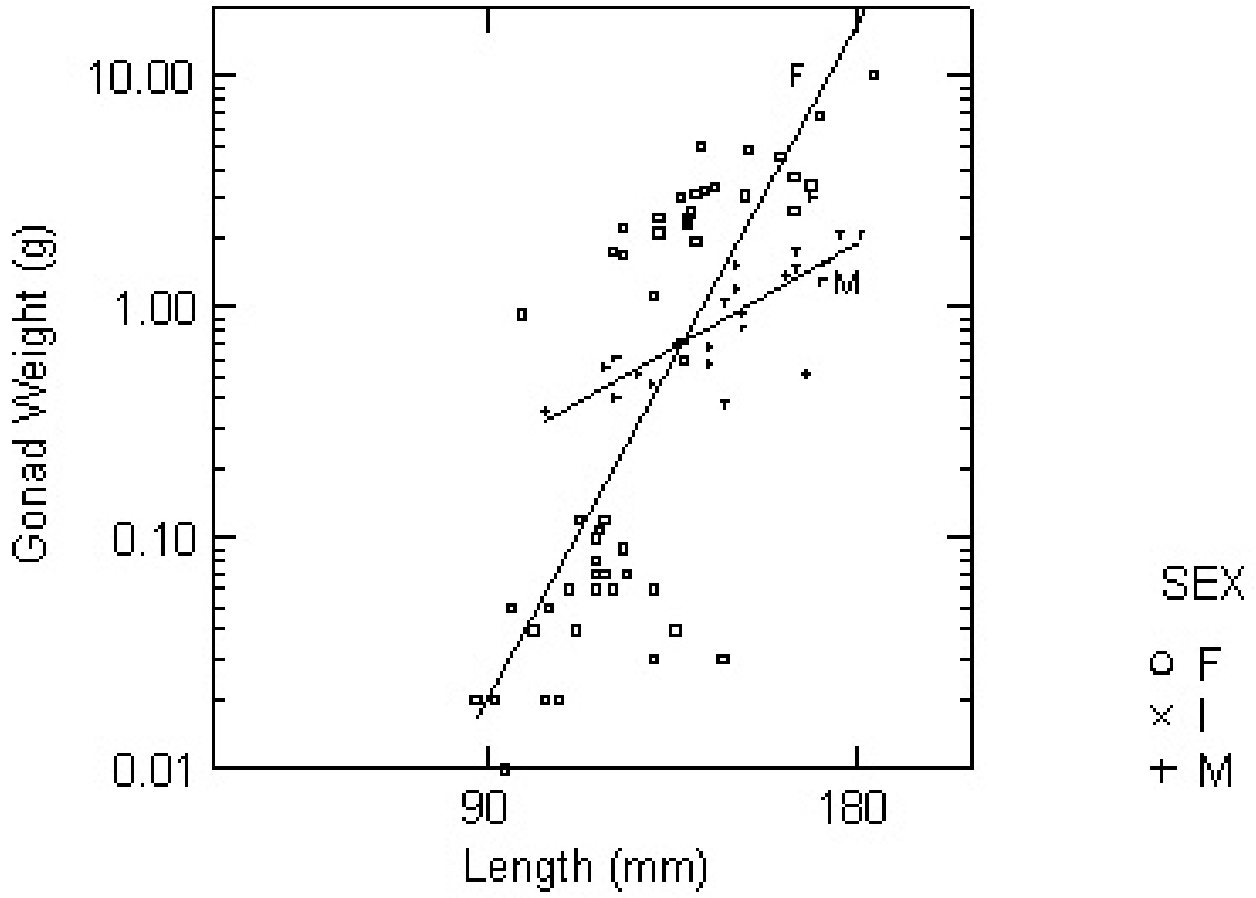


Figure 4.10 Gonad Weight (g) of Brook Trout as a Function of Body Weight (g); Results for Female and Male Brook Trout are Plotted Separately

A total of 27 female brook trout had mature ovaries, and egg counts were performed on those ovaries. Table 4.31 provides the station of origin, length, weight, scale age, ovary weight, and number of eggs counted for these fish. No statistical analysis was undertaken for these fish, due to the small numbers reporting. The number of eggs per mature female brook trout is plotted as a function of weight in Figure 4.11.

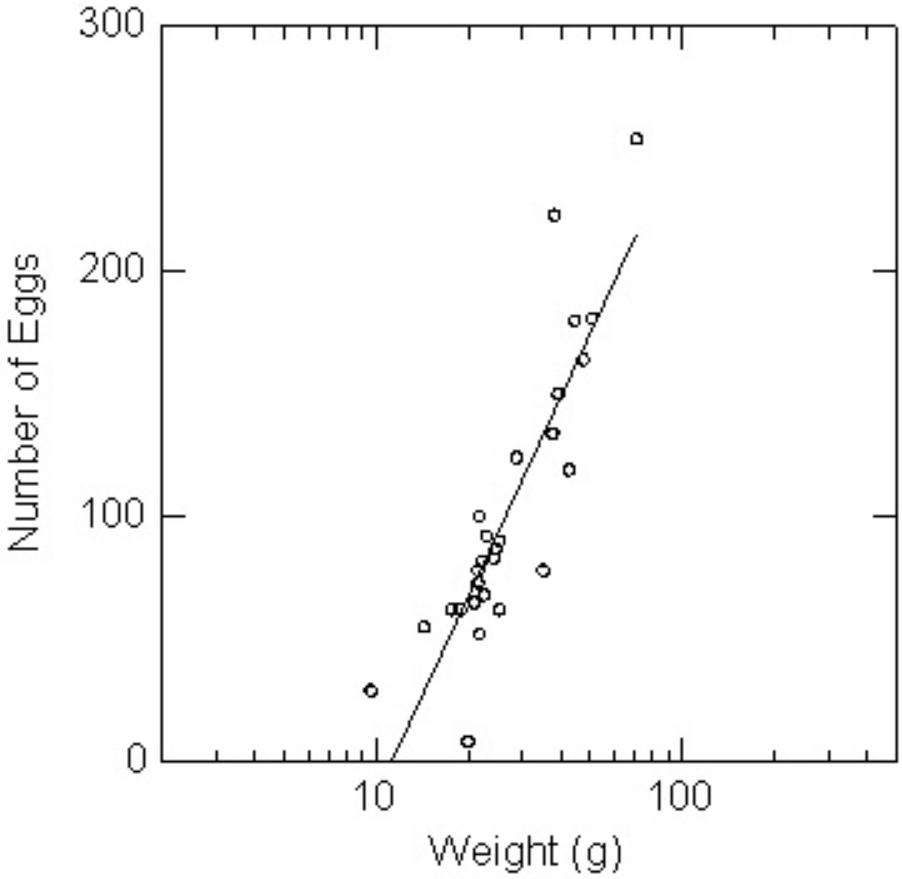


Figure 4.11 Number of Mature Eggs in Brook Trout Ovaries as a Function of Body Weight (g)

Table 4.31 Mature Female Brook Trout Length, Weight, Age, Ovary Weight and Number of Eggs Counted for Stations in the PDA and Study Area

Station	Length (mm)	Weight (g)	Scale Age (years)	Ovary Weight (g)	Egg Count (#)
B2A2	96	9.6	1	0.93	29
	114	14.32	2	1.75	55
	134	28.66	1	4.95	124
B3A9	116	17.59	2	1.67	62
	129	22.49	2	3.03	68
	133	21.73	3	1.93	52
	136	39.25	2	5.46	150
	147	35.08	2	4.86	78
M3C3	123	21.66	1	1.12	100
	160	44.51	2	2.63	180
	165	50.61	2	3.39	181
S2A2	124	22.93	2	2.46	92
	131	24.13	2	2.41	83
	133	25.23	2	3.1	90

Table 4.31 Mature Female Brook Trout Length, Weight, Age, Ovary Weight and Number of Eggs Counted for Stations in the PDA and Study Area

Station	Length (mm)	Weight (g)	Scale Age (years)	Ovary Weight (g)	Egg Count (#)
	146	38.29	2	3.05	223
S3A3	116	18.88	1	2.212	62
	129	21.46	2	2.99	73
	130	19.93	2	0.589	8
	135	25.25	1	3.225	62
W4A17	124	21.5	2	2.106	78
	131	20.89	2	2.299	65
	132	22.11	2	2.568	82
	138	24.62	2	3.349	87
	156	37.66	2	4.516	134
	168	47.35	2	6.797	164
	160	42.61	2	3.71	119
	186	70.64	2	10.277	254

4.6.2 Slimy Sculpin

Slimy sculpin were collected only at four of the ten stations where quantitative electrofishing was carried out. Table 4.32 list the ranges of weight and lengths of slimy sculpin collected. Insufficient slimy sculpin were collected at these stations to meet the target of 100 individuals for EEM purposes following the protocol for non-lethal sampling, and therefore statistical comparisons between stations were not attempted.

Table 4.32 Number of Slimy Sculpin Collected per Station, with Length and Weight Ranges for Captured Fish

Site	Total Number of Slimy Sculpin Collected	Length (mm) Range	Weight (g) Range
B2A2	11	50 to 86	1.23 to 6.07
B3A9	26	29 to 86	0.20 to 7.07
W4A17	22	37 to 101	0.56 to 12.48
W4A31	3	40 to 87	0.81 to 7.70

The relationship between weight and length and age has been shown to be an accurate predictor of certain age classes of slimy sculpin (CRI 2007). At stations sampled in the upper Saint John River, YOY fish are generally 55 mm or less in length (CRI 2007; Stantec 2010). It has also been found that the condition factors for male and female YOY sculpin that have not yet reached sexual maturity are not significantly different when sampled between June and September (Brasfield 2007; see also CRI 2007). Gray (2003) reported data for slimy sculpin from forested catchments in west-central New Brunswick. Most of the YOY fish reported by Gray were less than 40 mm in length, and the “catchable” proportion of the slimy sculpin population at those sites was often less than 25% of the total population. The relatively low proportion of YOY fish captured at the stations within the Study Area is therefore consistent with results presented by Gray (2003).

Figure 4.12 shows the relationship found between weight and length for collected slimy sculpin. There is no indication in Figure 4.12 that there may be differences in the length-weight relationships at different sampling stations; however, as noted above, formal statistical comparisons were not made due to a low sample size. It appears that YOY sculpin in the Study Area may be smaller than those collected in studies on the Saint John River, but are similar in length to those reported from forested catchments by Gray (2003), as fish less than 40 mm in length and approximately 1.0 g weight group distinctly from larger fish. Streams within the Study Area are likely cooler, less productive, and faster flowing than sites sampled on the upper Saint John River, and each of these factors could affect growth rate. The larger sculpin are likely aged 1+ years and older, with several fish greater than 90 mm in length, slightly larger than the largest fish reported by Gray (2003). The fish 50 mm in length and greater likely represent age classes 1+, 2+ and potentially 3+ years.

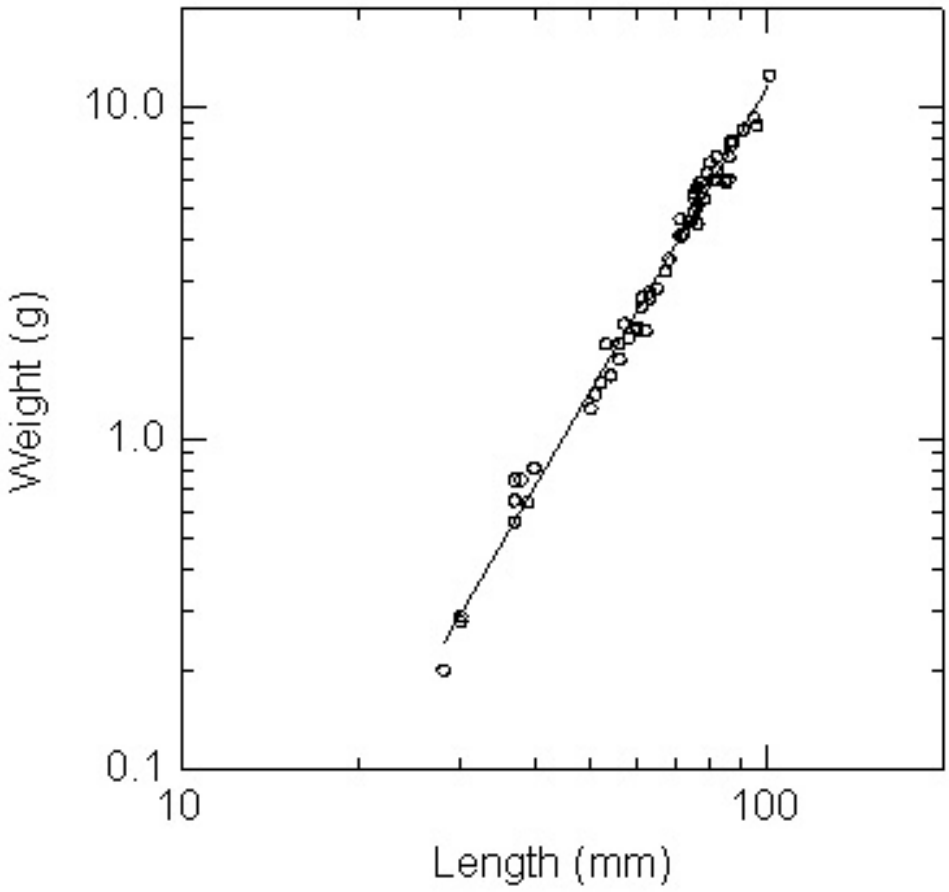


Figure 4.12 Body Weight (g) of Slimy Sculpin as a Function of Body Length (mm)

4.6.3 Summary of Fish Environmental Effects Monitoring

The key finding of the fish environmental effects monitoring is that the preferred (Environment Canada 2011) study design for EEM (*i.e.*, lethal sampling of 20 adult male and 20 adult female fish representing two species) is not likely to be successful for the Sisson Project, due to the generally low abundance of suitable fish species in the Study Area. Even assuming that with a high level of fishing effort, the required numbers could be obtained, repeated performance of this sampling methodology would be likely to have adverse effects on fish populations in the study reaches. On this basis, an alternative but less preferred methodology based on non-lethal sampling of two fish species to determine population structure and condition (Environment Canada 2011) is recommended for future work.

4.7 BENTHIC COMMUNITY ANALYSIS

The objective of the benthic invertebrate community survey was to evaluate the composition of the benthic invertebrate community present at representative stations within the watercourses of the PDA and Study Area. Benthic invertebrates represent a critical link in aquatic food webs, as they represent a wide range of feeding guilds, and are responsible for converting both non-living organic matter (*i.e.,* coarse and fine particulate organic matter and associated microbial assemblages) and living organic matter (including algal cells, microscopic multicellular animals, and other benthic invertebrates) into animal tissue that represents a major food resource for fish populations. The benthic invertebrate community survey was designed to meet the requirements of the Final EIA Guidelines and Terms of Reference (Stantec 2012c), to provide information on the benthic invertebrate community. In addition, benthic invertebrates represent a key component of most aquatic EEM programs, including the EEM program under the *MMER* required of operating metal mines that discharge mine effluent to fish habitat. Therefore, this benthic invertebrate community analysis is also patterned after studies required as part of EEM programs under the *MMER*, and is intended to provide baseline information that will be useful in the context of possible future obligations of the Project under the *MMER*.

The benthic invertebrate survey was conducted using kick nets as described in Section 3.4.4 between September 8 and 29, 2011. A total of 10 stations were sampled in concert with the quantitative electrofishing surveys (Section 4.3), corresponding to 2nd, 3rd and 4th order watercourses (Figure 3.4). The following locations were sampled:

- two stations from Bird Brook (B2A2 and B3A9);
- two stations from Sisson Brook (S2A2 and S3A2);
- one station from McBean Brook (M3C3);
- two stations from West Branch Napadogan Brook (W4A17 and W4A21);
- one station from East Branch Napadogan Brook (EBNB1);
- one station from Napadogan Brook (W4A31) below the confluence of the west and east branches; and
- one station from the Nashwaak River (NRC).

Based on the current Project Description (Stantec 2011b), stations on Bird Brook and Sisson Brook will eventually be lost or altered due to Project activities. These stations have been sampled for baseline purposes, but will not continue as stations in future EEM programs. McBean Brook may be affected either directly by habitat loss, or indirectly due to anticipated flow reduction caused by mine pit de-watering, but will not receive discharge of mine effluent. Stations W4A21 and W4A31 (exposure stations) are likely to be affected by flow reduction caused by water withholding from the present Bird and Sisson brooks, and could potentially receive discharge of mine effluent, to be determined in the EIA Report. Station W4A17 is an upstream reference station on West Branch Napadogan Brook, where the effects of the Project should be minimal. In selecting the reference stations, including W4A17, EBNB1 and NRC, care was taken to ensure that stream order, water depth and habitat types were closely matched between reference stations and exposure stations.

As part of the benthic community identification QA/QC protocol, 10% of the collected samples were re-sorted and re-identified to confirm that the original sorting recovered virtually all of the benthic invertebrates, and that the taxonomic identifications and counts were reproducible (detailed results can be found in Appendix E). Five samples out of 50 samples were re-sorted and results demonstrated that 94.8% to 99.4% of animals were recovered during the first sorting process. These recovery rates are considered acceptable according to standard practice. Three additional samples were fractionated to evaluate sub-sampling precision and accuracy: B3A9-2, EBNB1-3 and W4A21-2. Sample B3A9-2 was split into four individual sub-samples which were individually sorted, counted and then summed to represent the overall sample. Results from split samples were similar with precision ranging from 1.4% to 11.4% and accuracy ranging from 0.7% to 7.2%. Using the same approach, samples EBNB1-3 and W4A21-2 were split into two individual samples, sorted, counted and summed to represent overall samples. Results from split samples were again similar, with precisions of 2.5% (W4A21-2) and 7.8% (EBNB1-3) and accuracies of 1.3% (W4A21-2) and 4.1% (EBNB1-3). These precisions and accuracies are acceptable according to standard practice.

4.7.1 Supporting Environmental Measurements

Environmental effects monitoring programs carried out under the *MMER* require collection of supporting environmental measurements to aid in the interpretation of study results. These supporting measurements can include estimates of the dimensions of the mine effluent plume (not a consideration for this baseline study), as well as collection of water and sediment samples to characterize environmental conditions. Water and sediment sampling was carried out at the benthic sampling stations during both the initial habitat surveys (prior to benthic sampling), and in at the same time as the benthic sampling was completed. These results are presented in Sections 4.4.1 and 4.4.2, and Appendix D of this report, and will be referred to as needed to support the interpretation of the benthic invertebrate data.

As discussed in Section 4.4., water quality measurements included, but were not limited to, the following physical and chemical parameters:

- temperature, dissolved oxygen, specific conductivity, and pH taken in the field;
- nutrients including ammonia nitrogen, nitrite+nitrate nitrogen, total Kjeldahl nitrogen, total phosphorus, and ortho-phosphorus;

- total suspended solids and turbidity;
- total organic carbon;
- general chemistry parameters representing major anions and cations; and
- a suite of trace elements including total mercury and tungsten.

4.7.2 Statistical Analysis of Benthic Invertebrate Data

Statistical analysis of benthic invertebrates can be divided into two main processes, loosely characterized as "univariate analysis" and "multivariate analysis". In univariate analysis, individual parameters, indices or measures are calculated from the aggregated data, and statistical techniques such as ANOVA are used to determine whether a statistically-significant difference exists between sampling stations. In multivariate analysis, either parametric or non-parametric multivariate statistical methods may be applied to identify patterns, trends or correlations within the overall dataset, and to relate those to the prevailing environmental conditions. Determination of statistical significance is usually of lesser importance in multivariate analysis than identifying relationships that may be predictive or causal, and can be tested in subsequent investigations.

4.7.2.1 Univariate Analysis

The following endpoints were used to characterize the baseline condition of the benthic invertebrate community:

- taxonomic richness (richness, dimensionless);
- total invertebrate abundance (abundance, individuals/m^2);
- Simpson's diversity index (diversity, dimensionless);
- Simpson's evenness index (evenness, dimensionless); and
- Bray-Curtis index of dissimilarity (Bray-Curtis index, dimensionless).

These data correspond to endpoints used in the determination of effects as per the Technical Guidance for EEM under the *MMER*, and were calculated following guidance prepared by Environment Canada (2011). High Richness, Abundance and Diversity and Evenness are all considered to be indicators of good environmental quality. A low Bray-Curtis index when two stations are compared would indicate that the benthic communities at those stations are strongly similar, whereas a high Bray-Curtis index would indicate differences between the benthic communities.

The Richness (*i.e.,* total number of taxa present in one or more samples from any given station), total abundance (*i.e.,* number of invertebrates per m^2), Diversity, Evenness, and Bray-Curtis indices were calculated for each sample and are presented in Table 4.33.

Table 4.33 Benthic Invertebrate Community Descriptors

Replicate	Richness (# species)	Abundance (# individuals/m^2)	Diversity	Evenness	Bray-Curtis
Station B2A2					
1	40	824	0.913	0.287	0.853
2	49	1,918	0.923	0.265	0.592
3	49	1,111	0.928	0.283	0.748
4	35	1,079	0.887	0.253	0.726
5	39	1,333	0.920	0.320	0.707
Average	**42**	**1,253**	**0.914**	**0.282**	**0.725**
Median	**40**	**1,111**	**0.920**	**0.283**	**0.726**
Std. Dev.	**6**	**413**	**0.016**	**0.025**	**0.093**
Station B3A9					
1	30	4,470	0.736	0.126	0.373
2	47	2,889	0.852	0.144	0.399
3	47	5,333	0.726	0.078	0.363
4	42	3,186	0.848	0.157	0.291
5	40	2,767	0.897	0.243	0.396
Average	**41**	**3,729**	**0.812**	**0.149**	**0.364**
Median	**42**	**3,186**	**0.848**	**0.144**	**0.373**
Std. Dev.	**7**	**1,123**	**0.076**	**0.060**	**0.044**
Station S2A2					
1	44	9,151	0.893	0.213	0.551
2	45	5,154	0.939	0.362	0.575
3	46	2,523	0.874	0.173	0.802
4	43	2,470	0.909	0.256	0.715
5	46	5,315	0.903	0.225	0.632
Average	**45**	**4,923**	**0.904**	**0.246**	**0.655**
Median	**45**	**5,154**	**0.903**	**0.225**	**0.632**
Std. Dev.	**1**	**2,732**	**0.024**	**0.071**	**0.104**
Station S3A3					
1	33	1,258	0.866	0.227	0.671
2	42	1,165	0.898	0.232	0.681
3	46	2,283	0.906	0.232	0.527
4	49	2,470	0.902	0.209	0.624
5	39	1,179	0.892	0.238	0.718
Average	**42**	**1,671**	**0.893**	**0.228**	**0.644**
Median	**42**	**1,258**	**0.898**	**0.232**	**0.671**
Std. Dev.	**6**	**648**	**0.016**	**0.011**	**0.074**
Station M3C3					
1	45	4,978	0.876	0.179	0.699
2	48	2,710	0.922	0.268	0.659
3	47	2,642	0.900	0.214	0.719
4	48	1,907	0.835	0.126	0.792
5	49	7,645	0.898	0.199	0.762
Average	**47**	**3,976**	**0.886**	**0.197**	**0.726**
Median	**48**	**2,710**	**0.898**	**0.199**	**0.719**
Std. Dev.	**2**	**2,352**	**0.033**	**0.052**	**0.052**

Table 4.33 Benthic Invertebrate Community Descriptors

Replicate	Richness (# species)	Abundance (# individuals/m^2)	Diversity	Evenness	Bray-Curtis
Station W4A17					
1	39	5,534	0.818	0.141	0.239
2	47	8,606	0.886	0.186	0.328
3	46	3,713	0.857	0.152	0.169
4	42	4,495	0.932	0.349	0.245
5	48	4,860	0.927	0.285	0.190
Average	**44**	**5,442**	**0.884**	**0.223**	**0.234**
Median	**46**	**4,860**	**0.886**	**0.186**	**0.239**
Std. Dev.	**4**	**1,887**	**0.048**	**0.091**	**0.062**
Station W4A21					
1	35	2,179	0.937	0.450	0.709
2	39	1,434	0.928	0.354	0.720
3	44	2,197	0.936	0.355	0.625
4	41	2,427	0.940	0.407	0.633
5	47	2,100	0.933	0.316	0.641
Average	**41**	**2,067**	**0.935**	**0.376**	**0.665**
Median	**41**	**2,179**	**0.936**	**0.355**	**0.641**
Std. Dev.	**5**	**374**	**0.005**	**0.052**	**0.045**
Station W4A31					
1	42	1,763	0.920	0.298	0.665
2	51	2,925	0.937	0.310	0.663
3	48	1,545	0.925	0.279	0.724
4	47	3,480	0.915	0.251	0.534
5	47	3,093	0.920	0.265	0.708
Average	**47**	**2,561**	**0.923**	**0.281**	**0.659**
Median	**47**	**2,925**	**0.920**	**0.279**	**0.665**
Std. Dev.	**3**	**856**	**0.008**	**0.024**	**0.075**
Station EBNB1					
1	51	2,172	0.956	0.449	0.607
2	57	1,663	0.957	0.409	0.689
3	61	932	0.961	0.422	0.772
4	50	1,251	0.941	0.340	0.772
5	47	921	0.947	0.403	0.825
Average	**53**	**1,388**	**0.953**	**0.405**	**0.733**
Median	**51**	**1,251**	**0.956**	**0.409**	**0.772**
Std. Dev.	**6**	**533**	**0.008**	**0.040**	**0.086**
Station NRC					
1	57	4,384	0.925	0.235	0.656
2	54	1,269	0.909	0.204	0.721
3	52	3,430	0.915	0.225	0.665
4	52	2,559	0.912	0.218	0.677
5	62	3,133	0.931	0.234	0.571
Average	**55**	**2,955**	**0.918**	**0.223**	**0.658**
Median	**54**	**3,133**	**0.915**	**0.225**	**0.665**
Std. Dev.	**4**	**1,151**	**0.009**	**0.013**	**0.055**

Notes:
1) Bray-Curtis index is referenced to the median condition at station W4A17.

Numerically dominant benthic invertebrate taxa encountered included water mites (Acarina), beetles (*Optioservus*, *Oulimnius* and *Promoresia*), mayflies (*Ephemerella*, *Eurylophella*, *Habrophlebia* and *Paraleptophlebia*), stonefly (*Sweltsa*), caddisflies (*Hydropsyche* and *Lepidostoma*) and fingernail clams (*Pisidium*). Richness was very high, with many stations supporting in excess of 50 taxa. This is a strong indicator of good environmental quality, also supported by the high Diversity values (generally greater than 0.9).

The taxonomic composition of the benthic community data were broadly summarized using the EPT:C index, where the abundance of pollution-sensitive taxa such as mayflies, stoneflies and caddisflies (the families Ephemeroptera, Plecoptera and Trichoptera, or collectively EPT) is compared to the abundance of a generally pollution-tolerant taxon (*e.g.,* midges or Chironomidae) (Table 4.34). The EPT:C metric ranged by sample from a low of 0.84 (B2A2-1) to a high of 22.25 (B3A9-1). Taken as the average for each station, this metric ranged from a low of 3.11 (B2A2) to a high of 13.48 (B3A9), with values typically above 5. These values indicate a generally high abundance of the EPT taxa, and are suggestive of high water quality.

Table 4.34 Summary of Benthic Invertebrate Taxonomic Composition as EPT:C

Replicate	EPT (#/sample)	EPT (% in sample)	Chironomidae (C) (#/sample)	Chironomidae (C) (% in sample)	EPT:C
Station B2A2					
1	151	18.3%	179	21.7%	0.84
2	803	41.9%	118	6.2%	6.79
3	283	25.5%	136	12.3%	2.08
4	384	35.5%	115	10.6%	3.34
5	384	28.8%	154	11.6%	2.49
Average	**401**	**30.0%**	**141**	**12.5%**	**3.11**
Median	**384**	**28.8%**	**136**	**11.6%**	**2.49**
Std. Dev.	**244**	**9.1%**	**27**	**5.7%**	**2.25**
Station B3A9					
1	638	14.3%	29	0.6%	22.25
2	1,129	39.1%	86	3.0%	13.13
3	978	18.3%	75	1.4%	13.00
4	1,007	31.6%	86	2.7%	11.71
5	867	31.3%	118	4.3%	7.33
Average	**924**	**26.9%**	**79**	**2.4%**	**13.48**
Median	**978**	**31.3%**	**86**	**2.7%**	**13.00**
Std. Dev.	**185**	**10.3%**	**32**	**1.4%**	**5.44**
Station S2A2					
1	3,742	40.9%	444	4.9%	8.42
2	2,247	43.6%	373	7.2%	6.03
3	1,462	58.0%	215	8.5%	6.80
4	1,452	58.8%	294	11.9%	4.94
5	2,272	42.8%	602	11.3%	3.77
Average	**2,235**	**48.8%**	**386**	**8.8%**	**5.99**
Median	**2,247**	**43.6%**	**373**	**8.5%**	**6.03**
Std. Dev.	**933**	**8.8%**	**148**	**2.9%**	**1.77**

Table 4.34 Summary of Benthic Invertebrate Taxonomic Composition as EPT:C

Replicate	EPT (#/sample)	EPT (% in sample)	Chironomidae (C) (#/sample)	Chironomidae (C) (% in sample)	EPT:C
Station S3A3					
1	516	41.0%	39	3.1%	13.09
2	502	43.1%	39	3.4%	12.73
3	1,108	48.5%	168	7.4%	6.57
4	935	37.9%	161	6.5%	5.80
5	416	35.3%	93	7.9%	4.46
Average	**695**	**41.2%**	**100**	**5.7%**	**8.53**
Median	**516**	**41.0%**	**93**	**6.5%**	**6.57**
Std. Dev.	**306**	**5.1%**	**63**	**2.3%**	**4.07**
Station M3C3					
1	1,720	34.6%	444	8.9%	3.87
2	1,409	52.0%	151	5.6%	9.36
3	771	29.2%	215	8.1%	3.58
4	194	10.2%	168	8.8%	1.15
5	3,588	46.9%	588	7.7%	6.10
Average	**1,536**	**34.6%**	**313**	**7.8%**	**4.81**
Median	**1,409**	**34.6%**	**215**	**8.1%**	**3.87**
Std. Dev.	**1,289**	**16.4%**	**193**	**1.4%**	**3.09**
Station W4A17					
1	1,803	32.6%	247	4.5%	7.29
2	3,208	37.3%	803	9.3%	4.00
3	1,373	37.0%	179	4.8%	7.66
4	2,194	48.8%	344	7.7%	6.38
5	1,767	36.4%	473	9.7%	3.73
Average	**2,069**	**38.4%**	**409**	**7.2%**	**5.81**
Median	**1,803**	**37.0%**	**344**	**7.7%**	**6.38**
Std. Dev.	**700**	**6.1%**	**246**	**2.5%**	**1.84**
Station W4A21					
1	1,731	79.4%	258	11.8%	6.71
2	961	67.0%	176	12.3%	5.47
3	1,577	71.8%	215	9.8%	7.33
4	1,731	71.3%	258	10.6%	6.71
5	1,487	70.8%	194	9.2%	7.69
Average	**1,497**	**72.1%**	**220**	**10.7%**	**6.78**
Median	**1,577**	**71.3%**	**215**	**10.6%**	**6.71**
Std. Dev.	**318**	**4.5%**	**37**	**1.3%**	**0.84**
Station W4A31					
1	1,097	62.2%	93	5.3%	11.77
2	1,677	57.4%	645	22.1%	2.60
3	1,022	66.1%	57	3.7%	17.81
4	1,918	55.1%	172	4.9%	11.15
5	1,943	62.8%	746	24.1%	2.61
Average	**1,531**	**60.7%**	**343**	**12.0%**	**9.19**
Median	**1,677**	**62.2%**	**172**	**5.3%**	**11.15**
Std. Dev.	**444**	**4.4%**	**327**	**10.1%**	**6.55**

Table 4.34 Summary of Benthic Invertebrate Taxonomic Composition as EPT:C

Replicate	EPT (#/sample)	EPT (% in sample)	Chironomidae (C) (#/sample)	Chironomidae (C) (% in sample)	EPT:C
Station EBNB1					
1	1,355	62.4%	237	10.9%	5.73
2	1,025	61.6%	108	6.5%	9.53
3	473	50.8%	104	11.2%	4.55
4	667	53.3%	147	11.7%	4.54
5	552	59.9%	133	14.4%	4.16
Average	**814**	**57.6%**	**146**	**10.9%**	**5.70**
Median	**667**	**59.9%**	**133**	**11.2%**	**4.55**
Std. Dev.	**369**	**5.2%**	**54**	**2.9%**	**2.22**
Station NRC					
1	2,688	61.3%	695	15.9%	3.87
2	932	73.4%	100	7.9%	9.29
3	2,147	62.6%	344	10.0%	6.24
4	1,785	69.7%	276	10.8%	6.47
5	1,606	51.3%	233	7.4%	6.89
Average	**1,832**	**63.7%**	**330**	**10.4%**	**6.55**
Median	**1,785**	**62.6%**	**276**	**10.0%**	**6.47**
Std. Dev.	**651**	**8.6%**	**223**	**3.4%**	**1.93**

4.7.2.1.1 Analysis of Variance (ANOVA)

Analysis of variance was used to evaluate whether there were significant differences present between the abundance, richness, diversity, evenness, Bray-Curtis and EPT indices of benthic invertebrates at the various stations. Prior to statistical analysis, the data for abundance and richness were log_{10}-transformed in order to improve the homogeneity of the variances. The statistical analysis was based on five replicate samples collected at each of the ten sampling stations representing various watercourses and watercourse orders. Significant differences were evaluated following Environment Canada (2011) technical guidance. The significance of a statistical result is expressed as a "p" value (e.g., $p<0.001$ which would indicate that the probability of a result occurring by chance would be less than one in one thousand). Following the convention recommended by Environment Canada (2011), a determination of significance with respect to a difference in the benthic invertebrate community between any two stations is made at a p value of 0.1 ($p=0.1$).

Benthic Invertebrate Abundance

There were significant differences in abundance of benthic invertebrates between sampling stations detected by ANOVA (log_{10}-transformed data, $p<0.001$, Table 4.35, Figure 4.13). Subsequent testing using Tukey's HSD test (see Appendix E) revealed that total abundance was:

- significantly lower at B2A2 when compared to B3A9, M3C3, NRC, S2A2 and W4A17;
- significantly lower at EBNB1 when compared to M3C3, S2A2 and W4A17;
- significantly lower at S3A3 when compared to S2A2, M3C3, B3A9 and W4A17; and

- significantly lower at W4A21 when compared to W4A17.

There were no other significant differences among stations. Further examination of the data using a Spearman correlation matrix showed that there were no meaningful correlations (correlation coefficient, r > +0.700, or r < -0.700) between abundance and supporting measurements (*i.e.,* sediment and water quality parameters). Such correlations, if identified, could provide hypotheses regarding the underlying cause of differences between benthic invertebrate communities at different locations. There was no clear explanation for the statistically significant differences that were identified between stations.

Table 4.35 ANOVA for Log10-transformed Abundance of Benthic Invertebrates

Source	Sum of Squares	Degree of Freedom	Mean Square	F-ratio	p
Station	2.177	9	0.242	8.127	<0.001
Error	1.190	40	0.030		

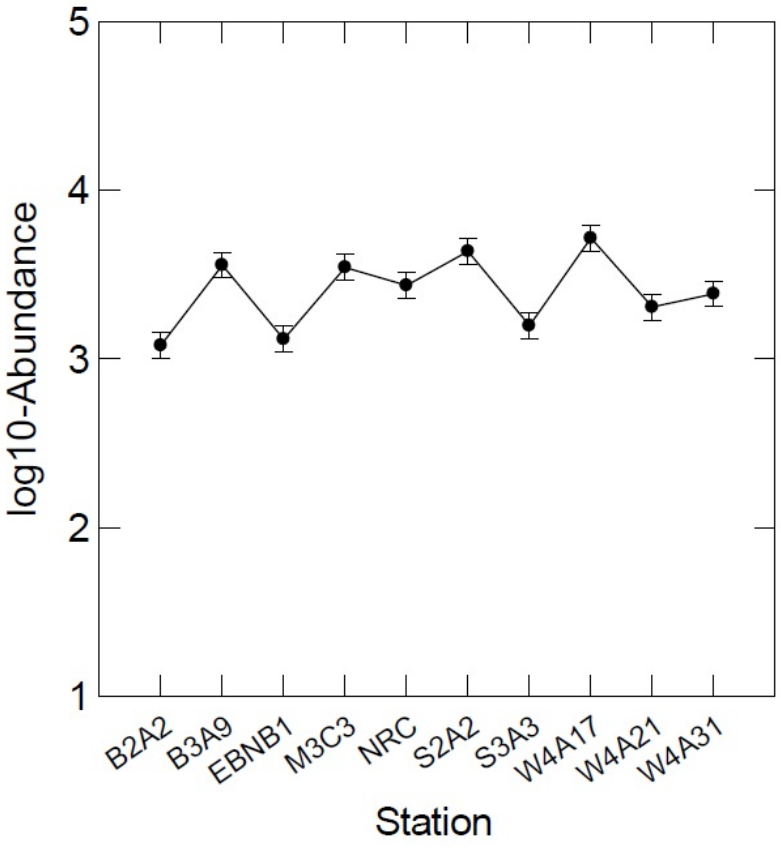


Figure 4.13 Adjusted Station Mean of Log 10-transformed Abundance

Richness

There were significant differences in richness of benthic invertebrates between sampling stations detected by ANOVA (log_{10}-transformed data, p<0.001, Table 4.36, Figure 4.14). Subsequent testing using Tukey's HSD test (see Appendix E) revealed that richness was:

- significantly higher at EBNB1 when compared to stations B2A2, B3A9, S3A3 and W4A21; and
- significantly higher at NRC when compared to B2A2, B3A9, S3A3, W4A17 and W4A21.

There were no other significant differences among stations. Further examination of the data using a Spearman correlation matrix showed that there were no meaningful correlations ($r > +0.700$, or $r < -0.700$) between richness and supporting measurements (*i.e.,* sediment and water quality parameters). There was no clear explanation for the statistically significant differences that were identified between stations.

Table 4.36 ANOVA for Log10-transformed Taxonomic Richness of Benthic Invertebrates

Source	Sum of Squares	Degree of Freedom	Mean Square	F-ratio	p
Station	0.097	9	0.011	4.633	<0.001
Error	0.093	40	0.002		

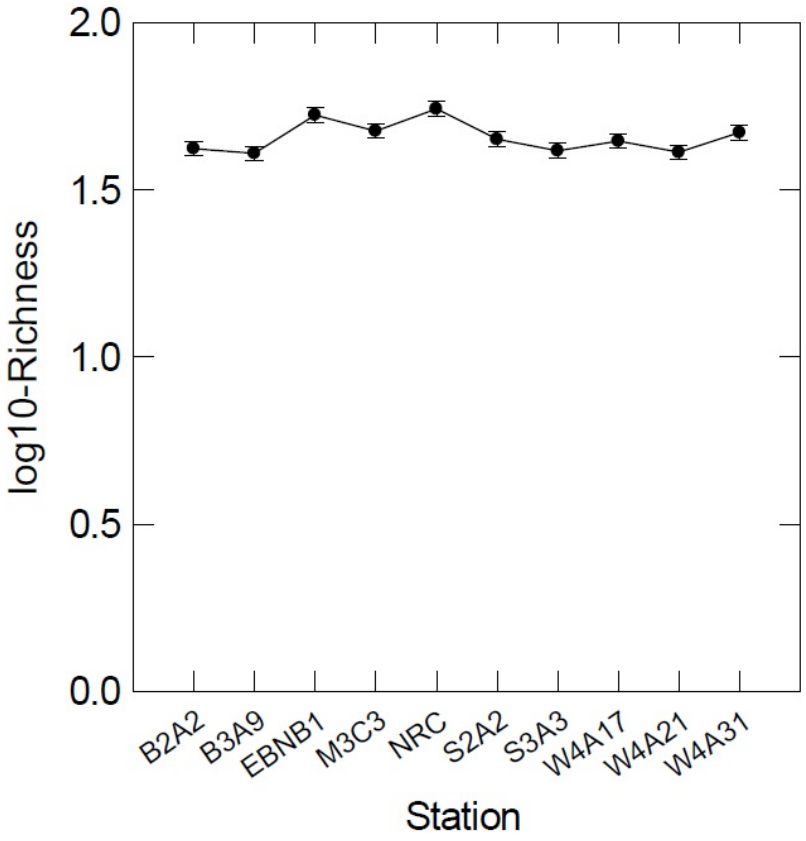


Figure 4.14 Adjusted Station Mean of Log 10-transformed Richness

Diversity

There were significant differences in diversity of benthic invertebrates between sampling stations detected by ANOVA ($p<0.001$, Table 4.37, Figure 4.15). Subsequent testing using Tukey's HSD test (see Appendix E) revealed that diversity was:

- significantly lower at B3A9 when compared to all other stations;
- significantly lower at M3C3 when compared to station EBNB1; and
- significantly lower at W4A17 when compared to EBNB1.

There were no other significant differences among stations. Further examination of the data using a Spearman correlation matrix showed that there were no meaningful correlations ($r > +0.700$, or $r < -0.700$) between diversity and supporting measurements (*i.e.,* sediment and water quality parameters). There was no clear explanation for the statistically significant differences that were identified between stations.

Table 4.37 ANOVA for Diversity

Source	Sum of Squares	Degree of Freedom	Mean Square	F-ratio	p
Station	0.066	9	0.007	7.003	<0.001
Error	0.042	40	0.001		

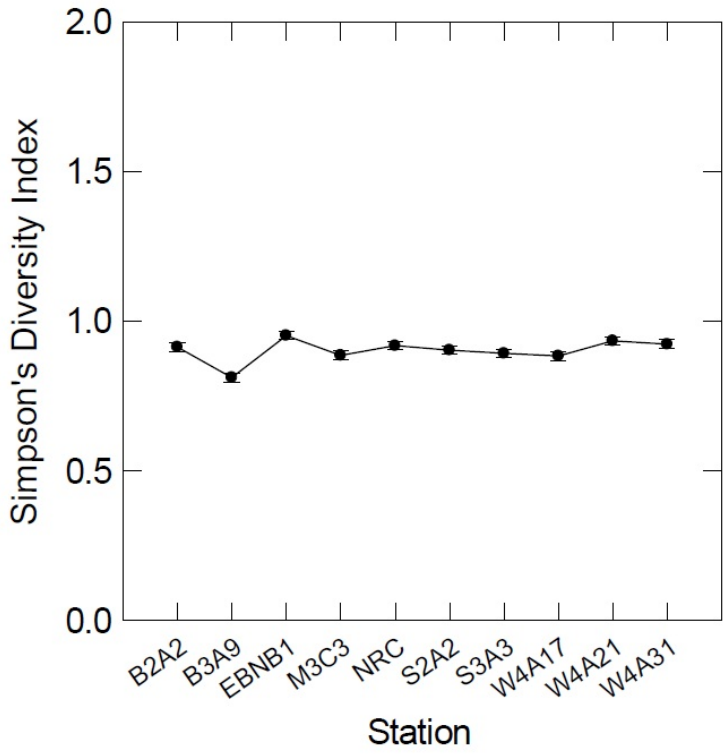


Figure 4.15 Adjusted Station Mean of Diversity

Evenness

There were significant differences in evenness of benthic invertebrates between sampling stations detected by ANOVA ($p<0.001$, Table 4.37, Figure 4.16). Subsequent testing using Tukey's HSD test (see Appendix E) revealed that evenness was:

- significantly higher at B2A2 when compared to B3A9;
- significantly higher at EBNB1 when compared to B2A2, B3A9, M3C3, NRC, S2A2, S3A3, W4A17 and W4A31;
- significantly higher at W4A21 when compared to B3A9, M3C3, NRC, S2A2, S3A3 and W4A17; and
- significantly higher at W4A31 when compared to B3A9.

There were no other significant differences among stations. Further examination of the data using a Spearman correlation matrix showed that there were no meaningful correlations ($r > +0.700$, or $r < -0.700$) between Evenness and supporting measurements (*i.e.,* sediment and water quality parameters). There was no clear explanation for the statistically significant differences that were identified between stations.

Table 4.38 ANOVA for Evenness

Source	Sum of Squares	Degree of Freedom	Mean Square	F-ratio	p
Station	0.277	9	0.031	12.095	<0.001
Error	0.102	40	0.003		

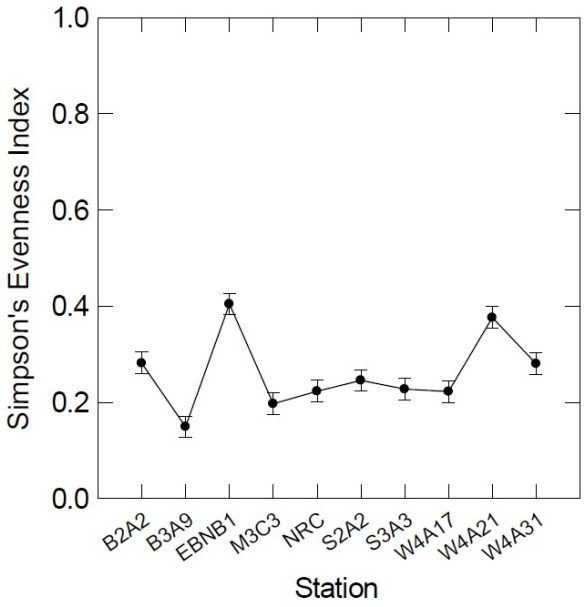


Figure 4.16 Adjusted Station Mean of Evenness

Bray-Curtis Index

There were significant differences in the Bray-Curtis index of benthic invertebrates between sampling stations, when compared against the median value for Station W4A17 as a reference point, detected by ANOVA ($p<0.001$, Table 4.39, Figure 4.17). Station W4A17 was selected as the primary reference station because it is located in the West Branch Napadogan watershed, upstream of the confluence with Sisson Brook, and in terms of physical location within the overall watershed, represents a "typical" site that should persist in a relatively undisturbed condition throughout the life of the Project. Subsequent testing using Tukey's HSD test (see Appendix E) revealed that Bray-Curtis index was:

- significantly lower at B3A9 when compared to other stations (*i.e.,* station B3A9 is rather similar to W4A17); and
- significantly lower at W4A17 (used for comparison in Bray-Curtis index calculations) when compared to other stations.

There were no other significant differences among stations. Further examination of the data using a Spearman correlation matrix showed that there were no meaningful correlations ($r > +0.700$, or $r < -0.700$) between Bray-Curtis index and supporting measurements (*i.e.,* sediment and water quality parameters).

The use of the Bray-Curtis index as outlined in the Environment Canada (2011) technical guidance for EEM studies, however, is methodologically flawed. It is self-evident that when a particular reference station is compared to its own median characteristics, it will be found to be very close to that median. Likewise, when other stations are compared to that reference station, they will be found to be less similar to the reference than it is to itself. The test was included here only because it is a required component of EEM programs under the *MMER*.

Table 4.39 ANOVA for Bray-Curtis Index

Source	Sum of Squares	Degree of Freedom	Mean Square	F-ratio	p
Station	1.271	9	0.141	27.566	<0.001
Error	0.205	40	0.005		

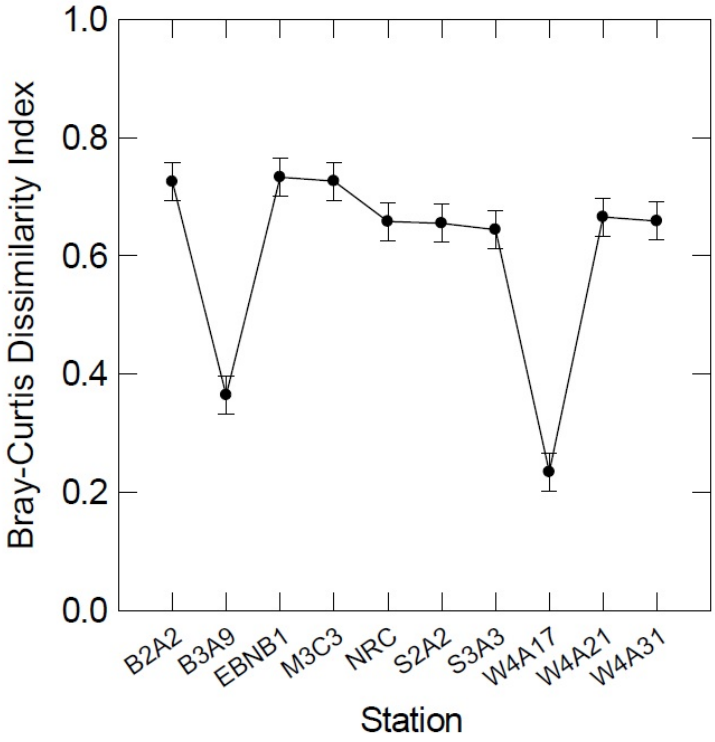


Figure 4.17 Least Mean Square, of Adjusted Station Mean, Showing Direction of Effect of Bray-Curtis Index

EPT:C Index

There were significant differences in the EPT:C Index for benthic invertebrates between sampling stations detected by ANOVA (p=0.003, Table 4.40, Figure 4.18). Subsequent testing using Tukey's HSD test (see Appendix E) revealed that the EPT/C index was:

- significantly higher at B3A9 when compared to B2A2, EBNB1, M3C3, NRC, S2A2, W4A17 and W4A21.

There were no other significant differences among stations. Further examination of the data using a Spearman correlation matrix showed that there were no meaningful correlations ($r > +0.700$, or $r < -0.700$) between EPT:C Index and supporting measurements (*i.e.,* sediment and water quality parameters). There was no clear explanation for the statistically significant differences that were identified between stations.

Table 4.40 ANOVA for EPT:C Index

Source	Sum of Squares	Degree of Freedom	Mean Square	F-ratio	p
Station	367.329	9	40.814	3.415	0.003
Error	478.001	40	11.950		

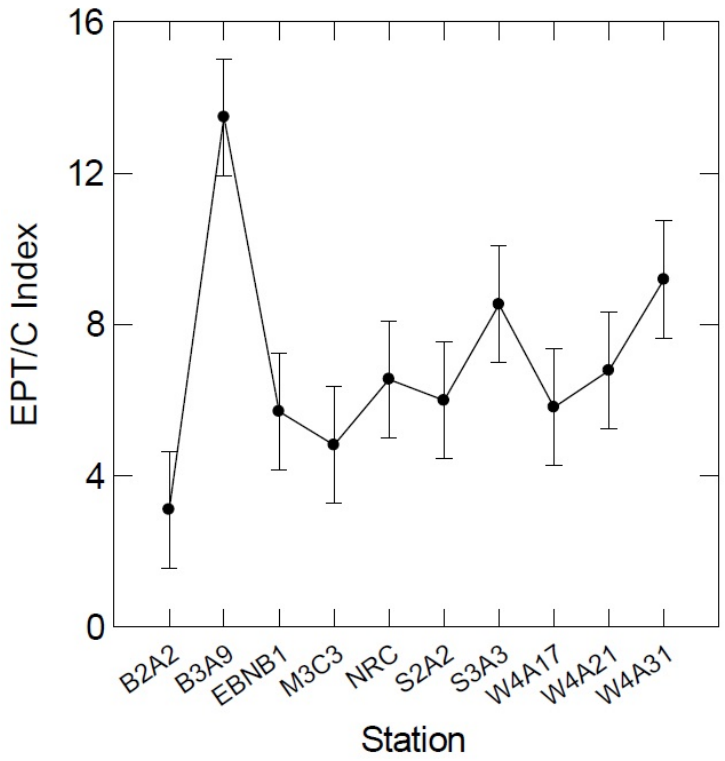


Figure 4.18 Adjusted Station Mean of EPT:C Index

4.7.2.1.2 Multivariate Analysis

The benthic invertebrate community data were investigated using non-metric multidimensional scaling (NMDS). NDMS is a non-parametric ordination technique that can be used to explore similarities and differences between benthic communities and to identify fundamental structures and relationships in the data.

The benthic invertebrate abundance data were compared using a Spearman (non-parametric) correlation matrix. This was done to measure the overall likeness between the assemblages captured in each sample. The Spearman correlation matrix was then used as the basis for NMDS, the results being plotted in two dimensions. The two-dimensional plot allows the overall relationships between stations in a complex multi-species data set to be presented with minimal loss of information.

The Spearman correlation matrix was also used as the basis for a cluster analysis (Euclidean distance, complete linkage algorithm), that provides complementary information about overall similarities and dissimilarities in the taxonomic data. The cluster analysis (Figure 4.19) broadly divided the set of samples into groupings that reflected the sampling stations, with little overlap between clusters. This indicates that the benthic invertebrate communities collected at each station were in some way distinct, and that these distinctions were replicated across samples collected at each station.

The NMDS ordination plot for the benthic invertebrate data is shown in Figure 4.20. Based on the ordination plot, there are clear distinctions between the different watercourses, and between different watercourse orders. The NMDS plot also confirms the segregation of samples according to sampling

station that was observed in the cluster tree. Fourth order (*i.e.,* large) watercourses W4A17, W4A21, W4A31 and NRC are generally found on the right side of NMDS Dimension 1. Second order (*i.e.,* small) watercourses B2A2 and S2A2 are found on the left side of NMDS Dimension-1, and third order watercourses B3A9, S3A3 and M3C3 generally position in between second and fourth order watercourses. In addition, samples collected from West Branch Napadogan Brook and Napadogan Brook (*i.e.,* W4A17, W4A21 and W4A31), Sisson Brook (*i.e.,* S2A2 and S3A3) and Bird Brook (*i.e.,* B2A2 and B3A9) show affinities based on stream that are stronger than affinities based on stream order.

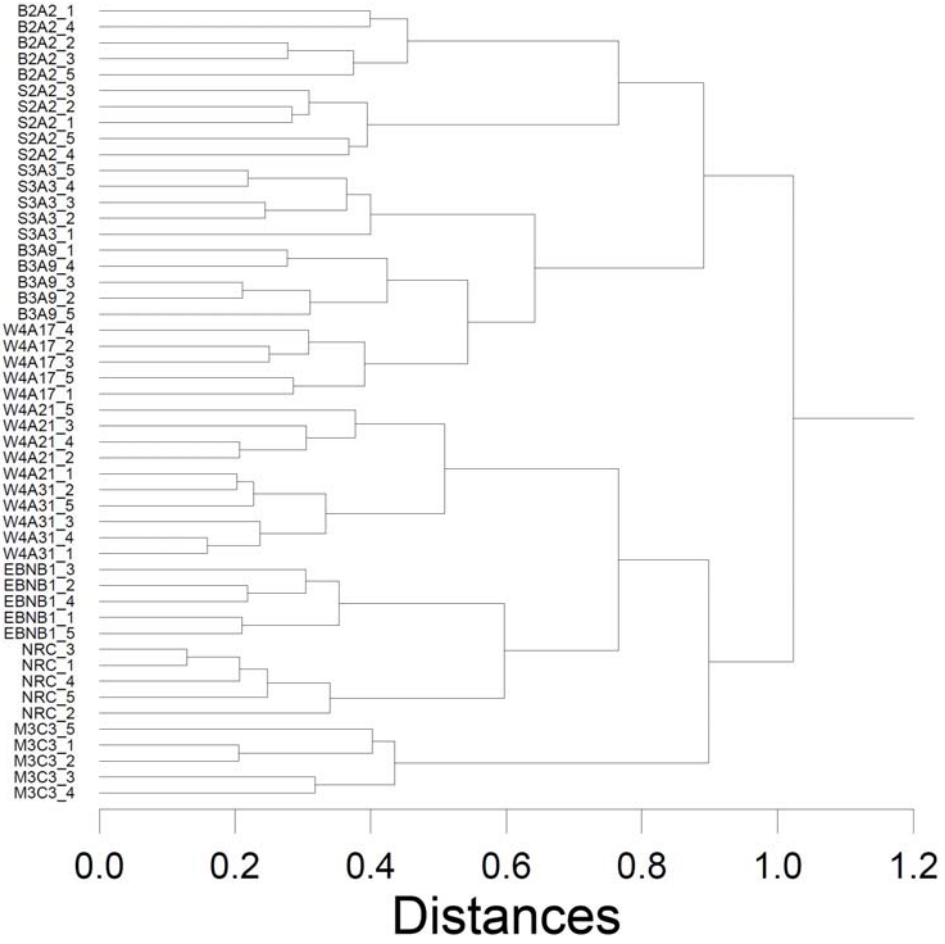


Figure 4.19 Cluster Tree Showing Relationships Between Individual Benthic Samples

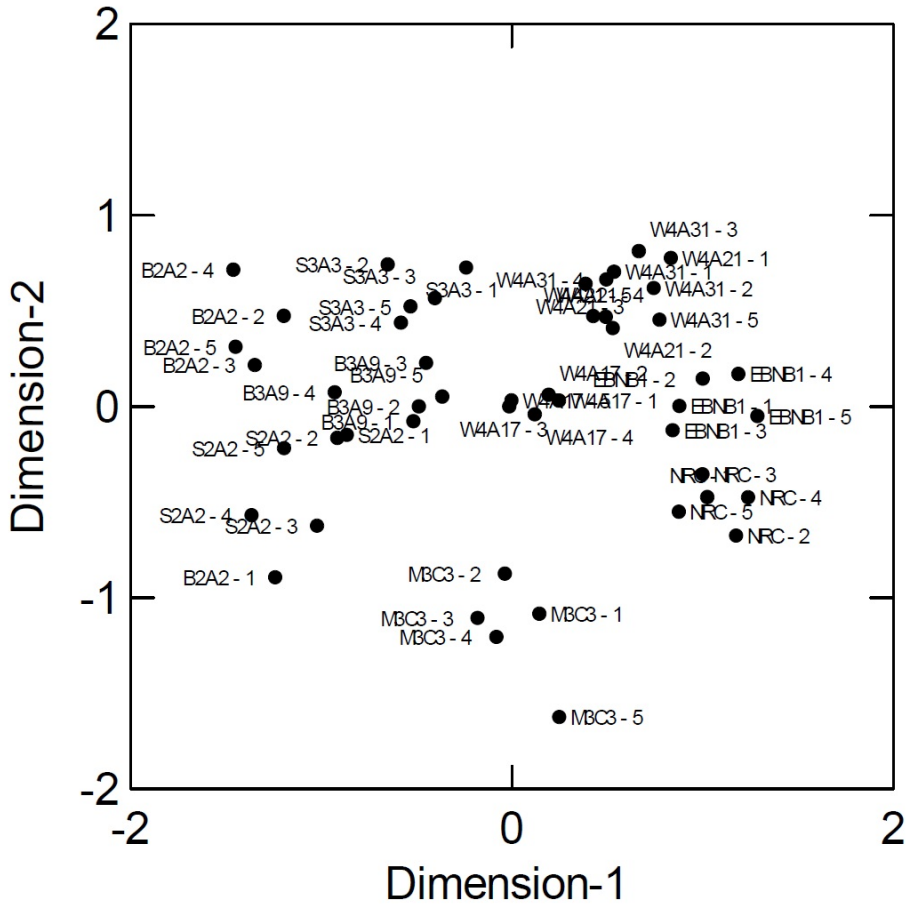


Figure 4.20 Ordination Plot Showing Relationships Between Individual Benthic Samples

Physical causes for the clusters or station distribution in NMDS were explored by examining simple correlations to predict NMDS Dimension-1 and Dimension-2 scores from supporting environmental measures. These correlation coefficients (r-values) are plotted as vectors in Figure 4.21. The analysis was limited to parameters (such as water and sediment chemistry data) with at least 50% detection. The Pearson correlation analysis found noteworthy regression coefficients (*i.e.*, r > 0.700) between NMDS Dimension-1 scores and alkalinity (r = 0.789), conductivity (r = 0.810), bicarbonate (r = 0.774), cation sum (r = 0.888), theoretical conductivity (r = 0.748), hardness (r = 0.889), calcium (r = 0.906), sediment nickel (r = 0.700), specific conductivity (r = 0.784), and field pH (r = 0.759). No noteworthy regression coefficients were identified for NMDS Dimension-2 scores.

These vectors demonstrate that samples situated to the right of the NMDS ordination plot were characterized by higher concentrations of a suite of strongly inter-correlated water quality parameters including alkalinity, bicarbonate, calcium, hardness, cation sum, specific conductivity and pH, particularly at stations EBNB1, NRC and W4A17.

Correlations were also examined between the abundance of predominant benthic invertebrates and NMDS Dimension-1 and Dimension-2 scores (Figure 4.22 and Appendix E). The following taxa had Spearman correlation coefficients that exceeded an arbitrary r-value of 0.700:

- positive on Dimension-1: *Rhithrogena* (r = 0.762), *Epeorus* (r = 0.796), *Leucrocuta* (r = 0.784), *Agnetina* (r = 0.710), *Agapetus* (r = 0.703), and *Ferrissia* (r = 0.754); and
- positive on Dimension-2: *Sweltsa* (r = 0.793).

Mayflies *Rhithrogena*, *Epeorus* and *Leucrocuta*, stonefly *Agnetina* and caddisfly *Agapetus*, which correlated positively with Dimension-1, were generally found in highest numbers in samples collected from West Branch Napadogan Brook and Nashwaak River (4th order watercourses) and East Branch Napadogan Brook (a 3rd order watercourse). The snail *Ferrissia* was found in highest numbers in samples collected from the Nashwaak River and East Branch Napadogan Brook. It is unclear whether these taxa are responding directly to stream order, or whether they may be responding to water quality (higher pH and water hardness), which is also related to stream order in these streams. The stonefly *Sweltsa* was found at most stations, however, stations M3C3 and NRC exhibited the lowest numbers.

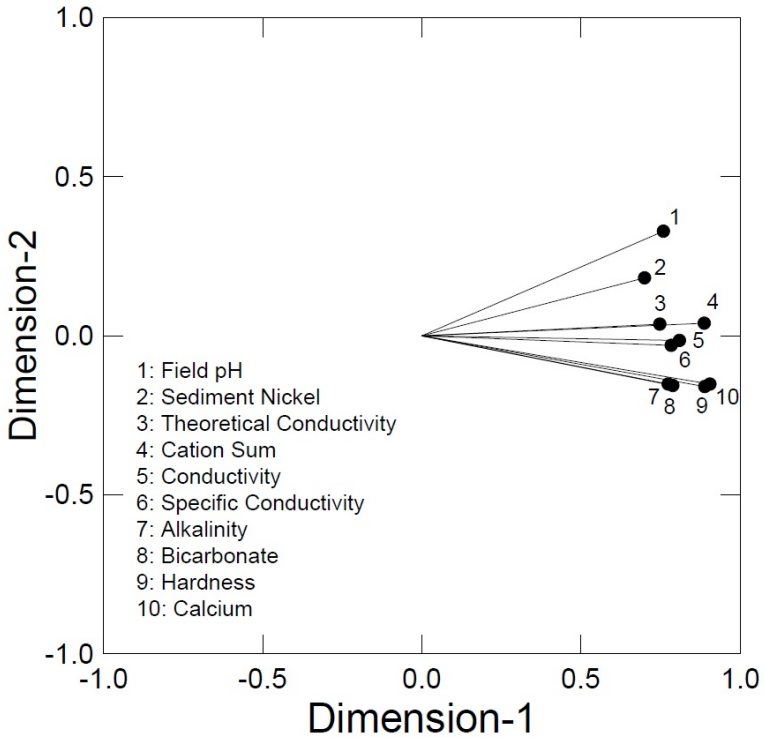


Figure 4.21 Pearson Correlations between Supporting Environmental Measures with NMDS Dimensions 1 and 2

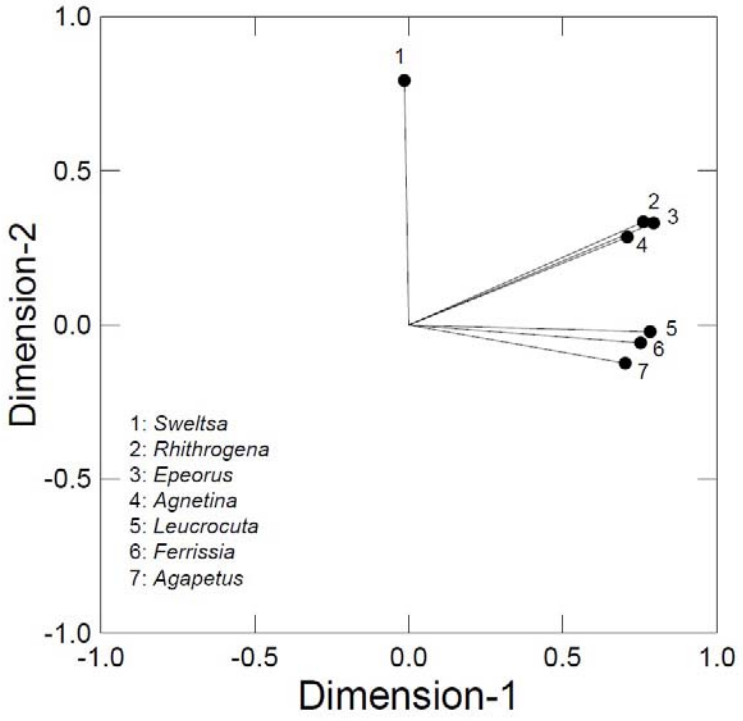


Figure 4.22 Spearman Correlation Coefficients for Benthic Invertebrate Community Survey according to NMDS Dimensions Scores

4.7.3 Summary of Benthic Community Analysis

The univariate analyses of the benthic invertebrate community identify statistically significant differences between stations, but are unable to identify underlying causes that may explain the differences. However, it is important to note that the stations are in many cases different (as are the watercourses), and that these differences in abundance, richness, diversity and evenness are a normal part of the natural environment.

The multivariate analysis sheds more light on the differences between stations. Spread from left to right across NMDS Dimension 1 (Figure 4.20), the stations aggrade according to stream order, with second order streams transitioning through third order, to fourth order streams on the right. Within Napadogan Brook there is also a progression from upstream to downstream as stations W4A17, W4A21 and W4A31 plot progressively from left to right. Stations EBNB1 and NRC are somewhat similar to, although distinct from, the other third and fourth order streams. Station M3C3, while plotting in an appropriate area as a third order stream on NMDS Dimension-1, plots below the other stations on NMDS Dimension-2. This difference between M3C3 and the other stations could be attributable to the large amount of wetland area in its drainage basin, a factor that was also reflected in the fish habitat surveys.

As further underscored by both the NMDS ordination and the cluster analysis (Figure 4.19), however, it is clear that each station supports a distinctive benthic invertebrate community, and that the differences between stations are genuine and representative of the existing conditions within the Study Area.

4.8 PERIPHYTON ANALYSIS

The objective of the periphyton community survey was to evaluate the composition and biomass of the periphyton community present at representative stations within the watercourses of the PDA and Study Area. Periphyton is a form of biofilm, comprising a functionally-defined assemblage of algal and other species living attached to solid surfaces such as rocks or logs on the stream bed, that produces a food supply for many aquatic organisms. Of primary concern in the analysis of the periphyton community are the algal species capable of using light energy as their primary energy source through photosynthesis. However, as a biofilm, the periphyton community also includes bacteria and fungi that degrade other living and non-living organic matter that is incorporated in the biofilm. In addition, the biofilm will contain small animals such as protists and rotifers that feed on organic matter, bacteria, or algal cells present in the biofilm or filtered from the water passing by. Though not specifically a requirement of the Final EIA Guidelines issued by NBENV, the periphyton community is an important component of food and other nutrients to the aquatic community and as such an evaluation of the existing condition of periphyton in the Study Area was conducted.

As proposed in the river continuum concept (Vannote *et al.* 1980), rivers undergo a predictable suite of changes as they progress from headwaters to mouth. Headwater streams in temperate regions tend to be small and shaded by overhanging vegetation. This condition results in shading (thereby limiting light availability for photosynthesis) as well as providing an abundant supply of leaf litter as a source of carbon and energy for ecosystem functioning. Benthic invertebrates belonging to the feeding guild of "shredders" convert leaf litter (*i.e.,* coarse particulate organic matter) to fine particulate organic matter, increasing the surface area and accelerating processes of microbial and fungal colonization and metabolism. Fine particulate organic matter is readily transported downstream, providing a food supply for filter feeding invertebrates. In contrast, downstream reaches of rivers are wider, with more exposure to direct sunlight. Where water depths remain shallow, primary production on attached substrates can be substantial, whereas input of coarse particulate organic matter from nearby riparian areas is lower. These downstream river reaches are often beneficiaries of fine particulate organic matter exported from upstream reaches. The standing crop of chlorophyll *a* collected at 15 sites in the Middle Fork of the Salmon River drainage basin in Idaho (Riskin *et al.* 2003) increased from 2nd to 4th order streams, peaked in the 5th order stream, and declined in higher orders. The data supported the predictions of the river continuum concept, except that peak values were reached somewhat earlier, in terms of stream order, because of the lack of shading in these streams. Downstream decreases in periphyton biomass were not completely attributable to increasing turbidity and decreasing benthic productivity, but were considered to be partially related to discharge. Chlorophyll *a* concentrations from periphyton samples are often positively correlated with nutrient availability (*e.g.*, total nitrogen and total phosphorus) at both open and closed canopy sites (Riskin *et al.* 2003).

The analysis of periphyton conducted here included the following overall measures as indicators of the abundance and role of periphyton in ecosystem functioning within the Study Area (complete information regarding the periphyton survey results can be found in Appendix E):

- total dry mass of biofilm (g/m^2) scraped from the surface of rocks collected from selected reaches indicating the total amount of material (inorganic and organic) incorporated within the periphyton biofilm;
- ash-free dry mass (g/m^2) of biofilm scraped from the surface of rocks collected from those reaches , indicating the mass of organic matter (as loss on ignition) included within the total dry mass of biofilm;
- chlorophyll *a* content (g/m^2) of biofilm scraped from the surface of rocks collected from those reaches, indicating the amount of photosynthetic pigment present in the biofilm; and
- algal taxonomy to determine the types of algal species present, and their relative abundance, indicating the types of algae present in the biofilm, as well as the number of living algal cells present, and the calculated biomass of these cells within the biofilm.

The periphyton survey was conducted between July 22 and August 8, 2011, under mid-summer conditions, during a period of stable stream flows. Station NRC in the upper Nashwaak River was sampled on September 28, 2011. A total of 10 stations corresponding to 2nd, 3rd and 4th order watercourses were sampled; these were the same stations used to collect the benthic invertebrate and quantitative fish community data (see Figure 3.4). On this basis, information on aquatic habitat types, fish communities, benthic invertebrate communities, and water and sediment quality collected at these stations and presented elsewhere in this report can be cross-referenced to information on the periphyton community.

4.8.1 Biomass and Chlorophyll *a*

Information on periphyton recovered from rocks at each stream station is summarized in Table 4.41. The periphyton biofilm is described in terms of total dry solids recovered (g/m^2, including both inorganic and living and dead organic matter contained in the biofilm); volatile solids recovered (g/m^2, representing the dry mass of organic matter lost during ashing of the total dry solids sample); and chlorophyll *a* (mg/m^2, a measure of the living photosynthetic matter present). Expressed as the average of three samples per station, the periphyton dry solids and volatile solids are relatively consistent from station to station. The overall average dry solids mass contained in the periphyton film was 27.4 g/m^2, and the overall average volatile solids mass was 10.6 g/m^2. Based on this, approximately 39% of the mass contained in the periphyton film was organic matter (*i.e.*, matter that was lost on ashing).

Table 4.41 Total Dry Mass, Ash Free Dry Mass, and Chlorophyll *a* Content of Periphyton Films Scraped from Rocks at Stations Within the Study Area

Stream	Station (Stream Order)	Periphyton Total Dry Mass (g/m^2)	Periphyton Ash Free Dry Mass (g/m^2)	Periphyton Chlorophyll *a* (g/m^2)
Bird Brook	B2A2 (2)	60.7	26.6	0.039
	B3A9 (3)	25.8	10.8	0.012
Sisson Brook	S2A2 (2)	18.8	6.8	0.015
	S3A2 (3)	26.6	7.1	0.012
McBean Brook	M3C3 (3)	15.3	9.6	0.013
West Branch Napadogan Brook	W4A17 (4)	11.4	4.2	0.014
	W4A21 (4)	26.9	7.1	0.029
	W4A31 (4)	18.6	5.5	0.010
East Branch Napadogan Brook	EBNB1 (3)	25.3	7.9	0.010
Nashwaak River	NRC (4)	44.5	20.5	0.047

Notes:
1) Each reported value is the mean of three replicate samples.
2) Raw data for individual samples can be found in Appendix E.

Riskin *et al.* (2003) reported a literature-based median periphyton chlorophyll *a* concentration of 21 mg/m^2 for moderately enriched streams (corresponding to 1.3 mg/L for total nitrogen and 0.12 mg/L for total phosphorus). The median periphyton chlorophyll *a* concentrations for "impaired" New England open- and closed-canopy streams (Riskin *et al.* 2003) were similar (17 and 6 mg/m^2, respectively), although values for reference sites were generally lower (median chlorophyll *a* value 5.4 mg/m^2, Riskin *et al.* 2003). However, chlorophyll *a* values were highly variable, ranging from 1.4 to 22 mg/m^2 in reference streams, and from 0.3 to 166 mg/m^2 in "impaired" streams. Chlorophyll *a* values reported in the present study were similar to the ranges reported by Riskin *et al.* (2003) for New England streams, although less variable, having a mean value of 19.9 mg/m^2 but ranging from 9.6 to 47.3 mg/m^2. These values suggest a moderate level of primary productivity in all of the streams, including headwater reaches. This could be a function of the relatively open canopy present at most sites, or could reflect availability of nutrients.

The ash free dry mass of periphyton collected from New England reference streams ranged from 1.6 to 17 g/m^2 with a median value of 6.4 g/m^2 (Riskin *et al.* 2003), similar to but slightly lower than the mean (10.6 g/m^2) and range (4.2 to 26.6 g/m^2) of the values reported in this study. Again, these values suggest a moderate level of productivity in all of the streams, including headwater reaches.

4.8.2 Periphyton Taxonomic Composition

For each of the 10 sampling stations where periphyton was evaluated, three replicate samples were collected, and each of these samples was sub-sampled for taxonomic analysis. Based on the mean results from the three replicate samples per station (Table 4.42), the predominant taxonomic group found was diatoms (Diatomaceae, 105 taxa recorded, representing 85.5 to 100% of cells counted) followed by blue-green algae (Cyanobacteria, 9 taxa recorded, representing 0 to 14.5% of cells counted) and green algae (Chlorophyceae, 4 taxa recorded, representing 0 to 2.3% of cells counted).

Table 4.42 Results of Taxonomic Analysis of Periphyton Samples

Stream	Station (Stream Order)	Total # Species	% Diatoms	% Blue-green Algae	% Green Algae	Mean Density (cell/cm^2)	Mean algal Biomass (g/m^2)
Bird Brook	B2A2 (2)	63	98.5	1.5	0.0	78458	0.212
	B3A9 (3)	58	96.0	2.00	2.0	30542	0.114
Sisson Brook	S2A2 (2)	43	93.2	6.9	0.0	11140	0.026
	S3A2 (3)	53	95.6	4.4	0.0	36352	0.082
McBean Brook	M3C3 (3)	57	91.6	6.2	2.3	43626	0.031
West Branch Napadogan Brook	W4A17 (4)	49	100.0	0.0	0.0	17550	0.034
	W4A21 (4)	40	96.7	3.3	0.0	16342	0.075
	W4A31 (4)	24	100.0	0.0	0.0	28398	0.056
East Branch Napadogan Brook	EBNB1 (3)	41	97.0	3.0	0.0	27257	0.056
Nashwaak River	NRC (4)	47	85.5	14.5	0.0	232683	0.398

4.8.3 QA/QC

Stantec implemented a QA/QC program to ensure that data produced were of acceptable and verifiable quality. For each component of the study, the QA/QC program included documents and specifications such as Standard Operating Procedures and Safe Work Practices (available from Stantec upon request). Approximately 10% of the samples submitted to RPC, including samples for analysis of dry mass, ash-free dry mass, and chlorophyll *a*, were field duplicates. The laboratory employed additional quality control measures including analysis of blanks, laboratory control spikes, certified reference materials, surrogate standards, and/or duplicate samples.

4.8.4 Summary of Periphyton Analysis

A high-level analysis was conducted to characterize the periphyton community present in the Study Area. The following key points were noted.

- Station NRC on the Nashwaak River had the highest mean ash free dry mass, chlorophyll *a* content, density, abundance and biomass of periphyton (Tables 4.42 4.43). Periphyton samples at this station were mostly diatoms (85.5%) however, the taxonomic analysis also indicated that this station had the highest number of cyanobacteria (14.5%) present. These results could be indicative of possible nutrient enrichment at this station, from upstream or nearby sources such as cottages (although the water quality results did not suggest this), or could be due to the relatively open habitat and low shading.

- Stations B2A2 and B3A9 on Bird Brook, followed by M3C3 on McBean Brook and S3A2 and S2A2 on Sisson Brook had the richest total number of species, and were dominated by diatoms. Periphyton biomass and chlorophyll a concentrations at these stations were generally low (with the exception of Station B2A2, which was located in a relatively open area suggestive of a former beaver meadow, and had low shading).

- Numbers of species were generally lowest at stations in East Branch Napadogan, West Branch Napadogan, and Napadogan brooks, and were lowest at Station W4A31, which was the lowest station sampled on the Napadogan Brook system. However, diatoms remained the dominant taxonomic group at these stations.

Taken overall, the periphyton data indicate a moderate level of primary productivity, and moderate availability of organic matter, in the periphyton biofilm. The periphyton is dominated by diatoms, which comprise a high quality food resource for benthic invertebrates.

4.9 AQUATIC SPECIES OF CONSERVATION CONCERN

As was discussed in Section 2.9, Stantec identified the following SOCC species as having habitat or life history characteristics, as well as known distribution in New Brunswick that could lead to their presence in or utilization of habitat, within the PDA or Study Area:

- Outer Bay of Fundy (OBoF) Atlantic salmon (*Salmo salar*, a fish);
- American eel (*Anguilla rostrata*, a fish);
- pigmy snaketail (*Ophiogomphus howei*, a dragonfly);
- yellow lampmussel (*Lampsilis cariosa*, a mussel);
- brook floater (*Alasmidonta varicosa*, a mussel); and
- prototype quillwort (*Isoetes prototypus*, a plant).

Stantec developed survey methodologies (Section 3.6) aimed at confirming the presence or absence (as the case may be) of each of these aquatic SOCC in the Study Area. With the exception of surveys for prototype quillwort, surveys for aquatic SOCC were carried out largely in concert with other aquatic surveys discussed in Sections 4.1 to 4.3. Surveys for prototype quillwort were carried out separately and reported as part of the Baseline Vegetated and Wetland Environments Technical Report (Stantec 2012b).

A summary of the field survey results for aquatic SOCC is as follows.

- Surveys for Atlantic salmon were carried out in conjunction with the quantitative and qualitative fish surveys. As noted in Sections 4.2 and 4.3, Atlantic salmon were found in the lower portion of Bird Brook, the West and East Branches of Napadogan Brook, and the Nashwaak River. The majority of salmon captured were large parr that were close to becoming smolts. With these results, it is confirmed as expected that some watercourses in the Study Area (or parts thereof) support Atlantic salmon, a key aquatic SOCC.

- Surveys for American eel were also carried out in conjunction with the quantitative and qualitative fish surveys. As noted in Sections 4.2 and 4.3, small numbers of American eel were found in Bird, Sisson and McBean brooks, but were relatively abundant in East Branch Napadogan Brook and in some of the tributaries to West Branch Napadogan Brook. Eels were generally found in 3rd order and higher watercourses that, for the most part, had diverse habitat and fish communities.

- Surveys for the pigmy snaketail dragonfly were conducted in conjunction with the rapid fish habitat bio-assessment surveys. The surveys did not identify any pigmy snaketail dragonflies, though exuvia were collected when located during the surveys. The collected dragonfly exuvia were sent to Stantec's benthic invertebrate lab in Guelph, Ontario for identification, and were further evaluated for DNA barcoding by Biodiversity Institute of Ontario. None of the exuvia samples were found to be pigmy snaketail dragonfly. The habitat type preferred by pigmy snaketail, as described in the literature, would classically be found in higher-order watercourses than are present in the Study Area (COSEWIC 2008). It is thus assumed that the species is not present in the Study Area.

- Surveys for rare mussels were conducted in conjunction with the rapid fish habitat bio-assessment surveys. Though live specimens of clams could not be found, clam shells were collected as part of the surveys where they were found cast up along the river bank. All of the clam shells that were submitted for identification at Stantec's benthic invertebrate lab in Guelph, Ontario were determined to be Eastern Pearlshell (*Margaritifera margaritifera*). This species was reported to be the most common unionid mussel found in the adjacent Miramichi watershed (MREAC 2009). None of the clam shell samples were found to be yellow lampmussel or the brook floater. It is therefore concluded that these species are not present in the Study Area.

- Surveys for the prototype quillwort were conducted by Stantec botanists in September 2011 in Christmas Lake. Trouser Lake was not surveyed for prototype quillwort as the fen wetland adjacent to this lake transitioned directly into deep water lake habitat, making it unsuitable wetland habitat for that species. The lacustrine shallow water wetland of Christmas Lake was surveyed, but prototype quillwort was not discovered. These surveys confirmed that conditions were not suitable for this plant within the lake, as the lake substrate and water column are silted. There is no other habitat within the Study Area or PDA that is suitable to prototype quillwort.

It is noted that these sampling surveys for aquatic SOCC were one-time sampling events and there is the potential that SOCC were missed. It is the professional judgment of Stantec biologists that all reasonable efforts were taken to find and identify potential SOCC within the Study Area. Though some aquatic SOCC, specifically Atlantic salmon and American eel, are present in the Study Area (as was expected), Stantec could find no evidence of the occurrence of other aquatic SOCC or SAR in the Study Area.

5.0 SUMMARY

This Baseline Aquatic Environment Technical Report was prepared as background information for the Environmental Impact Assessment (EIA) for the Sisson Project (the Project). The purpose of this report was to describe the existing baseline conditions of the Aquatic Environment within the Project Development Area (PDA) and Study Area for the Project, with a particular focus on fish and fish habitat as defined in the Fisheries Act, and in addition with attention to technical guidance provided for aquatic Environmental Effects Monitoring (EEM) studies carried out pursuant to the *Metal Mining Effluent Regulations* annexed to the *Fisheries Act*.

The Aquatic Environment has been identified as a valued environmental component (VEC) for the EIA of the Project due to its importance in supporting aquatic life in the area surrounding the Project. The Aquatic Environment consists of the watercourses and water bodies that provide habitat for fish and other freshwater aquatic species, and includes fish, fish habitat, and other living organisms residing in that habitat. This report was focused on evaluating the Aquatic Environment near the Project in two key areas: the Project Development Area (PDA) and the surrounding Study Area. The PDA was defined as the area of physical disturbance associated with the construction and operation of the Project (approximately 1,200 ha). The Study Area was defined as an area of approximately 5,314 ha of land encompassing the PDA and other potentially affected aquatic habitats and reference areas, including portions of the main stem of Napadogan Brook, the West Branch Napadogan Brook between Bird Brook and East Branch Napadogan Brook and selected tributaries, tributaries to McBean Brook, Bird Brook, Sisson Brook, and selected stations on East Branch Napadogan Brook and the Nashwaak River (the latter of which were selected as reference areas).

This Technical Report presented the background information reviewed from published literature, followed by the field studies conducted and resulting data collected within the Study Area, so as to establish existing baseline environmental conditions of the Aquatic Environment within the PDA and Study Area. In particular, this work was to characterize the fish habitat, fish species present, water, sediment and fish tissue quality, and the benthic and periphyton communities currently existing in the PDA and Study Area to establish existing environmental conditions for the EIA report of the Project. This information will support the quantification of any harmful alteration, disruption or destruction (HADD) of fish habitat that will arise as a consequence of the Project as well as the development of an appropriate fish habitat compensation agreement as will be required for the Project. Additionally, the work served to gather baseline data to support the development of a long-term environmental effects monitoring (EEM) program for the Aquatic Environment, as may be required as a condition of the EIA, subsequent approvals and permits, or the *MMER* annexed to the *Fisheries Act*.

Existing information was identified in consultation with government agencies, experts, and key stakeholders. In addition to providing helpful information in relation to available data and studies, this consultation provided a forum for discussion of issues and incorporating feedback and suggestions from these stakeholders and regulatory agencies into the EIA process. Two working groups were formed to identify available information and receive such feedback for the EIA: a regulatory working group with regulatory agencies (including the Department of Fisheries and Oceans Canada (DFO), New Brunswick Department of Natural Resources (NBDNR), and New Brunswick Department of Environment (NBENV)) focusing on matters relating to fish, fish habitat, potential interactions between

the Project and fish habitat (HADD), and the development of a compensation agreement in respect of HADD; and a stakeholder working group (including the Nashwaak Watershed Association Inc. (NWAI), the Atlantic Salmon Federation (ASF), and the Canadian Rivers Institute (CRI)) formed to solicit input from key stakeholders on the design of the Aquatic Environment work, and to provide stakeholders with information related to the results of such work and its linkage to the EIA process. The available data provided by these groups and from the existing literature sources were collected and reviewed. Previous data collected by Rescan™ in support of the Sisson Project at its early stages (including data from water quality and hydrological monitoring programs that have been ongoing within the Study Area since 2008) were also reviewed. This information provided an understanding of the Aquatic Environment present in the Study Area prior to undertaking field studies, and to identify data gaps which would be filled by the collection of specific field data in the Study Area to characterize existing environmental conditions for the EIA.

Following an identification of gaps in available information on fish, fish habitat, water and sediment quality, and the benthic and periphyton communities in the Study Area, Stantec developed a work plan to fill these identified data gaps and collect aquatic data representative of the Sisson Project site. Based on the identified data gaps, field studies were designed and carried out in summer and fall of 2011. Field data were collected for water quality, sediment quality, stream morphology, fish habitat, fish populations, benthic invertebrate communities, and periphyton communities.

Remote sensing surveys and mapping of watercourses was conducted as an initial step in the planning of the field studies for 2011. A desktop mapping exercise was carried out, using light detection and ranging (LiDAR) data covering the entire Study Area. These data were collected specifically for the Sisson Project. The LiDAR dataset was also used to identify potential waterfalls, steep sections impassable to fish, or barriers to navigation, for subsequent field verification. The topographic model was then used to define specific segments of the watercourses to be further characterized by field crews. Each stream segment was assigned a unique name, following a standardized naming convention. Using the verified data, additional parameters such as embeddedness, bankfull width, and bankfull depth were added to the model to aid in qualitative station selection.

Aquatic field studies were conducted in the PDA and Study Area between June and September 2011. These included a rapid fish habitat bio-assessment survey of watercourses in the PDA to characterize aquatic habitat and *in situ* water and sediment quality, habitat surveys with qualitative electrofishing at 32 stations within the Study Area to further characterize habitats, water and sediment quality, and fish species presence in selected reaches of each watercourse, habitat surveys with quantitative electrofishing at 10 stations in the Study Area to gather further information on fish populations in selected reaches within the Study Area (including non-lethal sampling of slimy sculpin and lethal sampling of small numbers of brook trout and for EEM purposes and/or fish tissue metals analysis), sampling of the benthic invertebrate community and the periphyton community, and surveys for aquatic species of conservation concern (SOCC).

Rapid fish habitat bio-assessment surveys were first conducted between June 13 and June 29, 2011 in watercourses in the PDA. A total of 35 km of stream habitat was surveyed, including all of Sisson Brook and Bird Brook, several tributaries to McBean Brook, and tributaries to the West Branch Napadogan Brook. Standard rapid bio-assessment forms were completed in each reach within the PDA, along with *in situ* water quality measurements. Photographs were also taken to document habitat characteristics. Habitat within the PDA was found to be variable but overall high quality and suitable for

a variety of fish species. Cold water habitat suitable for spawning, rearing, feeding, migration and overwintering of salmonids was present. In the remainder of the Study Area (and in particular in lower Napadogan), habitat was mostly riffle-run with some pool, and was good to high quality habitat suitable for spawning, and feeding for salmonids. Water temperatures in the lower Napadogan during late summer were too high to support juvenile salmon, though parr may seek springs and seeps as cool water refuge.. There were distinct differences in habitat within the watercourses surveyed in the PDA and Study Area. Differences observed were likely caused by geography (*e.g.,* Sisson Brook is higher gradient than Bird Brook, and the West Branch Napagodan Brook has more bedrock and higher grade compared to the East Branch Napadogan Brook). Overall, habitat was found to be suitable to be supportive of a wide variety of freshwater fish species during various life and reproductive stages.

Habitat surveys with qualitative electrofishing were then conducted between July 20 and August 9, 2011 in watercourses in the Study Area. Thirty-two stations were selected for the qualitative fish and fish habitat surveys to represent all major aquatic habitat types present within the PDA and Study Area. Stations were located on each of the major watercourses potentially affected by the Project as well as at reference locations that will not likely be affected. These included five stations within the Sisson Brook watershed, eight stations within the Bird Brook watershed, seven stations within the McBean Brook watershed, eleven stations in the Napadogan Brook watershed (East Branch, West Branch, and main stem), and one station on the upper Nashwaak River. *In situ* and laboratory water and sediment samples, fish habitat surveys using standard DFO/NBDNR habitat survey forms, and fish community data from qualitative electrofishing of 100 m reaches of watercourse at each station were collected in a single pass. The surveys confirmed that fish habitat, water quality, and sediment quality in the Study Area are generally good to very good and typical of that expected for a rural and undeveloped area of central New Brunswick. The surveys also confirmed that the watercourses in the Study Area contain species of fish that would be expected of a central New Brunswick watershed, including Atlantic salmon, brook trout, American eel, sea lamprey, slimy sculpin, blacknose dace, pearl dace, creek chub, common shiner, white sucker, and longnose sucker.

Habitat surveys with quantitative electrofishing were then carried out between September 8 and September 29, 2011 in watercourses in the Study Area. A total of 10 sampling stations were selected from among the set of 32 stations previously sampled, three within the PDA and seven outside the PDA but within the Study Area. *In situ* and laboratory water and sediment samples, and fish community data from quantitative electrofishing of 100 m reaches of watercourse at each station, were collected. Quantitative electrofishing was undertaken using barrier nets to isolate an area of habitat at each station, and multiple “passes” of electrofishing through the habitat were completed, and the number and characteristics of fish collecting during each pass were recorded to calculate quantitative fish population estimates (*i.e.,* number of fish per unit of habitat). Small numbers of brook trout were retained at each station for subsequent EEM and fish tissue analysis. Sampling of the benthic invertebrate and periphyton communities (discussed below) was also carried out during the quantitative surveys.

Surface water and sediment samples were collected during the qualitative and quantitative surveys to supplement *in situ* water quality measurements collected in the field during all. These samples were submitted for chemical analysis to characterize surface water quality and sediment quality in the Study Area. Water quality was within the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater) for warm and cold water fish species throughout most of the surveyed areas. Exceptions were within headwater and wetland areas where DO tended to be low, temperatures high

and pH was acidic. Water temperatures in first and second order watercourse sections were within the preferred range of brook trout. Water temperatures in the second, third and some fourth order watercourse sections were within the preferred range of salmon. Water temperatures may partly explain the separation found between trout and salmon with in the Study Area. The sediment quality results showed that stations in proximity to the ore body (*i.e.,* stations in Sisson and McBean Brooks) show naturally elevated concentrations of several trace metals in sediment as expected, including arsenic, molybdenum, and tungsten, as well as iron and manganese in McBean Brook. Stations in the West Branch Napadogan Brook flow system show elevated concentrations of uranium, and stations in the East Branch Napadogan Brook system show elevated concentrations of magnesium and mercury, but the cause of the high mercury concentrations is not known. In many cases, the sediment mineralization is also reflected by concentrations in water. On this basis, it was expected that biological tissue quality would also vary in response to variation in bioavailable metals concentrations within the Study Area. The water and sediment sampling results show that surface water quality and sediment quality in the Study Area can be described as good to excellent.

Sampling and analysis of fish tissue was carried out in concert with the lethal sampling of brook trout as part of the quantitative electrofishing surveys. Mercury concentrations in brook trout carcass samples are below thresholds established by Environment Canada and the Ontario Ministry of Environment to protect human health. Assuming that total mercury is predominantly present in the form of methyl mercury, concentrations in brook trout whole fish samples are above a threshold established by CCME to protect wildlife consumers of fish. However, since the threshold value is designed to be highly protective, this does not necessarily indicate that wildlife consumers of brook trout will experience adverse health effects. Concentrations of several trace metals in brook trout liver were found to vary significantly within the Napadogan Brook system. These metals included aluminum, cadmium, cobalt, copper, mercury, molybdenum, sodium and thallium, which were generally elevated in brook trout livers from Sisson Brook; silver, which was higher in brook trout livers from Bird Brook than in Napadogan Brook; and potassium, which was lower in brook trout livers from Sisson Brook than in Napadogan Brook. Mercury concentrations in brook trout livers representing three fish from East Branch Napadogan Brook were generally lower than at other stations, in spite of higher measured mercury concentrations in water and sediment from East Branch Napadogan Brook. However, selenium concentrations in the livers of these fish were concurrently higher than usual in other streams. Selenium is known to act in an antagonistic manner with respect to mercury accumulation by fish, and this appears to be the case in East Branch Napadogan Brook.

Although full statistical analysis was not completed following the EEM model for brook trout or slimy sculpin, due to lower than required numbers of fish collected, there was little evidence to suggest the presence of meaningful differences in survival, growth or condition of fish between sampling stations. However, the key finding of the fish environmental effects monitoring was that the preferred (Environment Canada 2011) study design for EEM (*i.e.,* lethal sampling of 20 adult male and 20 adult female fish representing two species) is not likely to be successful for the Sisson Project, due to the generally low abundance of suitable fish species in the Study Area. Even assuming that with a high level of fishing effort, the required numbers could be obtained, repeated performance of this sampling methodology would be likely to have adverse effects on fish populations in the study reaches. On this basis, an alternative but less preferred methodology based on non-lethal sampling of two fish species to determine population structure and condition (Environment Canada 2011) is recommended for future work.

Sampling of the benthic community was carried out in concert with the quantitative electrofishing surveys to characterize the nature and abundance of benthic invertebrates in sediments of watercourses in the Study Area. Samples of benthos at each station were collected using standard D-frame kick nets, and the collected samples sent to a taxonomist for identification. The diversity and number of species collected were both very high, indicating high overall environmental quality throughout the Study Area. The univariate analyses of the benthic invertebrate community identified statistically significant differences between stations, but were unable to identify underlying causes that may explain the differences. The multivariate analysis identified stream order as a major factor in overall community structure. It is clear that each station supports a distinctive benthic invertebrate community, and that the differences between stations are genuine and representative of the existing conditions within the Study Area.

Sampling of periphyton was carried out in concert with the quantitative electrofishing surveys to characterize the nature and abundance of periphyton as primary producer communities within the streams within in the Study Area. Taken overall, the periphyton data indicate a moderate level of primary productivity, and moderate availability of organic matter, in the periphyton biofilm. The periphyton is dominated by diatoms, which comprise a high quality food resource for benthic invertebrates. The Nashwaak River showed the greatest periphyton productivity out of all the watercourses surveyed, followed by stations on Bird Brook and McBean Brook.

A review of the existing information at the onset of the 2011 aquatic program had identified the potential presence of aquatic SOCC in Central New Brunswick, and thus their presence or absence in the Study Area needed to be confirmed. Surveys were undertaken in concert with other field studies to identify the presence of Atlantic salmon, American eel, pigmy snaketail (a dragonfly), yellow lampmussel (a mussel), brook floater (a mussel), and protytype quillwort (a plant) in the Study Area. Though the field surveys confirmed the presence of Atlantic salmon and American eel in various watercourses in the Study Area (as initially expected), Stantec could find no evidence of the other target SOCC or species at risk (SAR) in the Study Area.

Overall, the water and environmental quality (including fish habitat quality) within the Study Area are very good, but not unique. Fish populations were typical of cold water watercourses in New Brunswick. Similar conditions are likely to be encountered throughout central New Brunswick where human activity is limited largely to forestry.

6.0 REFERENCES

6.1 LITERATURE CITED

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Appendix A

Glossary and List of Acronyms and Units

GLOSSARY

Term	Definition
algae	A large group of aquatic organisms traditionally classified as plants, but lacking stems, leaves and roots.
anadromous	Describes the migration pattern of certain fish, such as salmon, that spend most of their life at sea before moving into fresh water to reproduce in rivers, streams, or lakes.
aquatic	Refers to organisms (plants, animals, bacteria), that are found in water. This term can also refer to the physical environment related to water (habitat).
bankfull (width, depth)	Refers to the channel forming flows, where the watercourse is filled just to its banks. Bankfull discharge can be estimated using width to depth ratios.
baseline	Background, pre-activity, pre-construction, or pre-Project environmental conditions.
benthic	Of or relating to or happening on the bottom under a body of water, *e.g.,* benthic invertebrate is an insect, mussel or worm living on the bottom of a lake or river.
catastomids	Fish belonging to the family *Catastomidae*, which includes white sucker and other fish known as suckers
cold water fish species	This refers to fish species that require cool water temperatures (4 - 20°C) to complete their life cycles. Atlantic salmon, brook trout, and slimy sculpin are all cold water fish species .
cottids	Fish belonging to the family *Cottidae*, including the slimy sculpin.
cyprinid	Fish belonging to the family *Cyprinidae*, which includes carp and some of the fish known as minnows.
electrofishing	Refers to a common technique used by fisheries scientist that uses direct electrical currents to attract and stun fish for collection.

Term	Definition
embeddedness	Is an index of the degree to which larger substrate particles (cobble, rock boulders) are buried or surrounded by finer particles (sand, clay). Embeddedness is placed into four categories from 1 to 4 representing a particle being buried from <20% (1) to >50%(4). An increase in embeddedness will often result in a decrease in numbers of invertebrates and amount of fish habitat present in the watercourse.
endemic	Restricted to a specific geographic area.
Environmental Effects Monitoring (EEM)	This refers to the federal *Metal Mining Environmental Effects Regulations* (MMER) under the *Fisheries Act* that requires all metal mines authorized to discharge effluent into receiving waters conduct an environmental effects study. Studies are of the potential effects of effluent on the fish population, on fish tissue and on the benthic invertebrate community in accordance with the requirements and within the periods set out in Schedule 5 of *MMER*. Results of EEM studies must be submitted to Environment Canada and must also follow the technical guidelines of *MMER.*
Euclidean distance	Refers to the distance between points as would be measured using a ruler. This term may be used when calculating distance on maps or with GIS software using the Pythagorean formula.
exuviae	A biological term that refers to the moulded exoskeleton on skin of an insect or crustacean.
fish	Freshwater fish will refer to fish (as defined in Section 2 of the Fisheries Act) that live in freshwater during at least part of their life cycle. Fish include (a) parts of fish, (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals
fish habitat	Fish habitat as defined in Section 34(1) of the *Fisheries Act* includes spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes. Fish habitat will be assumed to include the physical (*e.g.*, substrate/sediment, temperature, flow velocity and volumes, water depth), chemical (*e.g.*, water quality), and biological (*e.g.*, fish, benthic macro-invertebrates, periphyton, aquatic macrophytes) attributes of the Aquatic Environment that are required by fish to carry out life cycle processes

Term	Definition
fry	Refers to a young fish often just hatched from its egg. For Atlantic salmon this stage of development is also called an Alvin.
gomphid	Refers members of the dragonfly family Gomphidae .
gonads	Refers to the reproductive organs, ovaries and testes .
headwater(s)	The upper area of a watershed most commonly first order watercourses that collect run-off from riparian areas. Commonly identified as the source or start of the watercourse.
intolerant	In the context of aquatic species such as fish, benthic invertebrates or periphyton, this term refers to a lack of tolerance of changes to water quality (temperature, dissolved oxygen (DO), pH, trace elements) where individuals or assemblages these species do not grow well in low (*e.g.,* pH, DO) high (*e.g.*, temperature, mercury) or changing water quality conditions.
invertebrate	A group of organisms that lack a backbone/vertebrae. Insects, and mussels are two examples of organisms from this group.
morphology	Refers to the study of the form or shape of things. In reference to animals such as fish or insects the term refers to the shape and structure of their bodies and limbs (e.g., fins, legs, antenna). In reference to a watercourse, it would relate to the shape and characteristics of the channel.
naiads	This refers to a larval phase of several aquatic insects, specifically mayflies, dragonflies and damselflies. This term is also used to refer members of the freshwater mussel family Unionidae.
Outer Bay of Fundy (OBoF)	Refers to the population of Atlantic salmon that migrate to and from the Outer Bay of Fundy into the Saint John River and its tributaries.
parr	Refers to the first one to three years an Atlantic salmon spends in freshwater. This stage occurs after the fry stage.
parsimonious	Stingy, thrifty, or meager.
periphyton	Refers to freshwater organisms, usually algae or cyanobacteria, attached to or clinging to plants, rocks and other objects on the bottom of watercourses.

Term	Definition
Project Development Area (PDA)	The Project Development Area (PDA) is the physical area within which most of the Project infrastructure will be located and where most of the Project activities will occur. The PDA typically represents the area of physical disturbance associated with the construction and operation of the Project. In the case of this EIA, the PDA comprises an area of approximately 1,200 hectares (ha) that includes the area of physical disturbance associated with the open pit, processing facility, storage areas, and tailings storage facility (TSF). Watercourses that are expected to be directly affected by the Project and where fish habitat loss is expected to occur include portions of Sisson Brook, Bird Brook, as well as the headwaters of some minor tributaries to McBean Brook that could be affected by changes to groundwater flow patterns caused by pit dewatering. Some minor tributaries to Napadogan Brook could also be affected by habitat loss in their headwaters, or by seepage from the TSF.
reach	Refers to a section of watercourse of a defined length that can be based on geomorphic habitat characteristics or a pre-determined sampling area.
redd	Refers to the “nest” excavated by a salmon or trout in which to lay their eggs. The female will excavate the redd eggs will be fertilized by the male and then the eggs are buried leaving a noticeable and characteristic depression in the stream bed.
reference area	Refers to a site, station or general area within a scientific study. This area is generally a comparatively undeveloped or unaffected site used for comparison to developed or affected sites in environmental monitoring studies.
salmonid	A fish of the salmon family (*Salmonidae*), a group of fish that includes salmon, trout and char.
sinuosity	Refers to the ratio of the watercourse channel length to the length of the valley in which the watercourse occurs. This can also be calculated using the valley slope or grade in relation to the watercourse channel slope.
smolt	This refers to the stage in the Atlantic salmon’s life cycle where parr change to a silvery appearance and move downstream and out to saltwater. This stage usually occurs when parr are around 15 cm in length.
spawn or spawning	This refers to the act of a fish laying its eggs.

Term	Definition
species at risk	Species at risk include species that are listed under Schedule 1 of the *Species at Risk Act (SARA)* as "Extirpated", "Endangered", or "Threatened" and/or listed under the New Brunswick *Endangered Species Act* (NB *ESA*) as "Endangered" or "Regionally Endangered".
species of conservation concern	Species of conservation concern includes those listed species that are not currently under the protection of *SARA* (*i.e.*, are listed as "special concern" in Schedule 1 of *SARA*; listed in Schedule 2 or 3 of *SARA*; listed as "special concern", "threatened" or "endangered" by COSEWIC but not yet listed in Schedule 1 of *SARA*); ranked as "S1", "S2", or "S3" in New Brunswick by AC CDC; and/or ranked as "May Be At Risk" or "Sensitive" in New Brunswick by the Canadian Endangered Species Conservation Council (CESCC).
Strahler method	Refers to the method of classifying watercourses (streams) developed by A.N. Strahler (1952,1957), where watercourses are given a number, or order based on position in the watershed. Watercourses are named from smallest "first order" tributaries in the headwaters increasing in number where two watercourses of the same order meet. Classification provides a high level classification of stream networks.
stream network, drainage network	Refers to the watercourses within a watershed area that collect and move water downstream.
stream order	Watercourse classification based on size of contributing area (watershed), channel morphology, and discharge. *e.g*. the smallest headwater streams are first order, when two first order watercourses meet they become second order, when two second order meet they become third order *etc.*
Study Area	The Study Area, which encompasses the PDA as well as other potentially affected aquatic habitats and reference areas within an area of 5,314 ha of land, includes the following watercourses: the main stem of Napadogan Brook where changes to stream flow or water chemistry are expected to occur as a result of the Project, in addition to the upper portion, the West Branch Napadogan Brook between Bird Brook and East Branch Napadogan Brook where changes to stream flow or water chemistry are expected to occur as a result of the Project; the West Branch Napadogan Brook and selected tributaries where minor changes to stream flow or water chemistry may occur, or which may be treated as reference areas; tributaries to McBean Brook where changes to stream flow or water chemistry may occur as a result of the Project; Bird Brook and Sisson Brook where fish habitat will be destroyed as a result of the Project; and selected stations on East Branch Napadogan Brook and the Nashwaak River which were selected as reference areas.

Term	Definition
taxonomy	Refers to the branch science concerned with classification. Biological taxonomy separates living organisms into domain, kingdom, phylum, class, order, family, genus and species based on physical characteristics.
Thalweg	A line following the middle of the channel or deepest part of riverbed from source to mouth (upstream to downstream), also the line of steepest descent along the stream.
tolerant	In the context of aquatic species or communities, refers to tolerance of shade where individuals or assemblages of tree species grow well in low-light conditions or the shade of other plants.
unionid	Refers a family of freshwater clams or mussels distinguished by their complex life cycles, and separate sexes.
viscera	Refers to the internal organs of fish.
warm water fish species	This refers to fish species that require and can tolerate warm water temperatures (16 to 20°C). Sucker, dace and minnows are all warm water fish species.
watercourse	As defined under the New Brunswick *Clean Water Act*, watercourse means the full width and length, including the bed, banks, sides, and shoreline, or any part, of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not.
watershed	Refers to an area that is drains to a watercourse, generally watersheds are separated by ridges of land that separates water flowing to different rivers basins or seas.
Zippin method	Refers to the methodology developed by Zippin (1956; 1958) but subsequently modified to estimate population size based on a removal method and regression where individuals are removed from a population with decreasing sample size at each removal. Generally when sampling fish populations barrier nets are placed at a defined interval and the area is fished consecutively until declining numbers of fish are collected.

COSEWIC/*SARA* Status Definitions	
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC)	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Provincial General Status Rank Definitions (NB *ESA* and CESCC)	
At Risk	Species for which a formal assessment has been completed, and determined to be at risk of extirpation or extinction. Includes species either listed as "Endangered" or "Threatened" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or as Endangered or Regionally Endangered under the NB *ESA* and accompanying regulations.
May Be At Risk	Species or populations that may be at risk of extirpation or extinction, and are therefore candidates for a detailed risk assessment.
Sensitive	Species which are not believed to be at risk of extirpation or extinction, but which may require special attention or protection to prevent them from becoming at risk.
Secure	Species that are not believed to be "At Risk", "May Be At Risk", or "Sensitive". These were generally species that were widespread and/or abundant.
Status Undetermined	Species for which there is insufficient data, information, or knowledge available to evaluate their status. These are usually species for which there were few documented occurrences in New Brunswick.
Not Assessed	Species known or believed to be present in New Brunswick but which have not yet been assessed.
Exotic	Species that have been introduced to the province as a result of human activity (*i.e.,* non-native).
Extirpated	Species that are no longer thought to be present in New Brunswick, although they exist elsewhere.

Provincial General Status Rank Definitions (NB *ESA* and CESCC)	
Extinct	Species that are no longer thought to exist anywhere.
Accidental	Vagrants, or species occurring infrequently and unpredictably, for which New Brunswick is outside of their usual range. For NBDNR general status ranks it was used only for birds and dragonflies.
Occurrence Not Verified	Species which have been reported in New Brunswick, but for which there is no documented evidence, or species which are suspected to occur in New Brunswick because they occur in neighbouring provinces or states.

LIST OF ACRONYMS AND UNITS

Acronym/Unit	Definition
1SW	1 sea winter
AC CDC	Atlantic Canada Conservation Data Centre
ASF	Atlantic Salmon Federation
CESCC	Canadian Endangered Species Conservation Coucil
cm	centimetre
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRI	Canadian Rivers Institute
DEM	digital elevation model
DFO	Department of Fisheries and Oceans Canada
DO	dissolved oxygen
e.g.,	for example
EEM	environmental effects monitoring
EIA/EA	environmental impact assessment/environmental assessment
g	gram
GIS	geographic information system
GPS	global positioning system
HADD	harmful alteration, disruption or destruction (of fish habitat)
i.e.,	that is
ICP-AES	inductively coupled plasma atomic emission spectroscopy
ICP-PMS	inductively coupled plasma mass spectrometry
km	kilometre (1,000 metres)

Acronym/Unit	Definition
LiDAR	light detection and ranging
m	metre
masl	metres above sea level
mm	millimetre
MMER	*Metal Mining Effluent Regulations*
MSW	multi-sea winter
NB *ESA*	New Brunswick *Endangered Species Act*
NBDELG	New Brunswick Department of Environment and Local Government (formerly New Brunswick Department of Environment, or NBENV)
NBDNR	New Brunswick Department of Natural Resources
NBELC	New Brunswick Ecological Land Classification
NWAI	Nashwaak Watershed Association Inc.
OBoF	Outer Bay of Fundy
OMOE	Ontario Ministry of Environment
PDA	Project Development Area
QA/QC	quality assurance/quality control
RPC	Research and Productivity Council
SAR	species at risk
SARA	*Species at Risk Act*
SOCC	species of conservation concern
TIC	total inorganic carbon
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TOC	total organic carbon

Acronym/Unit	Definition
TP	total phosphorus
TSF	tailings storage facility
US EPA	United States Environmental Protection Agency
VEC	valued environmental component
YOY	young-of-year

Appendix B

AC CDC Data Report

Atlantic Canada Conservation Data Centre
Centre de données sur la conservation du Canada Atlantique

DATA REPORT 4311: Sisson Brook, NB

Prepared 1 February, 2012
by S.H. Gerriets

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5.0 Source Bibliography

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (ACCDC) is part of a network of circa 85 NatureServe data centres and heritage programs in 50 states, 10 provinces and 1 territory, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The ACCDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador. Although a non-governmental agency, the ACCDC is supported by 6 federal agencies, plus 4 provincial governments, outside grants and data processing fees. URL: www.ACCDC.com.

Upon request and for a fee, the ACCDC reports known observations of rare and endangered flora and fauna, in and near a specified study area. As a supplement to that data, the ACCDC includes locations of managed areas with some level of protection, and also known sites of ecological interest. Data summarised in each report is attached as DBF files which may be opened from within data software (Excel, Access) or mapped in GIS (ArcView, MapInfo, AutoCAD).

1.1 RESTRICTIONS

The ACCDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By receiving ACCDC data, recipients assent to the following limits of use:

a.) Data is restricted to use by trained personnel who are sensitive to its potential threat to rare and endangered taxa.
b.) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c.) The ACCDC requires Data Users to cease using and delete data 12 months after receipt.
d.) ACCDC data responses are restricted to that data in our Data System at the time of the data request.
e.) Data is qualified as to location (Precision) and time (SurveyDate); cf Data Dictionary for details.
f.) ACCDC data reports are not to be construed as exhaustive inventories of taxa in an area.
g.) The non-occurrence of a taxon cannot be inferred by its absence in an ACCDC data report.

1.2 ADDITIONAL INFORMATION

Please direct biological questions about ACCDC data to: Sean Blaney, ACCDC: (506) 364-2658, and technical data queries to: Stefen Gerriets, ACCDC: (506) 364-2657.
For provincial information on rare taxa and protected areas, or information on game animals, deer yards, old growth forest, archeological sites, fish habitat etc, please contact Stewart Lusk, NBDNR: (506) 453-2440.

2.0 RARE AND ENDANGERED TAXA

A 5km buffer around the study area contains 23 records of 16 taxa from 11 sources, a relatively low density of records (quintile 1): 0.05 rec/km2.

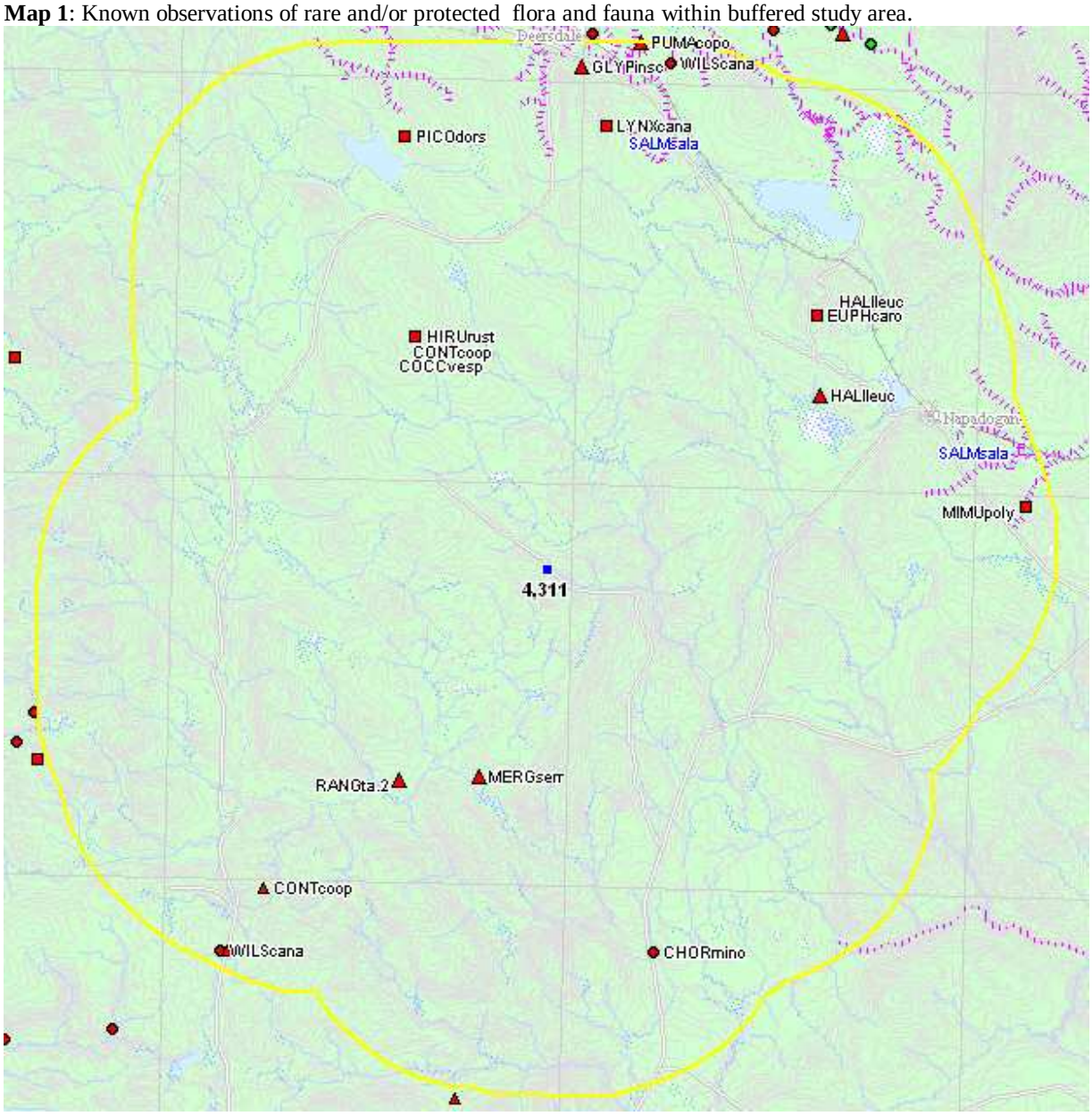
2.1 FLORA

A 5km buffer around the study area contains 0 records of vascular, 0 records of nonvascular flora (see attached *ob.dbf).

2.2 FAUNA

A 5km buffer around the study area contains 23 records of 16 vertebrate, 0 records of invertebrate fauna (cf attached *ob.dbf). Sensitive data: Wood Turtles are PRESENT in the study area (cf attached WOTU.rtf).

Map 1: Known observations of rare and/or protected flora and fauna within buffered study area.

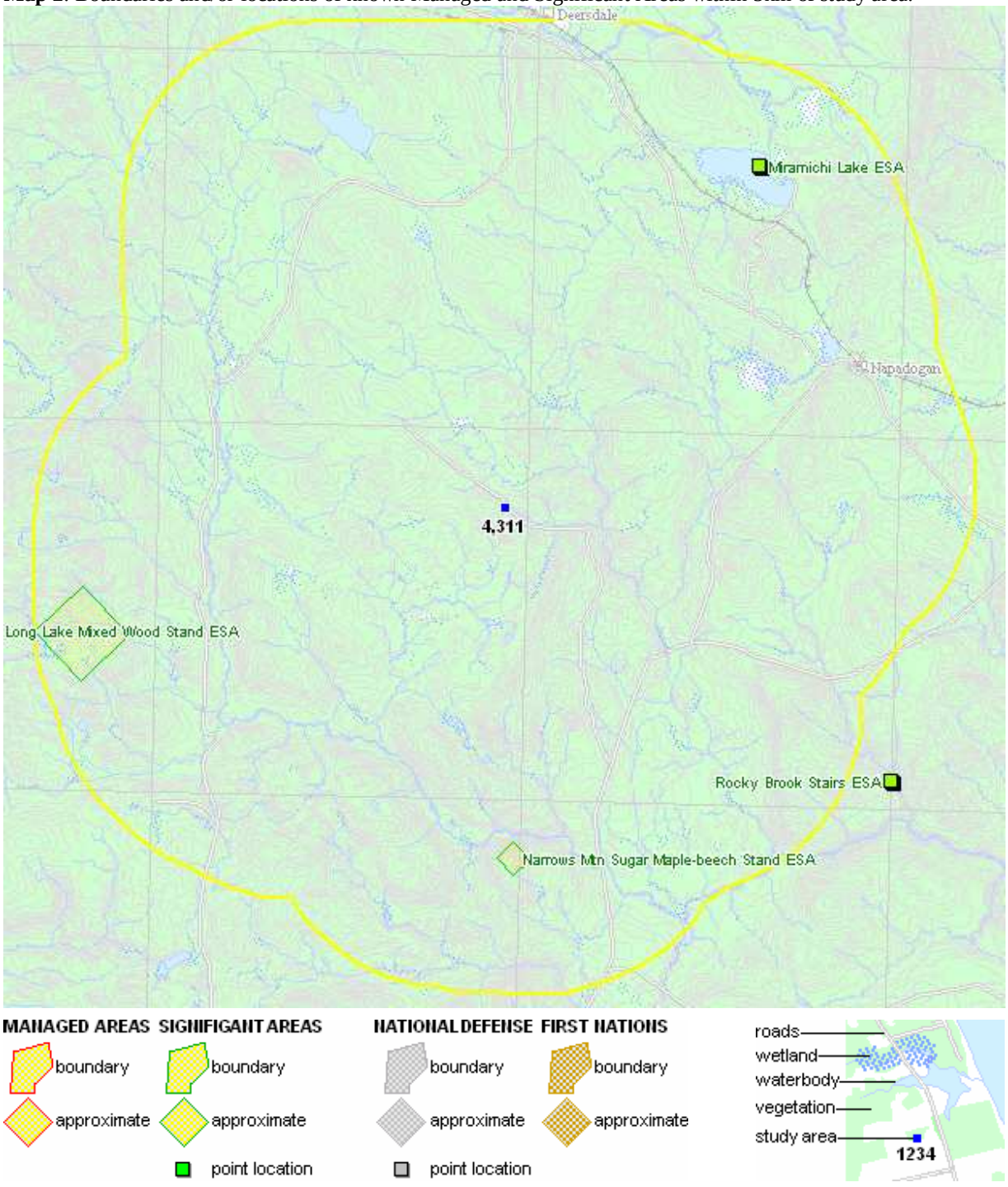


3.0 SPECIAL AREAS

3.1 MANAGED AREAS
No Managed Areas identified.

3.2 SIGNIFICANT AREAS
The GIS scan identified 3 biologically significant sites in the vicinity of the study area; such sites are known for exceptional biotic richness but may or may not have legal status (see attached *sa.dbf).

Map 2: Boundaries and/or locations of known Managed and Significant Areas within 5km of study area.



4.0 TAXON LISTS

Rare and/or endangered taxa within the buffered area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation. [p] = vascular plant, [n] = nonvascular plant, [a] = vertebrate animal, [i] = invertebrate animal, [c] = community.

4.1 FLORA

	scientific name	common name	prov. rarity	prov. status	COSEWIC	obs	dist.km

4.2 FAUNA

	scientific name	common name	prov. rarity	prov. status	COSEWIC	obs	dist.km
a	Salmo salar pop. 7	Atlantic Salmon - Outer Bay of Fundy pop.	S2		E	1	42 ±0
a	Rangifer tarandus pop. 2	Woodland Caribou (Atlantic-Gaspésie pop.)	SX		E	1	7 ±1
a	Glyptemys insculpta	Wood Turtle	S3		T	1	13 ±1
a	Hirundo rustica	Barn Swallow	S3B		T	1	8 ±5
a	Chordeiles minor	Common Nighthawk	S3B		T	1	9 ±0.1
a	Wilsonia canadensis	Canada Warbler	S3S4B		T	3	13 ±0.1
a	Contopus cooperi	Olive-sided Flycatcher	S3S4B		T	3	8 ±5
a	Salmo salar pop. 12	Atlantic Salmon - Gaspe - S. Gulf pop.	S2		SC	2	102 ±0
a	Euphagus carolinus	Rusty Blackbird	S3B		SC	1	9 ±5
a	Puma concolor pop. 1	Cougar - Eastern pop.	SU,SH	Endangered	DD	1	13 ±1
a	Lynx canadensis	Canada Lynx	S1	Reg.Endangered	NAR	2	11 ±5
a	Haliaeetus leucocephalus	Bald Eagle	S3B	Reg.Endangered	NAR	2	7 ±1
a	Picoides dorsalis	American Three-toed Woodpecker	S3?			1	12 ±5
a	Mimus polyglottos	Northern Mockingbird	S3B			1	11 ±5
a	Mergus serrator	Red-breasted Merganser	S3B,S4S5N			2	6 ±1
a	Coccothraustes vespertinus	Evening Grosbeak	S3S4B,S4S5N			1	8 ±5

4.3 RANGE MAPS

The legally protected taxa listed below are linked to the study area by predictive range maps based upon expert estimates of distribution. Taxa listed here but not in the observation data above, are unknown within the study area but perhaps present. Ranges of rank 1 indicate possible occurrence, those of rank 2 and 3 increasingly less probable.

	scientific name	common name	prov. rarity	prov. status	COSEWIC	range
a	Glyptemys insculpta	Wood Turtle	S3		T	1
a	Lynx canadensis	Canada Lynx	S1	Reg.Endangered	NAR	2
p	Listera australis	Southern Twayblade	S2	Endangered		1
p	Pterospora andromedea	Giant Pinedrops	S1	Endangered		2
p	Juglans cinerea	Butternut	S3		E	1
p	Isoetes prototypus	Prototype Quillwort	S2	Endangered	SC	1
a	Buteo lineatus	Red-shouldered Hawk	S2B		NAR	1
a	Buteo lineatus	Red-shouldered Hawk	S2B		NAR	2
p	Pedicularis furbishiae	Furbish's Lousewort	S1	Endangered	E	2

5.0 SOURCE BIBLIOGRAPHY

The recipient of this data shall acknowledge the ACCDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

recs	source
6	Lepage, D. 2009. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 143,498 recs.
6	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
3	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc.
2	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
2	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
2	Bateman, M.C. 2000. Waterfowl Brood Surveys Database, 1990-2000 . Canadian Wildlife Service, Sackville, unpublished data. 149 recs.
2	Dept of Fisheries & Oceans. 2001. Atlantic Salmon Maritime provinces overview for 2000. DFO.
1	Toner, M. 2005. Lynx Records 1996-2005. NB Dept of Natural Resources, 48 recs.
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1	Scott, Fred W. 1998. Updated Status Report on the Cougar (Puma Concolor couguar) [Eastern population]. Committee on the Status of Endangered Wildlife in Canada, 298 recs.
1	Dept of Fisheris & Oceans. 2001. Atlantic Salmon Maritime provinces overview for 2000. DFO.

Appendix C

Rapid Bio-assessment

Appendix C-1

Summary Tables

Table C-1.1 Bird Brook Rapid Bio-assessment Survey Data

Reach	Date Walked	Reach Start	Reach Stop	Score	HADD Area (m2)	Length (m)	Bankfull Width (m)	Bankfull Depth (m)	Wet Width (m)	Wet Depth (m)	Substrate %							Land Use								NPS Pollution				Barriers					Bank Erosion (% undercut)		Channel Sinuosity	Channel Grade	Estimated Grade (%)
											Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines	Embeddedness (1-4)	Uncut Forest	Clearcut	Selective Logging	Pasture Hay	Agricultural Row Crops	Buffer Strip	Comment	Evidence? (y/n)	Some Sources? (y/n)	Obvious Sources? (y/n)	Buffer Strip? (y/n)	Culvert in Reach? (y/n)	Perched? (Y/N)	Other Barriers? (y/n)	Beaver Activity? (y/n)	Comment	Left Bank	Right Bank	High / Med / Low	High / Med / Low	
B1A1	22-Jun-11	2455273.1 7488336.3	2455400.6 7488386.1	140	81	180	0.45	0.30	0.35	0.10	0	70	0	0	0	20	10	1	100	0	0	0	0	0		n	n	n	n	n	n	n	n		0	0	high	med	3
B1A2	22-Jun-11	2455400.6 7488386.1	2455571.7 7488404.5	151	258	172	1.50	0.40	1.25	0.20	10	60	0	0	0	25	5	1	100	0	0	0	0	0		n	n	n	n	n	n	n	n		5	10	med	med	3
B1A3	22-Jun-11	2455571.7 7488404.5	2455750.4 7488530.9	153	239	272	0.88	0.40	0.63	0.20	5	40	10	5	0	40	0	1	100	0	0	0	0	0		n	n	n	n	n	n	n	n		20	20	high	med	2.5
B1A4	22-Jun-11	2455750.4 7488530.9	2456251.2 7488836.7	106	1128	600	1.88	0.70	1.63	0.40	0	0	0	0	10	25	65	4	100	0	0	0	0	0		n	n	n	n	n	n	n	y	Old beaver dam in reach.	50	50	high	low	0.5
B1A5	22-Jun-11	2456251.2 7488836.7	2456699.1 7488261.4	143	432	720	0.60	2.50	2.25	0.40	0	20	5	0	0	50	25	2	100	0	0	0	0	0		n	n	n	n	y	n	n	y	Old beaver dam in reach.	5	5	high	low	1
B1A6	22-Jun-11	2456699.1 7488261.4	2456822.3 7488195.9	127	689	212	3.25	0.65	3.00	0.50	0	10	0	0	0	20	70	3	100	0	0	0	0	0		n	n	n	n	n	n	n	y		30	30	high	low	0.5
B1B1	23-Jun-11	649359 5139822	2456934.5 7488341.2	124	196	338	0.58	0.30	0.40	0.13	0	5	0	0	0	15	80	2	100	0	0	0	0	0		n	n	n	n	n	n	n	n		40	40	high	low	1
B1B2	22-Jun-11	2456934.5 7488341.2	2456822.3 7488195.9	124	103	187	0.55	0.28	0.45	0.13	0	0	0	0	0	10	90	0	100	0	0	0	0	0		n	n	n	n	n	n	n	n		50	50	med	low	0.5
B1C1	22-Jun-11	2455883.3 7488301.8	2455970.4 7488243.2	NA	98	184	0.53	0.38	0.33	0.18	0	0	10	5	5	70	10	1	100	0	0	0	0	0	Clearcut with 30 m buffer at end on left bank.	n	n	n	y	n	n	n	n		10	10	med	low	0.5
B1D1	16-Jun-11	2455525.0 7487243.5	2455854.4 7487062.9	88	203	226	0.90	0.35	0.70	0.18	0	0	5	5	10	40	40	2	0	100	0	0	0	0	Lots of slash in the watercourse. (LWD) clearcut to watercourse edge.	n	n	n	n	n	n	n	n		5	5	high	low	1
B1D2	16-Jun-11	2455854.4 7487062.9	2456196.9 7487141.3	114	533	426	1.25	0.26	0.98	0.35	0	2.5	2.5	5	20	60	10	0	0	10	0	0	0	90		n	n	n	y	n	n	n	n		50	50	high	low	1
B1D3	16-Jun-11	2456196.9 7487141.3	2456447.7 7487217.3	120	397	361	1.10	0.60	0.90	0.30	0	0	5	10	20	60	5	1	0	10	0	0	0	90		n	n	n	y	y	n	n	n		40	40	high	low	1
B1D4	16-Jun-11	2456447.7 7487217.3	2456671.3 7487443.8	146	637	391	1.63	0.60	1.25	0.16	0	20	25	10	5	40	0	2	90	0	0	0	0	10	Clear cut right bank upper end of reach.	n	n	n	y	y	n	n	n		65	65	high	low	1
B1D5	15-Jun-11	2456671.3 7487443.8	2456873.4 7487504.7	131	296	197	1.50	0.30	1.25	0.25	0	5	15	10	10	40	20	1	90	0	0	0	0	10		n	n	n	y	n	n	n	n		20	20	high	med	1.5
B1E1	22-Jun-11	2456671.7 7487090.0	2456783.1 7487300.7	NA	193	297	0.65	0.35	0.33	0.30	0	10	15	5	10	40	20	1	100	0	0	0	0	0		n	n	n	n	n	n	n	n		5	5	low	low	1.5
B1E2	22-Jun-11	2456783.1 7487300.7	2456948.9 7487434.7	NA	165	262	0.63	0.65	0.40	0.33	0	0	0	0	5	65	30	1	100	0	0	0	0	0		n	n	n	n	n	n	n	n		5	5	high	low	0.2
B1F1	22-Jun-11	2456892.3 7487179.9	2457088.1 7487281.2	NA	203	271	0.75	0.40	0.45	0.25	0	0	0	0	0	40	60	0	50	0	50	0	0	0		n	n	n	n	n	n	n	y	Backwatered in dowstream most part.	0	0	low	low	0.2
B1G1	17-Jun-11	2457509.0 7487202.1	2457642 7487269.7	148	662	209	3.17	0.45	3.50	0.35	0	10	10	5	10	40	25	2	100	0	0	0	0	0	Wetland bog.	n	n	n	n	n	n	n	n		30	30	high	low	0.5
B1G1 (Adjacent Trib)	17-Jun-11	2457703.8 7487168.6	2457681.9 7487278.6	NA	54	134	0.40	0.23	0.32	0.10	0	0	10	0	0	40	50	3	100	0	0	0	0	0	Wetland bog.	n	n	n	n	n	n	n	n		65	65	med	low	0.5
B1H2	23-Jun-11	2458465.7 7488348.6	2458883.6 7488061.0	NA	206	200	1.03	0.65	0.65	0.27	0	0	0	5	15	50	30	2	100	0	0	0	0	0		n	n	n	n	n	n	n	n		5	5	high	low	1.5
B1H3	23-Jun-11	2458566.3 7488283.1	2458883.6 7488061.0	NA	1368	456	3.00	0.57	1.83	0.30	0	0	5	5	30	30	30	1	100	0	0	0	0	0		n	n	n	n	n	n	n	n		5	5	high	low	1
B1I2	23-Jun-11	2458990.4 7487958.8	2458990.3 7488101.1	NA	387	172	2.25	0.45	1.50	0.20	0	0	0	0	5	15	80	2	80	0	0	0	0	20		n	n	n	n	n	n	n	n		5	5	high	low	0.5
B2A1	22-Jun-11	2455970.4 7488243.2	2456270.9 7487894.4	NA	384	548	0.70	0.50	0.35	0.20	0	0	15	5	20	40	20	1	100	0	0	0	0	0	All beaver influence. Clearcut on left bank with good buffer.	n	n	n	y	n	n	n	y	Old beaver activity.	0	0	high	low	0.5
B2A2	22-Jun-11	2456270.9 7487894.4	2456764.7 7487706.5	162	2083	595	3.50	0.45	3.00	0.30	0	10	10	5	15	40	20	1	95	0	0	0	0	5	30 m of buffer strip.	n	n	n	y	n	n	n	n		10	10	high	low	1
B2B1 (A)	22-Jun-11	649032 5139430	2456831.6 7487894.0	126	1193	265	4.50	0.55	4.00	0.35	0	40	10	0	0	40	10	2	100	0	0	0	0	0		n	n	n	n	y	n	n	y	Culvert at the end of reach.	20	20	med	med	3
B2B1 (B)	22-Jun-11	2456831.6 7487894.0	2456817.6 7487615.4	128	2254	392	5.75	0.75	5.25	0.45	0	20	10	0	0	40	30	3	100	0	0	0	0	0		n	n	n	n	y	n	y	y	Culvert at start of reach. Beaver dams in reach.	60	60	high	low	1
B2C1	23-Jun-11	2458883.6 7488061.0	2459058.3 7487852.3	164	266	266	1.00	0.80	0.63	0.45	5	5	20	10	20	20	20	1	70	0	0	0	0	30	Buffered at start of reach.	n	n	n	y	n	n	n	y	Some old chewings.	10	10	high	low	1
B2C2	23-Jun-11	2459058.3 7487852.3	2459108.4 7487683.3	169	305	203	1.50	0.60	1.50	0.37	5	0	25	20	20	20	10	1	70	0	0	0	0	30	Left bank clear cut with 10-20 m buffer.	n	n	n	y	n	n	n	n	Beaver chewings on the main stem.	15	15	med	low	1
B3A1	22-Jun-11	2456806.0 7487555.7	2456890.2 7487495.5	NA	5160	129	40.00	>2	30.00	>1	0	5	15	10	30	20	20	1	0	0	0	0	0	0	Wetland pond.	n	y	n	n	y	n	n	n	Culvert is washed out.	0	0	low	low	0.5

Table C-1.1 Bird Brook Rapid Bio-assessment Survey Data

Reach	Stream Order	Channel Morphology							Channel Form						% Vegetation			Woody Debris	Water Quality						Species of Conservation Concern				Additional Comments
		Riffle	Run	Steady	Pool	Deadwater	Other	Comment	Braiding? (y/n)	Lateral Bars? (y/n)	Medial Bars? (y/n)	Islands? (y/n)	Sand on Banks? (y/n)	Comment	Canopy Cover (%)	Dominant Bank Vegetation	Dominant Riparian Vegetation	Lots / Med / Low / None	DO (%)	DO (mg/l)	pH	Sp Conductivity (µS/cm)	Temperature (°C)	Water Quality Coordinates	Suitable Invertebrate Habitat? (y/n)	Bivalves Observed? (y/n)	Dragonflies Collected? (y/n)	Bivalves Collected (Y/N)	
B1A1	1	100	0	0	0	0	0	Approx. 80% of reach goes below ground.	y	n	n	n	n		90	grass	trees	none	62.1	6.80	4.9	12.7	11.4	2455356.1 7488382.0	n	n	n	n	Most of watercourse undefined and flows below ground.
B1A2	1	90	0	0	10	0	0		y	n	n	y	n	Approx. 20% flows underground.	80	grass	trees	low	80.9	8.91	5.3	15.8	10.4	2455479.6 7488414.0	n	n	n	n	Noted fish at the midpoint. Watercourse undefined at points and periodically flows below ground. NOMAD and GPS used.
B1A3	1	90	0	0	10	0	0		y	y	n	y	y		75	grass	trees	med	88.6	9.94	5.8	17.5	10.0	2455728.8 7488489.8	n	n	n	n	Fish observed within reach.
B1A4	1	20	0	70	0	10	0		y	y	n	n	y		65	grass	shrubs (alders)	lots	80.4	8.55	5.6	18.3	11.7	2455928.8 7488704.8	n	n	n	n	Old beaver dam and swampy area in the first 1/4 of reach. Many alders and difficult terrain.
B1A5	1	30	0	60	20	0	0		y	y	n	n	y		70	grass	shrubs	lots	75.3 85.6	7.66 8.78	5.4 5.5	17.3 17.2	13.5 14	2456407.1 7488643.8	n	n	n	n	Took water quality in the first and last quarters of reach (top results for upper quarter) - results very similar for both. Found marijuana garden on this stream - garden has been removed by RCMP.
B1A6	1	10	0	50	0	40	0		y	n	n	n	n		60	grass	shrubs	lots	20.6	1.66	5.2	17.6	15.0	2456796.9 7488231.7	n	n	n	n	Stream drains into wetland area where it meets adjacent stream B1B2 earlier than predicted.
B1B1	1	40	0	60	0	0	0		y	n	n	n	n	Approx. 40% flows below ground.	60	grass	shrubs	med	39.8	4.72	5.0	20.0	10.9	649262 5139689	n	n	n	n	Braiding, undefined in areas, approx 40% flows below ground.
B1B2	1	20	0	50	0	30	0		y	n	n	n	n	Goes below ground in upper reach periodically.	60	grass	shrubs	med	40.3	4.50	4.4	19.0	12.9	2456890.6 7488304.1	n	n	n	n	Stream difficult to follow in the upper reaches, small and flows below ground.
B1C1	1	0	0	100	0	0	0	Small headwater.	y	n	n	n	n		70	grass	shrubs	low	68.2	8.03	5.3	16.7	9.7	2455907.6 7488287.6	n	n	n	n	Other "twin" headwater reach is a wetland at the start and the end is a wet meadow (i.e., B1C2). Never developes a channel throughout and is confined by valley walls.
B1D1	1	0	0	100	0	0	0	Headwaters.	y	n	n	n	n		10	grass	trees	lots	104.2	11.56	6.0	14.3	10.7	2455655.2 7487131.1	n	n	n	n	Stream continued approximately 150 m into clearcut above road. Small stream, slow flow. Lots of slash in over the watercourse and clearcut over watercourse.
B1D2	1	65	0	30	5	0	0		n	y	n	n	n		40	grass	shrubs	lots	82.0	8.75	6.3	11.6	11.1	2455977.2 7487060.3	n	n	n	n	Watercourse clearcut (90% buffered) on both sides.
B1D3	1	70	0	15	15	0	0		n	y	y	y	n		50	grass	trees	lots	80.1	8.80	6.2	15.3	11.0	2456305.9 7487212.8	n	n	n	n	We shortened reach so that it ended at the fire road culvert as habitat changes below.
B1D4	1	55	20	5	20	0	0	Some erosion at upper end of reach (due to road?).	n	n	n	n	y		70	grass	trees	lots	86.3	9.37	6.4	15.8	11.4	2456632.6 7487405.0	n	n	n	n	Clearcut on right side of upper reach. Erosion near start of reach (due to culvert?). Reach lengthened upstream to road.
B1D5	1	15	85	0	0	0	0		n	y	n	n	y	Evidence of high flows/deposition.	60	grass	shrubs	lots	82.6	9.04	6.5	20.8	10.7	2456739.4 7487443.3	n	n	n	n	Evidence of high flows/some deposition.
B1E1	1	50	50	0	0	0	0		y	n	n	n	n		45	grass	shrubs/trees	lots	82.3	8.75	5.4	12.9	11.8	2456779 7487263.4	n	n	n	n	Not the right habitat for clams or dragonflies. Channel increases in grade and disappears before getting to the road. There was thinning ongoing on either side of the watercourse. Other form NA to watercourse.
B1E2	1	0	0	100	0	0	0		n	y	n	n	y	Backwatered at end of reach.	40	grass/ shrubs	shrubs	lots	73.1	8.05	6.2	21.9	10.1	2456901.8 7487401.9	n	n	n	n	Slow small reach no odonata. Fish observed in reach. Other form does not apply.
B1F1	1	0	0	100	0	0	0		n	n	n	n	n	Backwatered, little to no flow.	65	moss	trees	lots	65.8	7.57	5.8	20.6	10.0	2456989.0 7487281.9	n	n	n	n	B3A2 is backwatered by beaver pond, therefore, much of this reach is backwatered as well. Observed fish on watercourse.
B1G1	1	0	0	100	0	0	0		y	n	n	n	n	Wetland stream.	30	grass/ shrubs	shrubs	low	86.2	9.14	6.2	-	12.0	2457552.2 7487208.8	n	n	n	n	Trib enters RB. Followed until it ended. Observed fish in reach. Low gradient wetland watercourse. Watercourse continues from end of reach in multiple branches. Not suitable for dragonflies or clams.
B1G1 (Adjacent Trib)	1	0	0	100	0	0	0		n	n	n	n	n	Wetland stream.	40	grass	shrubs	low	43.2	5.06	4.5	-	9.9	2457696.1 7487171.9	n	n	n	n	Small, unmarked tributary the meets up with B1G1 when draining into B3A4. Wetland stream.
B1H2	1	0	0	100	0	0	0		y	n	n	n	n		80	moss	shrubs/trees	lots	52.4	5.69	6.1	23.2	13.0	2458527.9 7488316.0	n	n	n	n	Reach does not extend upstream as predicted to B1H1. Upper end of reach ends with disorganized morphology, water everywhere (wet area), clearing.
B1H3	1	0	0	100	0	0	0		y	n	n	n	n	Goes underground.	80	grass	shrubs	lots	77.4	8.65	6.3	22.8	10.6	2458792.3 7488127.1	n	n	n	n	Could not find reach B1I2 (adjacent 1st order stream) where predicted. Found trib where WQ collected on this B2C1. Not appropriate habitat for the other form. Watercourse flows underground in places. Braided, not well defined.
B1I2	1	0	100	0	0	0	0		n	n	n	n	n		65	grass	shrubs	med	68.9	7.63	5.6	17.3	13.2	2459001.6 7488048.3	n	n	n	n	Reach is not where shown. Found at the midpoint of B2C1. Not appropriate for other form. Did not follow reach to the end as was typical of other streams surveyed and we can predict what will happen.
B2A1	2	0	0	90	0	10	0		n	n	n	n	n	Defined channel with beaver dams some dead water.	50	grass	shrubs	low	85.8	9.76	5.6	16.2	10.0	2456114.7 7488064.4	n	n	n	n	Observed fish at the start of reach small (10 cm). Old beaver chewings also meadows. Several old dams.
B2A2	2	50	50	0	0	0	0		y	y	n	y	y		85	grass	alders/ trees	lots	90.1	9.88	6.1	17.6	10.6	2456481.9 7487807.8	n	n	n	n	Last two reaches no habitat assessment data sheets - low gradient headwaters. Fish observed in reach. Reach ends at wetland meadow.
B2B1 (A)	2	50	10	0	20	20	0		y	n	y	y	n		70	grass	shrubs	low	29.7	3.10	5.0	17.5	12.0	649065 5139226	n	n	n	n	Another marijuana garden was identified on this river. The RCMP has since disposed of it. Split reach in two as it changed to different habitat below the road culvert. This reach upstream of road.
B2B1 (B)	2	0	0	90	0	10	0		n	n	n	n	n		10	grass	trees	low	18.1	1.67	5.5	18.5	14.6	649096 5138998	n	n	n	n	Split reach in half as lower half quite different from upper. This is the lower half of the reach from the road/culvert downstream to B3A1.
B2C1	2	70	10	20	0	0	0	Upstream end is lower in grade.	y	n	n	n	n		70	grass	shrubs	lots	75.5	8.37	6.2	21.4	10.3	2458990.4 7487958.8	n	n	n	n	Did not find benthic invertebrates. Aquatic vegetation observed in watercourse. Not the right habitat for bivalves. Clear cuts on the right and left banks. Right bank buffer is wider (about 30-50 m).
B2C2	2	70	30	0	0	0	0		n	n	n	n	n		80	grass	trees	lots	87.9	9.82	5.9	18.6	10.5	2459070.7 7487779.4	n	n	n	n	Looked for inverts but none found. No bivalves observed. Clear cut on the left bank approximately 10 m buffer at reach break. There is a small waterfall on this reach.
B3A1	3	0	0	0	0	100	0	At culvert wetland.	n	n	n	n	n	Pond.	0	grass	trees	med	83.8	8.66	5.9	17.9	14.3	2456806.0 7487555.7	n	n	n	n	Fish jumping in wetland pond. Other sheet not filled out as does not apply.

Table C-1.1 Bird Brook Rapid Bio-assessment Survey Data

Reach	Date Walked	Reach Start	Reach Stop	Score	HADD Area (m2)	Length (m)	Bankfull Width (m)	Bankfull Depth (m)	Wet Width (m)	Wet Depth (m)	Substrate %							Land Use								NPS Pollution				Barriers					Bank Erosion (% undercut)		Channel Sinuosity	Channel Grade	Estimated Grade (%)
											Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines	Embeddedness (1-4)	Uncut Forest	Clearcut	Selective Logging	Pasture Hay	Agricultural Row Crops	Buffer Strip	Comment	Evidence? (y/n)	Some Sources? (y/n)	Obvious Sources? (y/n)	Buffer Strip? (y/n)	Culvert in Reach? (y/n)	Perched? (Y/N)	Other Barriers? (y/n)	Beaver Activity? (y/n)	Comment	Left Bank	Right Bank	High / Med / Low	High / Med / Low	
B3A2	22-Jun-11	2456890.2 7487495.5	2457088.1 7487281.2	NA	7340	367	NA	NA	20.00	>2	0	0	5	5	5	25	60	4	100	0	0	0	0	0		n	n	n	n	n	n	n	y		0	0	low	low	0.5
B3A3	22-Jun-11	2457088.1 7487281.2	2457191.0 7487315.8	NA	2625	105	NA	NA	25.00	>2	0	0	10	5	5	10	70	0	100	0	0	0	0	0		n	n	n	n	n	n	n	y	Entire reach within pond 100 % organic.	0	0	low	low	0.5
B3A4	22-Jun-11	2457191.0 7487315.8	2457692.6 7487292.8	157	2965	593	5.00	0.75	4.50	0.45	0	20	30	10	5	30	5	2	100	0	0	0	0	0		n	n	n	n	n	n	y	y	Beaver dam/pond at upper end reach.	40	40	med	med	2.5
B3A5	17-Jun-11	2457681.9 7487278.6	2457822.8 7487382.0	120	560	160	3.50	0.68	3.00	0.38	0	5	15	5	5	50	20	3	100	0	0	0	0	0	Wetland.	n	n	n	n	n	n	n	n		30	30	high	low	0.5
B3A6	23-Jun-11	2457822.8 7487382.0	2458493.3 7487637.3	170	5684	812	7.00	2.50	5.33	0.63	10	30	20	30	5	5	0	1	100	0	0	0	0	0	Likely thinned 2-4 years ago.	y	n	n	n	n	n	n	n		25	25	med	med	2.5
B3A7	23-Jun-11	2458493.3 7487637.3	2458911.9 7487619.9	147	13125	525	25.00	0.65	15.00	0.40	5	15	30	10	20	10	10	1	100	0	0	0	0	0		n	n	n	n	n	n	n	y	Minor beaver activity.	20	20	med	low	1
B3A8	23-Jun-11	2458911.9 7487619.9	2459108.4 7487683.3	167	1200	150	8.00	0.80	7.00	0.63	20	10	30	20	10	5	5	0	70	0	0	0	0	30		n	n	n	n	n	n	n	n		10	10	med	low	1.5- 2.0
B3A9	24-Jun-11	2459108.4 7487683.3	2459346.1 7487613.4	175	1836	306	6.00	0.70	4.50	0.53	15	35	30	10	5	5	0	1	100	0	0	0	0	0		n	n	n	n	n	n	n	n		10	10	med	med	3
B3A10	24-Jun-11	2459346.1 7487613.4	2459541.2 7487288.0	175	3014	471	6.40	0.70	4.15	0.40	20	40	30	5	5	0	0	1	100	0	0	0	0	0		n	n	n	n	n	n	n	n	Flashy flows, mobile channel.	5	5	med	low	1.5 - 2.0

Table C-1.1 Bird Brook Rapid Bio-assessment Survey Data

Reach	Stream Order	Channel Morphology							Channel Form						% Vegetation			Woody Debris	Water Quality						Species of Conservation Concern				Additional Comments
		Riffle	Run	Steady	Pool	Deadwater	Other	Comment	Braiding? (y/n)	Lateral Bars? (y/n)	Medial Bars? (y/n)	Islands? (y/n)	Sand on Banks? (y/n)	Comment	Canopy Cover (%)	Dominant Bank Vegetation	Dominant Riparian Vegetation	Lots / Med / Low / None	DO (%)	DO (mg/l)	pH	Sp Conductivity (µS/cm)	Temperature (°C)	Water Quality Coordinates	Suitable Invertebrate Habitat? (y/n)	Bivalves Observed? (y/n)	Dragonflies Collected? (y/n)	Bivalves Collected (Y/N)	
B3A2	3	0	0	0	0	100	0		n	n	n	n	n	Backwatered.	20	shrubs	shrubs	low	83.5	8.20	5.9	18.7	13.9	2457060.1 7487264.4	n	n	n	n	Fish jumping in pond. Clearing on the right bank. Reach is backwatered in the upper reach and complete pond in the lower reach. Other form does not apply.
B3A3	3	0	0	0	0	100	0		n	n	n	n	n	Ponded.	10	shrubs	shrubs	low	NA	NA	NA	NA	NA	See reach B3A2 (in pond as well)	n	n	n	n	Reach is ponded. Surveyed at the end of day. Did not get to dam. Likely in the next reach, could hear running water.
B3A4	2	5	0	80	15	0	0		n	y	n	n	y		60	grass	shrubs (alders)	med	51.9	5.37	5.8	18.8	14.0	649602 5138498	y	n	n	n	Did not have benthic sampling net. Did not see dragonflies or clams.
B3A5	3	0	0	100	0	0	0	Wetland.	y	n	n	y	n	Highly braided.	45	grass	alders	low	86.1	9.25	6.3	-	12.2	2457759.2 7487338.8	n	n	n	n	Watercourse highly braided, soft sediment throughout reach, approximately 1 m at the start. No benthic inverts or bivalves found.
B3A6	3	40	30	25	5	0	0		y	y	n	y	y	Looks flashy.	40	shrubs	trees	lots	88.0	8.69	6.4	19.5	15.6	2458244.7 7487635.6	n	n	n	n	Only did lower part of reach due to time (256 m). Lots of aquatic vegetation in stream. Did not catch any benthic invertebrates. Did not see any bivalves. Unsurveyed reach likely high grade and riffly. Lots of evidence of high flashy flows and channel movement. Collected crayfish head.
B3A7	3	30	20	30	10	10	0		y	y	n	y	y	Channel is very braided.	70	shrubs	trees	lots	90.3	9.17	6.3	19.7	14.3	2458771.1 7487561.4	n	n	n	n	No inverts or bivalves observed or collected. Reach starts at a pinch point. Beaver is active in the reach and the lower part of reach backwatered. Channel is all over the place. Massive amounts of large woody debris.
B3A8	3	55	40	0	5	0	0		y	y	n	y	y	Cut face on bar forms.	30	shrubs	trees	lots	91.9	9.51	6.5	18.7	14.2	2459032.9 7487667.8	y	n	n	n	No emerging dragonflies observed. None found with benthic sampling net - found ephemeroptera only. Lots of large woody debris jams - channel very mobile, cutting into banks and bars in places.
B3A9	2	55	25	10	10	0	0		y	y	n	y	y		60	grass/ shrubs	trees	lots	91.5	9.86	6.3	19.4	11.9	2459210.5 7487654.8	y	n	y	n	Benthic sweep found invertebrates - ephemeroptera, trichoptera, tipulidae, chironomids, gomphid larvae. Banks are mossy, evidence of flash flows, mobile bars overflow channels braiding, high prevalence of large woody debris.
B3A10	2	65	25	0	10	0	0		y	y	y	y	y		25	grass	trees	lots	95.8	10.27	6.6	19.4	12.3	2459479.5 7487374.1	y	n	y	n	Sampling for inverts completed near mouth of reach within midpoint of reaches W4A19 and W4A18. Found and collected dragonfly larvae. Lots of LWD in reach, channel splits and backflow channels. Opens up and widens out before reaching West Branch Napadogan River

Table C-1.2 Sisson Brook Rapid Bio-assessment Survey Data

Reach	Date Walked	Reach Start	Reach Stop	Score	HADD Area (m2)	Length (m)	Bankfull Width (m)	Bankfull Depth (m)	Wet Width (m)	Wet Depth (m)	Substrate %							Land Use							NPS Pollution				Barriers					Bank Erosion (% undercut)		Channel Sinuosity	Channel Grade	Estimated Grade (%)	Stream Order	Channel Morphology					
											Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines	Embeddedness (1-4)	Uncut Forest	Clearcut	Selective Logging	Pasture Hay	Agricultural Row Crops	Buffer Strip	Evidence? (y/n)	Some Sources? (y/n)	Obvious Sources? (y/n)	Buffer Strip? (y/n)	Culvert in Reach? (y/n)	Perched? (y/n)	Other Barriers? (y/n)	Beaver Activity? (y/n)	Comment	Left Bank	Right Bank	High / Med / Low	High / Med / Low			Riffle	Run	Steady	Pool	Deadwater	Other
S1A1	20-Jun-11	2457740.9 7484099.2	2457945.8 7484415.8	93	689	372	1.85	0.50	1.55	0.37	0	0	0	5	25	20	50	1	100	0	0	0	0	0	n	n	n	n	n	n	n	y	Old beaver activity.	0	0	low	low	0.2	1	0	0	15	0	85	0
S1A2	20-Jun-11	2457945.7 7484415.8	2458067.1 7484765.1	131	573	382	NA	NA	1.50	1.25	0	0	0	0	0	0	100	0	100	0	0	0	0	0	n	n	n	n	n	n	n	y	Old beaver activity, organic substrate.	10	10	low	low	0.2	1	0	0	0	0	100	0
S1A3	20-Jun-11	2458067.1 7484765.1	2458232.8 7485252.6	139	1157	514	2.25	0.65	1.25	0.35	0	0	5	5	15	60	15	2	100	0	0	0	0	0	n	n	n	n	n	n	n	y	Old beaver activity.	20	20	high	low	0.5	1	0	0	100	0	0	0
S1B1	21-Jun-11	649834 5136754	650092 5136577	133	478	382	1.25	0.40	1.00	0.20	0	0	5	10	15	40	30	2	100	0	0	0	0	0	n	n	n	n	y	y	n	n	Culvert is located at start of reach road.	30	30	med	med	3	1	60	0	35	5	0	0
S1B2	21-Jun-11	650092 5136577	2457999.5 7485270.5	large pond	0																																							
S1B3	21-Jun-11	2457999.5 7485270.5	2458232.8 7485252.6	131	702	234	3.00	0.43	2.50	0.13	0	35	0	0	0	45	20	2	100	0	0	0	0	0	n	n	n	n	n	n	n	y	Multiple dams on reach.	30	30	med	low	2	1	80	0	20	0	0	0
S1C1	15-Jun-11	2457420.0 7486446.9	2457621.7 7486339.9	NA	118	236	0.50	0.20	0.50	0.13	0	30	10	5	5	25	25	1	90	0	0	0	0	10	y	n	n	y	n	n	y	n	High grade, flows underground.	0	0	high	med	4	1	0	0	0	0	0	100
S1C2	15-Jun-11	2457621.7 7486339.9	2457993.2 7486174.9	143	156	313	0.50	0.35	0.50	0.15	0	30	10	5	5	40	10	1	100	0	0	0	0	0	y	n	n	n	n	n	n	n		0	0	high	low	1.5	1	0	0	100	0	0	0
S1C3	15-Jun-11	2457839.4 7486237.1	2458002.3 7486150.2	155	132	220	0.60	0.45	0.60	0.20	0	25	5	5	5	35	25	1	100	0	0	0	0	0	y	n	n	n	n	n	y	n	Large boulders may present barrier.	30	30	high	low	1.5 to 2	1	10	0	90	0	0	0
S1C5	15-Jun-11	2458002.3 7486150.2	2458302.7 7486189.0	144	502	309	1.63	0.50	1.38	0.28	0	1	9	20	10	40	20	1	100	0	0	0	0	0	n	n	n	n	n	n	n	n		30	30	high	low	1.5	1	80	20	0	0	0	0
S1C6	15-Jun-11	2458302.7 7486189.0	2458459.4 7486113.2	141	320	256	1.25	0.43	0.83	0.30	2	3	20	10	20	40	5	1	100	0	0	0	0	0	y	n	n	n	n	n	n	n	Waterfall at end of reach passable.	20	20	med	low	2	1	30	60	10	0	0	0
S1D2	14-Jun-11	2458103.4 7486913.8	2458181.4 7486720.2	135	95	270	0.35	0.35	0.30	0.25	0	15	25	5	5	30	20	1	90	0	0	0	0	10	n	n	n	y	n	n	n	n		0	0	high	low	>1%	1	100	0	0	0	0	0
S1D3	14-Jun-11	2458181.4 7486720.2	2458294.2 7486385.1	129	400	400	1.00	0.37	1.00	0.20	0	10	20	10	10	30	20	1	70	0	0	0	0	30	n	n	n	y	n	n	n	n	Clear cut on LB at start of reach, 5-10 m buffer strip, potential fish sighting.	5	5	high	low	1	1	20	0	0	80	0	0
S1D4	14-Jun-11	2458294.2 7486385.1	2458488.7 7486115.3	144	386	336	1.15	0.42	1.25	0.20	0	5	20	30	10	30	5	1	80	15	0	0	0	5	y	n	n	n	n	n	n	n	Culvert downstream of reach end.	30	30	med	low	1.5	1	85	10	3	2	0	0
S1D4 Trib	14-Jun-11	2458381.2 7486286.5	2458519.3 7486422.1	na	98	196	0.50	0.40	0.30	0.15	0	0	0	0	0	0	100	0	100	0	0	0	0	0	n	n	n	n	y	n	n	n	Likely drainage spring fed.	0	0	high	low	1.5	1	0	0	100	0	0	0
S1E1	15-Jun-11	2458978.3 7486393.9	2459075.8 7486260.1	NA	132	151	0.88	0.70	0.63	0.13	0	10	20	10	15	15	30	1	100	0	0	0	0	0	n	n	n	n	n	n	n	y	End of reach in large, active beaver pond, dam.	40	40	high	high	5	1	50	0	50	0	0	0
S1E2	15-Jun-11	2459075.8 7486260.1	2459089.4 7486169.0	102	39	77	0.50	0.40	0.30	0.20	55	0	0	0	5	10	30	0	80	0	20	0	0	0	n	n	n	n	n	n	y	n	Large 10 m waterfall at mouth of brook.	0	0	low	med	<4	1	50	0	50	0	0	0
S2A1 (A)	20-Jun-11	650609 5136797	2458383.3 7485581.2	163	414	138	3.00	0.70	3.00	0.50	0	10	10	0	20	35	25	2	100	0	0	0	0	0	n	n	n	n	n	n	n	y	Old beaver dam at upstream end of reach.	10	10	med	low	2	2	60	0	20	20	0	0
S2A1(B)	20-Jun-11	2458232.8 7485252.6	650609 5136797	125	627	228	2.75	0.80	2.25	0.55	0	20	10	0	0	40	30	3	100	0	0	0	0	0	n	n	n	n	n	n	n	n	Old beaver pond, drained /grassy.	20	20	high	low	1	2	10	10	80	0	0	0
S2A2	20-Jun-11	2458383.3 7485581.2	2458438.4 7485817.6	186	1220	244	5.00	0.50	4.50	0.45	5	20	25	30	5	15	0	2	100	0	0	0	0	0	n	n	n	n	n	n	n	n		5	5	low	low	2	2	50	30	0	20	0	0

Table C-1.2 Sisson Brook Rapid Bio-assessment Survey Data

Reach	Channel Form						% Vegetation			Woody Debris	Water Quality						Species of Conservation Concern				Additional Comments
	Braiding	Lateral Bars	Medial Bars	Islands	Sand on Banks	Comment	Canopy Cover (%)	Dominant Bank Vegetation	Dominant Riparian Vegetation	Lots / Med / Low / None	DO (%)	DO (mg/l)	pH	Sp Conductivity (µS/cm)	Temperature (°C)	Water Quality Coordinates	Suitable Invertebrate Habitat? (y/n)	Dragonflies Collected (y/n)	Bivalves Collected (y/n)	Bivalves Observed? (y/n)	
S1A1	y	n	n	n	n	Old beaver pond, wetland.	40	grass	shrubs	med	92.00	9.30	6.0	22.0	15.2	2457894.0 7484319.3	n	n	n	n	Old beaver dams throughout reach, watercourse starts at wetland at transmission line, no clear channel until near the start of the next reach.
S1A2	n	n	n	n	n	Grassy wetland watercourse.	10	grass	grass	med	96.10	9.51	6.0	19.0	14.3	2458052.8 7484591.1	n	n	n	n	Moved end of reach up (see coordinates), cedar waxwings observed along with piliated woodpecker. Otter, moose and bear signs observed.
S1A3	n	n	y	n	y		10	grass	shrubs	med	98.00	10.03	6.2	18.1	14.2	2458171.4 7485009.3	y	n	n	n	Looked for dragonflies, did not see exuvia or larvae, red sp of adult and also same black sp from last week.
S1B1	y	y	y	y	y		75	grass	shrubs	lots	96.50	10.00	4.9	12.2	12.9	650028 5136608	n	n	n	n	Reach extends upstream to road, small beaver pond at lower end, ponds and dams on watercourse.
S1B2																					Beaver pond encompasses all of S1B2 and lower part of predicted S1B1 (now in this reach). Blue dragonflies observed.
S1B3	y	y	n	y	n	Periodically goes underground.	80	grass	shrubs	low	76.00	7.65	5.3	18.6	14.8	650418 5136598	n	n	n	n	Large pond at start of reach several beaver dams and old beaver ponds.
S1C1	y	n	n	n	n	Undefined channel flows underground.	65	grass	trees	lots	91.20	10.75	6.0	17.8	7.8	2457573.2 7486361.4	n	n	n	n	Undefined channel stream flows underground.
S1C2	y	n	n	n	y	Undefined channel.	65	grass	trees	lots	90.40	10.62	6.0	1.8	8.0	2457795.4 7486273.5	n	n	n	n	Not appropriate habitat for collection of dragonflies and clams, headwater channel, braided and flows underground, spring fed.
S1C3	y	n	n	n	y	Underground flow.	65	grass	trees	med	93.70	10.99	6.2	18.4	8.1	2457930.5 7486151.1	n	n	n	n	Not appropriate habitat for dragonflies or clam collection.
S1C5	y	n	n	n	y	Flow underground (about 40% of watercourse) probably spring fed).	65	grass	trees	med	80.00	8.60	6.1	2.1	12.2	2458143.1 7486179.1	n	n	n	n	Not suitable habitat for dragonflies.
S1C6	y	n	n	y	n	Watercourse goes under moss several times.	70	grass	trees	lots	97.00	11.34	6.2	19.1	8.6	2458417.9 7486124.2	y	n	n	n	Swept found caddis flies, chironomids, mayflies, diptera no odonata. Start of reach higher grade and wider than end of reach.
S1D2	y	n	n	n	n	Headwater braided unstructured, periodically below ground.	85	shrubs trees	trees	lots	87.50	10.24	6.1	14.4	7.1	2458143.8 7486858.9	n	n	n	n	Not suitable habitat for dragon flies/clams. Channel is undefined S1D1 does not exists ends in a clear cut slash pile.
S1D3	y	n	n	n	n	Channel goes underground, moss tree roots highly braided.	65	grass shrubs	trees	lots	90.80	10.43	6.2	2.1	9.8	2458237.6 7486623.4	n	n	n	n	Stream is braided goes out under mossy bits then reforms. Reach starts out high grade and becomes alder.
S1D4	y	n	n	n	n	Small watercourse, moss braiding.	85	shrubs	trees	lots	87.30	9.71	6.4	-	10.7	2458342.6 7486335.5	n	n	n	n	Looked but found nothing, not suitable habitat for dragonflies or clams. Found an unmarked tributary mid-reach (see below).
S1D4 Trib	y	n	n	n	n	10% of the watercourse flows underground under moss and tree roots.	85	grass	trees	med	NA	NA	NA	NA	NA	NA	n	n	n	n	Not suitable habitat for dragonflies or clams.
S1E1	y	n	n	n	n	Undefined channel.	65	grass	trees	low	80.90	7.58	6.3	-	18.2	2459032.0 7486319.4	n	n	n	n	Large active dam beaver pond on the uppermost end of reach (saw beaver), not suitable habitat for dragonflies or molluscs.
S1E2	y	n	n	n	n	Undefined channel US, DS steep grade, entrenched.	65	grass	trees	none	81.40	8.54	6.1	16.1	12.7	2459089.3 7486218.9	n	n	n	n	Not appropriate habitat for dragonflies or molluscs or fish.
S2A1 (A)	y	n	n	y	n		80	grass	shrubs (alders)	low	NA	NA	NA	NA	NA	see S2A1(B)	y	n	n	n	Split reach in two as very different -B is old beaver pond area.
S2A1(B)	n	n	n	n	n	Old beaver pond, very different than lower reach, lots of trout observed jumping in the pond.	5	grass	shrubs	none	107.70	10.55	6.1	-	15.9	650589 5136641	n	n	n	n	Other half of reach inside old drained beaver pond area. Pond at upper-most end of reach with lots of trout jumping in it.
S2A2	y	y	n	n	n		65	grass	trees	low	114.20	11.97	6.1	-	13.8	650710 5137044	y	y	n	n	Sampled for inverts at start of reach and found dragonfly larvae - collected.

Table C-1.2 Sisson Brook Rapid Bio-assessment Survey Data

Reach	Date Walked	Reach Start	Reach Stop	Score	HADD Area (m2)	Length (m)	Bankfull Width (m)	Bankfull Depth (m)	Wet Width (m)	Wet Depth (m)	Substrate %							Land Use							NPS Pollution				Barriers					Bank Erosion (% undercut)		Channel Sinuosity	Channel Grade	Estimated Grade (%)	Stream Order	Channel Morphology					
											Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines	Embeddedness (1-4)	Uncut Forest	Clearcut	Selective Logging	Pasture Hay	Agricultural Row Crops	Buffer Strip	Evidence? (y/n)	Some Sources? (y/n)	Obvious Sources? (y/n)	Buffer Strip? (y/n)	Culvert in Reach? (y/n)	Perched? (y/n)	Other Barriers? (y/n)	Beaver Activity? (y/n)	Comment	Left Bank	Right Bank	High / Med / Low	High / Med / Low			Riffle	Run	Steady	Pool	Deadwater	Other
S2A3	20-Jun-11	2458438.4 7485817.6	2458573.7 7486030.3	182	841	253	3.33	0.63	3.25	0.43	5	10	40	30	10	5	0	1	100	0	0	0	0	0	n	n	n	n	y	y	n	n	Culvert/road at the end of reach.	10	10	low	low	2	2	50	35	0	15	0	0
S2A4	14-Jun-11	2458573.7 7486030.3	2458797.9 7486103.7	147	546	273	2.00	0.40	1.30	0.40	0	5	15	10	20	40	10	1	100	0	0	0	0	0	y	n	n	n	y	y	n	y	Old beaver activity, culvert still passable at high flows.	10	10	med	low	2	2	40	20	35	0	5	0
S2B1	14-Jun-11	2458513.8 7486100.0	2458929.7 7486138.4	154	1125	360	3.13	0.58	2.75	0.28	0	5	15	5	25	40	10	1	100	0	0	0	0	0	n	n	n	n	y	y	n	y	Old beaver activity, culvert still passable at high flows.	10	10	high	low	1	2	35	60	0	5	0	0
S3A1	15-Jun-11	2458795.2 7486111.4	2458927.5 7486138.5	184	482	138	3.50	0.44	3.00	0.21	10	20	25	20	10	10	5	1	100	0	0	0	0	0	n	n	n	n	n	n	n	n		30	30	low	med	3.5	3	60	30	0	10	0	0
S3A2	15-Jun-11	2458927.5 7486138.5	2459365.5 7486142.2	187	1872	468	4.00	0.55	3.83	0.35	15	20	35	10	5	10	5	1	100	0	0	0	0	0	n	n	n	n	n	n	n	y	Possibly old dam.	10	10	low	low	1.5	3	35	35	0	30	0	0
S3A3	16-Jun-11	2459365.5 7486142.2	2459542.4 7486070.8	179	857	191	4.50	0.63	3.83	0.35	20	5	20	35	10	10	0	1	100	0	0	0	0	0	n	n	n	n	n	n	y	n	Waterfall, mixed wood.	20	20	med	low	1.5 to 2	3	50	40	0	10	0	0
S3A4	16-Jun-11	2459542.4 7486070.8	2459749.1 7485976.8	187	830	237	3.50	0.42	3.00	0.36	10	5	20	40	20	5	0	1	100	0	0	0	0	0	n	n	n	n	n	n	n	n		10	10	low	low	2	2	65	30	0	5	0	0

Table C-1.2 Sisson Brook Rapid Bio-assessment Survey Data

Reach	Channel Form						% Vegetation			Woody Debris	Water Quality						Species of Conservation Concern				Additional Comments
	Braiding	Lateral Bars	Medial Bars	Islands	Sand on Banks	Comment	Canopy Cover (%)	Dominant Bank Vegetation	Dominant Riparian Vegetation	Lots / Med / Low / None	DO (%)	DO (mg/l)	pH	Sp Conductivity (µS/cm)	Temperature (°C)	Water Quality Coordinates	Suitable Invertebrate Habitat? (y/n)	Dragonflies Collected (y/n)	Bivalves Collected (y/n)	Bivalves Observed? (y/n)	
S2A3	n	n	n	n	n		70	grass	trees	none	116.50	12.18	5.9	19.3	13.1	650806 5137253	y	y	n	n	Mayfly, stonefly, caddis fly, yellow spotted salamander caught in sweep. Dragonfly larva collected. Good site for e-fishing.
S2A4	y	y	n	y	y	Closer to culvert channel braids and runs all over.	75	grass	trees	med	96.40	10.25	6.8	20.6	12.6	2458650.1 7486074.8	y	n	n	n	Swept but none found, channel disorganized increases in grade at end of reach, nice riffle. Substrate larger at end of reach.
S2B1	y	y	n	y	y		50	alders grass	alders	lots	95.10	10.70	6.7	21.3	10.0	2458634.7 7486151.8	y	n	n	n	Tried to collect dragonflies at several locations chironomid, tricoptera, ephemeroptera. Bunch of backwatered areas maybe old beaver ponds, watercourse is disorganized braided.
S3A1	n	n	n	n	n	Pretty strait and fast flow.	55	grass	trees	med	95.90	10.42	6.8	22.0	11.5	2458869.3 7486135.1	y	exuvia	n	n	Collected dragonfly exuvia from next to watercourse. Sampled for invertebrates and found stoneflies.
S3A2	n	y	y	y	y		50	grass	trees	lots	98.90	10.98	6.8	21.5	11.0	2459166.9 7486154.8	y	exuvia	n	n	Lots of emerging dragonflies, black straight tail.
S3A3	n	y	y	y	y		75	grass	trees	lots	112.20	12.53	6.6	22.2	9.8	2459351.9 7486142.8	y	exuvia	n	n	Watercourse looks very mobile at high flows, confined within the valley walls. Photo of staff gauge.
S3A4	y	y	y	y	y	Mobile at high flows.	70	grass	trees	lots	111.20	12.72	6.8	22.3	9.8	2459602.6 7486037.3	y	exuvia	n	n	Mobile channel morphology at high flows, watercourse is moving large materials. Collected dragonfly exuvia.

Table C-1.3 McBean Brook Rapid Bio-assessment Survey Data

Reach	Date Walked	Reach Start	Reach Stop	Score	HADD Area (m2)	Length (m)	Bankfull Width (m)	Bankfull Depth (m)	Wet Width (m)	Wet Depth (m)	Substrate %							Embeddedness (1-4)	Land Use								Comment	NPS Pollution				Comment	Barriers				Comment	Bank Erosion (% undercut)		Channel Sinuosity	Channel Grade	Estimated Grade (%)	Stream Order	Channel Morphology							Comment
											Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		Uncut Forest	Clearcut	Selective Logging	Pasture Hay	Agricultural Row Crops	Buffer Strip	Other			Evidence? (y/n)	Some Sources? (y/n)	Obvious Sources? (y/n)	Buffer Strip? (y/n)		Culvert in Reach? (y/n)	Perched? (y/n)	Other Barriers? (y/n)	Beaver Activity? (y/n)		Left Bank	Right Bank					Riffle	Run	Steady	Pool	Deadwater	Other	
M1K2	28-Jun-11	2456629.6 7485796.3	2456761.9 7485550.3	NA	105	300	0.35	0.15	0.25	0.06	0	10	60	10	0	0	20	3	50	50	0	0	0	0	0	Left side has no buffer strip (clear cut).	n	n	n	y		n	n	n	n		0	0	med	low	2	1	40	0	0	0	60	0	
M1K3	28-Jun-11	2456761.9 7485550.3	2456856.6 7485271.0	NA	250	320	0.78	0.33	0.55	0.13	5	55	30	0	0	0	10	1	0	30	0	0	0	70	0	Clear cut left side (about 30% with no buffer).	n	n	n	y		n	n	n	n		5	5	low	med	3	1	40	0	30	0	30	0	
M1K4	28-Jun-11	2456856.6 7485271.0	2456845.8 7485071.4	136	300	240	1.25	0.40	1.00	0.20	0	50	30	0	0	0	20	3	60	20	0	0	0	20	0	Powerline area cleared to brook.	n	n	n	y		n	n	n	n	Could not find culvert on upper side (grown over/closed in).	10	10	med	low	2	1	60	0	30	10	0	0	
M1K5	28-Jun-11	2456845.8 7485071.4	2456875.2 7484963.3	149	109	115	0.95	0.50	0.70	0.20	0	20	20	0	0	0	60	2	95	0	0	0	0	0	5	5% unmarked road crossing.	n	n	n	n		y	y	y	y	Reach empties into beaver pond. Powerline area sprayed with herbicides.	20	20	low	low	2	1	40	30	0	10	20	0	
M1K6	28-Jun-11	2456917.3 7484962.5	2456989.8 7485003.5	NA	0	122	NA	NA	NA	NA	0	60	10	0	0	0	30	2	95	5	0	0	0	0	0	Upper end in powerline area that reach drains.	n	n	n	n		n	n	n	y	Reach empties into beaver pond. Powerline area sprayed with herbicides.	NA	NA	high	low	2	1	NA	NA	NA	NA	NA	NA	95% undefined channel and underground flow.
M1L1	29-Jun-11	2456664.8 7485169.9	2456704.4 7484931.2	135	116	270	0.43	0.65	0.40	0.13	0	15	60	0	0	5	20	2	100	0	0	0	0	0	0		n	n	n	n		y	n	n	y	Old beaver activity at beginning of reach.	20	20	med	low	1	1	20	0	60	0	20	0	
M1L2	29-Jun-11	2456753.1 7484953.4	NA	NA	0		Did not complete reach - small trickle of water entering here - not defined watercourse and not fish habitat																																												
M1M1	21-Jun-11	2457330.6 7484807.2	2457221.1 7484759.4	NA	125	178	0.70	0.45	0.45	0.20	0	0	0	5	5	30	60	0	5	0	0	0	0	0	95	95% wetland area.	n	n	n	n		n	n	n	y	Power line in reach herbicide sprayed, old beaver dam and chew.	0	0	high	low	0.2	1	5	0	95	0	0	0	Drains into wetland and pond.
M1M2	21-Jun-11	2457266.2 7484930.1	2457230.8 7484830.7	NA	24	120	0.20	0.20	0.10	0.10	0	2	3	5	10	50	30	0	40	0	0	0	0	0	60	60% marsh.	n	n	n	n		n	n	n	y	60% of reach is marsh, old beaver dam in reach.	0	0	med	low	1	1	10	0	0	0	90	0	
M1M3	21-Jun-11				0	M1M3, no flow likely only side channel or drainage.																																											
M1M4	21-Jun-11	2457083.8 7484753.1	2457168.4 7484755.2	NA	107	107	1.00	0.60	0.45	0.30	0	0	0	0	0	0	100	0	0	0	0	0	0	0	100	100% wetland with organics substrate.	n	n	n	n		n	n	n	y	Watercourse is in wetland. power line in reach herbicide sprayed, old beaver dam and chew.	0	0	med	low	0.2	1	0	0	100	0	0	0	
M1M5	21-Jun-11	2457198.1 7484748.2	2457185.5 7484561.8	NA	0	219	Beaver Pond Encompasses Entire Reach																																										
M1N1	21-Jun-11	649819 5135569	2457196.8 7484553.8	56	1569	523	3.00	1.25	2.50	0.63	0	0	0	0	0	20	80	0	25	75	0	0	0	0	0	Runs through powerline.	n	n	n	n		n	n	n	n	Approx. 0.6 m deep silt on bottom of watercourse in places. Runs through herbicide-sprayed powerline.	60	60	high	low	0.5	1	10	0	90	0	0	0	
M1N2	21-Jun-11	649669 5135673	649685 5135836	85	196	196	1.00	0.33	0.75	0.13	0	0	0	0	0	10	90	0	100	0	0	0	0	0	0		n	n	n	n		n	n	n	n		10	10	med	low	0.5	1	0	0	100	0	0	0	Lots of algae.
M1N3	21-Jun-11	649747 5135990	649685 5135836	102	173	207	0.83	0.28	0.58	0.13	0	0	0	0	0	30	70	0	70	30	0	0	0	0	0	30% in powerline area.	n	y	n	n		n	n	n	n	Lower end of reach in cleared powerline area (sprayed with herbicides).	10	10	med	low	0.5	1	10	0	80	10	0	0	
M2D1	29-Jun-11	2456713.9 7484902.0	2456724.3 7484769.6	NA	140	140	1.00	0.45	0.80	0.28	0	0	40	20	5	0	35	2	100	0	0	0	0	0	0		n	n	n	n		n	n	y	y	Dam at lower end of large pond. 80% of reach is in pond.	20	20	med	low	2	2	15	0	5	0	80	0	80% in beaver pond.
M2D2	29-Jun-11	2456724.3 7484769.6	2456418.8 7484450.9	118	358	550	0.65	0.48	0.40	0.18	0	5	10	0	0	10	75	2	100	0	0	0	0	0	0		n	n	n	n		n	n	y	y	Reach dominated by bogs and beaver ponds/dams.	10	10	med	low	0.5	2	10	0	10	0	80	0	
M2D3	30-Jun-11	2456418.8 7484450.9	2456234.0 7484453.1	144	500	200	2.50	0.55	2.25	0.33	0	20	5	0	0	35	40	1	100	0	0	0	0	0	0		n	n	n	n		n	n	n	n		5	5	low	low	1	2	5	0	60	10	25	0	
M2D4	30-Jun-11	2456234.0 7484453.1	2455936.0 7484386.3	150	1020	340	3.00	0.50	2.50	0.30	0	35	10	0	0	30	25	1	100	0	0	0	0	0	0		n	n	n	n		y	n	y	y	Road is below beaver pond - couldn't see culvert but assume it's there. Lots of new and former beaver activity.	15	15	med	low	1	2	40	0	30	10	20	0	
M2E1	21-Jun-11	2457196.8 7484553.8	2456316.5 7483900.3	120	4000	1200	3.33	0.75	3.00	0.55	0	20	10	5	5	40	20	1	100	0	0	0	0	0	0		n	n	n	n		n	n	n	y	Upper reach is wetland, lower section is alder swamp, beaver dams throughout the reach.	0	0	med	med	0	2	2	0	98	0	0	0	
M2E2	21-Jun-11	2456316.5 7483900.3	2456201.4 7483774.7	166	263	150	1.75	2.50	1.13	0.30	0	15	5	5	15	40	20	1	100	0	0	0	0	0		Was thinned.	n	n	n	n		n	n	n	y		10	10	high	low	1	2	0	100	0	0	0	0	

Table C-1.3 McBean Brook Rapid Bio-assessment Survey Data

Reach	Channel Form						% Vegetation			Woody debris	Water Quality						Species of Conservation Concern				Additoinal Comments
	Braiding? (y/n)	Lateral Bars? (y/n)	Medial Bars? (y/n)	Islands? (y/n)	Sand on Banks? (y/n)	Comment	Canopy Cover (%)	Dominant Bank Vegetation	Dominant Riparian Vegetation	Lots / Med / Low / None	DO (%)	DO (mg/l)	pH	Sp Conductivity (µs/cm)	Temperature (°C)	Water Quality Coordinates	Suitable Invertebrate Habitat? (y/n)	Bivalves Observed? (y/n)	Dragonflies Collected? (y/n)	Bivalves Collected? (y/n)	
M1K2	y	n	n	n	n	Approx. 80% of reach flows below ground.	60	grass	trees	none	71.0	7.65	5.8	14.3	12.2	2456738.9 7485668.3	n	n	n	n	M1K1 not completed (upper reach). Most of this stream is undefined and flows below ground (approx. 80%). Barely any defined channel - did not complete 2nd form. No dragonflies observed.
M1K3	y	n	n	n	n	Approx. 90% of reach below ground.	60	grass	trees	none	63.0	7.09	5.7	14.6	11.7	2456821.4 7485366.9	n	n	n	n	Majority of reach flows below ground. Did not see or sample dragonflies. Not suitable for 2nd form.
M1K4	y	n	n	n	n		65	grass	trees	med	83.0	8.80	6.0	16.1	13.9	2456872.6 7485115.2	n	n	n	n	Did not see dragonflies and did not sample - not suitable habitat. Powerline goes through reach - cleared to the brook. Culvert is closed in at road - could not find on upper side of road.
M1K5	y	n	n	n	n	Undefined watercourse (approx. 30% below ground).	70	grass	shrubs	low	90.4	9.40	6.2	16.9	14.2	2456858.3 7484992.5	n	n	n	n	No dragonflies observed and no sampling. Unmarked road and culvert mid reach (partially grown in). Brook empties into large beaver pond at the lower end of reach. Observed small fish at end of reach 5 m before pond.
M1K6	NA	NA	NA	NA	NA	Approx. 95% of reach flows below ground.	80	grass	trees	none	NA	NA	NA	NA	NA	NA	n	n	n	n	Not defined watercourse - almost completely below ground. Looks to drain small area of powerline (wet, grassy ground at start of reach). All dead water when showing. No 2nd form as does not apply.
M1L1	y	n	n	n	n	Approx. 50% of reach flows below ground.	60	grass	shrubs	low	79.3	8.66	6.4	23.6	12.1	2456678.6 7485006.9	n	n	n	n	Did not see dragonflies and did not sample - not suitable habitat. Mainly headwater watercourse and runs below ground. Reach extends above road/culvert in upper end then runs along road to the east - small, undefined, not fish habitat - did not follow.
M1L2																					Did not complete this reach. Saw small trickle of water entering beaver pond at this point. Not fish habitat and not defined watercourse.
M1M1	n	n	n	n	n	Headwater undefined channel, springs.	10	grass	grass/ shrubs	low	81.9	8.67	6.3	43.2	12.6	2457267.6 7484781.8	n	n	n	n	Not suitable habitat for dragonflies or clams, EPA form not relevant for reach.
M1M2	y	n	n	n	n	Upstream stretch is ponded, watercourse is undefined.	30	grass	grass	med	76.5	8.00	6.1	27.1	12.2	2457242.9 7484869.5	n	n	n	n	Not suitable habitat for dragonflies or clams, EPA form not relevant for reach.
M1M3																					M1M3, no flow likely only side channel or drainage. Associated with old beaver medow and pond.
M1M4	y	n	n	n	n	Multi channel wetland watercourse.	5	grass	grass	none	71.5	7.65	5.9	15.7	14.8	2457136.3 7484764.2	n	n	n	n	Wetland/pond. M1M3, no flow likely only side channel or drainage. Pond is likely fish habitat.
M1M5																					No sheets for this reach. Beaver pond area. Not a watercourse.
M1N1	n	n	n	n	n		5	grass	shrubs	low	88.6	8.26	5.2	22.7	19.8	649685 5135836	n	n	n	n	Not suitable habitat for collection of inverts. Start of reach is upstream of old beaver pond. Section runs through powerline area (herbicide-sprayed).
M1N2	n	n	n	n	n		40	grass	shrubs	med	82.0	7.31	4.3	-	17.5	649696 5135774	n	n	n	n	Not suitable habitat for collection of inverts. Deep silt in watercourses with little water flow (steady). Algae prevalent in watercourse.
M1N3	n	n	n	n	n		40	grass	shrubs	low	85.2	9.22	5.9	-	11.7	649744 5135955	n	n	n	n	Not suitable habitat for collection of inverts. Stream starts lower than predicted. Above reach start is undefined wet ground area.
M2D1	y	n	n	n	n		30	grass	shrubs	low	75.3	6.60	6.4	24.1	21.1	2456735.7 7484809.4	n	n	n	n	No dragonflies observed and no sampling. 80% of this reach (upper end) in beaver pond - watercourse characterizations refer to the lowest 50 m of reach. No 2nd assessment form.
M2D2	y	n	n	n	n	Approx. 20% flows below ground (lower end).	40	grass	shrubs/ alders	low	37.3	3.90	5.9	22.7	16.5	2456502.4 7484477.7	n	n	n	n	No dragonflies seen and no sampling. Not suitable habitat for inverts. Almost no defined watercourse. Dominated by bogs and beaver pond. Slow water (mostly still). Only one point close to the end of reach that we could complete water quality. Very little discharge.
M2D3	y	n	n	n	n		60	grass	shrubs/ alders	low	71.3	7.40	5.4	22.6	14.6	2456339.5 7484463.4	n	n	n	n	No dragonflies observed and not suitable invert habitat/no sampling.
M2D4	y	n	n	n	n		60	grass	shrubs/ alders	low	68.9	6.84	6.0	20.2	17.5	2456022.6 7484448.2	n	n	n	n	No dragonflies observed and not suitable invert habitat/no sampling. First 100 m of reach is within an active beaver pond (built over road). There is an old clearing (former beaver pond) near the end of the reach at the confluence with other brook.
M2E1	n	n	n	n	n		10	grass	grass/ shrubs	med	51.6 66.1	5.15 6.53	5.5 5.4	18.70 18.00	16.1 15.5	2456786.4 7484075.8 2456547.0 7484033.5	n	n	n	n	Second set of watercourse data was collected downstream near the end of the reach. Beaver activity throughout most of the reach, very boggy right next to the watercourse hard to stay by the watercourse. Clearcut mid reach 30 m buffer. Channel becomes less beaver influenced downstream more riffles big boulders, more solid ground approx 150 m from end of reach.
M2E2	y	n	n	n	n		80	grass	alders	lots	84.2	8.57	5.5	17.6	14.1	2456245.9 7483812.9	n	n	n	n	Looked for odonata did not find, lots of alders in reach big boulders.

Table C-1.4 West Branch Napadogan Brook Rapid Bio-assessment Survey Data

Reach	Date Walked	Reach Start	Reach Stop	Score	HADD Area (m2)	Length (m)	Bankfull Width (m)	Bankfull Depth (m)	Wet Width (m)	Wet Depth (m)	Substrate %							Embeddedness (1-4)	Land Use						Comment	NPS Pollution				Barriers				Comment	Bank Erosion (% undercut)		Channel Sinuosity	Channel Grade	Estimated Grade (%)
											Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		Uncut Forest	Clearcut	Selective Logging	Pasture Hay	Agricultural Row Crops	Buffer Strip		Evidence? (y/n)	Some Sources? (y/n)	Obvious Sources? (y/n)	Buffer Strip? (y/n)	Culvert in Reach? (y/n)	Perched? (y/n)	Other Barriers? (y/n)	Beaver Activity? (y/n)		Left Bank	Right Bank	High / Med / Low	High / Med / Low	
W1F1	28-Jun-11	2454370.3 7489026.6	2454718.8 7489012.1	146	591	444	1.33	0.40	1.10	0.18	0	5	15	0	5	70	5	1	95	0	0	0	0	5		n	n	n	n	y	n	n	n		60	60	med	low	2
W1F2	28-Jun-11	2454718.8 7489012.1	2454949.0 7489038.6	153	496	248	2.00	0.50	1.50	0.25	0	20	20	0	0	60	0	1	80	0	0	0	0	20		n	n	n	n	n	n	n	n		50	50	low	high	4
W1F3	28-Jun-11	2454949.0 7489038.6	2455354.1 7489258.4	153	715	500	1.43	0.50	1.20	0.30	0	5	15	0	0	80	0	2	70	0	0	0	0	30		n	n	n	y	n	n	n	n	30% of reach buffer stripped.	60	60	med	med	3
W1F4	6/27/2011 6/28/2011	2455354.1 7489258.4	2455332.9 7489626.5	141	652	400	1.63	0.55	1.38	0.38	0	0	15	0	5	80	0	2	100	0	0	0	0	0		n	n	n	n	y	n	n	y	Beaver dams and ponds throughout reach.	60	60	med	low	2
W1F5	27-Jun-11	2455332.9 7489626.5	2455231.9 7489857.6	129	639	284	2.25	0.60	2.00	0.40	0	10	0	0	0	70	20	2	100	0	0	0	0	0		n	n	n	n	n	n	y	y	Beaver dams and pond (30-40 m wide) in reach.	30	30	med	low	2
W1G1					0																				Headwater no defined channel, water flows underground (moss and rock and roots).													
W1G2	27-Jun-11	2454237.6 7489229.6	2454598.2 7489234.2	136	172	286	0.60	0.33	0.40	0.13	0	0	5	10	20	60	5	1	60	0	40	0	0	0		n	n	n	n	y	n	n	n	Culvert on four mile brook road.	30	30	med	low	2
W1G3	27-Jun-11	2454598.2 7489234.2	2454807.3 7489213.9	161	197	270	0.73	0.38	0.53	0.18	0	5	5	15	15	60	0	1	100	0	0	0	0	0		n	n	n	n	n	n	n	n		20	20	low	low	2
W1G4	27-Jun-11	2454807.3 7489213.9	2455051.4 7489492.5	151	222	370	0.60	0.38	0.45	0.18	0	0	0	0	30	60	10	0	100	0	0	0	0	0		n	n	n	n	y	y	n	y	Old beaver pond at reach end.	30	30	med	med	2.5
W1G5	27-Jun-11	2455051.4 7489492.5	2455102.0 7489730.3	140	196	251	0.78	0.50	0.53	0.20	0	0	10	0	0	70	20	2	40	60	0	0	0	0	Cut long ago. Spaced at points up to the brook.	n	n	n	n	n	n	n	y	Beaver ponds at end and start of reach.	70	70	high	low	2
W1G6	27-Jun-11	2455102.0 7489730.3	2455223.2 7489831.4	150	153	184	0.83	0.43	0.58	0.23	0	5	0	0	20	60	15	1	100	0	0	0	0	0		n	n	n	n	n	n	n	y	Beaver pond at the end of reach.	70	70	high	low	2
W1N1	Upper 30 m of W1W2 characteristic of headwaters (undefined and below ground). Therefore, did not complete upper reach W1N1 (not fish habitat).																																					
W1N2	29-Jun-11	2457256.5 7489037.6	2457548.0 7489058.7	138	342	360	0.95	0.53	0.70	0.23	10	50	20	0	0	0	20	1	100	0	0	0	0	0	Approx. 40% of right side thinned (older clearcut area?).	n	n	n	n	n	n	y	y	Beaver dams present. Lower 3/4 of reach in beaver pond.	5	5	med	med	3
W1N3	29-Jun-11	2457548.0 7489058.7	2457894.4 7489268.6	163	500	400	1.25	0.45	1.00	0.30	0	60	20	5	0	15	0	1	100	0	0	0	0	0		n	n	n	n	n	n	n	n		5	5	low	high	4
W1N4	29-Jun-11	2457894.4 7489268.6	2458055.6 7489387.9	176	735	210	3.50	0.55	3.00	0.25	0	10	50	0	20	20	0	1	100	0	0	0	0	0		n	n	n	n	n	n	y	y	Small dam in reach.	20	20	med	med	3
W2B1	27-Jun-11	2455231.9 7489857.6	2455187.9 7490222.1	142	680	340	2.00	0.65	1.75	0.45	0	15	5	0	0	70	10	2	100	0	0	0	0	0		n	n	n	n	n	n	y	y	Beaver dams in reach (old).	30	30	med	low	2

Table C-1.4 West Branch Napadogan Brook Rapid Bio-assessment Survey Data

Stream Order	Channel Morphology							Channel Form						% Vegetation			Woody debris	Water Quality						Species of Conservation Concern				Additional Comments
	Riffle	Run	Steady	Pool	Deadwater	Other	Comment	Braiding? (y/n)	Lateral Bars? (y/n)	Medial Bars? (y/n)	Islands? (y/n)	Sand on Banks? (y/n)	Comment	Canopy Cover (%)	Dominant Bank Vegetation	Dominant Riparian Vegetation	Lots / Med / Low / None	DO (%)	DO (mg/l)	pH	Sp Conductivity (µs/cm)	Temperature (°C)	Water Quality Coordinates	Suitable Invertebrate Habitat? (y/n)	Bivalves Observed? (y/n)	Dragonflies Collected? (y/n)	Bivalves Collected? (y/n)	
1	80	15	0	5	0	0		y	y	y	y	y		80	grass	trees	low	91.6	10.66	6.4	26.4	9.5	2454546.3 7488975.6	n	n	n	n	Reach starts almost exactly as predicted. No dragonfly signs and no sampling. Not suitable invert habitat.
1	40	30	0	30	0	0		y	y	y	y	y		75	grass	trees	low	95.8	11.90	6.5	26.2	9.1	2454838.0 7488996.6	n	n	n	n	Saw trout in small pool (took pics). No dragonflies observed.
1	60	25	0	15	0	0		y	y	y	n	y		70	grass	trees	low	93.0	10.90	6.2	24.1	9.2	2455235.9 7489128.3	n	n	n	n	Did not sample inverts. No dragonflies observed.
1	50	20	0	30	0	0		n	n	n	n	y		65	grass	trees	low	84.0	8.94	5.8	22.0	12.4	2455332.9 7489626.5	n	n	n	n	Did not see dragonflies. Lots of beaver activity in this reach. Lots of dams/ponds/former ponds.
1	10	0	80	0	10	0		n	n	n	n	n		40	grass	shrubs	med	93.0	9.89	6.3	20.6	12.7	2455231.9 7489857.6	n	n	n	n	Lots of beaver activity throughout. Large pond in reach (30-40 m wide).
																												Much flow below ground, not fish habitat). Therefore, did not complete reach above this one (W1G1).
1	90	0	0	10	0	0		y	n	n	y	n	Water below ground approx 25% of reach.	85	grass	trees	low	78.1	8.50	5.6	17.8	11.9	2454451.6 7489193.2	n	n	n	n	Followed reach upstream until it became very characteristic of headwaters (much flow below ground, not fish habitat). Therefore, did not complete reach above this one (W1G1).
1	50	20	0	30	0	0		y	n	n	n	n	Below ground at points (20%).	90	grass	trees	none	83.9	9.27	5.7	16.6	12.0	2454735.3 7489171.7	n	n	n	n	Starting to look like headwaters at points - goes below ground occasionally.
1	60	20	0	20	0	0		y	y	y	n	y		65	grass	trees/ shrubs	low	89.5	10.30	6.5	24.3	9.8	2455006.1 7489318.2	n	n	n	n	Observed poison ivy in this reach. End of reach is old beaver pond. Culvert in reach is perched but likely passable at high flows.
1	80	15	5	0	0	0		y	n	n	y	y		70	grass	shrubs	med	87.0	9.49	6.5	21.8	12.0	2455080.3 7489697.1	n	n	n	n	Observed lots of poison ivy in this reach. Reach was cleared long ago and has since grown in. Spaced at certain points up to the watercourse banks. Beaver ponds at start and end of reach.
1	60	30	0	10	0	0		y	n	n	y	n		65	grass	shrubs	med	84.3	9.15	6.4	20.8	11.5	2455166.4 7489752.1	n	n	n	n	Saw fish in this reach (possibly dace). Reach ends at beaver pond.
1	20	0	20	0	60	0		y	n	n	n	n		30	grass	trees	med	73.1	7.61	5.3	18.6	13.3	2457384.6 7489053.8	n	n	n	n	Upper 30 m of watercourse characteristic of headwaters (undefined and below ground). Therefore, did not complete upper reach W1N1. Lower 3/4 of this reach is within an active beaver pond.
1	70	20	0	10	0	0		y	n	n	n	n		75	grass	trees	low	76.5	7.56	5.8	18.5	15.8	2457715.6 7489148.3	n	n	n	n	Could not sample or see dragonflies - predominately boulder laden habitat.
1	60	20	0	20	0	0		y	n	n	n	n		60	grass	shrubs/ alders	low	84.7	8.95	6.3	19.7	14.4	2457989.1 7489304.7	y	n	n	n	Completed benthic sampling. Found stoneflies, chironomids, ephemeroptera, and crustacean but no dragonfly larvae. Lowest part of the reach is sandy-gravely habitat - upper part mostly rocks.
2	20	0	60	10	10	0		y	y	n	y	y		65	grass	shrubs	low	90.5	9.51	6.4	21.7	12.8	2455208.2 7490047.8	y	n	n	n	Benthic invert. sampling completed. Chironomids and stoneflies, no dragonflies found. Saw lots of little fish in old beaver pond area.

Appendix C-2

Field Forms

Stantec Rapid Aquatic Habitat Survey

Watercourse: NRC Nashwaak River Control **Date:** Aug 15, 2011 **Job Number:** 121610356

Coordinates Reach Start: see back. **Photo #:** 3180 - 3190

Coordinates Reach End:

Weather Conditions: Pthy Cloudy **Personnel:** EMW JK

Reach Length:	200
Avg. Bankfull Width:	10-15
Avg. Bankfull Depth:	.25 - 1.5
Avg. Wet Width:	9 - 15
Avg. Wet Depth:	.20 - .75

Substrate%	
Bedrock	10
Boulder	10
Rock	25
Rubble	25
Gravel	10
Sand	10
Fines	10
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	0
Selective Logging	0
Pasture/Hay	0
Agricultural Row Crops	0
Buffer strips	0

NPS Pollution	**Y**	**N**
Evidence	☐	☐
Some Sources	☑	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: bridge + road (sediment)

Embeddedness (Score 1-4): 1

Comment: road over WC

Bank Erosion	
Undercut Banks (%)	
Left Bank	10
Right Bank	10

	Y	**N**
Culvert in reach?	☐	☑
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity	
High	☐
Med	☐
Low	☑

Channel Grade	
High	☐
Med	☐
Low	☑
Estimated %	1%

Channel Form	**Y**	**N**
Braiding	☐	☑
Lateral Bars (well sorted bar forms)	☑	☐
Medial Bars	☐	☑
Islands	☐	☑
Sand on Banks	☑	☐

Notes:

Morphology %	
Riffle	15
Run	15
Steady	50
Pool	20
Deadwater	0

Notes:

Stream order (from map) ___

Vegetation %	
Canopy Cover	10%
Dominant Bank Veg	shrubs/trees
Dominant Riparian Veg	shrubs / grasses

Large Woody Debris	
High	☐
Med	☐
Low	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	100.6%; 9.22mg/L
pH	7.1
Sp. Conductivity (µs/cm)	29.3
Temperature (°C)	19.2

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? (Y) / N

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

3 shells collected, more observed on banks

Samples Taken? Yes ☑ No ☐

GPS Coordinates Lat: 2448365.5 Long: 7487643.3

Other comments (additional photo # etc...)

Pot in temperature logger,

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: S/A | **Date:** June 20, 2011 **Job Number:** 121810356

Coordinates Reach Start: 457867.7 7484187.9 WGPT **Photo #:** 2460 – 2466 ✓

Coordinates Reach End:

Weather Conditions: Partly cloudy **Personnel:** EW PT

Reach Length: 372.2

Avg. Bankfull Width: .2 - 3.5

Avg. Bankfull Depth: .5 -

Avg. Wet Width: .1 - 3

Avg. Wet Depth: .4, .6, .10

Land Use (Total 100%)	(%)
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: wetland

NPS Pollution	Y	N
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Substrate%	
Bedrock	0
Boulder	0
Rock	0
Rubble	5
Gravel	25
Sand	20
Fines	50
Total (100%)	100

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	0
Right Bank	0

Culvert in reach?	Y	N
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: old

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: old beaver pond

Morphology %

Riffle	
Run	
Steady	15
Pool	
Deadwater	85

Notes:

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	0.2

Stream order (from map) 1

Vegetation %

Canopy Cover	40
Dominant Bank Veg	Grass
Dominant Riparian Veg	Shrubs

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 9.30 mg/l 92.0%

pH 6.0

Sp. Conductivity (µs/cm) ~~tt~~ 22 µs

Temperature (°C) 15.2

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) old beaver dams wc starts ~~at~~ weltland transmission line no clear channel. channel starts near at @ next reach.

MJSV

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME SIA I	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EW DT		
FORM COMPLETED BY EW	DATE June 2C TIME 3:00 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 93

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: SW2 **Date:** June 20, 2011 **Job Number:** 121810356

Coordinates Reach Start: 14581276 7484013.9 **Photo #:** 2467 - 2476

Coordinates Reach End:

Weather Conditions: Partly cloudy **Personnel:** EW DT

Reach Length: ~~530~~ 382m

Avg. Bankfull Width: NA

Avg. Bankfull Depth: NA

Avg. Wet Width: 1 - 2m

Avg. Wet Depth: 1 - 1.5m

Substrate%

Bedrock	0
Boulder	0
Rock	0
Rubble	0
Gravel	0
Sand	0
Fines	100% (Very)
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: Headwater

Embeddedness (Score 1-4) 0

Comment:

Channel Sinuosity

High	☐
Med	☐
Low	☑

Bank Erosion

Undercut Banks (%)	
Left Bank	10%
Right Bank	10%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity? old dam	☑	☑

Notes:

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	20

Channel Form NA

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %

Riffle	
Run	
Steady	
Pool	
Deadwater	100%

Notes: grassy wetland stream **Notes:**

Stream order (from map) 1

Vegetation %

Canopy Cover	10
Dominant Bank Veg	grass
Dominant Riparian Veg	grass

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 951 mg/l 96.1

pH 6.10

Sp. Conductivity (µs/cm) 19 µs/cm

Temperature (°C) 14.3

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☒

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☒

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) moved end of reach up. cedar waxwings observed Pileated woodpecker

Dave says otter, moose, bear

MJS ✓

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME SIA2	LOCATION	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EW DT		
FORM COMPLETED BY EW	DATE June 26 TIME 3:36 AM (PM)	REASON FOR SURVEY

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated in sampling reach	**1. Epifaunal Substrate/ Available Cover**	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 131

V MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: SA3 **Date:** June 16, 2011 **Job Number:** 121810358

Coordinates Reach Start: 2458231.4 7485252.3 **Photo #:** 2477 - 2490 ✓

Coordinates Reach End:

Weather Conditions: Cloudy **Personnel:** EMW DT

Reach Length: ~~363.5~~ 514 (extends into upper reach)

Avg. Bankfull Width: 2, 2.5

Avg. Bankfull Depth: .5, .8

Avg. Wet Width: 1 - 1.5

Avg. Wet Depth: .5, .20

Substrate%

Bedrock	0
Boulder	0
Rock	5
Rubble	5
Gravel	15
Sand	80
Fines	15
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness

(Score 1-4) 2

Comment: open wetland/grassland

Bank Erosion

Undercut Banks (%)	
Left Bank	20
Right Bank	20

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity? old	☑	☐

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	5

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☑
Islands	☐
Sand on Banks	☑

Notes:

Morphology %

Riffle	
Run	
Steady	100
Pool	
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %

Canopy Cover	10
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 98.0 & / 10.03 mg/l

pH 6.2

Sp. Conductivity (µs/cm) 18.1

Temperature (°C) 14.2

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

looked for dragonflies did not see exuvia, red sp. also same blackroses from last week.

VMJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME SLAT	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EW DT		
FORM COMPLETED BY EMW	DATE June 20 TIME 4:00 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. **Epifaunal Substrate/ Available Cover**	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
2. **Embeddedness**	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. **Velocity/Depth Regime**	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
4. **Sediment Deposition**	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. **Channel Flow Status**	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 139

MJS✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: SIB1 **Date:** June 21, 2011 **Job Number:** 121810356

wp#023-026 (upper 213) reach / water quality: x 650030 Y5136608 – 0105

Coordinates Reach Start: reach **Photo #:** 0094 – 0099 ✓

Coordinates Reach End:

Weather Conditions: sunny / partly cloudy **Personnel:** MJS & MF

Reach Length:	382 m
Avg. Bankfull Width:	0.75 – 1.75 m
Avg. Bankfull Depth:	0.30 – 0.50 m
Avg. Wet Width:	0.5 – 1.5 m
Avg. Wet Depth:	0.10 – 0.30 m

Substrate%

Bedrock	
Boulder	~~10~~
Rock	5
Rubble	10
Gravel	15
Sand	40
Fines	30
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4): 2

Comment:

Bank Erosion	
Undercut Banks (%)	
Left Bank	30
Right Bank	30

Culvert in reach?	**Y**	**N**
Is it perched?	☑	☐
Other barriers?	☐	☐
Beaver activity?	☐	☐

Notes: @ where reach meets road wp#026

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☑
Islands	☑
Sand on Banks	☑

Notes:

Morphology %	
Riffle	~~60~~
Run	
Steady	~~35~~
Pool	5
Deadwater	

Notes:

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	3%

Stream order (from map) 1

Vegetation %	
Canopy Cover	75%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	96.5% / 10.00 mg/L
pH	4.9
Sp. Conductivity (µs/cm)	12.2 µs/cm
Temperature (°C)	12.9 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- small beaver pond @ begin lower end 0094 - 0095

- reach extends upstream to road (wp # 026) & beyond

wp 024 - upper end of beaver ponds / dams, watercourse observed once again here upward pics 0094 - 0099

pics 0096 & 0097

wp 025 - water quality pics 0098 - 0099

wp 026 - stream meets road @ culvert

pics: 0101 - 0105

"a" w/p # 023-026

MJSV

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME 51 B[illegible]	LOCATION 121810356
STATION #_____ RIVERMILE_____	STREAM CLASS 1
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MJS MOF,	
FORM COMPLETED BY MJS	DATE June 21 TIME 12:00 AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 100	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). 70	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 40	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 25	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 50	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 75	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 100
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 133

Beaver pond encompasses all of SIBZ & some of SIB1 ✓MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: SIBZ + SIB1 (lower 113) Date: June 21, 2011 Job Number: 121810356 023 + twp #

Coordinates Reach Start: _____ Photo #: 0089 – 0093 ✓

Coordinates Reach End: _____

Weather Conditions: _____ Personnel: MJS + MF

Reach Length: _____

Avg. Bankfull Width: _____

Avg. Bankfull Depth: _____

Avg. Wet Width: _____

Avg. Wet Depth: _____

Land Use (Total 100%) (%)

Uncut Forest	
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution

	Y	N
Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	
Sand	
Fines	
Total (100%)	

Embeddedness (Score 1-4) ___

Bank Erosion

Undercut Banks (%)

Left Bank _____

Right Bank _____

Culvert in reach?

	Y	N
Is it perched?	☐	☐
Other barriers?	☐	☐
Beaver activity?	☐	☐

Notes: _____

Channel Sinuosity

High	☐
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☐
Estimated %	

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %

Riffle	
Run	
Steady	
Pool	
Deadwater	

Notes: _____

Stream order (from map) ___

Vegetation %

Canopy Cover	
Dominant Bank Veg	
Dominant Riparian Veg	

Large Woody Debris

Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	
pH	
Sp. Conductivity (µs/cm)	
Temperature (°C)	

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

— heard toad, blue dragonflies flying around (couldn't get pic)

Benthic Invertebrates

Suitable invertebrate habitat? Y / N

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

— start of reach is large beaver pond

— pond encompasses entire reach + 1st 1/3 of S1B1

wp# 021 - lower end pond,

022 - pic # 0090 from side of pond looking towards wp S1B2

pic 0089 - POND

023 - upper end of beaver pond @ another dam (small pond)

pic # 0091-0093

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 187

✓ MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S3 A4 Sisson	LOCATION	
STATION # S3A4 RIVERMILE	STREAM CLASS 2	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY Stantec	
INVESTIGATORS MJS EMW		
FORM COMPLETED BY EMW	DATE June 16, 2011 TIME 9:48 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates — dragonfly exuvia

Odonata _____

Gomphids _____

Samples Taken? Yes ☑ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- mobile channel morphology @ high flows

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: S3A4 **Date:** June 16, 2011 **Job Number:** 121810356

Coordinates Reach Start: X 2459503.2 Y 7486063.6 **Photo #:** 2324 - 2343

Coordinates Reach End:

Weather Conditions: partly cloudy **Personnel:** MJS + EMW + MF

Reach Length:	237 m
Avg. Bankfull Width:	3.5
Avg. Bankfull Depth:	0.42
Avg. Wet Width:	3.0
Avg. Wet Depth:	0.36

Substrate%

Bedrock	10
Boulder	5
Rock	20
Rubble	40
Gravel	20
Sand	5
Fines	-
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	✓
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) |

Bank Erosion	
Undercut Banks (%)	
Left Bank	10
Right Bank	10

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☐
Beaver activity?	☐	☐

Notes:

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☑
Islands	☑
Sand on Banks	☑

Notes: Mobile @ high flows

Morphology %	
Riffle	65
Run	30
Steady	-
Pool	5
Deadwater	-

Notes:

Stream order (from map) 2

Vegetation %	
Canopy Cover	70
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 111.2 / 12.72 mg/L

pH 6.8

Sp. Conductivity (µs/cm) 22.3 mS

Temperature (°C) 9.8°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 179

MJS✓

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S3A3 Sisson	LOCATION	
STATION # S3A3 RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW MTS		
FORM COMPLETED BY	DATE June 16 2011 TIME 9:25 AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids 2

Samples Taken? Yes ☑ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☑ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

none observed

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

WC looks to be very mobile @ high flows, confined in valley walls. Took reading @ staff gauge

Stantec Rapid Aquatic Habitat Survey

√ MJS

Watercourse: S3A3 √ **Date:** June 16, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2311 – 2323

Coordinates Reach End: _____

Weather Conditions: cloudy √ **Personnel:** EMA MJS MF

Reach Length: 190.5 m

Avg. Bankfull Width: 5, 6, 2, 5 m

Avg. Bankfull Depth: 96(pool), 36

Avg. Wet Width: 4, 4.5, 3 m

Avg. Wet Depth: 74cm(pool), 16, 20

Substrate%

Bedrock	20
Boulder	5
Rock	20
Rubble	35
Gravel	10
Sand	10
Fines	
Total (100%)	100 %

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Comment: mixed wood

Embeddedness (Score 1-4) 2

Bank Erosion

Undercut Banks (%)	
Left Bank	20%
Right Bank	20%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☑	☐
Beaver activity?	☐	☑

Notes: waterfall

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	1.5-2 %

Channel Form

Braiding	☐
Lateral Bars	☑
Medial Bars	☑
Islands	☑
Sand on Banks	☑

Notes: _____

Morphology %

Riffle	50
Run	40
Steady	0
Pool	10
Deadwater	0

Notes: waterfall mid reach

Stream order (from map) 1 3

Vegetation %

Canopy Cover	75
Dominant Bank Veg	grass
Dominant Riparian Veg	Trees

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 112.2% / 12.53 mg/L

pH 6.6

Sp. Conductivity (µs/cm) 22.2 ms/cm

Temperature (°C) 9.8°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 187

✓ 53A2

MMJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Sisson	LOCATION	
STATION # 53A3 RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + EMW		
FORM COMPLETED BY EMW	DATE June 15, 11 TIME 1:20 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids 2

Samples Taken? Yes ☑ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☑

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

lots of emerging dragonflies, black, straight tail

✓ S3A2 ✓ MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: ~~S3A3~~ X **Date:** June 15, 2011 **Job Number:** 1218103 56

Coordinates Reach Start: water quality 2499(31.5 7485955.3 **Photo #:** 2262 – 2280

Coordinates Reach End:

Weather Conditions: partly cloudy **Personnel:** EMW & MJS

Reach Length:	~~~420m~~ 468m	**Substrate%**	
Avg. Bankfull Width:	4.0	Bedrock	~~20~~ 15
Avg. Bankfull Depth:	0.36 0.5-0.8	Boulder	20
Avg. Wet Width:	~~3.5~~ 3.5 3-5m	Rock	35
Avg. Wet Depth:	0.14 0.4-0.5	Rubble	10
		Gravel	5
		Sand	10
		Fines	5
		Total (100%)	

Land Use (Total 100%)	**(%)**	**NPS Pollution**	**Y**	**N**
Uncut Forest	100	No Evidence	☑	☐
Clearcut		Some Sources	☐	☐
Selective Logging		Obvious Sources	☐	☐
Pasture/Hay		Buffer Strip	☐	☐
Agricultural Row Crops		Type:		
Buffer strips				

Comment:

Embeddedness (Score 1-4) 1

Bank Erosion		**Culvert in reach?**	**Y**	**N**
Undercut Banks (%)		Is it perched?	☐	☐
Left Bank	10	Other barriers?	☐	☐
Right Bank	10	Beaver activity?	☑	☐

Notes: possible old dam

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Grade

High	☐
Med	☐
Low	☑

Estimated % 1.5

Channel Form		**Morphology %**	
Braiding	~~☑~~	Riffle	35
Lateral Bars	☑	Run	35
Medial Bars	☑	Steady	
Islands	☑	Pool	30
Sand on Banks	☑	Deadwater	

Notes: **Notes:**

Stream order (from map) 3

Vegetation %		**Large Woody Debris**	
Canopy Cover	50	Lots	☑
Dominant Bank Veg	grass	Med	☐
Dominant Riparian Veg	trees	None	☐
	←	Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 98.9% / 10.98 mg/L

pH 6.8

Sp. Conductivity (µs/cm) ~~21.7~~ 21.5

Temperature (°C) 11

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 164

✓ 53A1

✓ MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Sisson	LOCATION	
STATION # 53A2 RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + EMW		
FORM COMPLETED BY ~~MJS~~ EMW	DATE June 15, 2011 TIME 2:27 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

1 stonefly & 1 dragonfly casings

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☑ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

MJS ✓

Stantec Rapid Aquatic Habitat Survey

53A1

Watercourse: ~~Sissons 53A2~~ **Date:** June 15, 2011 **Job Number:** 121810556

water quality ×2458816.0 ~~7686~~ 144.1

Coordinates Reach Start: _____ **Photo #:** 2281 – ~~2286~~ 2289

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** MJS + EMW

Reach Length:	137.7m	**Substrate%**	
Avg. Bankfull Width:	3.5 m	Bedrock	10
Avg. Bankfull Depth:	0.44	Boulder	20
Avg. Wet Width:	3.0	Rock	~~25~~
Avg. Wet Depth:	0.21	Rubble	20
		Gravel	10
		Sand	10
		Fines	5
		Total (100%)	

Land Use (Total 100%)	**(%)**	**NPS Pollution**	**Y**	**N**
Uncut Forest	100	No Evidence	☑	☐
Clearcut		Some Sources	☐	☐
Selective Logging		Obvious Sources	☐	☐
Pasture/Hay		Buffer Strip	☐	☐
Agricultural Row Crops		Type:		
Buffer strips				

Comment: _____

Embeddedness (Score 1-4) 1

Bank Erosion		**Culvert in reach?**	**Y**	**N**
Undercut Banks (%)	~~~	Is it perched?	☐	☐
Left Bank	30	Other barriers?	☐	☑
Right Bank	30	Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity	
High	☐
Med	☐
Low	☑

Channel Grade	
High	☑
Med	☑
Low	☐
Estimated %	3.5%

Channel Form		**Morphology %**	
Braiding	☐	Riffle	60
Lateral Bars	☐	Run	30
Medial Bars	☐	Steady	
Islands	☐	Pool	~~5~~ 10
Sand on Banks	☐	Deadwater	

Notes: pretty straight * & fast-flow

Notes: _____

Stream order (from map) 2 ~~3~~

Vegetation %	
Canopy Cover	55
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 95.9% / 10.42 mg/L

pH 6.8

Sp. Conductivity (µs/cm) ~~1613~~ 2210 µS

Temperature (°C) 11.5°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 154

VMJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Sisson	LOCATION	
STATION # SZB 1 RIVERMILE	STREAM CLASS	
LAT ____ LONG ____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW MJS		
FORM COMPLETED BY EMW	DATE June 14, 2011 TIME 4:20 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Triple to edleat @ several pts. chironomid, tricoptera, epemeroptera.

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...): none observed

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) bunch of back water areas maybe old beaver pond, wc is disorginized, braided

✓ correct

Stantec Rapid Aquatic Habitat Survey

MJS ✓

Watercourse: S2B | (Sisson **Date:** June 14 2010 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2182 - 2190 2185 - 88

Coordinates Reach End: _____

Weather Conditions: Sun **Personnel:** EMW, MJS

Reach Length: ~~[illegible]~~ 360m ✓

Avg. Bankfull Width: 3. to 3.25 ~~[illegible]~~

Avg. Bankfull Depth: 58cm

Avg. Wet Width: 2.75

Avg. Wet Depth: 20-36cm

Substrate%	
Bedrock	—
Boulder	5
Rock	15
Rubble	5
Gravel	25
Sand	50
Fines	10
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☒
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Comment: lots of Alders, possibly old beaver dam @ end of reach

Bank Erosion	
Undercut Banks (%)	
Left Bank	10
Right Bank	10

Culvert in reach?	**Y**	**N**
Is it perched? not barrier	☑	☐
Other barriers?	☐	☑
Beaver activity? old	☑	☐

Notes: _____

Channel Sinuosity	
High	☑
Med	☐
Low	☐

Channel Grade	
High	☐
Med	☑
Low	☑
Estimated %	1%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes: _____

Morphology %	
Riffle	35
Run	60
Steady	0
Pool	5
Deadwater	0

Notes: _____

Stream order (from map) ~~1~~ 2

Vegetation %	
Canopy Cover	50
Dominant Bank Veg	alders/grass
Dominant Riparian Veg	Alders

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 95.1%, 10.70 mg/l

pH 6.7

Sp. Conductivity (µs/cm) 21.3

Temperature (°C) 10.0°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 147

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME SZAU	LOCATION SISSON
STATION # _____ RIVERMILE _____	STREAM CLASS 1
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY EW MG	DATE June 14, 20[illegible] TIME 4:45 AM (PM) REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates Took several sweeps but No luck

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

None observed.

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

Channel disorginized. Tin grade @ end of Reach + nice riffle. Substrate gets larger @ end of reach.

Stantec Rapid Aquatic Habitat Survey

MJ✓

Watercourse: S244 **Date:** June 14, 2011 **Job Number:** 121810356

Coordinates Reach Start: 2458573.712/7486~~08~~.39 **Photo #:** 219.1 – 2207

Coordinates Reach End: 2458795.2/7486111.49

Weather Conditions: Partly sonny **Personnel:** EMW MJS

Reach Length: 273m

Avg. Bankfull Width: 1 to 3m

Avg. Bankfull Depth: .3, .5 m

Avg. Wet Width: .7, 2.~~6~~

Avg. Wet Depth: .2, .60

Substrate%

Bedrock	0
Boulder	5
Rock	15
Rubble	10
Gravel	20
Sand	40
Fines	10
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
No Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	10%
Right Bank	10%

Culvert in reach?	**Y**	**N**
Is it perched?	☑	☐
Other barriers?	☐	☑
Beaver activity? (old)	☐	☐

Notes: culvert still passible @ high flow

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	2%

Channel Form

Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes: closer to culvert channel braids runs all over

Morphology %

Riffle	40
Run	20
Steady	35
Pool	
Deadwater (backwaters)	5

Notes:

Stream order (from map) 1 2

Vegetation %

Canopy Cover	75
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☐
Med	☑
None	☐
← Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 96.4% 10.25mg/l

pH 6.8

Sp. Conductivity (µs/cm) 206 µs/cm

Temperature (°C) 12.6°C

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 182

"a" 121810356 VMJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S2A3	LOCATION Sisson
STATION # S2A3 RIVERMILE _____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MS + ~~[illegible]~~ MF	
FORM COMPLETED BY MS	DATE June 20, 2011 TIME 7:00 AM (PM) — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 100	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). 70	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 40	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 25	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 50	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 75	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 100
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

w/p 001

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? (Y) / N

Odonata _____

Gomphids _____

mayfly + stonefly + caddisfly
yellow-spotted salamander
+ unkown

Samples Taken? Yes ☑ No ☒

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☑

unknown - dragonfly

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

w/p 001 pic 0003 - culvert @ reach start
invert.
002 pics 0004 - 0011
003 water quality pics 0012 -
004 reach end pics 0011 - 0018

- good site - potential - e-fish

Stantec Rapid Aquatic Habitat Survey

VMJS

Watercourse: SZA3 **Date:** June 20,20 **Job Number:** 1218103

water quality E 0650801 N5157253

Coordinates Reach Start: _____ **Photo #:** 0003 – 0018 ✓ see back

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + MF

Reach Length:	253m	**Substrate%**	
Avg. Bankfull Width:	2.75-4.50m	Bedrock	5
Avg. Bankfull Depth:	0.45-0.80 m	Boulder	10
Avg. Wet Width:	2.5-4.0 m	Rock	40
Avg. Wet Depth:	0.25-0.6m	Rubble	30
		Gravel	10
Land Use (Total 100%)	**(%)**	Sand	5
Uncut Forest	100	Fines	–
Clearcut		**Total (100%)**	100
Selective Logging			
Pasture/Hay			
Agricultural Row Crops			
Buffer strips			

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Comment: _____

Bank Erosion	
Undercut Banks (%)	
Left Bank	10
Right Bank	10

Culvert in reach?	**Y**	**N**
Is it perched?	☑	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity	
High	☐
Med	☐
Low	☑

Channel Grade	
High	☐
Med	☑ N/A
Low	☑
Estimated %	20%

Channel Form	
Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

N/A

Notes: _____

Morphology %	
Riffle	50
Run	35
Steady	
Pool	15
Deadwater	

Notes: _____

Stream order (from map) 2

Vegetation %	
Canopy Cover	70
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☐
None	☑
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	116.5/12.18mg/L
pH	5.9
Sp. Conductivity (µs/cm)	19.3
Temperature (°C)	13.1°C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 169

"A"

MJS ✓

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME SZAZ	LOCATION 12181025b	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS & MF		
FORM COMPLETED BY MS	DATE June 20 TIME 3:45 AM (PM)	REASON FOR SURVEY

	Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat (40); well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat (20); habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat (0); lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness (0) (25)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
	SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / N

Odonata _____

Gomphids _____

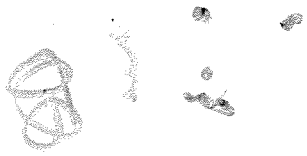
Samples Taken? Yes ☑ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☑

drgnfly only

Observations of Bivalves / Shells (Photo # etc...):



Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

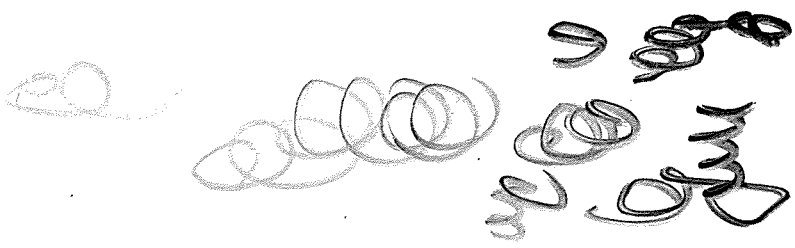
w/P (5) pics 0019-0023

(6) water quality pics -0024-0028

(7) pics 0029-0033

(8) small spring pics 0034-0035

(9) ~~end~~ Start of reach/invert sampling 0036-0040



Stantec Rapid Aquatic Habitat Survey

VMJS

Watercourse: S2A2 **Date:** Jun. 20, 2011 **Job Number:** 121810356

water quality E0650716 N 5137046

Coordinates Reach Start: _____ **Photo #:** 0019 - 0040 ✓

Coordinates Reach End: _____

Weather Conditions: overcast **Personnel:** MJS + MF

Reach Length:	⇒ 244m	
Avg. Bankfull Width:	3.5 – 6.5m	5
Avg. Bankfull Depth:	0.35 – 0.65	0.5
Avg. Wet Width:	3 – 6m	4.5m
Avg. Wet Depth:	0.3 – 0.6	0.45m

Substrate%

Bedrock	5
Boulder	20
Rock	25
Rubble	30
Gravel	5
Sand	15
Fines	
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4): 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	2%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %	
Riffle	50
Run	30
Steady	
Pool	20
Deadwater	

Notes: _____

Stream order (from map) 2

Vegetation %	
Canopy Cover	65
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☐
None (Low ✓)	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	114.2% / 11.97 mg/L
pH	6.1
Sp. Conductivity (µs/cm)	0.02
Temperature (°C)	13.8

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 125

MJS ✓

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME 52A1 (B)	LOCATION 121810356
STATION #_____ RIVERMILE_____	STREAM CLASS 2
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MJS + MF	
FORM COMPLETED BY MS	DATE June 20, 2011 TIME 3:30 AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 100	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). 70	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 40	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 25	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 50	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 75	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 100
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- inside old beaver pond — very dif. than lower reach

012 - pics # 0053 - 0056

wp# 013 - pics # 0057 - 0061 water quality

014 - beaver pond @ end of reach w another dam (newer) - also tributary origin @ this point

- lots of trout jumping in pond. pics: 0062 - 0065

↳ drainage pond

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: S2A1 (B) **Date:** June 20, 2011 **Job Number:** 121810356

Coordinates Reach Start: @ WP011 **Photo #:** 0053 - 0065 ✓

Coordinates Reach End: @ WP 014

Weather Conditions: _____ **Personnel:** MJS & MF

Reach Length: ~ 228m

Avg. Bankfull Width: 0.86 - 0.9m

Avg. Bankfull Depth: 0.65 - 0.95m

Avg. Wet Width: 2.0 - 2.5 m

Avg. Wet Depth: 0.4 - 0.7 m

Substrate%

Bedrock	
Boulder	15 20
Rock	5 10
Rubble	
Gravel	
Sand	40
Fines	30
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐
Type:		

Embeddedness (Score 1-4): 3

Comment: Via old beaver pond - dried grass

Bank Erosion

Undercut Banks (%)	
Left Bank	20
Right Bank	20

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☐
Beaver activity?	☐	☐

Notes: _____

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	1%

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

N/A

Notes: _____

Morphology %

Riffle	10
Run	10
Steady	80
Pool	
Deadwater	

Notes: _____

Stream order (from map): 2

Vegetation %

Canopy Cover	5%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris

Lots	☐
Med	☐
None	☑
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	107.7% / 10.55 mg/L
pH	6.1
Sp. Conductivity (µs/cm)	0.02 µS
Temperature (°C)	15.9°C

EMBEDDEDNESS (CRITERIA): 1 <20% 2 20% - 35% 3 35% - 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 163

MJS V

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME SZA1 (A)		LOCATION 12181035 6	
STATION # SZA1	RIVERMILE	STREAM CLASS	
LAT (A)	LONG	RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS + MJ			
FORM COMPLETED BY MS		DATE June 20 TIME 330 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / N

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

wp ~~[illegible]~~ pics @ 1/4 # 0041-0045 ~~0050~~

010

011 0046 - 0050

↳ old beaver dam

0051-0052

found old dam - uninhabited. Now a marsh / no trees

~ 150 x 100 m

Stantec Rapid Aquatic Habitat Survey

MJS ✓

Watercourse: S2 A1 (A) **Date:** June 20, 2011 **Job Number:** 121810356

shortened reach to w/P # 011 (@ upper end

Coordinates Reach Start: _____ **Photo #:** 0041-0052 ✓

Coordinates Reach End: _____

Weather Conditions: cloudy. **Personnel:** MJS + MF

Reach Length:	shortened wp#009 - 011	138m
Avg. Bankfull Width:	2.75 - 3.25m	3.0m
Avg. Bankfull Depth:	0.5 - 0.9 m	0.7m
Avg. Wet Width:	2.5 - 3.5m	3.0 m
Avg. Wet Depth:	0.3 - 0.7m	0.5 m

Substrate%

Bedrock	—
Boulder	10
Rock	10
Rubble	
Gravel	20
Sand	35
Fines	25
Total (100%)	

2!

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 2

Bank Erosion

Undercut Banks (%)	
Left Bank	10
Right Bank	10

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☐
Beaver activity?	☑	☐

Notes: dam @ upstream end (old)

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☑
Sand on Banks	☐

Notes: _____

Morphology %

Riffle	60
Run	
Steady	20
Pool	20
Deadwater	

Notes: _____

Stream order (from map) 2

Vegetation %

Canopy Cover	80
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs alders

Large Woody Debris

Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Low ✓

Water Quality

DO Saturation (%)	
pH	
Sp. Conductivity (µs/cm)	
Temperature (°C)	

took @ new reach

S2 A1 B

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 102

MJS ✓

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME S1E2	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS EMW		
FORM COMPLETED BY EMW	DATE June 15 TIME 3:00 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Not good habitat for Dragon Flies, clams or Fish.

MJS v

Stantec Rapid Aquatic Habitat Survey

Watercourse: S1E2 **Date:** June 15, 2011 **Job Number:** 121810356

water qual: 245 9122.5 7486217.7

Coordinates Reach Start: _____ **Photo #:** 2296 - 2310

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** MJS + EMW

Reach Length:	77m
Avg. Bankfull Width:	.5
Avg. Bankfull Depth:	.4
Avg. Wet Width:	.30
Avg. Wet Depth:	.20

Substrate%

Bedrock	55
Boulder	0
Rock	0
Rubble	0
Gravel	5
Sand	10
Fines	30
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	80%
Clearcut	
Selective Logging (old)	20%
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4): 0

Comment: _____

Bank Erosion	
Undercut Banks (%)	0
Left Bank	0
Right Bank	0

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☑	☐
Beaver activity?	☐	☑

Notes: large 10m waterfall @ mouth

Channel Sinuosity	
High	☐
Med	☐
Low	☑

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %	
Riffle	50
Run	
Steady	50
Pool	
Deadwater	

Channel Grade	
High	☑
Med	☑
Low	☐
Estimated %	<4%

Notes: channel undefined near end of reach -S

Notes: undefined channel US, DS steep grade entrenched

Stream order (from map): 1

Vegetation %	
Canopy Cover	65%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☐
None	☑
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 81.4% / 8.54 mg/L

pH 6.1

Sp. Conductivity (µs/cm) 16.1 µS

Temperature (°C) 12.7 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates not suitable habitat

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

see above

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

Large dam / beaver pond on the uppermost end of reach.

No 2nd form

MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: S1 E1 **Date:** June 15, 2011 **Job Number:** 121810356

water qual. X 2458927.7 Y 7486188.4

Coordinates Reach Start: _____ **Photo #:** 2290 – 2295

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + EMW

Reach Length:	151.3 m
Avg. Bankfull Width:	0.5 – 1.25m
Avg. Bankfull Depth:	0.70
Avg. Wet Width:	0.25 – 1.0 m
Avg. Wet Depth:	0.10 – 0.15

Substrate%

Bedrock	—
Boulder	10
Rock	20
Rubble	10
Gravel	15
Sand	15
Fines	30
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	✓
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Channel Sinuosity

High	☑
Med	☐
Low	☐

Bank Erosion	
Undercut Banks (%)	
Left Bank	40
Right Bank	40

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☐
Beaver activity?	☑	☐

Notes: end of reach in beaver pond, reach dammed

Channel Grade

High	☑
Med	☐
Low	☐
Estimated %	5%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: undefined channel

Morphology %	
Riffle	50
Run	
Steady	50
Pool	
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %	
Canopy Cover	65
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☑ low
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 80.9% / 7.58 mg/L

pH 6.3

Sp. Conductivity (µs/cm) 0.0 µs

Temperature (°C) 18.2 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

not suitable habitat

No rapid assess. form

Unmarked Tributary entering S1D4 VMJS No rapid assess. form

Stantec Rapid Aquatic Habitat Survey

S1D4(Trib) ~~S1C6 or S2B1~~ ? (Trib?)

Watercourse: Sisson ~~S1C6~~? **Date:** June ~~15~~ 14, 2011 **Job Number:** 121810356

Coordinates Reach Start: X 2458488.79 Y 7486115.33 **Photo #:** 2147 - 2158 ~~2152, 2153, 2154~~ ~~2208-2216~~

Coordinates Reach End: 2458506.5 + 7486432.6

Weather Conditions: partly cloudy **Personnel:** EMW + MJS

Reach Length:	195.9 m	**Substrate%**	
Avg. Bankfull Width:	0.5	Bedrock	
Avg. Bankfull Depth:	0.4	Boulder	
Avg. Wet Width:	0.3	Rock	
Avg. Wet Depth:	0.1-0.2 m	Rubble	
		Gravel	
		Sand	
		Fines	100
		Total (100%)	

Land Use (Total 100%)	**(%)**	**NPS Pollution**	**Y**	**N**
Uncut Forest	100	No Evidence	☑	☐
Clearcut		Some Sources	☐	☐
Selective Logging		Obvious Sources	☐	☐
Pasture/Hay		Buffer Strip	☐	☐
Agricultural Row Crops		Type:		
Buffer strips				

Comment:

Embeddedness (Score 1-4) 0

Bank Erosion		**Culvert in reach?**	**Y**	**N**
Undercut Banks (%)	0	Is it perched?	☐	☑
Left Bank	0	Other barriers?	☐	☑
Right Bank	0	Beaver activity?	☐	☑

Notes: Likely drainage/ spring fed

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	1.5%

Channel Form		**Morphology %**	
Braiding	☑	Riffle	
Lateral Bars	☐	Run	
Medial Bars	☐	Steady	100
Islands	☐	Pool	
Sand on Banks	☐	Deadwater	

Notes: some underground 10%

Notes:

Stream order (from map) 1

Vegetation %		**Large Woody Debris**	
Canopy Cover	85%	Lots	☐
Dominant Bank Veg	grass	Med	☑
Dominant Riparian Veg	trees	None	☐
		Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)

pH

Sp. Conductivity (µs/cm)

Temperature (°C)

not possible

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0

Total Score 144

SID4

VMJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Sisson	LOCATION NB	
STATION # SZBD RIVERMILE <	STREAM CLASS 1	
LAT 2468378 LONG 7862827	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY EMW MJS	DATE June 14, 2011 TIME 1213 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates Looked Nothing wrong type of Habitat

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

No, too riffly

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Photo # on Nomad Last picture of stop 2162

upper end 5104

→ 1st reach completed @ noon June 14.

MJS ✓

Stantec Rapid Aquatic Habitat Survey

S104

Watercourse: Sisson S2B1 **Date:** June 14, 2011 **Job Number:** 121810356

x wrong (Y)7486115.3368

Coordinates Reach Start: (X) 24 58 488.7942 **Photo #:** 2135-2139=2146 2159-2162

Coordinates Reach End:

Weather Conditions: overcast **Personnel:** EW, MJS

Reach Length:	~~500m~~ ~~286m~~ 336m	**Substrate%**	
Avg. Bankfull Width:	1.80 to 0.5 1.15m avg	Bedrock	0
Avg. Bankfull Depth:	49.35 cm 0.42m	Boulder	5
Avg. Wet Width:	~~200~~ to 0.5 1.25m avg	Rock	20
Avg. Wet Depth:	10 - 30 cm 0.2m	Rubble	30
		Gravel	10

Land Use (Total 100%)	(%)	**NPS Pollution**	Y	N
Uncut Forest	80	No Evidence	☐	☑
Clearcut	15	Some Sources	☐	☐
Selective Logging		Obvious Sources	☐	☐
Pasture/Hay		Buffer Strip	☐	☐
Agricultural Row Crops		Type: None		
Buffer strips (10m)	5			

Sand	30
Fines	5
Total (100%)	100%

Comment: cc on LB @ end of reach

Embeddedness (Score 1-4) 1

Bank Erosion		**Culvert in reach?**	Y	N
Undercut Banks (%)	~~30~~	Is it perched?	☐	☐
Left Bank	36	Other barriers?	☐	☐
Right Bank	30	Beaver activity?	☐	☐

Notes: No, DS of Reach ~~at~~ end

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Form		**Morphology %**	
Braiding	☑	Riffle	85
Lateral Bars	☐	Run	10
Medial Bars	☐	Steady	3
Islands	☐	Pool	2
Sand on Banks	☐	Deadwater	

Notes: ~~small~~ wet moss braiding in place

Notes:

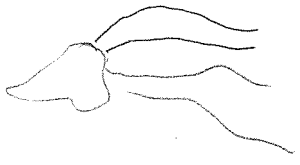
Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	1.5

Stream order (from map) 1

Vegetation %	
Canopy Cover	85
Dominant Bank Veg	~~shrub~~
Dominant Riparian Veg	Tree

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐



Water Quality

DO Saturation (%) 873 (9.71 mg/l)

pH 6.4

Sp. Conductivity (µs/cm) 0.0 µs

Temperature (°C) 10.7

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 129

VMJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME BOB Sisson	LOCATION	
STATION # SID3 RIVERMILE	STREAM CLASS	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW + MJS		
FORM COMPLETED BY MJS + EMW	DATE 6-14-2011 TIME 1:16 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

N

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

stream is braided goes under mossy bits then reforms. Reach starts out high gradient ↓ becomes aldery

Stantec Rapid Aquatic Habitat Survey

✓MJS

Watercourse: Sisson S103 **Date:** June 14, 2011 **Job Number:** 121810356

Coordinates Reach Start: **Photo #:** Nomad ~~2~~ 2163-2171

Coordinates Reach End: 2458202.79/7486698.85

Weather Conditions: Cloudy/Buggy **Personnel:** EW MS

Reach Length:	400 m
Avg. Bankfull Width:	0.5 to 1.5 m
Avg. Bankfull Depth:	0.5 to 0.24
Avg. Wet Width:	0.5 to 1.5 m
Avg. Wet Depth:	10 - 30

Substrate%	
Bedrock	0
Boulder	~~10~~ ~~5~~ 10
Rock	20
Rubble	10
Gravel	10
Sand	30
Fines	~~15~~ 20
Total (100%)	100

GS

Land Use (Total 100%)	**(%)**
Uncut Forest	70
Clearcut	~~30~~
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	30

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type: 5-10 m Buffer strip

Embeddedness (Score 1-4) 1

Comment: cc on LB @ start of Read

Bank Erosion	
Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: possible fish siting

Channel Sinuosity	
High	☑
Med	☐
Low	☐

Channel Grade	
High	☐
Med	☑
Low	☑
Estimated %	1%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: goes underground moss/tree roots, highly braided

Morphology %	
Riffle	20
Run	
Steady	
Pool	80
Deadwater	

Notes: braided

Stream order (from map) 1

Vegetation %	
Canopy Cover	65
Dominant Bank Veg	grass/shrub
Dominant Riparian Veg	Trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☑

Water Quality

DO Saturation (%) 90.8 10.43 mg/l

pH 6.2

Sp. Conductivity (µs/cm) 2.~~5~~

Temperature (°C) 9.8

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% 35% 3 35% 50% 4 > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 135

√ MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Sisson	LOCATION	
STATION # SID2 RIVERMILE	STREAM CLASS	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS & EMW		
FORM COMPLETED BY MJS	DATE 6-14-2011 TIME 2:05 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Not suitable habitat for arayonfios / clams, channel is undefined SIDI. does not exist ends in clear cut slash + hill.

√ MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: Sisson S102 **Date:** June 14, 2011 **Job Number:** 121816356

Coordinates Reach Start: _____ **Photo #:** 2175 - 2181

Coordinates Reach End: _____

Weather Conditions: Cloudy **Personnel:** EW MS

Reach Length:	270 m
Avg. Bankfull Width:	0.2 to 0.5 m
Avg. Bankfull Depth:	0.30 to 0.40 m
Avg. Wet Width:	.2 to .4
Avg. Wet Depth:	.20 to .30

Substrate%

Bedrock	0
Boulder	15
Rock	25
Rubble	5
Gravel	5
Sand	30
Fines	20
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	90
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	10

Comment: clearcut on LB also @ end of WC

NPS Pollution	**Y**	**N**
No Evidence	☑	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type: _____

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	0
Left Bank	0
Right Bank	0

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	>1%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %	
Riffle	100%
Run	
Steady	
Pool	
Deadwater	

Notes: Channel runs under ground

Notes: headwater, braided & unstructured

Stream order (from map)

Vegetation %	
Canopy Cover	85
Dominant Bank Veg	Shrubs/trees
Dominant Riparian Veg	Trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 87.5% 10.24 mg/l

pH 6.1

Sp. Conductivity (µs/cm) 14.4 ms/cm

Temperature (°C) 7.1 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 141

MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME SIC 6	LOCATION Sisson	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS ~~EWW~~ MJS		
FORM COMPLETED BY ~~EWW~~ MJS	DATE June 15 TIME 9:15 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

swept caddis Fly chironomids, mayflies diptera.

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

start of reach higher grade + wider than end of reach.

Stantec Rapid Aquatic Habitat Survey

vMJS

Watercourse: SIC6 Sisson **Date:** June 15, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2208 - 2223 ~~2140 - 2223~~

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** EW MJS

Reach Length: 256 m

Avg. Bankfull Width: 1.5, 2, .5, 1

Avg. Bankfull Depth: .85, .60, ?

Avg. Wet Width: 1.5, 1, .5, 3

Avg. Wet Depth: .20, .40

Substrate%

Bedrock	2
Boulder	3
Rock	20
Rubble	10
Gravel	20
Sand	40
Fines	5
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: mixed wood

NPS Pollution	**Y**	**N**
No Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	20%
Left Bank	20%
Right Bank	20%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: waterfall @ end of reach possible

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☑
Sand on Banks	☐

Notes: WC goes under moss several times

Morphology %

Riffle	30
Run	60
Steady	10
Pool	
Deadwater	

Notes: Fish nursery

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	2%

Stream order (from map) 1

Vegetation %

Canopy Cover	70%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	97.0%, 11.34 mg/l
pH	6.2
Sp. Conductivity (µs/cm)	19.1 µs/cm
Temperature (°C)	8.6°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 144

MJS ✓

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Sisson	LOCATION	
STATION # SICS RIVERMILE	STREAM CLASS I	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW MJS		
FORM COMPLETED BY EMW	DATE June 15, 2011 TIME 10:00 (AM) PM	REASON FOR SURVEY

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

not suitable habitat

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

see above

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- higher grade than lower reach

?

SIDReach

Stantec Rapid Aquatic Habitat Survey

VMJS

Watercourse: SIC5 **Date:** June 15 2011 **Job Number:** 121810356

Coordinates Reach Start: X 2458297.9 Y 7486196.5 **Photo #:** 2224 - 2236

Coordinates Reach End: 2457993.28 7486174.97

Weather Conditions: partly cloudy **Personnel:** ~~2224~~ MJS & EMW

Reach Length:	308.6 m
Avg. Bankfull Width:	0.75 - 2.~~75~~ 1.25 - 7.75
Avg. Bankfull Depth:	0.5 0.5
Avg. Wet Width:	0.5, 2.5 1.0 - 1.5
Avg. Wet Depth:	0.20 - 0.4 0.7 - 0.3

Substrate%

Bedrock	—
Boulder	1%
Rock	9%
Rubble	20
Gravel	10
Sand	40
Fines	20
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	~~80~~
Left Bank	30
Right Bank	30

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☐
Beaver activity?	☐	☑

Notes:

Channel Sinuosity	
High	☑
Med	☐
Low	☐

Channel Grade	
High	☐
Med	☑
Low	☑
Estimated %	1.5%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☑

Morphology %	
Riffle	80
Run	20
Steady	
Pool	
Deadwater	

Notes: flow underground (~40%) spring-fed?

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	65
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 80% / 8.6 mg/l

pH 6.1

Sp. Conductivity (µs/cm) 2.1 µs/cm

Temperature (°C) 12.2°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 155 QF

V.MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Sisson	LOCATION	
STATION # S163 RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + EMW		
FORM COMPLETED BY MJS	DATE June 14 TIME 10:50 AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Not appropreate habitat for clams or dragon flies,

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: SIC3 ? **Date:** June 15, 2011 **Job Number:** 121816356

Coordinates Reach Start: **Photo #:** 2232 - 2248

Coordinates Reach End: 2458139.5 7486040.1 (wg location)

Weather Conditions: Sunny **Personnel:** EMW MJS

Reach Length: 220 m

Avg. Bankfull Width: .7, .5

Avg. Bankfull Depth: .40, .50

Avg. Wet Width: .7, .5, ?

Avg. Wet Depth: .10, .30, .10

Substrate%

Bedrock	0
Boulder	25
Rock	5
Rubble	5
Gravel	5
Sand	35
Fines	35
Total (100%)	1000

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
No Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: 10-15 m from Rd

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	30
Right Bank	30

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☑	☐
Beaver activity?	☐	☑

Notes: boulders may preset barrier ✓

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	1.5 to 2

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☑

Notes: underground flow

Morphology %

Riffle	10
Run	
Steady	90
Pool	
Deadwater	

Notes: flows under rocks moss roots. likely lots of gw inputs

Stream order (from map) 1

Vegetation %

Canopy Cover	65
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 93.7% / 10.99 mg/l

pH 6.2

Sp. Conductivity (µs/cm) 18.4 µs/cm

Temperature (°C) 8.1

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 143

VMJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME SIC2	LOCATION Sisson	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW MJS		
FORM COMPLETED BY EMW	DATE June 15, 2011 TIME 11:40 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Not appropreate habitat for collection.
Undefined Headwater channel, braided. Flows ondergrad, stream fed

Stantec Rapid Aquatic Habitat Survey

✓ MJS

Watercourse: SIC2 **Date:** June 15, 2011 **Job Number:** 171810356

Coordinates Reach Start: **Photo #:** ~~2244~~ 2249 - 2253

Coordinates Reach End: 2457906.0 7486104.2 (wg location)

Weather Conditions: Sunny **Personnel:** EW MS

Reach Length: 3.12.5

Avg. Bankfull Width: NA (no defined channel)

Avg. Bankfull Depth: .30, .40

Avg. Wet Width: .5

Avg. Wet Depth: .10, .15, .20

Substrate%	
Bedrock	0
Boulder	~~25~~ 30
Rock	10
Rubble	5
Gravel	5
Sand	~~35~~ 40
Fines	10
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: m

NPS Pollution	**Y**	**N**
No Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: 100 m from rd

Embeddedness (Score 1-4) 1

Bank Erosion NA

Undercut Banks (%)	
Left Bank	
Right Bank	

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	1.5

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☑

Notes: undefined channel

Morphology %	
Riffle	
Run	
Steady	100
Pool	
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	65
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 90.4% / 10.62 mg/l

pH 6.0

Sp. Conductivity (µs/cm) 1.8 µs/cm

Temperature (°C) 8.0 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

undefined channel flows above + below ground.

No 2nd form ✓ MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: 914 **Date:** June 15, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2254 - 2261

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** EMW, MJS

Reach Length: 236m

Avg. Bankfull Width: >.5

Avg. Bankfull Depth: ≈ .20

Avg. Wet Width: ~~.10-.15~~ >.5

Avg. Wet Depth: .10, .15

Substrate%

Bedrock	0
Boulder	80
Rock	10
Rubble	5
Gravel	5
Sand	25
Fines	25
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	90%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips (30m)	10%

Comment: @ start of reach

NPS Pollution	**Y**	**N**
No Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type: old channel in use

Embeddedness (Score 1-4) 1

Bank Erosion NA

Undercut Banks (%) _____

Left Bank _____

Right Bank _____

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☑	☐
Beaver activity?	☐	☑

Notes: high grade under ground

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

~~High~~	~~☑~~
(Med)	☑
Low	☐

Estimated % 4%

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %

Riffle	NA
Run	
Steady	
Pool	
Deadwater	

Notes: undefined channel Flows underground

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	65%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 91.2% / 10.75 mg/L

pH 6.0

Sp. Conductivity (µs/cm) 17.8 µs/cm

Temperature (°C) 7.8°C

2256-2260

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 131

MJS ✓

1 of 1

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Sisson	LOCATION 12181356	
STATION # 5183 RIVERMILE	STREAM CLASS I	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY	DATE June 21 TIME 10:50 AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

w/p # 015 ~~start of~~ stream enters beaver pond pics # 0066 - 0070

016 beaver dam 0071 - 0074

017 trib (unmarked) stream enters old beaver pond 0075 - 0076

018 — upper end small trib. fr. 017 - 018 ends @ small beaver pond see track log pics 0078 0077

019 - water quality / pics 0079 - 0081

020 - pics # 0082-0086

021 - dam (@ reach start) very large pond 0087-0088

Stantec Rapid Aquatic Habitat Survey

VMJS

Watercourse: SI B3 **Date:** June 21, 2011 **Job Number:** 121810356

Coordinates Reach Start: wg X 650407 Y 5136597 **Photo #:** 0066 - 0088 ✓

Coordinates Reach End:

Weather Conditions: sunny **Personnel:** MJS + MF

Reach Length:	234m
Avg. Bankfull Width:	2.5 - 3.5m
Avg. Bankfull Depth:	0.35 - 0.50
Avg. Wet Width:	2.0 - 3.0 m
Avg. Wet Depth:	0.05 - 0.20 m

Substrate%

Bedrock	
Boulder	35%
Rock	
Rubble	
Gravel	
Sand	45%
Fines	20
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	30%
Right Bank	30%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: multiple dams

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☐

Notes: periodically underground

Morphology %	
Riffle	80%
Run	
Steady	20%
Pool	
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	80%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

low ✓

Water Quality

DO Saturation (%)	76.0% / 7.65 mg/L
pH	5.3
Sp. Conductivity (µs/cm)	~~18.6~~ MS/cm
Temperature (°C)	14.8 °C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Stantec

Sisson 121810356

Walkover Field Sheets

Bird Brook

July 7, 2011
Entred by MJS
QA/QC by EMW July 20, 2011

Designed by: Checked by:

RECYCLED Paper FSC FSC® C101537

Printed on FSC®-certified and 100 percent recycled postconsumer waste paper.

VMJS

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Bck		LOCATION 12181035 6	
STATION # B1A1	RIVERMILE	STREAM CLASS 1	
LAT	LONG	RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS + MF			
FORM COMPLETED BY MJS		DATE June 22, 2011 TIME 9:50 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10 / 70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 140 ✓

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: B1A1 **Date:** June 22, 2011 **Job Number:** 121810356

WQ X2455343.1 Y7488373.5 - 148 - 158

Coordinates Reach Start: _____ **Photo #:** 0150-0158 ✓

Coordinates Reach End: _____

Weather Conditions: sunny/partly cloudy **Personnel:** MJS + MF

Reach Length: 180 m

Avg. Bankfull Width: 0.35 - 0.55 - 0.45m

Avg. Bankfull Depth: 0.30 0.3m

Avg. Wet Width: 0.25 - 0.45 0.35m

Avg. Wet Depth: 0.10 0.10m

Substrate%

Bedrock	
Boulder	70
Rock	
Rubble	
Gravel	
Sand	20
Fines	10
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	
Left Bank	0
Right Bank	0

~ 80% below ground

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐

Estimated % 3%

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %

Riffle	100
Run	
Steady	
Pool	
Deadwater	

Notes: below grnd or moist substrate

Stream order (from map) 1

Vegetation %

Canopy Cover	90%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☐
Med	☐
None	☑
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	62.1% / 6-80 mg/L
pH	4.9
Sp. Conductivity (µs/cm)	12.7 µs/cm
Temperature (°C)	11.4

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? **Y** / **N**

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

start of reach

wp 041 - water quality & pics → 00150-0152
→ 0153-0155

wp 042 - end of reach 156-158

EMW

VMJS

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brk	LOCATION 1218 10 356	
STATION # BIAZ RIVERMILE	STREAM CLASS	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + MF		
FORM COMPLETED BY MJS	DATE June 22, 2011 TIME 1020 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 151

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: B1A2 **Date:** June 22, 2016 **Job Number:** 121810356

Coordinates Reach Start: WQ X 2455231.2 Y 7488344.0 **Photo #:** 0159 — 0172 ✓

Coordinates Reach End:

Weather Conditions: sunny **Personnel:** MJS & MF

Reach Length:	~172m		
Avg. Bankfull Width:	1.25 - 1.75m	1.5m	
Avg. Bankfull Depth:	0.35 - 0.45m	0.4m	
Avg. Wet Width:	1.0 - 1.5m	1.25m	
Avg. Wet Depth:	0.15 - 0.25m	0.2m	

Substrate%

Bedrock	10
Boulder	60
Rock	
Rubble	
Gravel	
Sand	25
Fines	5
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Comment:

Bank Erosion	
Undercut Banks (%)	
Left Bank	5
Right Bank	10

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	3%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☑
Sand on Banks	☐

Notes: ~20% flows below ground

Morphology %	
Riffle	80 90
Run	
Steady	
Pool	10
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	80
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☐
None (low ✓)	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	80.9% / ~~10 11.80~~ 8.91 mg/L
pH	5.3
Sp. Conductivity (µs/cm)	15.8 µS/cm
Temperature (°C)	10.4 °C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- noted fish @ mid point

wp# 043 pics 0159 - 0161 overz

wp# 044 pics 0162 - 0166 & water quality water course becomes defined

- started using nomad for this reach as well

EMW

√MJS

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brk	LOCATION	
STATION # B143 RIVERMILE	STREAM CLASS 1	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + MF		
FORM COMPLETED BY MJS	DATE June 22, 2011 TIME 10:45 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10)	Greater than 70% of (70) substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable (40) habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable (20) habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable (0) habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and (25) boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and (50) boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and (75) boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and (100) boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 153 ✓

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: BIA3 **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: WQ X 2455725.3 Y 7488484.1 **Photo #:** 0173 - 0182 ✓

Coordinates Reach End:

Weather Conditions: sunny **Personnel:** MJS & MS

Reach Length: 272m

Avg. Bankfull Width:	0.75 - 1.0m	0.88
Avg. Bankfull Depth:	0.3 - 0.5m	0.4
Avg. Wet Width:	0.5 - 0.75m	0.63
Avg. Wet Depth:	0.1 - 0.3m	0.2

Substrate%

Bedrock	~~40~~ 5
Boulder	40
Rock	10
Rubble	5
Gravel	
Sand	40
Fines	
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	20
Right Bank	20

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	2.5%

Channel Form

Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes:

Morphology %

Riffle	90
Run	
Steady	
Pool	10
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %

Canopy Cover	75
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	88.6% / ~~90.4%~~ 9.94 mg/L
pH	5.8
Sp. Conductivity (µs/cm)	17.5 µS/cm
Temperature (°C)	10.0 °C

EMBEDDEDNESS (CRITERIA): 1 <20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese.

Benthic Invertebrates

Suitable invertebrate habitat? Y (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- observed fish
- pics on nomad

EMW

V MJS

'11'

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brk		LOCATION 12181035G	
STATION # B14	RIVERMILE	STREAM CLASS 1	
LAT	LONG	RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS & MF			
FORM COMPLETED BY MJS	DATE June 22, 2011 TIME 12:15 AM (PM)	REASON FOR SURVEY	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 10 / 70	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 40	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
2. Embeddedness 0 / 25	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 50	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 75	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 100
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 106

✓MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: BIA4 **Date:** June 22, 2011 **Job Number:** 121810356

W/Q X 2456191.6 Y 7488696.8

Coordinates Reach Start: _____ **Photo #:** 0183 - 0213 ✓

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + MF

Reach Length:	600m	
Avg. Bankfull Width:	1.0 - 2.75	1.88
Avg. Bankfull Depth:	0.5 - 0.9 m	0.7
Avg. Wet Width:	0.75 - 2.5m	1.63
Avg. Wet Depth:	0.2 - 0.6m	0.4

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	10
Sand	25
Fines	65
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution

	Y	N
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4): 4

Comment: _____

Bank Erosion

Undercut Banks (%)	
Left Bank	50
Right Bank	50

Culvert in reach?

	Y	N
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: old dam

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑

Estimated % 0.5%

Channel Form

Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☐
Sand on Banks	☑

Notes: _____

Morphology %

Riffle	20
Run	
Steady	70
Pool	
Deadwater	10

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	65%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs, alders

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	80.4 % / 8.55 mg/L
pH	5.6
Sp. Conductivity (µs/cm)	18.3 µS/cM
Temperature (°C)	11.7 °C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- old beaver dam / swamp in 1st 1/4 of reach
- many alders, slow-going

EMW

VMJS

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brook	LOCATION 12181035b	
STATION # B1A5 RIVERMILE	STREAM CLASS	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS & MF		
FORM COMPLETED BY MJS	DATE June 22, 2011 TIME 3:00 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 143 ✓

Stantec Rapid Aquatic Habitat Survey

JMJS

Watercourse: BIA 5 **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: (W/Q X 2456385.2 Y 7488761.3) #2(x Y 249 ✓ **Photo #:** 0214 –

Coordinates Reach End:

Weather Conditions: Sunny **Personnel:** MJS & MF

Reach Length:	~720M	
Avg. Bankfull Width:	0,5 - 0.7m	0.6
Avg. Bankfull Depth:	1,75 - 3.25m	2.5
Avg. Wet Width:	1.5 - 3.0 m	2.25
Avg. Wet Depth:	0.3 - 0.5m	0.4

Substrate%

Bedrock	–
Boulder	20
Rock	5
Rubble	–
Gravel	–
Sand	50
Fines	25
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4): 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☑	☐
Beaver activity?	☑	☐

Notes: -dam (old)

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	1%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☐
Sand on Banks	☑

Notes:

Morphology %	
Riffle	30
Run	
Steady	60
Pool	20
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	70
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality W/Q #1

DO Saturation (%)	75.3% / 7.66mg/L
pH	5.4
Sp. Conductivity (µs/cm)	17.3 MS/cm
Temperature (°C)	13.5 °C

W/Q #2

85.6% / 8.78 mg/L
5.5 pH
17.2 MS/cm
14.8 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? **Y / N**

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

note: found grow-op on stream

pics 0217 - 0220

- slow going - lots of alders

EMW

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brk	LOCATION	
STATION # BIA6 RIVERMILE	STREAM CLASS	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + MF		
FORM COMPLETED BY MJS	DATE June 22 2011 TIME 330 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 10	Greater than 70% of 70 substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable 40 habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable 20 habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable 0 habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and 25 boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and 50 boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and 75 boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and 100 boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 127

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: BIAG **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: (W10) X 2456981.8 Y 7488562.7 **Photo #:** 250 - 262

Coordinates Reach End:

Weather Conditions: partly cloudy **Personnel:** MJS + MF

Reach Length:	212m	
Avg. Bankfull Width:	2.25 - 4.25m	3.25
Avg. Bankfull Depth:	0.55 - 0.75m	0.65
Avg. Wet Width:	2.0 - 4.0	3.0
Avg. Wet Depth:	0.4 - 0.6m	0.5

Substrate%

Bedrock	
Boulder	10
Rock	
Rubble	
Gravel	
Sand	20
Fines	70
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4): 3

Bank Erosion	
Undercut Banks (%)	
Left Bank	30
Right Bank	30

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☐
Beaver activity?	☑	☐

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	0.5%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes:

Morphology %	
Riffle	10
Run	
Steady	50
Pool	
Deadwater	40

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	60%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	20.6% / 1.66 mg/L
pH	5.2
Sp. Conductivity (µs/cm)	17.6 µs/cm
Temperature (°C)	15 °C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- stream met w BIBI earlier than predicted as the two drain into swamp @ the same place

EMW

MJS✓

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brk		LOCATION 12181035G	
STATION # B1B1	RIVERMILE	STREAM CLASS 1	
LAT	LONG	RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS + MF			
FORM COMPLETED BY MJS	DATE June 22, 2011 TIME 10:30 (AM) PM	REASON FOR SURVEY	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable (40) habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable (20) habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable (0) habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
2. Embeddedness (0) (25)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and (50) boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and (75) boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and (100) boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 124 ✓

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: BIB1 **Date:** June 23, 2011 **Job Number:** 121810356

Coordinates Reach Start: W/Q X 649260 Y 5139687 **Photo #:** 0278-0295 ✓

Coordinates Reach End:

Weather Conditions: partly cloudy **Personnel:** MJS + MF

Reach Length: ~338m

Avg. Bankfull Width:	0.40 - 0.75m	0.58m
Avg. Bankfull Depth:	0.20 - 0.35m	0.30m
Avg. Wet Width:	0.25 - 0.6m	0.40m
Avg. Wet Depth:	0.05 - 0.20m	0.13m

Substrate%

Bedrock	
Boulder	~~10~~ 5
Rock	
Rubble	
Gravel	
Sand	15
Fines	80
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4): 2

Comment:

Bank Erosion

Undercut Banks (%)	
Left Bank	40%
Right Bank	40%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑ 1
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	1.0%

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %

Riffle	40
Run	
Steady	60
Pool	
Deadwater	

Notes: ~40% stream below ground

Notes:

Stream order (from map): 1

Vegetation %

Canopy Cover	60
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	39.8% / 4.72 mg/L
pH	5.0
Sp. Conductivity (µs/cm)	20.0 µS/cm
Temperature (°C)	10.9

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? **Y / N**

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

wp 045 045:278-280 - start of reach
46 046:281-283
47 047:284-286
48 048:287-289
49 049:290-292 - water quality
50 050:293-295

END

"a"

MJS ✓

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brk	LOCATION	
STATION # BIBZ RIVERMILE	STREAM CLASS 1	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + MF		
FORM COMPLETED BY MJS	DATE June 22, 2011 TIME 4:30 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	10 70 Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40 40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20 20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	0 Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
2. Embeddedness	0 25 Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	50 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	75 Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	100 Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 124 ✓

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: B1B2 **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 263-277 ✓

Coordinates Reach End: _____

Weather Conditions: partly cloudy **Personnel:** MJS & MF

Reach Length:	187m	
Avg. Bankfull Width:	0.5 - 0.6	0.55
Avg. Bankfull Depth:	0.20 - 0.35	0.28
Avg. Wet Width:	0.4 - 0.5	0.45
Avg. Wet Depth:	0.05 - 0.20	0.13

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	
Sand	10
Fines	90
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐
Type:		

Embeddedness
(Score 1-4) n/a 10

Comment: _____

Bank Erosion	
Undercut Banks (%)	
Left Bank	50
Right Bank	50

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	0.5%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %	
Riffle	20
Run	
Steady	50
Pool	
Deadwater	30

Notes: goes underground in upper reach

Notes: _____

Stream order (from map) 1

Vegetation %	
Canopy Cover	60%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	40,3% 4.50 mg/L
pH	4.4
Sp. Conductivity (µs/cm)	19 µS/cM
Temperature (°C)	12.9 °C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- stream difficult to follow in upper reach - small & goes underground

EMW

~~No 2nd form?~~ MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: BIC1 **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: 2455848.67 7488333.95 **Photo #:** 2548 - 2558 ✓

Coordinates Reach End:

Weather Conditions: Sun **Personnel:** EMW DT

NC 2455844.4 7486327.8

Reach Length:	184		
Avg. Bankfull Width:	.5, .8, .3	0.53	
Avg. Bankfull Depth:	~~.36~~ .40	0.38	
Avg. Wet Width:	.3, .5, .2	0.33	
Avg. Wet Depth:	.20, .13, .2	0.18	

Substrate%

Bedrock	0
Boulder	0
Rock	10
Rubble	5
Gravel	5
Sand	70
Fines	10
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type:

Embeddedness

(Score 1-4) 1

Comment: clear cut w 30m buffer a end on LB

Bank Erosion	
Undercut Banks (%)	~~7~~
Left Bank	10
Right Bank	10

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑

Estimated % 15

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes:

Morphology %	
Riffle	
Run	
Steady	100
Pool	
Deadwater	

Notes: small headwater

Stream order (from map) 1

Vegetation %	
Canopy Cover	70
Dominant Bank Veg	grass
Dominant Riparian Veg	Shrubs

Large Woody Debris	
Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

a crw ✓

Water Quality

DO Saturation (%)	8.03 mg/L 68.2%
pH	5.3
Sp. Conductivity (µs/cm)	16.7 µS
Temperature (°C)	9.7°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

other 'twin' head water reach wetland ↗ start, end of reach is wet meadow
Never develops channel though is confined bw valley walls

Emm

MJS ✓

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brook	LOCATION	
STATION # BID1 RIVERMILE	STREAM CLASS 1	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS EMW MF		
FORM COMPLETED BY	DATE June 16, 2011 TIME 1135 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 (3)	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0

Total Score 88 ✓

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: BID 1 **Date:** June 16, 2011 **Job Number:** 121810356

W/Q/X 2455455.1 Y 7487217.6 **Photo #:** 2344 – 2359, 2352 – 2356

Coordinates Reach Start:

Coordinates Reach End:

Weather Conditions: partly cloudy / sunny ✓ **Personnel:** MJS, EMW, MF

Reach Length: 225.8 m

Avg. Bankfull Width:	0.8m, 1.0	0.9
Avg. Bankfull Depth:	0.26 m, 0.36, .44	0.35
Avg. Wet Width:	0.6 m, 0.8	0.7
Avg. Wet Depth:	0.08 m, .03, .32	0.18

Substrate%

Bedrock	0
Boulder	0
Rock	5
Rubble	5
Gravel	10
Sand	40
Fines	40
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	
Clearcut	100%
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☑

Type: clearcut right to wc edge

Embeddedness (Score 1-4) 2?

Comment: lots of slash in wc (LWD)

Bank Erosion	
Undercut Banks (%)	5
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☑	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	10%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes:

Morphology %	
Riffle	
Run	
Steady	100%
Pool	
Deadwater	

Notes: headwaters

Stream order (from map) 1

Vegetation %	
Canopy Cover	10%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 104.2 / 11.56 mg/L

pH 6.0

Sp. Conductivity (µs/cm) 14.3 mS

Temperature (°C) 10.7

EMBEDDEDNESS (CRITERIA): 1: < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑ not the right habitat

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

not the right Habitat.

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

-stream continued ~150m into clear-cut. Small stream (<0.5m) slow flow lots of slash in + over the wc, clearcut over wc.

end

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brook	LOCATION
STATION # B102 RIVERMILE	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS EMW MJS	
FORM COMPLETED BY EMW	DATE June 16, 2011 TIME 12:50 AM (PM) / REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. sand
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0

Total Score 114 ✓

Stantec Rapid Aquatic Habitat Survey

MJS ✓

Watercourse: BID2 Brook **Date:** June 16, 2011 **Job Number:** 121810356

Coordinates Reach Start: 2455662 7487102.2 WC **Photo #:** 2360 – 2377

Coordinates Reach End:

Weather Conditions: Sunny **Personnel:** EMW MS MF

Reach Length:	426.7	
Avg. Bankfull Width:	1, 1.5 m	1.25
Avg. Bankfull Depth:	0.18, 0.33	0.26
Avg. Wet Width:	0.75, 1.2	0.98
Avg. Wet Depth:	0.5, .20	0.35

Substrate%

Bedrock	
Boulder	2.5
Rock	2.5
Rubble	5
Gravel	20
Sand	60
Fines	10
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	
Clearcut	10
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	90

Comment:

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☑
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type:

Embeddedness
(Score 1-4) 0

Bank Erosion	
Undercut Banks (%)	
Left Bank	50
Right Bank	50

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☐
Beaver activity?	☐	☐

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	1%

Channel Form	
Braiding	☐
Lateral Bars	☑
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes:

Morphology %	
Riffle	65
Run	
Steady	30
Pool	5
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	40
Dominant Bank Veg	grass
Dominant Riparian Veg	~~Shrubs~~

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 82.0% / 8.75 mg/l
pH 6.3
Sp. Conductivity (µs/cm) 11.6 µS/cm
Temperature (°C) 11.1°C

EMBEDDEDNESS (CRITERIA) 1 <20% 2 20-25% 25-50% 4 >50% Page 1

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

no dragonflies seen
not suitable habitat

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- clearcut on both sides

EMW

✓ MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME BIDS Bird Br	LOCATION 12181035G	
STATION # BIDS RIVERMILE	STREAM CLASS 1	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS & EMW + MF		
FORM COMPLETED BY EMW	DATE June 16 TIME 105 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0

Total Score 120 ✓

Stantec Rapid Aquatic Habitat Survey

✓ MJS

Watercourse: BID3 **Date:** June 16, 2011 **Job Number:** 121810356

w/Q X 2456204.1 Y 7487137.6 2388-2392-90 W power reading

Coordinates Reach Start: _____ **Photo #:** 2385-2385

Coordinates Reach End: _____ 2378 - 2387

Weather Conditions: Sunny **Personnel:** MJS/EMW/MF

Reach Length:	291 361 m	
Avg. Bankfull Width:	1.0-1.2	1.1
Avg. Bankfull Depth:	0.74-0.45	0.60
Avg. Wet Width:	0.9	0.9
Avg. Wet Depth:	0.2-0.4	0.3

Substrate%

Bedrock	—
Boulder	—
Rock	5
Rubble	10
Gravel	20
Sand	60
Fines	5
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	
Clearcut	10
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	90

Comment: _____

NPS Pollution	**Y**	**N**
No Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type: _____

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	40
Right Bank	40

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	1%

Channel Form

Braiding	☐
Lateral Bars	☑
Medial Bars	☑
Islands	☑
Sand on Banks	☐

Notes: _____

Morphology %

Riffle	70
Run	
Steady	15
Pool	15
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	50
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 80.1% / 8.80 mg/L

pH 6.2

Sp. Conductivity (µs/cm) 15.3 µS

Temperature (°C) 11.0 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

not suitable habitat

Odonata _____

Gomphids _____

no dragonflies seen

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

see above

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- we made reach end @ the fire road culvert

EMW

MJS ✓

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME B104	LOCATION Bird Brook	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW MJS		
FORM COMPLETED BY EMW	DATE June/6/2011 TIME 2:07 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated broader than sampling reach	**6. Channel Alteration**	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
	SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
	8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
	SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
	9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
	SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
	SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
	SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0

Total Score 146 ✓

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: BLD4 Bird Brook **Date:** June 16, 2011 **Job Number:** 121810356

Coordinates Reach Start: @ culvert ≈ 2456779.9 7487035.7 **Photo #:** 2388 – 2403 / 2393 – 2403 see last photos of US Reach

Coordinates Reach End:

Weather Conditions: Sunny **Personnel:** EMW, MJS, MF

Reach Length:	~~340.8~~	391 m	
Avg. Bankfull Width:	2, 1.25	1.63	
Avg. Bankfull Depth:	.9, 1., .62, .42, .45	0.60	
Avg. Wet Width:	1.5, 1	1.25	
Avg. Wet Depth:	.25, .05, .15, .20	0.16	

Substrate%

Bedrock	
Boulder	20
Rock	25
Rubble	10
Gravel	5
Sand	40
Fines	
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	90
Clearcut	N/A
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	10

Comment: clear-cut right side upper reach

NPS Pollution	**Y**	**N**
No Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☑

Type:

Embeddedness (Score 1-4) 2

Bank Erosion

Undercut Banks (%)	
Left Bank	65
Right Bank	65

– erosion @ upper / start of reach (culvert?)

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	1%

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☑

Notes:

Morphology %

Riffle	~~grass~~
Run	20
Steady	5
Pool	20
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %

Canopy Cover	70
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 86.3% / 9.37 mg/l

pH 6.4

Sp. Conductivity (µs/cm) 15.8 mS/cm

Temperature (°C) 11.4°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Not great habitat for clams or

Last photo in nomad labeled

EMW wrong.

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME BIDS	LOCATION Bird Brk IZ18/0356	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS & EMW & MF		
FORM COMPLETED BY	DATE June 16, 2011 TIME 2:25 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 131 ✓

✓MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: BIDS **Date:** June 15 2011 **Job Number:** 1218103356

wq x 245675.4 Y 7487421.4

Coordinates Reach Start: 245642.5 7487400.1 **Photo #:** 2404 - 2415

Coordinates Reach End:

Weather Conditions: Sunny **Personnel:** EMW MJS, M

Reach Length:	196.5m	
Avg. Bankfull Width:	1.0 - 2.0	1.5
Avg. Bankfull Depth:	.25, .35	0.30
Avg. Wet Width:	0.75 - 1.75	1.25
Avg. Wet Depth:	.20, .30	0.25

Substrate%

Bedrock	0
Boulder	5
Rock	15
Rubble	10
Gravel	10
Sand	40
Fines	20
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	90 ~~100~~ 80
Clearcut	10
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	10

Comment:

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	
Left Bank	20
Right Bank	20

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	1.5 E

Channel Form	
Braiding	☐
Lateral Bars	☑
Medial Bars	☐
Islands	☐
Sand on Banks	☑

Morphology %	
Riffle	15
Run	85
Steady	
Pool	
Deadwater	

Notes: evidence of high flows, deposition

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	60
Dominant Bank Veg	grass
Dominant Riparian Veg	Shrubs

Large Woody Debris	
Lots	☑
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 82.6 / 9.04 mg/L

pH 6.5

Sp. Conductivity (µs/cm) 20.8

Temperature (°C) 16.7°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

no dragonflies observed
not suitable habitat

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

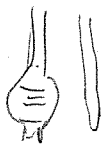
Observations of Bivalves / Shells (Photo # etc...):

see above

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)



End

~~No End form~~

MOSL

Stantec Rapid Aquatic Habitat Survey

Watercourse: ~~B13E7~~ B1E17[a] **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2635 - 2645

Coordinates Reach End: _____

Weather Conditions: partly cloudy **Personnel:** EMW DT

Reach Length:	297m		
Avg. Bankfull Width:	.5, .8	0.65	
Avg. Bankfull Depth:	.4, .3	0.35	
Avg. Wet Width:	.4, .5, .1	0.33	
Avg. Wet Depth:	.20, .40	0.30	

Substrate%

Bedrock	0
Boulder	10
Rock	15
Rubble	5
Gravel	10
Sand	40
Fines	20
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Comment: _____

Bank Erosion	
Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Grade

High	☑
Med	☑
Low	☑
Estimated %	1.5%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %	
Riffle	50
Run	50
Steady	
Pool	
Deadwater	

Notes: braided us disorginized headwater

Stream order (from map) 1

Vegetation %	
Canopy Cover	45%
Dominant Bank Veg	grass
Dominant Riparian Veg	Shrub, Trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 82.3% / 8.75 mg/l

pH 5.4

Sp. Conductivity (µs/cm) 12.9 µs/cm

Temperature (°C) 11.8°C

2456634.9
7487066.1

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Not the right habitat for clams or DF. Too BIF!? Channel ↑ in grade + disappears before getting to the road. There was thinning ongoing on either side of the wc.

other form not filled out as NA to watercourse

No 2nd form

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: B1E2 **Date:** June 20, 2011 **Job Number:** 121810356

22 → **Photo #:** 2619 – ~~2624~~ – 2634

Coordinates Reach Start:

Coordinates Reach End:

Weather Conditions: Partly Cloudy **Personnel:** EMW DT

Reach Length: 262 m

Avg. Bankfull Width:	.40, .5, >1m	0.63
Avg. Bankfull Depth:	.5, .8	0.65
Avg. Wet Width:	.30, .5	0.40
Avg. Wet Depth:	.3, .2, .5	0.33

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	5
Sand	65
Fines	30
Total (100%)	100 %

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	.2

Channel Form

Braiding	☐
Lateral Bars	☑
Medial Bars	☐
Islands	☐
Sand on Banks	☑

Morphology %

Riffle	
Run	
Steady	100%
Pool	
Deadwater	

Notes: None backwater @ end of reach

Notes:

Stream order (from map) 1

Vegetation %

Canopy Cover	40 %
Dominant Bank Veg	grass/sh
Dominant Riparian Veg	shrub

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 73.1% / 8.05 mg/L 2456928.2

pH 6.2 7487407.2

Sp. Conductivity (µs/cm) 21.9 µS/cm

Temperature (°C) 10.1 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

slow small reach No Odonata
Fish in reach
No other Form does not apply

EWM

No 2nd form

Stantec Rapid Aquatic Habitat Survey

✓ MJS

Watercourse: BIF1 **Date:** June 16, 2016 **Job Number:** 121810356

22

Coordinates Reach Start: _____ **Photo #:** 2606 - 2612

Coordinates Reach End: _____

Weather Conditions: Partly cloudy **Personnel:** EMW DT

Reach Length: 271 m

Avg. Bankfull Width:	.5 - 1	0.75
Avg. Bankfull Depth:	.40	0.40
Avg. Wet Width:	.5, .4	0.45
Avg. Wet Depth:	.20, .30	0.25

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	
Sand	40
Fines	60
Total (100%)	100 %

Land Use (Total 100%)	**(%)**
Uncut Forest	50
Clearcut	
Selective Logging	50
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: clearing on LB

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4): 0

Bank Erosion

Undercut Banks (%): 0

Left Bank: _____

Right Bank: _____

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: DS is backwatered

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Grade

High	☐
Med	☐
Low	☑

Estimated %: .2 %

Channel Form

Braiding (NA)	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: Backwatered little to No Flow

Morphology %

Riffle	
Run	
Steady	100 %
Pool	
Deadwater	

Notes: reach is backwatered

Stream order (from map)

Vegetation %

Canopy Cover	65
Dominant Bank Veg	moss
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 7.57 mg/L / 65.8 %

pH 5.8

Sp. Conductivity (µs/cm) 20.6 µs/cm

Temperature (°C) 10.0 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

B3A2 is backwatered & B1F1 is backwatered observed fish when doing WC.

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME BIG 1	LOCATION Bird Brook
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS EMW MJS	
FORM COMPLETED BY. EW	DATE June 17, 2011 TIME 10:21 (AM) PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 148 ✓

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: BIG1 **Date:** June 17, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2423 - 2439 ~~photos needed~~

Coordinates Reach End: _____

Weather Conditions: Partly cloudy **Personnel:** EMW MJS

Reach Length: 209 m

Avg. Bankfull Width:	4, 3, 2.5	~~3.20~~	3.17 GS
Avg. Bankfull Depth:	.5, .4	0.45	
Avg. Wet Width:	3.5	3.5	
Avg. Wet Depth:	.30, .40	0.35	

Substrate%

Bedrock	0
Boulder	10
Rock	10
Rubble	5
Gravel	10
Sand	30 40
Fines	25
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: wetland bog

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	30
Right Bank	30

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑

Estimated % .5

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: wetland stream

Morphology %	
Riffle	
Run	
Steady	100%
Pool	
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %	
Canopy Cover	30%
Dominant Bank Veg	Grass/Shrubs
Dominant Riparian Veg	Shrubs

Large Woody Debris	
Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Low

Water Quality

DO Saturation (%) 86.2% / 9.14 mg/L

pH 6.2

Sp. Conductivity (µs/cm) 0.02 ms

Temperature (°C) 12°C

EMBEDDEDNESS (CRITERIA): 1 - <20% 2 - 20% - 25% 3 - 25% - 50% 4 - >50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc…):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

Trib enters on RB Followed until ended observed fish as we were walking. Low grade wetland wc. WC continues on from end of reach in multiple branches, Not suitable for dragonflies or clams

No 2nd form

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: BIG1 ~~Trib~~ BirdBrook **Date:** June 17, 2011 **Job Number:** 121810356

Coordinates Reach Start: 2457671.8 7487208 **Photo #:** 2416 - 2422 ~~photos needed~~ 15

Coordinates Reach End:

Weather Conditions: cloudy **Personnel:** EMC MJS MF

Reach Length: 134 m

Avg. Bankfull Width:	.5, .3,	0.40
Avg. Bankfull Depth:	.15, .30	0.23
Avg. Wet Width:	.4, .3, .25	0.32
Avg. Wet Depth:	.5, .15	0.10

Substrate%

Bedrock	
Boulder	
Rock	10
Rubble	
Gravel	
Sand	40
Fines	50
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	✓
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: wetland

NPS Pollution	**Y**	**N**
No Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness

(Score 1-4) 3

Bank Erosion

Undercut Banks (%)	60%
Left Bank	65
Right Bank	65

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☐
Beaver activity?	☐	☐

Notes:

Channel Sinuosity

High	☐
Med	✓
Low	☐

Channel Grade

High	☐
Med	☐
Low	✓
Estimated %	0.5%

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

N/A

Notes:

Morphology %

Riffle	
Run	
Steady	100
Pool	
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %

Canopy Cover	40
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris

Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Low ✓

Water Quality

DO Saturation (%) 43.2%; 5.06 mg/l

pH 4.5

Sp. Conductivity (µs/cm) 0.01 µs/cm

Temperature (°C) 9.9°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates not suitable

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

not suitable

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- small, unmarked tributary from bird brook

BMW

No 2nd form

Stantec Rapid Aquatic Habitat Survey

MJSV

Watercourse: BIH2 **Date:** June 23, 2011 **Job Number:** 121810356

Coordinates Reach Start: 2458696.0 7486036.9 **Photo #:** 2678 — 2683 ✓

Coordinates Reach End:

Weather Conditions: Sunny ✓ **Personnel:** EMW DT

Reach Length: 200m

Avg. Bankfull Width:	1, 1.5, 1.6	1.03
Avg. Bankfull Depth:	.5, .8	0.65
Avg. Wet Width:	.5, .8	0.65
Avg. Wet Depth:	.10, .30, .40	0.27

Substrate%

Bedrock	0
Boulder	0
Rock	0
Rubble	5
Gravel	15
Sand	50
Fines	30
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 2

Comment:

Bank Erosion	
Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	1.5

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes:

Morphology %	
Riffle	
Run	
Steady	100%
Pool	
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	80
Dominant Bank Veg	moss
Dominant Riparian Veg	shrubs, trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 5.69 mg/l 0 / 52.4 %

pH 6.1

Sp. Conductivity (µs/cm) 23.2 µs/cm

Temperature (°C) 13.0°C

2458519.3
7487994.6

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

reach ends before st of B1 (H4, ? B1H1 ?) disorginized water everywhere, wet area b/w clear col.

End

No 2nd form MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: BLH3 **Date:** June 23 **Job Number:** 121810356

Coordinates Reach Start: 7458896.0 7488063.9 **Photo #:** 2669 - 2677 ✓

Coordinates Reach End:

Weather Conditions: Sunny **Personnel:** EMW DT

Reach Length:	≈400 ~~m~~	≈456 m
Avg. Bankfull Width:	4, 2	3.0
Avg. Bankfull Depth:	.5, .4, .8	0.57
Avg. Wet Width:	1.5, 3, 1	1.83
Avg. Wet Depth:	.10, .30, .50	0.30

Substrate%

Bedrock	C
Boulder	C
Rock	5
Rubble	5
Gravel	30
Sand	30
Fines	25 30
Total (100%)	100 E

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	≈1E

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: goes underground

Morphology %

Riffle	
Run	
Steady	100
Pool	
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %

Canopy Cover	80
Dominant Bank Veg	grass
Dominant Riparian Veg	shrub

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	8.65 mg/l / 77.4%
pH	6.3
Sp. Conductivity (µs/cm)	22.8 µs/cm
Temperature (°C)	10.6°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

could not Find the other trib (BILI/BILZ)
saw bt where we collected wc ≥ 20cm
Not appropreate habitat for the other form
wc flows underground in places, braided
Not well defined

JM

No 2nd form

Stantec Rapid Aquatic Habitat Survey

Watercourse: BLT **Date:** June 23, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2684 - 2693

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** EMW DT

Reach Length: >172

Avg. Bankfull Width: 2, 2.5 2.25

Avg. Bankfull Depth: .45

Avg. Wet Width: 1.5

Avg. Wet Depth: .10, .30

Substrate%

Bedrock	0
Boulder	0
Rock	0
Rubble	0
Gravel	5
Sand	15
Fines	80
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	80
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	20 (5-10 m)

Comment: _____

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☑ ?	☐
Obvious Sources	☐	☑
Buffer Strip	☐	☑

Type: _____

Embeddedness (Score 1-4) 2

Bank Erosion

Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	.5

Channel Form

Braiding None	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %

Riffle	
Run	100
Steady	
Pool	
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	65
Dominant Bank Veg	grass
Dominant Riparian Veg	Shrub

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 7.31 mg/l 68.9%

pH 5.16

Sp. Conductivity (µs/cm) 17.3

Temperature (°C) 13.2°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

Reach is not where shown. Not appropreate
For other Farm
did not follow to end typical can
predict what will happen

END

No 2nd form?

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: BZA1 **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2559 - 2576 ✓

Coordinates Reach End: 2456573.2 748786.1

Weather Conditions: Sun **Personnel:** EMW DT

Reach Length:	~~600m~~ 548m		
Avg. Bankfull Width:	.6, .8	0.7	
Avg. Bankfull Depth:	.50	0.5	
Avg. Wet Width:	.5, .2	0.35	
Avg. Wet Depth:	.15, 25	0.20	

Substrate%

Bedrock	0
Boulder	0
Rock	15
Rubble	5
Gravel	20
Sand	40
Fines	20
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type: _____

Embeddedness (Score 1-4) 1

Comment: all beaver influence
clearcut on LB is good buffer

Bank Erosion	
Undercut Banks (%)	0%
Left Bank	
Right Bank	

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: old beaver

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	.5

Channel Form	
Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: defined channel w/ beaver dams some deadwater

Morphology %	
Riffle	
Run	
Steady	90
Pool	
Deadwater	10

Notes: _____

Stream order (from map) 2

Vegetation %	
Canopy Cover	50
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

☑ Low

Water Quality

DO Saturation (%) 9.76 mg/l / 85.8 %
pH 5.6
Sp. Conductivity (µs/cm) 16.2 ms/cm
Temperature (°C) 10 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

observed fish @ start of reach small (10cm) old beaver chewing also ~~tons~~ meadows, several old dams.

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME BZAZ	LOCATION
STATION #_____ RIVERMILE_____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS EMW DT	
FORM COMPLETED BY EMW	DATE June 22, 2010 TIME 1138 AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 162 ✓

MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: BZA2 **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: 2456643.8 7487792.7 **Photo #:** 2576 - 2594
Coordinates Reach End: 2456779.7 7487705.9
Weather Conditions: Sunny **Personnel:** EMW DT

Reach Length:	595 m	
Avg. Bankfull Width:	3 - 4	3.5
Avg. Bankfull Depth:	.5, .4	0.45
Avg. Wet Width:	2.5 - 3.5	3.0
Avg. Wet Depth:	.20, .30, .40	0.3

Substrate%

Bedrock	0
Boulder	10
Rock	10
Rubble	5
Gravel	15
Sand	40
Fines	20
Total (100%)	100%

Land Use (Total 100%)	(%)
Uncut Forest	95 ~~100~~
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	5 (30m)

Comment:

NPS Pollution	Y	N
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type: 30m

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	
Left Bank	10
Right Bank	10

Culvert in reach?	Y	N
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	1%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes:

Morphology %	
Riffle	~~50~~
Run	50
Steady	
Pool	
Deadwater	

Notes:

Stream order (from map) 2

Vegetation %	
Canopy Cover	85
Dominant Bank Veg	grass
Dominant Riparian Veg	alders Trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	90.1%, 9.88 mg/L
pH	6.1
Sp. Conductivity (µs/cm)	17.6
Temperature (°C)	10.6°C

2456730.2
7487832.9

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates None seen

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

None seen

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

Last 2 reaches no Habt. Assess Data sheet → Low grade Headwaters.

Fish observed in reach

Reach ends @ wetland meadow

E. now

MJS ✓

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brk	LOCATION 1718103S6
STATION # B2B1 RIVERMILE	STREAM CLASS 1
LAT (A) LONG	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MJS + MF	
FORM COMPLETED BY MJS	DATE June 22, 2011 TIME 11:55 (AM) PM / REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 10	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). 70	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 40	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 25	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 50	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 75	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 100
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 126

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: B2B1 (A) – upstream to road **Date:** June 22, 2011 **Job Number:** 121810356

WQ E649067 N5139225

Coordinates Reach Start: _____ **Photo #:** 0296 – 310 ✓

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + MF

Reach Length:	~300m	265m	
Avg. Bankfull Width:	3.5 – 5.5m	4.5	
Avg. Bankfull Depth:	0.4 – 0.7m	0.55	
Avg. Wet Width:	3.0 – 5.0m	4.0	
Avg. Wet Depth:	0.2 – 0.5m	0.35	

Substrate%

Bedrock	
Boulder	40
Rock	10
Rubble	
Gravel	
Sand	40
Fines	10
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4): 2

Comment: _____

Bank Erosion

Undercut Banks (%)	
Left Bank	20
Right Bank	20

Culvert in reach?	**Y**	**N**
Is it perched?	☑	☑
Other barriers?	☐	☐
Beaver activity?	☑	☐

Notes: culvert @ end of reach

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	≈ 3%

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☑
Islands	☑
Sand on Banks	☐

Notes: _____

Morphology %

Riffle	50
Run	10
Steady	10
Pool	20
Deadwater	20

Notes: _____

Stream order (from map): 2

Vegetation %

Canopy Cover	70
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

low ✓

Water Quality

DO Saturation (%)	29.7% / 3.10 mg/L
pH	5.0
Sp. Conductivity (µs/cm)	17.5 µS/cm
Temperature (°C)	12.0 °C

EMBEDDEDNESS (CRITERIA) 1 = <20% 2 = 20% - 35% 3 = 35% - 50% 4 = 50% - 75% 5 = >75%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

051 - start of reach 0296-0297

052 - pics # ~~0298~~ - 0302

wp 053 - could see hose coming into other side of river - likely another grow-op E 648964 N 5139281 - on right side (w) looking downstream - stayed clear pic 0303

54 - pics 0304 - 0305

55/56/57 water quality + ~~pics 306-310~~

58 - culvert @ road crossing pics

"A"

√MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Bird Brk	LOCATION 12181035G
STATION # B2B1C(B) RIVERMILE	STREAM CLASS 2
LAT LONG	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MJS & MF	
FORM COMPLETED BY MJS	DATE June 22, 2010 TIME 12:30 AM (PM) REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 128 J

MJS ✓

Stantec Rapid Aquatic Habitat Survey

from road downward (B)

Watercourse: B2B1 2 **Date:** June 22, 2010 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 311 - 332 ✓

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** MJS + MF

Reach Length:	~ ~~250~~ m 392m
Avg. Bankfull Width:	4.0 - 7.5 m 5.75
Avg. Bankfull Depth:	0.6 - 0.9m 0.75
Avg. Wet Width:	3.5 - 7.0 m 5.25
Avg. Wet Depth:	0.3 - 0.6m 0.45

Substrate%	
Bedrock	
Boulder	20
Rock	10
Rubble	
Gravel	
Sand	40
Fines	30
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 3

Bank Erosion	
Undercut Banks (%)	
Left Bank	60
Right Bank	60

Culvert in reach? @ beginning	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☑	☐
Beaver activity?	☑	☐

Notes: dams

Channel Sinuosity	
High	☑
Med	☐
Low	☐

Channel Grade	
High	☐
Med	☐
Low	☑
Estimated %	1%

Channel Form	
Braiding	☐
Lateral Bars	☐
Medial Bars N/A	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %	
Riffle	
Run	
Steady	90
Pool	
Deadwater	10

Notes: _____

Stream order (from map) 2

Vegetation %	
Canopy Cover	10%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☐
None low ✓	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	18.1% / 1.67 mg/L
pH	5.5
Sp. Conductivity (µs/cm)	18.5 µs/cm
Temperature (°C)	14.6°C

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

wp 59 pics 311 - 316

60 - 317-319 beaver dam

61 - 320 - dam

62 - 321 - 325

063 - water quality pics # 326 - 330

064 - pics 331 - 332

BMW

JMJS

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME BLCK 1	LOCATION	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW DT		
FORM COMPLETED BY EMW	DATE June 23, 2011 TIME 11:40 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 10	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). 70	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 40	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 25	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 50	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 75	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 100
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 164 ✓

MJSL

Stantec Rapid Aquatic Habitat Survey

Watercourse: B2C1 **Date:** June 23, 2011 **Job Number:** 121810356

Coordinates Reach Start: 2459054.7 7487956.1 **Photo #:** 2658 - 2668 ✓

Coordinates Reach End: 2459122.0 7488271.1

Weather Conditions: ~~partly cloudy~~ **Personnel:** EW, DT

Reach Length:	268.9	
Avg. Bankfull Width:	1.5, .5	1.0
Avg. Bankfull Depth:	.8,	0.8
Avg. Wet Width:	1, .5, .4	0.63
Avg. Wet Depth:	.3, .6	0.45

Substrate%

Bedrock	5
Boulder	5
Rock	20
Rubble	10
Gravel	10
Sand	20
Fines	10
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	~~80~~
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	30

Comment:

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type: start of reach

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	10
Right Bank	10

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: some old chewing

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	1.9c

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes:

Morphology %

Riffle	70
Run	10
Steady	20
Pool	
Deadwater	

Notes: us lower grade

Stream order (from map) 2

Vegetation %

Canopy Cover	70
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 75.5% , 8.~~37~~ mg/L

pH 6.7

Sp. Conductivity (µs/cm) 21.4 µs/cm

Temperature (°C) 10.3°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Aquatic Veg in WC.

Benthic Invertebrates did not find

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...): Not the right habitat

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

Clear cuts on RB + LB. RB buffer wider 30-50 m

BMW

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME B2C2	LOCATION	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW DT		
FORM COMPLETED BY EMW	DATE June 23, 2011 TIME 1170 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0

Total Score 169

MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: BZC2 **Date:** June 23, 2011 **Job Number:** 121810356

Coordinates Reach Start: **Photo #:** 2646 - 2657

Coordinates Reach End: 24597.65.3 7487709.8

Weather Conditions: partly cloudy **Personnel:** EMW DT

Reach Length:	203	
Avg. Bankfull Width:	1, 2, 1.5	1.5
Avg. Bankfull Depth:	.6, .8, 1	0.6
Avg. Wet Width:	2, 2.5, .5, 1	1.5
Avg. Wet Depth:	.4, .2, .5	0.37

Substrate%

Bedrock	5
Boulder	10
Rock	25
Rubble	20
Gravel	30
Sand	20
Fines	10
Total (100%)	160 %

Land Use (Total 100%)	**(%)**
Uncut Forest	70
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	30

Comment: LB clear cut w 10-20m buffer

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	
Left Bank	15
Right Bank	15

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: beaver chewing on mainstem

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	1%

Channel Form	
Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: None of the above

Morphology %	
Riffle	70
Run	30
Steady	
Pool	
Deadwater	

Notes:

Stream order (from map) 2

Vegetation %	
Canopy Cover	80%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 87.9% / 9.82 mg/l

pH 5.9

Sp. Conductivity (µs/cm) 18.6 µs/cm

Temperature (°C) 10.5°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates looked none found

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

none observed

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

clear cut on LB ≈ 10m buffer @ reach break
small waterfall

EMW

No 2nd form

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: B3A1 **Date:** June 22, 2011 **Job Number:** 121810359

Coordinates Reach Start: _____ **Photo #:** 2595 - 2597 ✓ 2601

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** EMW DT

Reach Length: 129

Avg. Bankfull Width: 40m

Avg. Bankfull Depth: >2m

Avg. Wet Width: 30m

Avg. Wet Depth: >1m

Substrate%

Bedrock	0
Boulder	5
Rock	15
Rubble	10
Gravel	30
Sand	20
Fines	20
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☐	☐
Some Sources	☑	☐
Obvious Sources	☐	☐
Buffer Strip ✓	☐	☐

Type: washed out culvert

Comment: wetland pond

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%) 0%

Left Bank

Right Bank

Culvert in reach?	**Y**	**N**
Is it perched? washed out ✓	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Form

Braiding NA	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: Pond

Morphology %

Riffle	
Run	
Steady	
Pool	
Deadwater	100%

Notes: @ culvert wetland

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	5%

Stream order (from map) 3

Vegetation %

Canopy Cover	0
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 8.66 mg/l 83.8

pH 5.9

Sp. Conductivity (µs/cm) 17.9

Temperature (°C) 14.3°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Fish jumping in wetland. other sheet Not Filled out as does Not apply

Emw

No 2nd form

MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: B3A2 **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2414 ~~2598 2605~~ 2601 - 2605

Coordinates Reach End: 2456809.6748736 2.2

Weather Conditions: Partly Cloudy **Personnel:** EMW DT

Reach Length: 367m

Avg. Bankfull Width: NA

Avg. Bankfull Depth: NA

Avg. Wet Width: 20m

Avg. Wet Depth: >2m

Substrate%

Bedrock	0
Boulder	0
Rock	5
Rubble	5
Gravel	5
Sand	25
Fines	60 (organic)
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 4

Bank Erosion

Undercut Banks (%) 0%

Left Bank _____

Right Bank _____

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: _____

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: backwatered

Morphology %

Riffle	_____
Run	_____
Steady	_____
Pool	_____
Deadwater	100%

Notes: _____

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	.5%

Stream order (from map) 3

Vegetation %

Canopy Cover	20%
Dominant Bank Veg	shrubs
Dominant Riparian Veg	shrubs

Large Woody Debris

Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

☑ Low

Water Quality

DO Saturation (%) ~~12.~~ 83.5 % 15

pH 5.9 18.7 15

Sp. Conductivity (µs/cm) ~~187~~ 8.20 mg/l

Temperature (°C) ~~17.4°C~~ 13.9°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates not right habitat.

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Fish jumping in pond clearing on RB Reach is backwatered shortly after the culvert.

Did Not do other Form NA to habitat.

Emw

B3A3 No 2nd form MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: ~~B3A4~~ **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2613-2617+ 2615-2617

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** EMW DT

Reach Length: 105

Avg. Bankfull Width: NA

Avg. Bankfull Depth: NA

Avg. Wet Width: 20-30m

Avg. Wet Depth: > 2m

Land Use (Total 100%)	(%)
Uncut Forest	100 %
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: some thinnings

NPS Pollution	Y	N
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Substrate%	
Bedrock	
Boulder	
Rock	10
Rubble	5
Gravel	5
Sand	10
Fines	70
Total (100%)	100%

Embeddedness (Score 1-4) 2 ~~1~~ 0

Bank Erosion

Undercut Banks (%): 0

Left Bank: _____

Right Bank: _____

Culvert in reach?	Y	N
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: dam possibly old

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Grade

High	☐
Med	☐
Low	☑

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: pondech

Morphology %

Riffle	
Run	
Steady	
Pool	
Deadwater	100%

Notes: _____

Estimated %: .5%

Stream order (from map) 2 ~~3~~

Vegetation %

Canopy Cover	10%
Dominant Bank Veg	Shrub
Dominant Riparian Veg	shrub

Large Woody Debris

Lots	☐
Med	☐
None	☐ ☑ Low
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)

pH

Sp. Conductivity (µs/cm)

Temperature (°C)

same as Reach before

EMBEDDEDNESS (CRITERIA): 1 - < 20% 2 - 20% - 25% 3 - 25% - 50% 4 - > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Reach is ponded, surveyed a end of day and Did not get to dam initially in the next reach due to backflooding could hear running water.

EMW

√ MJS

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME B3A4 Bird Br		LOCATION Bird	
STATION # B3A4	RIVERMILE	STREAM CLASS 2	
LAT	LONG	RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS & MF			
FORM COMPLETED BY MJS		DATE June 22, 2011 TIME 3:05 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). (70)	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 157

Stantec Rapid Aquatic Habitat Survey

Watercourse: BSA4 **Date:** June 22, 2011 **Job Number:** 121810356

Coordinates Reach Start: W/Q E 649707 N 5138504 **Photo #:** 333 - 357

Coordinates Reach End:

Weather Conditions: ~overcast **Personnel:** MJS + MF

Reach Length:	~~~550m~~ 593m	
Avg. Bankfull Width:	3.5 - 6.5m	5.0
Avg. Bankfull Depth:	0.6 - 0.9 m	0.75
Avg. Wet Width:	3.0 - 6.0m	4.5
Avg. Wet Depth:	~~more~~ 0.3 - 0.6	0.45

Substrate%

Bedrock	
Boulder	20
Rock	30
Rubble	10
Gravel	5
Sand	30
Fines	~~5~~
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4): 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	~~40~~
Right Bank	40

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☑	☐
Beaver activity?	☑	☐

Notes: beaver dam/pond @ upmost end

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Form

Braiding	☐
Lateral Bars	☑
Medial Bars	☐
Islands	☐
Sand on Banks	☑

Notes:

Morphology %

Riffle	5
Run	
Steady	80
Pool	15
Deadwater	

Notes:

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2.5%

Stream order (from map) 2

Vegetation %

Canopy Cover	~~60~~ 80%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

lots of alder C

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	51.9% / 5.37 mg/L
pH	5.8
Sp. Conductivity (µs/cm)	18.8 µS/cm
Temperature (°C)	14.0 °C

EMBEDDEDNESS (CRITERIA): 1 - <20% 2 - 20% - 35% 3 - 35% - 50% 4 - >50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? (Y) N

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

- didn't have the net

Other comments (additional photo # etc...)

wp#

066 pics 333 - 336

067 pics 337 - 339

068 water quality 340 - 345

069 pics 351 - 355

~~069~~ - dam #356 ~ 20m above last pics

- observed fish in stream

- last part of reach to marker is beaver pond pic# 357

/ MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME B3A15		LOCATION Bird Brook	
STATION #_____ RIVERMILE_____		STREAM CLASS	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS EMW MJS			
FORM COMPLETED BY MJS	DATE June 17, 2011 TIME 11:10 (AM) PM	REASON FOR SURVEY	

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	(5) 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 114/120

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: B3A5 **Date:** June 17, 2011 **Job Number:** 121810356

Coordinates Reach Start: **Photo #:** 2440 - 2454 ~~Photos needed~~

Coordinates Reach End: 2457829.3 7487384.8

Weather Conditions: Sunny **Personnel:** EMW MJS MF

Reach Length:	160.4		
Avg. Bankfull Width:	2.5, 4.5	3.5	
Avg. Bankfull Depth:	.55, .80	0.68	
Avg. Wet Width:	2, 4	3.0	
Avg. Wet Depth:	.25, 0.5	0.38	

Substrate%

Bedrock	0
Boulder	5
Rock	15
Rubble	5
Gravel	5
Sand	50
Fines	20
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest ✓	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4): 3

Comment: wetland

Bank Erosion	
Undercut Banks (%)	
Left Bank	35
Right Bank	30

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	.5

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☑
Sand on Banks	☐

Notes: highly braided

Morphology %	
Riffle	
Run	
Steady	100%
Pool	
Deadwater	

Notes: wetland

Stream order (from map): 3

Vegetation %	
Canopy Cover	45
Dominant Bank Veg	grass
Dominant Riparian Veg	Alders

Large Woody Debris	
Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

✓ low

Water Quality

DO Saturation (%) 86.1% / 9.25 mg/l

pH 6.3

Sp. Conductivity (µs/cm) 0.02 ms/cm

Temperature (°C) 12.2°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____ None Found

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

None found.

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- WC highy Braided, soft sediment throughout reach, ≈ 1m @ start.

End

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME B3A6	LOCATION
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS EMW DT	
FORM COMPLETED BY EMW	DATE June 23, 2011 TIME _____ AM PM / REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 170

MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: B3A6 **Date:** June 23, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2731-2742

Coordinates Reach End: _____

Weather Conditions: Partly Cloudy **Personnel:** EMW DT

Reach Length: 812 m (lower 256 surveyed)

Avg. Bankfull Width: 4-10 7m

Avg. Bankfull Depth: 0.1, 0.4? 2.5

Avg. Wet Width: .3, .5, .8 5.33

Avg. Wet Depth: .6, 1, .3 0.63

Substrate%	
Bedrock	10
Boulder	30
Rock	20
Rubble	30
Gravel	5
Sand	5
Fines	0
Total (100%)	100%

Land Use (Total 100%)	(%)
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: likely thinned 2-4 yrs ago

NPS Pollution	Y	N
No Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	
Left Bank	25
Right Bank	25

Culvert in reach?	Y	N
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity	
High	☐
Med	☑
Low	☐

Channel Grade	
High	☑
Med	☑
Low	☐
Estimated %	~~2%~~ 2.5%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes: looks Flashy

Morphology %	
Riffle	40
Run	30
Steady	25
Pool	5
Deadwater	

Notes: _____

Stream order (from map) 2

Vegetation %	
Canopy Cover	40
Dominant Bank Veg	shrub
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

563 256

Water Quality

DO Saturation (%) 88.0% / 8.69 mg/l

pH 6.4

Sp. Conductivity (µs/cm) 19.5 µS/cm

Temperature (°C) 15.6 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

lots in stream

Benthic Invertebrates

Odonata _____ None caught or seen

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

same as above

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

only got mid reach due to time. likely continues as high grade triffly. lots of evidance of high flashy flows + channel movement.

Emm

"a"

VMSS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME B3A7	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW DT		
FORM COMPLETED BY EMW	DATE June 23, 2011 TIME 3:57 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 10	Greater than 70% of 70 substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable 40 habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable 20 habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable 0 habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and 25 boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and 50 boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and 75 boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and 100 boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern. ~disorgin ized	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 147 ✓

Stantec Rapid Aquatic Habitat Survey

VMOS

Watercourse: B3A7 **Date:** June 23, 2011 **Job Number:** 121810356

Coordinates Reach Start: 2458848.0 7487596.3 **Photo #:** 2706 - 2730

Coordinates Reach End:

Weather Conditions: cloudy **Personnel:** EMW PT

Reach Length:	~~608m~~ 525m	
Avg. Bankfull Width:	20 - 30m	25m
Avg. Bankfull Depth:	.5 - .8	0.65m
Avg. Wet Width:	10 - 20	15m
Avg. Wet Depth:	.3 - .5	0.4

Substrate%

Bedrock	5
Boulder	15
Rock	30
Rubble	10
Gravel	20
Sand	10
Fines	10
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 2

Comment:

Bank Erosion	
Undercut Banks (%)	
Left Bank	20
Right Bank	20

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: minor

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	1%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes:

Morphology %	
Riffle	30
Run	20
Steady	30
Pool	10
Deadwater	10

Notes: Channel is very Braided

Stream order (from map) 2/3

Vegetation %	
Canopy Cover	70
Dominant Bank Veg	Shrubs
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 90.3% / 9.17 mg/L

pH 6.3

Sp. Conductivity (µs/cm) 19.7 µs/cm

Temperature (°C) 14.30°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates none observed / collected

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...): None observed

Samples **T**aken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Reach sts @ a pinch pt. beaver is active in the reach first 500m backwatered channel is all over the place, massive amounts of LWD

EMW

'a'

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME B3A8	LOCATION
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS EMWDT	
FORM COMPLETED BY EMW	DATE June 23 20 REASON FOR SURVEY TIME 2:52 AM (PM)

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 10	Greater than 70% of 70 substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable 40 habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable 20 habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable 0 habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and 25 boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and 50 boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and 75 boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and 100 boulder particles are more than 75% surrounded by fine sediment.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0

Total Score 167

JMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: B3A8 **Date:** June 23, 2011 **Job Number:** 121810359

Coordinates Reach Start: **Photo #:** 2696 - 2705

Coordinates Reach End: 2459107.8 7487676.1

Weather Conditions: Cloudy **Personnel:** EMW DT

Reach Length:	150 m	
Avg. Bankfull Width:	6-10	8.0
Avg. Bankfull Depth:	.6 - 1	0.8
Avg. Wet Width:	5 - 9	7.0
Avg. Wet Depth:	.6, .4, 1,	0.63

Substrate%

Bedrock	20
Boulder	10
Rock	30
Rubble	20
Gravel	10
Sand	5
Fines	5
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	30
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	30

Comment:

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 0

Bank Erosion

Undercut Banks (%)	
Left Bank	10
Right Bank	10

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☑
Med	☐
Low	☐
Estimated %	1.5-2%

Channel Form

Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes: cut face on bar Farms

Morphology %

Riffle	55
Run	40
Steady	5
Pool	5
Deadwater	

Notes:

Stream order (from map) 2(3) 3

Vegetation %

Canopy Cover	30
Dominant Bank Veg	Shrub
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 9.51 mg/L / 91.9 %

pH 6.5

Sp. Conductivity (µs/cm) 18.7 µS/cm

Temperature (°C) 14.2°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates looked none emerging none w net. ephemeroptera only

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Lots of LWD/debris jams channel very mobile, cutting into banks/bars in places.

MJS ✓

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME B3A9	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW MJS		
FORM COMPLETED BY EMW	DATE June 28 2011 TIME 9:20 AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). (70)	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 **16**	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 **19** 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 **18** 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern. mobile flashy	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 175 ✓

Stantec Rapid Aquatic Habitat Survey

MJS

Watercourse: B3A9 **Date:** June 23, 2011 (24) **Job Number:** 121810356

Coordinates Reach Start: **Photo #:** 2743 - 2754

Coordinates Reach End: 2459107.6 7487657.2

Weather Conditions: Pt Cloudy **Personnel:** EMW MJS

Reach Length:	268 306m	
Avg. Bankfull Width:	5.5 - 6.5	6.0
Avg. Bankfull Depth:	.5, .9	0.7
Avg. Wet Width:	4 - 5	4.5
Avg. Wet Depth:	.4, .6, .8	0.53

Substrate%

Bedrock	15
Boulder	35
Rock	30
Rubble	10
Gravel	5
Sand	5
Fines	0
Total (100%)	100 %

Land Use (Total 100%)	**(%)**
Uncut Forest	100 %
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4): 1

Comment:

Bank Erosion	
Undercut Banks (%)	
Left Bank	10%
Right Bank	10%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☒
Med	☑
Low	☐
Estimated %	3%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes:

Morphology %	
Riffle	55
Run	25
Steady	10
Pool	10
Deadwater	

Notes:

Stream order (from map) 2

Vegetation %	
Canopy Cover	60
Dominant Bank Veg	grass/shrub
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	91.5% 9.86 mg/l
pH	6.3
Sp. Conductivity (µs/cm)	19.4 µS/cm
Temperature (°C)	11.9 °C

(2459361.4, 7487607.2)

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? (Y) / N

EPT, tipulidae, Chironomids

Odonata E

Gomphids Larva

Samples Taken? Yes ☑ No ☐ see nomad

GPS Coordinates Lat: Long:

Type Skins ☐ Larvae ☑

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: Long:

Other comments (additional photo # etc...)

Banks are mossy, evidance of flash flows, mobile bars. overflow channels braiding tones of LWD.

"a"

MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME B3A1C	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EMW MJS		
FORM COMPLETED BY EMW	DATE June 23, 2011 TIME 10:00 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 175

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: B3A10 **Date:** June 23, 2011 / 24 **Job Number:** 121810356

Coordinates Reach Start: **Photo #:** 2755 - 2783

Coordinates Reach End: 5459528.674872 480

Weather Conditions: Sunny **Personnel:** EMW MJS

Reach Length: 880m 471m

Avg. Bankfull Width: .5, 3, 10, 12 6.4m

Avg. Bankfull Depth: .6, .8, 0.7m

Avg. Wet Width: .6, .5, 8.3 4.15

Avg. Wet Depth: .3, .4, .5 0.4m

Substrate%

Bedrock	20
Boulder	40
Rock	30
Rubble	5
Gravel	5
Sand	0
Fines	0
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐
Type:		

Embeddedness (Score 1-4) 1

Comment:

Bank Erosion	
Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: Flashy flows mobile channel

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	1.5-2%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☑
Islands	☑
Sand on Banks	☑

Morphology %	
Riffle	65
Run	25
Steady	
Pool	10
Deadwater	

Notes: **Notes:**

Stream order (from map) 2

Vegetation %	
Canopy Cover	25
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 95.8% 10.27 mg/L

pH 6.6

Sp. Conductivity (µs/cm) 19.4 µs/cm

Temperature (°C) 12.3°C

EMBEDDEDNESS (CRITERIA): 1 <20% 2 20% - 25% 3 25% - 50% 4 >50% Page 1

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? (Y) / N

Odonata _____

Gomphids 6

Loaded in req samples collected in W9A18

Samples Taken? Yes ☑ No ☐

GPS Coordinates Lat: 2459911.2 Long: 2486968.7

Type Skins ☐ Larvae ☑

Observations of Bivalves / Shells (Photo # etc...): none observed

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) Lots of LWD, channel splits + backflow channels, opens up + widens out b/f meeting WB NR.

— no rapid ass. form

Stantec Rapid Aquatic Habitat Survey

Watercourse: MIK#2 **Date:** June 28, 2011 **Job Number:** 121810356

WQ (X) 2456789.4 (Y) 7485527.2

Coordinates Reach Start: _____ **Photo #:** 575 - 587

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + DT

Reach Length:	300m	
Avg. Bankfull Width:	0.2 - 0.5m	0.35
Avg. Bankfull Depth:	0.10 - 0.20m	0.15
Avg. Wet Width:	0.1 - 0.4m	0.25
Avg. Wet Depth:	0.02 - 0.10m	0.06

Substrate%

Bedrock	
Boulder	10
Rock	60
Rubble	10
Gravel	
Sand	
Fines	20
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	50%
Clearcut	50%
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: left side, no buffer

NPS Pollution	**Y**	**N**
Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type: left side clear cut

Embeddedness (Score 1-4): 3

Bank Erosion	
Undercut Banks (%)	
Left Bank	n/a
Right Bank	n/a

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☐

Notes: _____

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: ~ 80% below ground

Morphology %	
Riffle	40 60
Run	
Steady	
Pool	
Deadwater	60

Notes: _____

Stream order (from map): 1

Vegetation %	
Canopy Cover	60%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☐
None	☑
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	71% / 7.65 mg/L
pH	5.8
Sp. Conductivity (µs/cm)	14.3 µS/cm
Temperature (°C)	12.2 °C

EMBEDDEDNESS (CRITERIA): 1 <20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N) — No - dragonflies observed + no sampling

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☒

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☒

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- MIKI not completed upstream. Undefined & not fish habitat, mostly below ground

- barely any defined channel

- no rapid habitat assessment

~ No - rapid ass. form (~90% below grnd) ✓MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: MIK3 **Date:** June 28, 2011 **Job Number:** 121810355

wq (X) 2456848.3 (Y) 7485034.1

Coordinates Reach Start: _____ **Photo #:** 588 - 598

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + DT

Reach Length: ~320m

Avg. Bankfull Width: 0.30 - 1.25m 0.78

Avg. Bankfull Depth: 0.25 - 0.40m 0.33

Avg. Wet Width: 0.10 - 1.0m 0.55

Avg. Wet Depth: 0.05 - 0.20m 0.13

Substrate%

Bedrock	5
Boulder	60 55
Rock	30
Rubble	
Gravel	
Sand	
Fines	10
Total (100%)	100

Land Use (Total 100%)	(%)
Uncut Forest	
Clearcut	30
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	70

Comment: - clearcut left side ~ 30% no buffer

NPS Pollution	Y	N
Evidence	☐	☑
Some Sources	☐	☑
Obvious Sources	☐	☑
Buffer Strip	☑	☐

Type: _____

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	~ 5
Right Bank	5

Culvert in reach?	Y	N
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %

Riffle	40
Run	
Steady	30
Pool	
Deadwater	30

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	3%

Notes: ~90% below grnd

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	60%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☐
Med	☐
None	☑
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	63% / 7.09 mg/L
pH	5.7
Sp. Conductivity (µs/cm)	14.6
Temperature (°C)	11.7°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? **Y / (N)** – did not see / sample dragonflies

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

– majority below grnd
– becomes defined in lower reach

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 136

"a" MUKRA

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION 12810356
STATION # MIK4 RIVERMILE	STREAM CLASS 1
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MJS + DT	
FORM COMPLETED BY MJS	DATE June 28, 2011 TIME 220 AM (PM) REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Stantec Rapid Aquatic Habitat Survey

MJS ✓

Watercourse: MIK4 **Date:** June 28, 2011 **Job Number:** 121810356

WQ ⊗ 2456679.6 ⊕ 7485006.7

Coordinates Reach Start: _____ **Photo #:** 999-613

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + DT

Reach Length:	~240m	
Avg. Bankfull Width:	0.75 - 1.75m	1.25
Avg. Bankfull Depth:	0.30 - 0.50m	0.40
Avg. Wet Width:	0.5 - 1.5m	1.00
Avg. Wet Depth:	0.10 - 0.30m	0.20

Substrate%

Bedrock	
Boulder	~~40~~ 50
Rock	30
Rubble	
Gravel	
Sand	
Fines	20%
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	60%
Clearcut	20%
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	20%

Comment: powerline cleared

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☑
Obvious Sources	☐	☑
Buffer Strip	☑	☐

Type: _____

Embeddedness (Score 1-4) 3

Bank Erosion	
Undercut Banks (%)	
Left Bank	10
Right Bank	10

Culvert in reach?	**Y**	**N**
Is it perched? – closed-in	☑	☑
Other barriers?	☐	☐
Beaver activity?	☐	☐

Notes: _____

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %	
Riffle	60
Run	
Steady	30
Pool	10
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %	
Canopy Cover	65%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	83% / 8.8 mg/L
pH	6.0
Sp. Conductivity (µs/cm)	161
Temperature (°C)	13.9 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? **Y / N**

Odonata _____

Gomphids _____

-did not see dragonflies & did not sample

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

VMJS

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME MIKS	LOCATION 12181035S6	
STATION # _____ RIVERMILE _____	STREAM CLASS 1	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS & DT		
FORM COMPLETED BY MJS	DATE June 28, 2011 TIME 2:30 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). (70)	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	15 14 (13) 12 11	(10) 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 149

MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: MIKS **Date:** June 28, 2011 **Job Number:** 121810356

WQ ⊗ 2456793.5 Ⓨ 7485030.9

Coordinates Reach Start: _____ **Photo #:** 614 - 628

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS+DT

Reach Length:	~115 m		
Avg. Bankfull Width:	0.65 - 1.25 m	0.95	
Avg. Bankfull Depth:	0.40 - 0.60 m	0.50	
Avg. Wet Width:	0.4 - 1.0 m	0.70	
Avg. Wet Depth:	0.10 - 0.30 m	0.20	

Substrate%

Bedrock	
Boulder	20
Rock	20
Rubble	
Gravel	
Sand	
Fines	60
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	95%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☑
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: [illegible]

Comment: 5% road crossing

Embeddedness (Score 1-4): 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	20
Right Bank	20

Culvert in reach?	**Y**	**N**
Is it perched?	☑	☐
Other barriers?	☑	☐
Beaver activity?	☑	☐

Notes: beaver pond lowest end reach

Channel Sinuosity	
High	☐
Med	☐
Low	☑

Channel Grade	
High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %	
Riffle	40
Run	30
Steady	
Pool	10
Deadwater	20

Notes: undefined ~30%+ below ground

Notes: _____

Stream order (from map) 1

Vegetation %	
Canopy Cover	70%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☐
Med	☐
None	☑ low
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	90.4 % 9.4 mg/L
pH	6.2
Sp. Conductivity (µs/cm)	16.9 µS/cm
Temperature (°C)	14.2 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N) — no dragonflies observed / no sampling

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

— unmarked road / culvert mid-reach

— beaver pond @ lower end reach

- no rapid ass. form

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: MIK6 **Date:** June 28, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 629 - 637

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + DT

Reach Length: ~122m

Avg. Bankfull Width: _____

Avg. Bankfull Depth: N/a

Avg. Wet Width: _____

Avg. Wet Depth: _____

Substrate%

Bedrock	
Boulder	60
Rock	10
Rubble	
Gravel	
Sand	
Fines	30
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	95/100
Clearcut	5
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: upper end in powerline

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 2

Bank Erosion

Undercut Banks (%)

Left Bank N/a

Right Bank

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: pond @ reach end

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

N/a

Morphology %

Riffle	
Run	
Steady	
Pool	
Deadwater	

N/a

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Notes: 95% undefined & below grnd

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	80
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

N/A

Water Quality

DO Saturation (%) _____

pH _____

Sp. Conductivity (µs/cm) _____

Temperature (°C) _____

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

- No dragflies obs./no sampling

Benthic Invertebrates

Suitable invertebrate habitat? Y (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☒

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☒

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- no real watrse
- below ground, drainage for some of powerline, all dead water when showing

- no 2nd form

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Mill	LOCATION 12181035S6
STATION # _____ RIVERMILE _____	STREAM CLASS I
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MJS + DT	
FORM COMPLETED BY MJS	DATE June 29, 20 / TIME 1:00 AM (PM) / REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 135

Stantec Rapid Aquatic Habitat Survey

cmw ✓MJS

Watercourse: MILL **Date:** June 29, 2011 **Job Number:** 121810356

WQ (X) 2456820-3 (Y) 7485495.8

Coordinates Reach Start: _____ **Photo #:** 716 - 737

Coordinates Reach End: _____

Weather Conditions: cloudy / light showers **Personnel:** MJS + DT

Reach Length: 270m

Avg. Bankfull Width:	0.35 - 0.5m	0.43
Avg. Bankfull Depth:	0.45 - 0.85m	0.65
Avg. Wet Width:	0.20 - 0.60m	0.40
Avg. Wet Depth:	0.05 - 0.20m	0.13

Substrate%

Bedrock	
Boulder	15
Rock	60
Rubble	
Gravel	
Sand	5
Fines	20
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4): 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	20%
Right Bank	20%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: @ beginning

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑

Estimated % 1%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: ~ 50% below ground

Morphology %	
Riffle	20%
Run	
Steady	60%
Pool	
Deadwater	20%

Notes: _____

Stream order (from map) 1

Vegetation %	
Canopy Cover	60%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

low ✓

Water Quality

DO Saturation (%)	79.3% 8.66 mg/L
pH	6.4
Sp. Conductivity (µs/cm)	23.6 µS/cM
Temperature (°C)	12.1 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

no sampling

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N) - no dragonflies seen / not suitable habitat

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- mainly headwaters & below ground

No rapid hab. assess? Not watercourse

Stantec Rapid Aquatic Habitat Survey

Watercourse: M1 L2 **Date:** June 29, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 738 - 743

Coordinates Reach End: _____

Weather Conditions: raining **Personnel:** MJS & DT

Reach Length: _____

Avg. Bankfull Width: _____

Avg. Bankfull Depth: _____

Avg. Wet Width: _____

Avg. Wet Depth: _____

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	
Sand	
Fines	
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) ___

Bank Erosion

Undercut Banks (%)

Left Bank _____

Right Bank _____

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☐
Beaver activity?	☐	☐

Notes: _____

Channel Sinuosity

High	☐
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☐

Estimated % _____

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %

Riffle	
Run	
Steady	
Pool	
Deadwater	

Notes: _____

Stream order (from map) ___

Vegetation %

Canopy Cover	
Dominant Bank Veg	
Dominant Riparian Veg	

Large Woody Debris

Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	
pH	
Sp. Conductivity (µs/cm)	
Temperature (°C)	

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

— small trickle of water here, did not go above gps point. Not fish habitat, not water course

Stantec Rapid Aquatic Habitat Survey

MJS ✓

Watercourse: MM1 **Date:** June 21, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2497 - 2504

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** EMW DT

Reach Length:	178.2	
Avg. Bankfull Width:	.6/.8	0.7
Avg. Bankfull Depth:	.4/.5	0.45
Avg. Wet Width:	.4/.5	0.45
Avg. Wet Depth:	.10, .20, .30	0.20

Substrate%

Bedrock	0
Boulder	0
Rock	0
Rubble	5
Gravel	5
Sand	30
Fines	60
Total (100%)	100 ✓

Land Use (Total 100%)	**(%)**
Uncut Forest	5
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: wetland 95 ✓

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: powerline

Embeddedness (Score 1-4) 0

Bank Erosion	
Undercut Banks (%)	0
Left Bank	
Right Bank	

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity? old	☑	☐

Notes: _____

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	.2%

Channel Form NA

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: Headwater springs

Morphology %	
Riffle	5
Run	
Steady	95
Pool	
Deadwater	

Notes: Drains into wetland + Pond

Stream order (from map) 1

Vegetation %

Canopy Cover	100
Dominant Bank Veg	grass
Dominant Riparian Veg	grass shrubs

Large Woody Debris

Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Low

Water Quality

DO Saturation (%) 81.9% / 8.67 mg/L

pH 6.3

Sp. Conductivity (µs/cm) 43.2 µS/S

Temperature (°C) 12.6°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) not high habitat for DF muscles, Not suitable habitat for EPA Forbes.

Stantec Rapid Aquatic Habitat Survey

MJS ✓

Watercourse: M1 M2 **Date:** June 21, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2492 - 2495

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** EMW IDT

Reach Length: 200m ~120m

Avg. Bankfull Width: 20 cm US pond 3-5m

Avg. Bankfull Depth: 20 cm .5m deep

Avg. Wet Width: 10 cm 3-4

Avg. Wet Depth: 10 cm .4

Substrate%

Bedrock	0
Boulder	2
Rock	3
Rubble	5
Gravel	10
Sand	~~40~~ 30
Fines	30
Total (100%)	~~100~~ 80

Land Use (Total 100%)	**(%)**
Uncut Forest	40 ~~40~~
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: marsh ~~80~~ 60 %

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 2

Bank Erosion

Undercut Banks (%)	0%
Left Bank	
Right Bank	

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: old dam

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	1%

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %

Riffle	10
Run	
Steady	
Pool	
Deadwater	90

Notes: US stretch is pond WC becomes undefined

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	30
Dominant Bank Veg	grass
Dominant Riparian Veg	~~grass~~

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 76.5% / 8.00 mg/l

pH 6.1

Sp. Conductivity (µs/cm) 27.1 µs/cm

Temperature (°C) 12.2°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

not the right habitat for DF clams.
not suitable for EPA Form

Stantec Rapid Aquatic Habitat Survey

MJS V

Watercourse: M1 M4 **Date:** June 14, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2505 - 2514

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** EW DT

Reach Length: 107 m

Avg. Bankfull Width: 1 m

Avg. Bankfull Depth: .6

Avg. Wet Width: .5, .4

Avg. Wet Depth: .30

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	
Sand	
Fines	100% organic
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: powerline OS

Embeddedness (Score 1-4) 0

Comment: wetland 100%

Bank Erosion	
Undercut Banks (%)	0
Left Bank	
Right Bank	

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☐
Beaver activity? old	☑	☐

Notes: _____

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	.02

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %	
Riffle	
Run	
Steady	100%
Pool	
Deadwater	

Notes: multi channel wetland wc

Notes: _____

Stream order (from map) 2

Vegetation %	
Canopy Cover	5
Dominant Bank Veg	grass
Dominant Riparian Veg	grass

Large Woody Debris	
Lots	☐
Med	☐
None	☑
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%) 7.65 mg/l / 71.5%

pH 5.9

Sp. Conductivity (µs/cm) ~~17.6 µS~~ 15.7 µS

Temperature (°C) 14.8

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...) wetland

M1M3 No Flow likely only side channel drainage. Pond is likely fish habitat.

MJS

MJS

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME MINI		LOCATION SAC 12181035 6	
STATION # MINI	RIVERMILE	STREAM CLASS 1	
LAT	LONG	RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS + MF			
FORM COMPLETED BY MJS		DATE June 21, 2011 TIME 2:30 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10 / 70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 (3)	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0

Total Score 56

Stantec Rapid Aquatic Habitat Survey

√ MJS

Watercourse: MIN1 **Date:** June 21, 11 **Job Number:** 121810356

WQ/E6496871/5135837

Coordinates Reach Start: _____ **Photo #:** 0107-0125

Coordinates Reach End: _____

Weather Conditions: partly cloudy **Personnel:** MJS - MF

Reach Length:		
Avg. Bankfull Width:	2.5 - 3.5 m	3.0
Avg. Bankfull Depth:	1.0 - 1.5 m	1.25
Avg. Wet Width:	2 - 3 m	2.50
Avg. Wet Depth:	0.5 - 0.75 m	0.63

~ 0.6 m silt - deep!

Land Use (Total 100%)

	(%)
Uncut Forest	25
Clearcut	75
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: runs through power line

NPS Pollution

	Y	N
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐
Type:		

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	
Sand	20
Fines	80%
Total (100%)	

Embeddedness (Score 1-4) n/a

Bank Erosion

Undercut Banks (%)	
Left Bank	60
Right Bank	60

Culvert in reach?

	Y	N
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	0.5%

Channel Form

Braiding	☐
Lateral Bars (N/A)	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %

Riffle	10%
Run	
Steady	90%
Pool	
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	5%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris

Lots	☐
Med	☐
None (low ✓)	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	88.6% / 8.26 mg/L
pH	5.2
Sp. Conductivity (µs/cm)	22.7 uS/cm
Temperature (°C)	19.8 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

wp #028 - start of MIN1, just u/s of old beaver pond (grown-in)

#029 - dam @ lower end of old pond pics # 107-109 (just below wp # 029)

030 - pics 110-112

031 confluence of MIN1 + MIN3 / water quality pics # 113-117

032 - pics # 118-122

033 end - # 00123-0125

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME McBean Master		LOCATION 12181035G	
STATION # M1N2 RIVERMILE		STREAM CLASS 1	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS+MF			
FORM COMPLETED BY MS	DATE Jun 21, 2011 TIME 300 AM (PM)	REASON FOR SURVEY	

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover (10 / 70 / 40 / 20 / 0)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
	2. Embeddedness (0 / 25 / 50 / 75 / 100)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 85

Stantec Rapid Aquatic Habitat Survey

✓MJS

Watercourse: MINZ **Date:** June 21, 2011 **Job Number:** 121810356

Coordinates Reach Start: wq x 649697 Y 5135770 **Photo #:** 0135 - 147 ✓

Coordinates Reach End:

Weather Conditions: cloudy **Personnel:** MJS + MF

Reach Length: 196 m

Avg. Bankfull Width:	0.75 - 1.25	1.0
Avg. Bankfull Depth:	0.25 - 0.40 m	0.33
Avg. Wet Width:	0.5 - 1.0 m	0.75
Avg. Wet Depth:	0.05 - 0.20 m + deep silt	0.13

Land Use (Total 100%)

	(%)
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution

	Y	N
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	
Sand	10
Fines	90%
Total (100%)	

- deep silt ~0.3

Embeddedness (Score 1-4) n/a - 1

Bank Erosion

Undercut Banks (%)	
Left Bank	10
Right Bank	10

Culvert in reach?

	Y	N
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	0.5%

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

n/a

Notes:

Morphology %

Riffle	
Run	
Steady	100
Pool	
Deadwater	

Notes: lots of algae

Stream order (from map) 1

Vegetation %

Canopy Cover	40%
Dominant Bank Veg	grass
Dominant Riparian Veg	Shrubs

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	82.0% / 7.31 mg/L
pH	4.3
Sp. Conductivity (µs/cm)	60 µS
Temperature (°C)	17.5 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

037 - ~~start~~ end of reach pics 0135 - 0138

038 - water quality pics 0139 - 141

039 - pics # 00142 - 144

040 - ~~end~~ start of reach 145 - 147

JMJS

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME M1N3	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS 1	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + MF		
FORM COMPLETED BY MS	DATE June 21, 2011 TIME 330 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10 / 70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
2. Embeddedness (0 / 25)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0

Total Score 102

Stantec Rapid Aquatic Habitat Survey

EMW MJSV

Watercourse: MIN3 **Date:** June 21, 2011 **Job Number:** 121810356

wq X: 649748 Y: 5135953

Coordinates Reach Start: _____ **Photo #:** 0124 – 0134

Coordinates Reach End: _____

Weather Conditions: cloudy **Personnel:** MJS + MF

Reach Length:	207m		
Avg. Bankfull Width:	0.75 – 1.25; 0.5	0.83	
Avg. Bankfull Depth:	0.20 – 0.35m	0.28	
Avg. Wet Width:	0.5 – 1.0, 0.25	0.58	
Avg. Wet Depth:	0.10 – 0.15 m	0.13	

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	
Sand	30
Fines	70
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	~~70~~ 60%
Clearcut	30%
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: 30 in power line

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☑	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☑

Type: Riverine Herbicide

Embeddedness (Score 1-4): N/A or 1 0

Bank Erosion	
Undercut Banks (%)	
Left Bank	10%
Right Bank	10%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	0.5% Low

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

N/A

Notes: _____

Morphology %	
Riffle	10
Run	
Steady	80
Pool	10
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %	
Canopy Cover	40%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☐
Med	☐
None	☐ low
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	85.2% / 9.22 mg/L
pH	5.9
Sp. Conductivity (µs/cm)	0.0 µS/cm
Temperature (°C)	11.7°C

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

wp 034 - pics # 0124 - 0130 0128

035 - water quality pics 0129 - 0131

036 - stream ends (wet ground)

pics 0132 - 0134

- No rapid ass form — ~80% in beaver pond

Stantec Rapid Aquatic Habitat Survey

Watercourse: MZD1 **Date:** June 29, 2011 **Job Number:** 121810356

WQ (X) 2456701.3 (Y) 7484816.8

Coordinates Reach Start: _____ **Photo #:** .744 - 752

Coordinates Reach End: _____

Weather Conditions: raining **Personnel:** MJS + DT

Reach Length:	140 m	
Avg. Bankfull Width:	0.8 - 1.2m	1.0
Avg. Bankfull Depth:	0.4 - 0.5m	0.45
Avg. Wet Width:	0.6 - 1.0m	0.80
Avg. Wet Depth:	0.2 - 0.35m	0.28

Substrate%

Bedrock	
Boulder	
Rock	40
Rubble	20
Gravel	5
Sand	
Fines	35
Total (100%)	

for final 50m below pond

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4): 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	20%
Right Bank	20%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers? dam	☑	☐
Beaver activity?	☑	☐

Notes: 80% upper end in pond

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %

Riffle	15
Run	
Steady	5
Pool	
Deadwater	80% - pond

Notes: _____

Stream order (from map): 1 2

Vegetation %

Canopy Cover	30%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris

Lots	☐
Med	☐
None	☑ low
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	75.3% / 6.6 mg/L
pH	6.4
Sp. Conductivity (µs/cm)	24.1 µS/cm
Temperature (°C)	21.1 °C

EMBEDDEDNESS (CRITERIA): 1. ≤ 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

— no dragonflies observed / no sampling

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

— 80% in beaver pond

w/MJS

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME M2D2		LOCATION 12181035S6	
STATION # M2D2	RIVERMILE	STREAM CLASS I	
LAT	LONG	RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS + DT			
FORM COMPLETED BY MJS		DATE June 29, 2011 TIME ____ AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	100 70 Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40 40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20 20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	0 Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
2. Embeddedness	0 25 Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	50 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	75 Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	100 Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 (17) 16	(15) 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 118

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: MZD2 **Date:** June 29, 2011 **Job Number:** 121810356

WQ (X) 2456352.8 (Y) 7484394.4

Coordinates Reach Start: _____ **Photo #:** 753 + 779

Coordinates Reach End: _____

Weather Conditions: overcast **Personnel:** MJS & DT

Reach Length:	~550 m		
Avg. Bankfull Width:	0.45 + 0.85m	0.65	
Avg. Bankfull Depth:	0.35 - 0.60m	0.48	
Avg. Wet Width:	0.20 - 0.60m	0.40	
Avg. Wet Depth:	0.05 - 0.30m	0.18	

Substrate%

Bedrock	
Boulder	5
Rock	10
Rubble	
Gravel	
Sand	10
Fines	75
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 2

Comment: _____

Bank Erosion	
Undercut Banks (%)	
Left Bank	10%
Right Bank	10%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers? dam	☑	☐
Beaver activity?	☑	☐

Notes: dominated by bogs & beaver ponds

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑

Estimated % 0.5%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: ~20% below ground (lower end)

Morphology %	
Riffle	10%
Run	
Steady	10%
Pool	
Deadwater	80%

Notes: _____

Stream order (from map) 2

Vegetation %	
Canopy Cover	40%
Dominant Bank Veg	grass
Dominant Riparian Veg	~~Shrubs~~ alders

Large Woody Debris	
Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

low ✓

Water Quality

DO Saturation (%)	37.3 % / 3.90 mg/L
pH	5.9
Sp. Conductivity (µs/cm)	22.1 MS/cm
Temperature (°C)	16.5 °C

EMBEDDEDNESS (CRITERIA): 1 <20% 2 20% - 35% 3 35% - 50% 4 >50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

- no dragonflies seen
- no sampling

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- almost no defined watercourse. Dominated by bog & beaver pond. Slow water (mostly still). Only one point close to end that we could do water quality

- Very little discharge (prob not 2nd order stream)

'a'

✓ MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME M20445		LOCATION 12181035G	
STATION # _____ RIVERMILE _____		STREAM CLASS 2	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS + DT			
FORM COMPLETED BY MJS	DATE June 30, 2011 TIME 9:10 (AM) PM	REASON FOR SURVEY	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 10 70	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 40	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 25	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 50	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 75	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 100
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 144

Stantec Rapid Aquatic Habitat Survey

VMJS

Watercourse: M20#3 **Date:** June 30, 2011 **Job Number:** 121810356

WQ (X) 2456286.1 (Y) 7484418.1

Coordinates Reach Start: **Photo #:** 786 - 806

Coordinates Reach End:

Weather Conditions: ~cloudy, light rain **Personnel:** MJS & DT

Reach Length:	~200 m	
Avg. Bankfull Width:	1.75 - 3.25m	2.50m
Avg. Bankfull Depth:	0.50 - 0.6m	0.55m
Avg. Wet Width:	1.5 - 3.0 m	2.25m
Avg. Wet Depth:	0.25 - 0.40m	0.33 m

Substrate%

Bedrock	
Boulder	20
Rock	5
Rubble	
Gravel	
Sand	40 35
Fines	40
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☐
Beaver activity?	☐	☐

Notes:

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	1%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes:

Morphology %	
Riffle	5
Run	
Steady	60
Pool	10
Deadwater	25

Notes:

Stream order (from map) 2

Vegetation %	
Canopy Cover	60%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs, alders

Large Woody Debris	
Lots	☐
Med	☐
None	☐ low ✓
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	71.3% / 7.40 mg/L
pH	5.4
Sp. Conductivity (µs/cm)	22.6
Temperature (°C)	14.6°C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates — no dragonflies observed & no sampling completed

Suitable invertebrate habitat? **Y / N**

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

1 of 1

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME MZ04		LOCATION 12181035G	
STATION # _____ RIVERMILE _____		STREAM CLASS 2	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS & DT			
FORM COMPLETED BY MJS	DATE June 30, 2011 TIME 10:15 (AM) PM	REASON FOR SURVEY	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 150

- first 100m w/in beaver pond + old pond

Stantec Rapid Aquatic Habitat Survey

Watercourse: M2D4 **Date:** June 30 2011 **Job Number:** 121810356

WQ (X) 2486164.7 (Y) 7484532.2

Coordinates Reach Start: **Photo #:** 807 - 848

Coordinates Reach End:

Weather Conditions: cloudy **Personnel:** MJS + DT

Reach Length: 340m

Avg. Bankfull Width:	1.5 - 4.5m	3.0
Avg. Bankfull Depth:	0.4 - 0.6m	0.5
Avg. Wet Width:	1.0 - 4.0m	2.5
Avg. Wet Depth:	0.2 - 0.4m	0.3

Substrate%

Bedrock	
Boulder	~35
Rock.	10
Rubble	
Gravel	
Sand	30
Fines	25
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)

Left Bank 15%

Right Bank 15%

Culvert in reach?	**Y**	**N**
Is it perched? (unknown under pond)	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: lots of beaver / former beaver activity.

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑

Estimated % 1%

Channel Form

Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes:

Morphology %

Riffle	40
Run	
Steady	30
Pool	10
Deadwater	20

Notes:

Stream order (from map) 2

Vegetation %

Canopy Cover	60%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs
	alders

Large Woody Debris

Lots	☐
Med	☐
None (low)	☑
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	68.9% / 6.84 mg/L
pH	6.0
Sp. Conductivity (µs/cm)	20.2 µs/cm
Temperature (°C)	17.5

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

- no dragonflies/ not suitable habitat, no sampling

Suitable invertebrate habitat? **Y / N**

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☒

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

- not suitable habitat

Samples Taken? Yes ☐ No ☒

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- 1st 100 m in active beaver pond (covers road but still passable w truck - solid

- old clearing/former pond (beaver) close to reach end

VMJS

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME M2E2	LOCATION
STATION #_____ RIVERMILE_____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS EW DT	
FORM COMPLETED BY Emm	DATE June 21 TIME 1:41 AM PM — REASON FOR SURVEY

low grade most of reach

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (100)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). (70)	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 120

Stantec Rapid Aquatic Habitat Survey

EMW ✓ MJS

Watercourse: MZE7 **Date:** June 21, 2011 **Job Number:** 121810356

Coordinates Reach Start: _____ **Photo #:** 2520 – 2541

Coordinates Reach End: _____

Weather Conditions: Sonny **Personnel:** EMW DT

Reach Length:	1.2 km	
Avg. Bankfull Width:	3-5m, 2m	3.33
Avg. Bankfull Depth:	.5-1m	0.75
Avg. Wet Width:	2-4m	3.0
Avg. Wet Depth:	.4-.7	0.55

Substrate%	Upper	Lower
Bedrock	0	GS
Boulder	20	
Rock	10	
Rubble	5	
Gravel	5	
Sand	40	
Fines	organic 100	20 %
Total (100%)		100%

Land Use (Total 100%)	(%) Upper	Lower
Uncut Forest	100 %	
Clearcut		
Selective Logging		
Pasture/Hay		
Agricultural Row Crops		
Buffer strips		

Comment: wetland / Alder swamp

NPS Pollution	Y	N
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	60
Left Bank	
Right Bank	

Culvert in reach?	Y	N
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: dams throughout

Channel Sinuosity	
High	☐
Med	☑
Low	☐

Channel Grade	
High	☐ ↑ DS
Med	☑
Low	☐
Estimated %	0

Channel Form	
Braiding	None ☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: _____

Morphology %	
Riffle	2
Run	
Steady	98
Pool	
Deadwater	

Notes: _____

Stream order (from map) 1 / 2

Vegetation %	
Canopy Cover	10
Dominant Bank Veg	grass
Dominant Riparian Veg	grass/shrubs

Large Woody Debris	
Lots	☐ « DS
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

		WQ DS near end of reach
DO Saturation (%)	51.6%, 5.15 mg/l	66.1 %, 6.53 mg/l
pH	5.5	5.4
Sp. Conductivity (µs/cm)	18.7	18.0
Temperature (°C)	16.1°C	15.5 °C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

Beaver activity throughout most of reach, very boggy right next to WC hard to stay by it the whole way down. Clear cut mid reach 30m buffer. Channel becomes less beaver influenced DS more riffles big boulders more solid ground DS ~ 150m from end of reach.

1:45 pm

VM#5

Stantec Rapid Aquatic Habitat Survey

Watercourse: MZE 2 **Date:** June 21, 2021 **Job Number:** 121810356

Coordinates Reach Start: 2456787, 3748389 **Photo #:** 2542 - 2547

Coordinates Reach End:

Weather Conditions: Sonny **Personnel:** EW DT

Reach Length:	150 m	
Avg. Bankfull Width:	1.5 - 2	1.75
Avg. Bankfull Depth:	2 - 3	2.50
Avg. Wet Width:	.5 - 1.75	1.13
Avg. Wet Depth:	.30	0.30

Substrate%

Bedrock	0
Boulder	15
Rock	5
Rubble	5
Gravel	15
Sand	40
Fines	20
Total (100%)	100%

Land Use (Total 100%)	**(%)**
Uncut Forest	100%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: was thawed

NPS Pollution	**Y**	**N**
No Evidence	☑	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	
Left Bank	10%
Right Bank	10%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes:

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	1%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes:

Morphology %	
Riffle	
Run	100%
Steady	
Pool	
Deadwater	

Notes:

Stream order (from map) 1/2

Vegetation %		
Canopy Cover	Alders	80
Dominant Bank Veg		grass
Dominant Riparian Veg		alders

Large Woody Debris	
Lots	☑
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	84.2% / 8.57 mg/l
pH	5.15
Sp. Conductivity (µs/cm)	17.6 µS/cm
Temperature (°C)	14.1

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Odonata _____

Gomphids _____

looked Did Not Find

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

Lots of Alders, big boulders in WC

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME MZE C	LOCATION	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS EWDT		
FORM COMPLETED BY EMW	DATE June 20, 2014 TIME 200 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 100 70 40 20 0	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0 25 50 75 100	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 166

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION 12181035G
STATION # WIF1 RIVERMILE	STREAM CLASS
LAT LONG	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MJS Y DT	
FORM COMPLETED BY MJS	DATE Jun 28, 2011 TIME 11:30 (AM) PM / REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 146 ✓

EBM / MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: WIFI **Date:** June 28, 2011 **Job Number:** 121810356

WQ (X) 2454447.6 (Y) 7489043.0

Coordinates Reach Start: _____ **Photo #:** 554 - 572

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS & DT

Reach Length:	~~~330m~~ 444m		
Avg. Bankfull Width:	0.4 - 2.25m	1.33	
Avg. Bankfull Depth:	0.30 - 0.50m	0.40	
Avg. Wet Width:	0.2 - 2.0m	1.1m	
Avg. Wet Depth:	0.05 - 0.30m	0.18	

Substrate%

Bedrock	
Boulder	5%
Rock	15 ~~20~~%
Rubble	
Gravel	5%
Sand	70%
Fines	5%
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	95%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	5%

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	60%
Right Bank	60%

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form

Braiding	☑
Lateral Bars	☑
Medial Bars	☑
Islands	☑
Sand on Banks	☐

Notes: _____

Morphology %

Riffle	80
Run	15
Steady	
Pool	5
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	80%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

low ✓

Water Quality

DO Saturation (%)	91.6% / 0.66 mg/L
pH	6.4
Sp. Conductivity (µs/cm)	~~26~~ .4 ms/cm
Temperature (°C)	9.5°C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____ — no dragonfly signs

Gomphids _____

Samples Taken? Yes ☐ No ☑ — no sampling

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

— reach starts almost exactly as predicted

"A" 2011 ✓ MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION 121810356	
STATION # WIEZ RIVERMILE	STREAM CLASS 1	
LAT ____ LONG ____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS & DT		
FORM COMPLETED BY MJS	DATE June 2820 TIME 1040 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 (12) 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0) (25)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 153 ✓

Stantec Rapid Aquatic Habitat Survey

EMW ✓ MJS

Watercourse: W1F2 **Date:** June 28, 2011 **Job Number:** 121810356

WQ (X) 2454899.3 (Y) 7489242.7

Coordinates Reach Start: _____ **Photo #:** 534-55

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + DT

Reach Length:	240m	
Avg. Bankfull Width:	1.5 - 2.5m	2.0m
Avg. Bankfull Depth:	0.4 - 0.6m	0.5m
Avg. Wet Width:	1.0 - 2.0m	1.5m
Avg. Wet Depth:	0.1 - 0.4m	0.25m

Substrate%

Bedrock	
Boulder	20
Rock	20
Rubble	
Gravel	
Sand	60
Fines	
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	80
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	20%

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Bank Erosion

Undercut Banks (%)	
Left Bank	50
Right Bank	50

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	4% High

Channel Form

Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes: _____

Morphology %

Riffle	40
Run	30
Steady	
Pool	30
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	75
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

low ✓

Water Quality

DO Saturation (%)	95.8% / 11.9 mg/L
pH	6.5
Sp. Conductivity (µs/cm)	26.2 µS/cm
Temperature (°C)	9.1 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

— no sampling
- did not see dragonflies

Benthic Invertebrates

Suitable invertebrate habitat? **Y** / (**N**)

Odonata · _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- saw trout in small pools

"A"

/MJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION 12180356	
STATION # W1F3 RIVERMILE	STREAM CLASS 1	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + DT		
FORM COMPLETED BY MJS	DATE June 28, 2011 TIME 10:05 (AM) PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 153 ✓

JMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: W1 F3 **Date:** June 28 **Job Number:** 121810356

W1Q **Coordinates Reach Start:** (X) 2455527.0 (Y) 7489363.9 2011 **Photo #:** 0508 – 533

Coordinates Reach End:

Weather Conditions: sunny **Personnel:** MJS + DT

Reach Length:	~ 500 m		
Avg. Bankfull Width:	0.6 – 2.25m	1.43m	
Avg. Bankfull Depth:	0.3 – 0.7m	0.50m	
Avg. Wet Width:	0.4 – 2.0m	1.2m	
Avg. Wet Depth:	0.10 – 0.5m	0.3m	

Substrate%

Bedrock	
Boulder	5
Rock	15
Rubble	
Gravel	
Sand	80
Fines	
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	70%
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	30%

Comment:

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☑	☐

Type: ~ 30% buffer strip

Embeddedness (Score 1-4): 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	60
Right Bank	60

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☑
Estimated %	3%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☑
Islands	☐
Sand on Banks	☑

Notes:

Morphology %	
Riffle	60
Run	25
Steady	
Pool	15
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	70%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☐
None	☐ low ✓
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	93% / 10.9 mg/L
pH	6.2
Sp. Conductivity (µs/cm)	284.1 µS/cm
Temperature (°C)	9.2 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N) - did not sample - did not see dragonflies

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION 121810356
STATION # W1F4 RIVERMILE	STREAM CLASS
LAT LONG	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS DT + MJS	28
FORM COMPLETED BY MJS	DATE June 28, 2011 TIME 9:15 AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 100	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). 70	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 40	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 25	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 50	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 75	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 100
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 141 ✓

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: WIFH **Date:** June 27, 2011 + June 28, 2011 **Job Number:** 121810356

Coordinates Reach Start: WQ (X) 2455290.4 (Y) 7489670.9 **Photo #:** 0358 ~~-379~~ 492-0~~508~~ 507

Coordinates Reach End:

Weather Conditions: sunny w clouds **Personnel:** DT + MJS

Reach Length:	400 m		
Avg. Bankfull Width:	1.00 - 2.25m	1.63m	
Avg. Bankfull Depth:	0.50 - 0.60m	0.55m	
Avg. Wet Width:	0.75 - 2.00m	1.38m	
Avg. Wet Depth:	0.25 - 0.50m	0.38m	

Substrate%

Bedrock	
Boulder	
Rock	15
Rubble	
Gravel	5
Sand	~~&~~ 80
Fines	
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution

	Y	N
Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4): 2

Comment:

Bank Erosion

Undercut Banks (%)	
Left Bank	60
Right Bank	60

Culvert in reach? (Y) N

Is it perched?	☐	☑
Other barriers? beaver dams	☑	☑
Beaver activity?	☑	☐

Notes: dams / ponds

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form

Braiding	☐
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☑

Notes:

Morphology %

Riffle	50
Run	20
Steady	
Pool	30
Deadwater	

Notes:

Stream order (from map): 1

Vegetation %

Canopy Cover	65%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris

Lots	☐
Med	☐
None (low ✓)	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	84% / 8.94 mg/L
pH	5.8
Sp. Conductivity (µs/cm)	~~47~~ µS/cm 22.0
Temperature (°C)	~~9~~ 12.4°C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

— did not see dragonflies

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

— lots of beaver activity

EMW

✓ MJS

"a"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION 121810356	
STATION # W1FS RIVERMILE	STREAM CLASS	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + DT		
FORM COMPLETED BY MS	DATE June 27, 2011 TIME 11:05 AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover 100	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). 70	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 40	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness 0	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 25	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 50	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 75	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 100
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 129 ✓

V MJS ✓

Stantec Rapid Aquatic Habitat Survey

Watercourse: WIFS **Date:** June 27, 2011 **Job Number:** 121810356

Coordinates Reach Start: WQ (X) 2455280.2 Y 7489965.3 **Photo #:** 371 - 386 ✓

Coordinates Reach End:

Weather Conditions: Sunny ✓ **Personnel:** MJS + PJ

Reach Length: 284 m

Avg. Bankfull Width: 1.75 - 2.75 m 2.25 m

Avg. Bankfull Depth: 0.5 - 0.7 m 0.60 m

Avg. Wet Width: 1.5 - 2.5 m + pond ~30-40 m

Avg. Wet Depth: 0.3 - 0.5 m 2.0 m 6.40 m

Substrate%

Bedrock	
Boulder	10
Rock	
Rubble	
Gravel	
Sand	70
Fines	20
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 2

Bank Erosion

Undercut Banks (%)	
Left Bank	30
Right Bank	30

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers? dams	☑	☐
Beaver activity?	☑	☐

Notes: beaver dams / pond

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Form

Braiding	☐	N/a
Lateral Bars	☐	
Medial Bars	☐	
Islands	☐	
Sand on Banks	☐	

Notes:

Morphology %

Riffle	10
Run	
Steady	80
Pool	
Deadwater	10

Notes:

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Stream order (from map) 1

Vegetation %

Canopy Cover	40
Dominant Bank Veg	grass
Dominant Riparian Veg	Shrubs

Large Woody Debris

Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	93% / 9.89 mg/L
pH	6.3
Sp. Conductivity (µs/cm)	20.6 mS/cm
Temperature (°C)	12.7 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☐

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- lots of beaver activity throughout

EMW

JMJS

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME W1 G2		LOCATION 12181035 6	
STATION # W1G2 RIVERMILE		STREAM CLASS 1	
LAT	LONG	RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS + OT			
FORM COMPLETED BY MJS		DATE June 27 TIME 4:00 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (100) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. (25)	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 (16)	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0

Total Score 136 ✓

MOS

Stantec Rapid Aquatic Habitat Survey

Watercourse: WIGZ **Date:** June 27, 2011 **Job Number:** 121810356

WQ (X) 2454172.0 (Y) 7489257.2

Coordinates Reach Start: _____ **Photo #:** 476 - 491

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + DT

Reach Length:	286m	
Avg. Bankfull Width:	0.4 - 0.8m	0.6m
Avg. Bankfull Depth:	0.25 - 0.40m	0.33m
Avg. Wet Width:	0.2 - 0.6m	0.40m
Avg. Wet Depth:	0.05 - 0.20m	0.13m

Substrate%

Bedrock	
Boulder	
Rock	5
Rubble	10
Gravel	20
Sand	60
Fines	5
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	60
Clearcut	
Selective Logging	40%
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐
Type:		

Embeddedness (Score 1-4): 1

Comment: spacing activities to brook (cold)

Bank Erosion	
Undercut Banks (%)	
Left Bank	30
Right Bank	30

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☑
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes: _____

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☑
Sand on Banks	☐

Morphology %	
Riffle	90
Run	
Steady	
Pool	10
Deadwater	

Notes: water below ground ~25%

Notes: _____

Stream order (from map): 1

Vegetation %	
Canopy Cover	85%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☐
None	☑ low
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	78.1 / 8.5 mg/L
pH	5.6
Sp. Conductivity (µs/cm)	17.8 ms/cm
Temperature (°C)	11.9 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

– followed upstream of bridge until became very characteristic of headwaters (not fish habitat above reach)

EMW

VMJS

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION 12181035 6	
STATION # W163 RIVERMILE	STREAM CLASS 1	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS & DT		
FORM COMPLETED BY MJS	DATE June 27, 11 TIME 3:15 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10)	Greater than 70% of (70) substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable (40) habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable (20) habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable (0) habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and (25) boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and (50) boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and (75) boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and (100) boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 161

Stantec Rapid Aquatic Habitat Survey

Watercourse: WIG3 **Date:** June 27, 2011 **Job Number:** 121810356

WQ (X) Z 5454728.4 (Y) 7489007.3

Coordinates Reach Start: **Photo #:** 465 - 475

Coordinates Reach End:

Weather Conditions: sunny **Personnel:** MJS + DT

Reach Length: ~270m

Avg. Bankfull Width:	0.5 - 0.95m	0.73
Avg. Bankfull Depth:	0.25 - 0.50m	0.38
Avg. Wet Width:	0.3 - 0.75m	0.53
Avg. Wet Depth:	0.05 - 0.30m	0.18

Substrate%

Bedrock	
Boulder	5
Rock	5
Rubble	15
Gravel	15
Sand	60
Fines	
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment:

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	
Left Bank	20
Right Bank	20

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Grade

High	☐
Med	☐
Low	☑

Estimated % 2%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes: below grnd 0 20 %

Morphology %	
Riffle	50
Run	20
Steady	
Pool	30
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %	
Canopy Cover	90
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☐
None	☑
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	83.9 / 9.27 mg/L
pH	5.7
Sp. Conductivity (µs/cm)	16.6 µS/cm
Temperature (°C)	12.0 °C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? **Y** / (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

EMW

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION 1218/0356	
STATION # W1G4 RIVERMILE	STREAM CLASS 1	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + DT		
FORM COMPLETED BY MJS	DATE June 27 '01 TIME 3:00 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
2. Embeddedness (0) (25)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 151

Stantec Rapid Aquatic Habitat Survey

MJS ✓

Watercourse: W1 G4 **Date:** June 27, 2011 **Job Number:** 121810356

WQ (X) 2454514.1 (Y) 7489007.3

Coordinates Reach Start: _____ **Photo #:** 0440 – 464

Coordinates Reach End: _____

Weather Conditions: sunny ✓ **Personnel:** MJS & DT

Reach Length:	~370 m		
Avg. Bankfull Width:	0.45 – 0.75m	1.20	
Avg. Bankfull Depth:	0.25 – 0.50m	0.38	
Avg. Wet Width:	0.3 – 0.6m	0.45	
Avg. Wet Depth:	0.05 – 0.30m	0.18	

Substrate%

Bedrock	
Boulder	
Rock	
Rubble	
Gravel	30
Sand	60
Fines	10
Total (100%)	100

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**(N)**
Evidence	☐	☐
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) n/a ✓ 0

Bank Erosion

Undercut Banks (%)	
Left Bank	30
Right Bank	30

Culvert in reach?	**(Y)**	**N**
Is it perched?	☑	☐
Other barriers?	☐	☑
Beaver activity?	☑	☐

Notes: old pond @ reach end

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	2.5%

Channel Form

Braiding	☑
Lateral Bars	☑
Medial Bars	☑
Islands	☐
Sand on Banks	☑

Notes: _____

Morphology %

Riffle	60
Run	20
Steady	
Pool	20
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %

Canopy Cover	65
Dominant Bank Veg	grass
Dominant Riparian Veg	trees/shrubs

Large Woody Debris

Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

low

Water Quality

DO Saturation (%)	89.5% / 10.3 mg/L
pH	6.5
Sp. Conductivity (µs/cm)	24.3 µS/cm
Temperature (°C)	9.8

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? **Y** / (**N**)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- observed poison ivy

Data sheet (excel) states that culvert is perched but may be passible @ high flows.

'A'

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME		LOCATION 12181055 6	
STATION # WIGS	RIVERMILE	STREAM CLASS 1	
LAT	LONG	RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS			
FORM COMPLETED BY MJS		DATE June 27, 2011 TIME 1:30 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10)	Greater than 70% of (70) substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable (40) habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable (20) habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable (0) habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and (25) boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and (50) boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and (75) boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and (100) boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 140 ✓

Stantec Rapid Aquatic Habitat Survey

MJSV

Watercourse: WIGS **Date:** June 27 2011 **Job Number:** 121810356

Coordinates Reach Start: WQ (X) 2454716.0 (Y) 7489373.9

Coordinates Reach End:

Photo #: 426 - 439

Weather Conditions: sunny **Personnel:** MJS & DT

Reach Length:	251 m	
Avg. Bankfull Width:	0.55 - 1.00 m	0.78
Avg. Bankfull Depth:	0.40 - 0.60 m	0.50
Avg. Wet Width:	0.3 - 0.75 m	0.53
Avg. Wet Depth:	0.10 - 0.30 m	0.20

Land Use (Total 100%)	**(%)**
Uncut Forest	poor 40
Clearcut	60
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐
Type:		

Comment: - cut long ago - spaced @ points to brk.

Substrate%	
Bedrock	
Boulder	
Rock	10
Rubble	
Gravel	
Sand	70
Fines	20
Total (100%)	

Embeddedness (Score 1-4) 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	70
Right Bank	70

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☑	☑

Notes: pond @ end & start

Channel Sinuosity	
High	☑
Med	☐
Low	☐

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes:

Morphology %	
Riffle	80
Run	15
Steady	5
Pool	
Deadwater	

Notes:

Channel Grade	
High	☐
Med	☐
Low	☑
Estimated %	2%

Stream order (from map) 1

Vegetation %	
Canopy Cover	70
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	87.0% / 9.49 mg/L
pH	6.5
Sp. Conductivity (µs/cm)	21.8 µs/cm
Temperature (°C)	12.0 °C

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? **Y / N**

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

— lots of poison ivy

Emm

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION 12181035S6
STATION # W1CG RIVERMILE	STREAM CLASS 1
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MJS + DT	
FORM COMPLETED BY MJS	DATE June 27, 2011 TIME 12:50 AM (PM) REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10)	Greater than 70% of (70) substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable (40) habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable (20) habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable (0) habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0)	Gravel, cobble, and (25) boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and (50) boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and (75) boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and (100) boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 150 ✓

✓ MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: WIG6 **Date:** June 27, 2011 **Job Number:** 121810356

wa (X) 2455353.0 (Y) 7489700.8

Coordinates Reach Start: _____ **Photo #:** 414 – 425

Coordinates Reach End: _____

Weather Conditions: sunny **Personnel:** MJS + DT

Reach Length:	~184m		
Avg. Bankfull Width:	0.65 – 1.00m	0.83	
Avg. Bankfull Depth:	0.35 – 0.50m	0.43	
Avg. Wet Width:	0.4 – 0.75m	0.58	
Avg. Wet Depth:	0.15 – 0.30m	0.23	

Substrate%

Bedrock	
Boulder	5
Rock	
Rubble	
Gravel	20
Sand	60
Fines	15
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 1

Bank Erosion	
Undercut Banks (%)	
Left Bank	70
Right Bank	70

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☑	☑

Notes: beaver pond @ end of reach

Channel Sinuosity

High	☑
Med	☐
Low	☐

Channel Grade

High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☑
Sand on Banks	☐

Notes: _____

Morphology %	
Riffle	60
Run	30
Steady	
Pool	10
Deadwater	

Notes: _____

Stream order (from map) 1

Vegetation %	
Canopy Cover	65
Dominant Bank Veg	grass
Dominant Riparian Veg	Shrubs

Large Woody Debris	
Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	84.3% / 9.15 mg/L
pH	6.4
Sp. Conductivity (µs/cm)	20.8 µS/cm
Temperature (°C)	11.5 °C

EMBEDDEDNESS (CRITERIA): 1 < 20% / 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y (N)

Odonata _____

Gomphids _____

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

– saw fish (dace?)

EMW

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME WINZ	LOCATION 12810356
STATION # WINZ RIVERMILE	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MJS JDT	
FORM COMPLETED BY MJS	DATE June 29, 20 / TIME 950 (AM) PM / REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10 / 70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
2. Embeddedness (0 / 25)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0

Total Score 138 ✓

VMJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: WINZ **Date:** June 29, 2011 **Job Number:** 121810356

NAD 83 2457629.3 7488951.4

Coordinates Reach Start: _____ **Photo #:** 638-663

Coordinates Reach End: _____

Weather Conditions: overcast **Personnel:** MJS + DT

Reach Length:	360 m		
Avg. Bankfull Width:	0.65 – 1.25m	0.95	
Avg. Bankfull Depth:	0.35 – 0.70 m	0.53	
Avg. Wet Width:	0.4 – 1.0 m	0.70	
Avg. Wet Depth:	0.05 – 0.40m (deeper in ponds)	0.23	

Substrate%

Bedrock	10
Boulder	50
Rock	20
Rubble	
Gravel	
Sand	
Fines	20
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐
Type:		

Embeddedness (Score 1-4): 1

Comment: ~40% right side thinned (old clearcut?)

Bank Erosion	
Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers? dams	☑	☐
Beaver activity?	☑	☐

Notes: lower 3/4 reach beaver pond

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	3%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %	
Riffle	20
Run	
Steady	20
Pool	
Deadwater	60

Notes: _____ **Notes:** _____ **Stream order (from map)** 1

Vegetation %	
Canopy Cover	30%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☑
None	☐
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	73.1% / 7.61 mg/L
pH	5.3
Sp. Conductivity (µs/cm)	18.6 µS/cm
Temperature (°C)	13.3

EMBEDDEDNESS (CRITERIA): 1 < 20% 2 20% - 35% 3 35% - 50% 4 > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / (N)

Odonata _____

Gomphids _____

- did not see / sample for dragonflies

Samples Taken? Yes ☐ No ☒

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☒

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- last 30m undefined & below ground
→ ∴ did not complete WINI

- lower 3/4 of reach predominately beaver ponds (active)

EMW

"a"

VMJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME ~~[illegible]~~ W1N3	LOCATION 121810356
STATION # W1N3 RIVERMILE _____	STREAM CLASS 1
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MJS + DT 29	
FORM COMPLETED BY MJS	DATE June ~~28~~, 20 11 TIME 10:40 AM PM REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	100 Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). 70	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 40	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 0
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	0 Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 25	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 50	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 75	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 100
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 163

MJS

Stantec Rapid Aquatic Habitat Survey

Watercourse: W1 N3 **Date:** June 29 2011 **Job Number:** 121810356

Coordinates Reach Start: W/Q (X) 2457648.5 (Y) 7489053.3 **Photo #:** 664 – 689

Coordinates Reach End:

Weather Conditions: overcast **Personnel:** MJS & DT

Reach Length:	400 m	
Avg. Bankfull Width:	0.75 – 1.75m	1.25
Avg. Bankfull Depth:	0.40 - 0.50m	0.45
Avg. Wet Width:	0.5 – 1.5m	1.0
Avg. Wet Depth:	0.20 - 0.40m	0.30m

Substrate%

Bedrock	
Boulder	60
Rock	20
Rubble	5
Gravel	
Sand	15
Fines	
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4) 1

Comment: thining ~30% left side

Bank Erosion	
Undercut Banks (%)	
Left Bank	5
Right Bank	5

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers?	☐	☑
Beaver activity?	☐	☑

Notes:

Channel Sinuosity

High	☐
Med	☐
Low	☑

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	4%

high.

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Morphology %	
Riffle	70
Run	20
Steady	
Pool	10
Deadwater	

Notes: **Notes:**

Stream order (from map) 1

Vegetation %	
Canopy Cover	75%
Dominant Bank Veg	grass
Dominant Riparian Veg	trees

Large Woody Debris	
Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

low ✓

Water Quality

DO Saturation (%)	76.5% / 7.56 mg/L
pH	5.8
Sp. Conductivity (µs/cm)	18.5 µs/cm
Temperature (°C)	15.8 °C

EMBEDDEDNESS (CRITERIA): 1 <20% 2 20% - 35% 3 35% - 50% 4 >50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? **Y / N**

Odonata _____

Gomphids _____

- did not sample / see dragonflies - predom. boulde

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- marked drop @ the beginning of reach (~ 2-3 m)

"A"

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME WIN4		LOCATION 12181035G	
STATION # _____ RIVERMILE _____		STREAM CLASS 1	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS MJS + DT			
FORM COMPLETED BY MJS	DATE June 29, 2011 TIME 1130 (AM) PM	REASON FOR SURVEY	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10 / 70 / 40 / 20 / 0)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0 / 25 / 50 / 75 / 100)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 176 ✓

Stantec Rapid Aquatic Habitat Survey

VMJS

Watercourse: WIN4 **Date:** June 29, 2011 **Job Number:** 121810356

Coordinates Reach Start: WQ (X) 2457879.0 (Y) 7489253.7 **Photo #:** 690 – 715

Coordinates Reach End:

Weather Conditions: overcast **Personnel:** MJS + DT

Reach Length:	~210 m		
Avg. Bankfull Width:	2.5 – 4.5m	3.5	
Avg. Bankfull Depth:	0.40 – 0.70m	0.55	
Avg. Wet Width:	2.0 – 4.0m	3.0	
Avg. Wet Depth:	0.10 – 0.40m	0.25	

Substrate%

Bedrock	
Boulder	10
Rock	~~60~~ 50
Rubble	
Gravel	20
Sand	20
Fines	
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type:

Embeddedness (Score 1-4): 1

Comment:

Bank Erosion	
Undercut Banks (%)	
Left Bank	20
Right Bank	20

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers? small dam	☑	☐
Beaver activity?	☑	☐

Notes:

Channel Sinuosity

High	☐
Med	☑
Low	☐

Channel Grade

High	☐
Med	☑
Low	☐
Estimated %	3%

Channel Form	
Braiding	☑
Lateral Bars	☐
Medial Bars	☐
Islands	☐
Sand on Banks	☐

Notes:

Morphology %	
Riffle	60
Run	20
Steady	
Pool	20
Deadwater	

Notes:

Stream order (from map) 1

Vegetation %

Canopy Cover	~~40~~ 60%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs
	alders

Large Woody Debris

Lots	☐
Med	☑
None	☐ low
Trees / Grasses / Shrubs	☐

Water Quality

DO Saturation (%)	84.7% 8.95 mg/L
pH	6.3
Sp. Conductivity (µs/cm)	19.7 µs/cm
Temperature (°C)	14.4 °C

EMBEDDEDNESS (CRITERIA): 1. < 20% 2. 20% - 35% 3. 35% - 50% 4. > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? (Y)/N

stoneflies, chironomids ephemeroptera, crustacean

Odonata _____

Gomphids _____

Samples Taken? Yes ☑ No ☐ no dragonflies

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- lowest reach gravel to sandy habitat - upper mostly rocks

EMW

"A"

VMJS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME W.B. Napad.?	LOCATION 121810 356	
STATION # W2B1 RIVERMILE	STREAM CLASS 2	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MJS + DT		
FORM COMPLETED BY MJS	DATE June 27, 2011 TIME 12:00 AM (PM)	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover (10) (70)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). (40)	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. (20)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. (0)
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness (0) (25)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. (50)	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. (75)	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. (100)
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 142 ✓

Stantec Rapid Aquatic Habitat Survey

VMTS

Watercourse: WZB1 **Date:** June 27, 2011 **Job Number:** 121810356

WQ (X) 2455170.8 (Y) 7489841.6

Coordinates Reach Start: _____ **Photo #:** 387 - 413 ✓

Coordinates Reach End: _____

Weather Conditions: Sunny **Personnel:** MTS + DT

Reach Length:	340m		
Avg. Bankfull Width:	1.25 - 2.75M	~~4.00~~ 2.00M	
Avg. Bankfull Depth:	0.5 - 0.8m	0.65M	
Avg. Wet Width:	1.0 - 2.5m	1.75M	
Avg. Wet Depth:	0.3 - 0.6m	0.45M	

Substrate%

Bedrock	
Boulder	~~20~~ 15
Rock	5
Rubble	
Gravel	
Sand	~~60~~ 70
Fines	10
Total (100%)	

Land Use (Total 100%)	**(%)**
Uncut Forest	100
Clearcut	
Selective Logging	
Pasture/Hay	
Agricultural Row Crops	
Buffer strips	

Comment: _____

NPS Pollution	**Y**	**N**
Evidence	☐	☑
Some Sources	☐	☐
Obvious Sources	☐	☐
Buffer Strip	☐	☐

Type: _____

Embeddedness (Score 1-4) 2

Bank Erosion	
Undercut Banks (%)	
Left Bank	30
Right Bank	30

Culvert in reach?	**Y**	**N**
Is it perched?	☐	☐
Other barriers? dam	☑	☐
Beaver activity?	☑	☐

Notes: beaver dams (old)

Channel Sinuosity	
High	☐
Med	☑
Low	☐

Channel Grade	
High	☐
Med	☐
Low	☑
Estimated %	2%

Channel Form	
Braiding	☑
Lateral Bars	☑
Medial Bars	☐
Islands	☑
Sand on Banks	☑

Notes: _____

Morphology %	
Riffle	20
Run	
Steady	60
Pool	10
Deadwater	10

Notes: _____

Stream order (from map) 2

Vegetation %	
Canopy Cover	65%
Dominant Bank Veg	grass
Dominant Riparian Veg	shrubs

Large Woody Debris	
Lots	☐
Med	☐
None	☐
Trees / Grasses / Shrubs	☐

low ✓

Water Quality

DO Saturation (%)	90.5% / 9.51 mg/L
pH	6.4
Sp. Conductivity (µs/cm)	21.7 MS/CM
Temperature (°C)	12.8

EMBEDDEDNESS (CRITERIA): 1 - <20% 2 - 20% - 35% 3 - 35% - 50% 4 - > 50%

Notes: Aquatic Vegetation, Odors, Iron Floc, Manganese

Benthic Invertebrates

Suitable invertebrate habitat? Y / N

Odonata _____

Gomphids _____

none kept
no dragonflies
chironomids
& stoneflies

Samples Taken? Yes ☑ No ☐

GPS Coordinates Lat: _____ Long: _____

Type Skins ☐ Larvae ☐

Observations of Bivalves / Shells (Photo # etc...):

Samples Taken? Yes ☐ No ☑

GPS Coordinates Lat: _____ Long: _____

Other comments (additional photo # etc...)

- saw lots of little fish in old beaver pond area

EMW

Appendix C-3

Photos

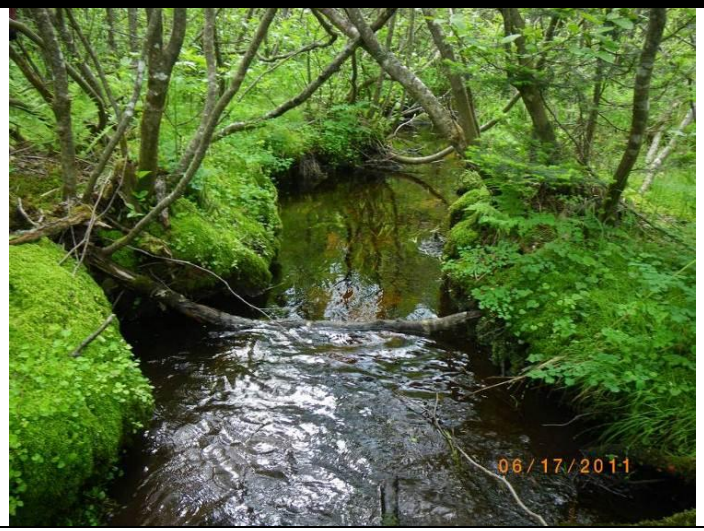
Bird Brook	
Photo 1 Bird Brook reach B1A1 looking US in headwater area of underground flow.	**Photo 2** Bird Brook reach B1A2 looking US in area where watercourse becomes defined.
Photo 3 Bird Brook reach B1A3 looking DS near mid-reach.	**Photo 4** Bird Brook reach B1A4 looking DS in alder-dominated area near mid-reach.

Bird Brook	
Photo 5 Bird Brook reach B1A5 looking upstream near mid-reach.	**Photo 6** Bird Brook reach B1A5 looking US in former beaver pond area in the lower reach.
Photo 7 Bird Brook reach B1A6 looking DS near the end of reach where it drains into a wetland area.	**Photo 8** Bird Brook reach B1B1 looking DS at undefined watercourse in headwater area near mid-reach.

Bird Brook	
Photo 9 Bird Brook reach B1B2 looking US at the start of reach.	**Photo 10** Bird Brook reach B1B2 looking US in wetland area near mid-reach.
Photo 11 Bird Brook reach B1C1 looking DS near the start of watercourse.	**Photo 12** Bird Brook reach B1D1 looking US in clear cut wetland area 100 m above reach-start.

Bird Brook	
Photo 13 Bird Brook reach B1D1 looking DS in buffer strip area with high windthrow disturbance at mid-reach.	**Photo 14** Bird Brook reach B1D2 looking DS in buffer strip area of high windthrow disturbance at mid-reach.
Photo 15 Bird Brook reach B1D3 looking DS 150 m upstream of road crossing.	**Photo 16** Bird Brook reach B1D4 looking US in area of mature forest near reach-start.

Bird Brook	
Photo 17 Bird Brook reach B1D5 looking US in the lower end of reach.	**Photo 18** Bird Brook reach B1E1 looking US near reach-end.
Photo 19 Bird Brook reach B1E2 looking US in area of in-stream woody debris at mid-reach.	**Photo 20** Bird Brook reach B1E2 looking US in low grade area of high grass cover near reach-end.

Bird Brook	
	
Photo 21 Bird Brook reach B1F1 looking US in slow flow and backwatered area due to beaver activities.	**Photo 22** Bird Brook reach B1G1 looking US in area of heavy alder-cover near mid-reach.
Photo 23 Bird Brook reach B1G2 looking US near the start of reach in area of undefined and below ground flow.	**Photo 24** Bird Brook reach B1H2 looking US near reach-end.

Bird Brook	
Photo 25 Bird Brook reach B1H3 looking DS near mid-reach.	**Photo 26** Bird Brook reach B1I2 looking US approximately 100 m from reach-end.
Photo 27 Bird Brook reach B2A1 looking DS in low-grade area near reach-start.	**Photo 28** Bird Brook reach B2A1 looking DS in backwatered beaver pond area near mid-reach.

Bird Brook	
Photo 29 Bird Brook reach B2A2 looking DS in area of increased grade near mid-reach.	**Photo 30** Bird Brook reach B2A2 looking DS in wetland meadow near reach-end.
Photo 31 Bird Brook reach B2B1 looking US near reach-start.	**Photo 32** Bird Brook reach B2B1 looking DS in beaver dammed/backwatered area 150 m from reach-start.

Bird Brook	
Photo 33 Bird Brook reach B2B1 looking upstream in meadow/former beaver pond area below road crossing.	**Photo 34** Bird Brook reach B2B1 looking DS at reach-end in wetland/natural deadwater and pond area.
Photo 35 Bird Brook reach B3A1 looking DS in sandy area of dense alder cover below road crossing.	**Photo 36** Bird Brook reach B3A2 looking DS in beaver dammed/ backwatered area near mid-reach.

Bird Brook	
Photo 37 Bird Brook reach B3A3 looking US from dam in active beaver pond area at reach-end.	**Photo 38** Bird Brook reach B3A4 looking DS in area of dense alder cover near reach-end.
Photo 39 Bird Brook reach B3A6 looking US at reach-start.	**Photo 40** Bird Brook reach B3A6 looking US at small waterfall 100 m from reach-end.

Bird Brook	
Photo 41 Bird Brook reach B3A7 looking DS 150 m from reach-end.	**Photo 42** Bird Brook reach B3A8 looking DS near mid-reach.
Photo 43 Bird Brook reach B3A9 looking US at reach-end.	**Photo 44** Bird Brook reach B3A10 looking DS in widened area at mid-reach.

Bird Brook
Photo 45 Bird Brook reach B3A10 looking US at the mouth on West Branch Napadogan Brook reach W4A19.

Sisson Brook	
Photo 46 Sisson Brook reach S1A1 looking DS in former beaver pond area.	**Photo 47** Sisson Brook reach S1A1 looking DS.
Photo 48 Sisson Brook reach S1A3 looking US.	**Photo 49** Sisson Brook reach S1A3 looking DS near reach-end.

Sisson Brook	

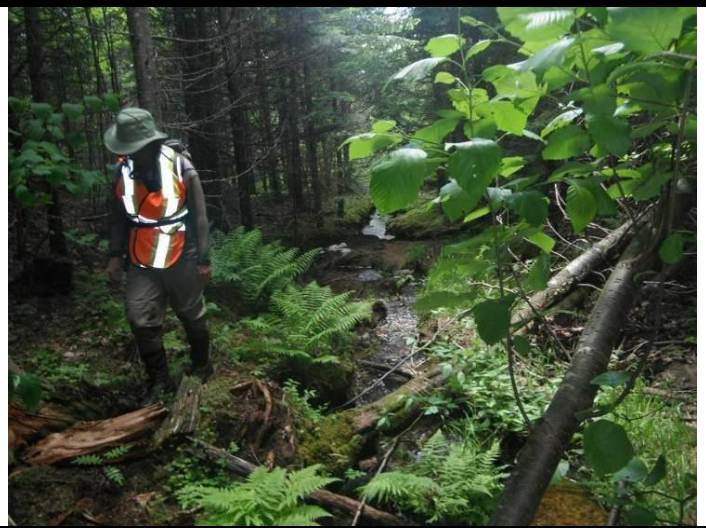



Photo 50 Sisson Brook reach S1B1 looking DS near the start of the reach.	**Photo 51** Sisson Brook reach S1B1 looking US in former beaver pond area.
Photo 52 Sisson Brook reach S1B2 looking from south side of active beaver pond encompassing entire reach.	**Photo 53** Sisson Brook reach S1B3 looking US near the start of reach.

Sisson Brook	
Photo 54 Sisson Brook reach S1C1 looking upstream near the start of reach in headwaters area.	**Photo 55** Sisson Brook reach S1C3 looking DS where watercourse becomes defined.
Photo 56 Sisson Brook reach S1C3 looking US near the end of reach.	**Photo 57** Sisson Brook reach S1C5 looking US near mid-reach.

Sisson Brook	

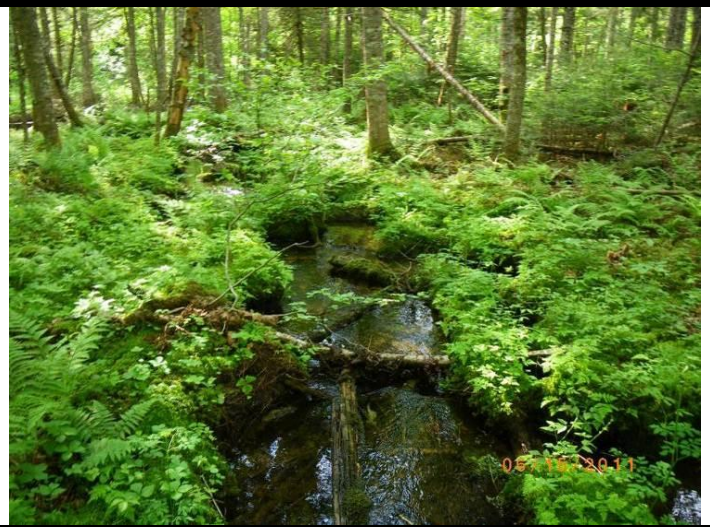



Photo 58 Sisson Brook reach S1C6 looking DS mid-reach.	**Photo 59** Sisson Brook reach S1C6 looking US at waterfall in the lower half of reach.
Photo 60 Sisson Brook reach S1D2 looking US near the start of the watercourse.	**Photo 61** Sisson Brook reach S1D2 looking US near reach-end in headwaters area.

Sisson Brook	
Photo 62 Sisson Brook reach S1D3 looking US in alder-dominated area within the upper half of reach.	**Photo 63** Sisson Brook reach S1D3 looking DS in lower half of reach.
Photo 64 Sisson Brook reach S1D4 looking US near mid-reach.	**Photo 65** Sisson Brook reach S1E1 looking US at active beaver pond near the beginning of watercourse.

Sisson Brook	

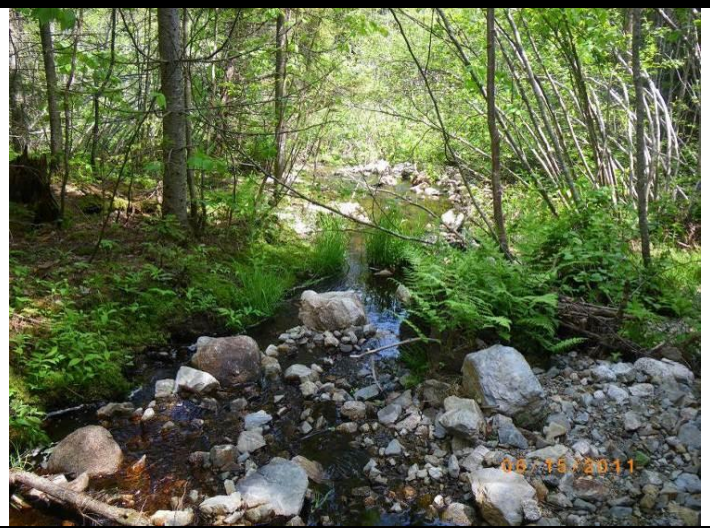
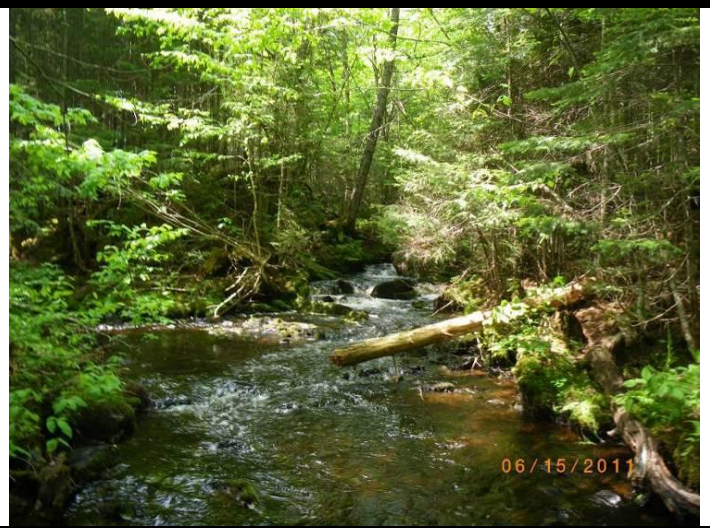



Photo 66 Sisson Brook reach S1E1 looking US near mid-reach.	**Photo 67** Sisson Brook reach S1E2 looking US near mid-reach.
Photo 68 Sisson Brook reach S2A1 looking US in former beaver pond area near reach-start.	**Photo 69** Sisson Brook reach S2A1 looking DS in alder-dominated area of the lower reach.

Sisson Brook	
Photo 70 Sisson Brook reach S2A2 looking US.	**Photo 71** Sisson Brook reach S2A3 looking DS.
Photo 72 Sisson Brook reach S2A4 looking DS near mid-reach.	**Photo 73** Sisson Brook reach S2B1 looking downstream near mid-reach.

Sisson Brook	
	
Photo 74 Sisson Brook reach S2B1 looking US near the end of reach.	**Photo 75** Sisson Brook reach S3A1 looking US near the start of reach.
Photo 76 Sisson Brook reach S3A2 looking DS near mid-reach.	**Photo 77** Sisson Brook reach S3A2 looking US from the right bank.

Sisson Brook

Photo 78 Sisson Brook reach S3A3 looking DS near reach-start.

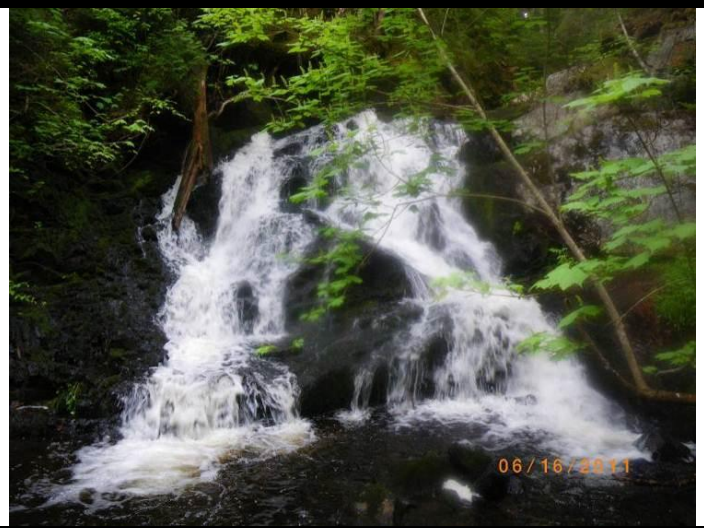


Photo 79 Sisson Brook reach S3A3 looking US from below waterfall at mid-reach.

Photo 80 Sisson Brook reach S3A4 looking US near mid-reach.

McBean Brook	
Photo 81 McBean Brook reach M1K2 looking US in headwaters area near mid-reach.	**Photo 82** McBean Brook reach M1K3 looking US in buffer stripped area of high windthrow where water-course becomes defined 100 m from reach-end.
Photo 83 McBean Brook reach M1K4 looking DS in cleared/ herbicide treated powerline right of way at mid-reach.	**Photo 84** McBean Brook reach M1K5 looking DS in undefined area of underground flow near 50 m below road crossing.

McBean Brook	
Photo 85 McBean Brook reach M1K6 looking US in very low flow area of powerline right of way drainage.	**Photo 86** McBean Brook reach M1L1 looking DS below road crossing.
Photo 87 McBean Brook reach M1L1 looking DS where watercourse meets low-grade wetland clearing and pond.	**Photo 88** McBean Brook reach M1M1 looking US in spring-fed area near reach-start.

McBean Brook	
Photo 89 McBean Brook reach M1M1 looking DS in low-grade wetland clearing near mid-reach.	**Photo 90** McBean Brook reach M1M2 looking US where watercourse enters low-grade wetland clearing.
Photo 91 McBean Brook reach M1M3 looking US in wetland clearing where watercourse meets wetland pond.	**Photo 92** McBean Brook reach M1M4 looking US in multi-channel wetland area near mid-reach.

McBean Brook	
Photo 93 McBean Brook reach M1M5 looking US in wetland pond which encompasses the entire reach.	**Photo 94** McBean Brook reach M1N1 looking US below former beaver dam and pond area/ clearing.
Photo 95 McBean Brook reach M1N1 looking DS at natural deadwater within cleared/herbicide treated powerline right of way.	**Photo 96** McBean Brook reach M1N2 looking US near reach-start.

McBean Brook	
Photo 97 McBean Brook reach M1N3 looking DS near reach-start.	**Photo 98** McBean Brook reach M2D2 looking westward into weland/ bog area 100 m from reach-start.
Photo 99 McBean Brook reach M2D2 looking DS in backwatered area due to beaver activities near mid-reach.	**Photo 100** McBean Brook reach M2D2 looking DS in first area of reach with visible flow 100 m from reach-end.

McBean Brook	
Photo 101 McBean Brook reach M2D3 looking DS in area of dense alder cover at mid-reach.	**Photo 102** McBean Brook reach M2D4 looking US approximately 80 m below road crossing/ active beaver pond.
Photo 103 McBean Brook reach M2D4 looking US at reach-end.	**Photo 104** McBean Brook reach M2E1 looking DS in wetland clearing/ natural deadwater area of high beaver activity 160 m below reach-start.

McBean Brook	
Photo 105 McBean Brook reach M2E1 looking US in natural deadwater area of high beaver activity 350 m below reach-start.	**Photo 106** McBean Brook reach M2E1 looking US from beaver dam in natural deadwater area at mid-reach.
Photo 107 McBean Brook reach M2E1 looking upstream in area of increased grade 300 m from reach-end.	**Photo 108** McBean Brook reach M2E2 looking DS near reach-start.

McBean Brook
Photo 109 McBean Brook reach M2E2 looking DS near mid-reach.

West Branch Napadogan Brook	
Photo 110 West Branch Napadogan Brook reach W1F1 looking downward at the start of reach in headwaters area of underground flow.	**Photo 111** West Branch Napadogan Brook reach W1F1 looking US near mid-reach.
Photo 112 West Branch Napadogan Brook reach W1F2 looking US near mid-reach.	**Photo 113** West Branch Napadogan Brook reach W1F3 looking US near mid-reach.

West Branch Napadogan Brook	
Photo 114 West Branch Napadogan Brook reach W1F4 looking from the right bank into active beaver pond 150 m above road in the first half of reach.	**Photo 115** West Branch Napadogan Brook reach W1F4 looking US at reach-end in front of former beaver dam.
Photo 116 West Branch Napadogan Brook reach W1F5 looking DS in former beaver pond/ grassy clearing at mid-reach.	**Photo 117** West Branch Napadogan Brook reach W1G2 looking US in headwaters area of underground flow near reach-start.

West Branch Napadogan Brook	
Photo 118 West Branch Napadogan Brook reach W1G2 looking DS 50 m below road crossing near mid-reach.	**Photo 119** West Branch Napadogan Brook reach W1G3 looking US 70 m from reach-end.
Photo 120 West Branch Napadogan Brook reach W1G4 looking US near mid-reach.	**Photo 121** West Branch Napadogan Brook reach W1G5 looking US in area of high deadfall 70 m below reach-start.

West Branch Napadogan Brook	
Photo 122 West Branch Napadogan Brook reach W1G6 looking US in grassy area near mid-reach.	**Photo 123** West Branch Napadogan Brook reach W1N2 looking US where watercourse flows below ground in headwaters area at reach-start.
Photo 124 West Branch Napadogan Brook reach W1N2 looking US at active beaver pond 100 m below reach-start.	**Photo 125** West Branch Napadogan Brook reach W1N3 looking DS in area of below and above ground flow 100 m from reach-start.

West Branch Napadogan Brook	
Photo 126 West Branch Napadogan Brook reach W1N3 looking DS 50 m from reach-end.	**Photo 127** West Branch Napadogan Brook reach W2B1 looking US in riffled/ gravely area near mid-reach.
Photo 128 West Branch Napadogan Brook reach W2B1 looking upstream from the main West Branch Napadogan Brook at the mouth of the reach.	**Photo 129** West Branch Napadogan Brook reach W2B1 looking DS in former beaver pond/ clearing 150 m from reach-start.

West Branch Napadogan Brook	
Photo 130 West Branch Napadogan Brook reach W2B1 looking DS in area of dense alder cover near reach-end.	**Photo 131** West Branch Napadogan Brook reach W2B1 looking into active beaver pond located at the reach-end in the main West Branch Napadogan Brook.

Appendix D

DFO/NBDNR Habitat Surveys with Qualitative Electrofishing

Appendix D-1

DFO/NBDNR Data Summary Tables followed by Field Forms

Table D-1.1 Modified DFO/NBDNR Stream Survey Forms for the Watercourses within the Study Area--Qualitative Fish Surveys

Watercourse	East	North	Reach No	Stream Type	Channel Type	Length (m)	Avg Width (m)		Substrate (%)							Avg. Bank Full Depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris	Embeddedness	Obstructions to fish passage (y/n)	Comments	% Site		% Shade	Stream Banks														DO (mg/L)	pH	Specific Conductivity (µS/cm)	Temp. C		Sinuosity (>or < 2)	Grade (>4% or <4%)	Depth			Pool rating Criteria		Pool Tail				
																												Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%																						
							Wet	Chan. Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines			L	R	L	R								Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding																1/4 (cm)	1/2 (cm)	3/4 (cm)								
																										Riffle / Ran	Pools																															
B1A5 (Bird Brook)	2456500.721	7488611.970	DS	6/8	1	100	2.30	2.70	0	5	5	0	5	40	45	40	15	5	5	40	40	35	4	N	Wooden road/culvert and 2 old beaver dams approximately 25 m downstream and 55 m downstream.	100	0	20	0	75	20	5	47.5	0	2.5	47.5	0	2.5	9.56	7.0	28.2	15.1	23.0	-	-	11.0	19.0	13.0	-	-	-	-	-	-
			US	6/8	1	100	1.50	1.80	0	10	5	0	15	45	25	40	34	0	0	70	70	20	2	N	First 30 m above road clearing/former beaver pond; then enclosed shrubs and narrower watercourse.	100	0	35	0	50	50	0	50	0	0	50	0	0	-	-	-	-	23.0	-	-	37.0	40.0	27.0	-	-	-	-	-	-
B1C1 (Bird Brook)	2455914.526	7488284.107	US	8	1	100	0.51	0.78	0	0	5	5	30	35	25	40	8.2	30	30	15	15	30	3	N	Small head waters. fish observed downstream.	100	0	65	0	50	40	10	50	0	0	50	0	0	7.79	5.4	23.0	11.6	20.2	-	-	7.0	7.2	6.2	-	-	-	-	-	-
			DS	8	1	100	0.29	0.31	0	0	5	5	20	35	35	40	19.5	10	10	30	30	5	3	N	Wetland opens into grass meadow and reach ends at old beaver dam.	100	0	45	0	60	30	10	50	0	0	50	0	0	-	-	-	-	-	-	-	14.6	16.0	14.5	-	-	-	-	-	-
B1D3 (Bird Brook)	2456495.760	7487222.922	US	5/8	1	100	1.06	1.77	0	0	0	5	5	70	20	20	12	65	65	65	65	>100	1	N	36 cm bank full height clear cut right bank.	100	0	80	0	50	40	10	50	0	0	50	0	0	8.62	6.2	24.6	13.9	25.0	-	-	5.0	6.1	4.3	-	-	-	-	-	-
			DS	5/8	1	100	1.20	1.64	0	0	5	15	20	50	10	20	10	95	95	25	25	20	1	N	Channel is downcutting in lower end.	100	0	70	0	65	20	15	20	0	30	20	0	30	-	-	-	-	-	-	-	8.2	5.6	4.6	-	-	-	-	-	-
B1H1 (Bird Brook)	2459254.978	7487652.942	US/DS	8	1	200	0.37	0.40	0	15	10	5	30	30	10	10	19	0	0	80	80	80	3	N	Headwater with no defined channel. likely not fish habitat until further downstream. No fish form. watercourse starts NE of road flowing underground.	100	0	50	0	30	40	30	50	0	0	50	0	0	6.73	5.9	36.1	15.2	17.0	<2	≥4	-	-	-	-	-	-	-	-	-
B2A2 (Bird Brook)	2458262.965	7488321.842	US	5/8	1	100	1.50	3.50	0	2	3	10	25	50	10	13.5	32.2	35	35	40	40	>100	1	N	Braided multi-channel.	100	0	55	0	40	40	20	50	0	0	50	0	0	9.72	5.9	20.9	13.6	21.0	>2	<4	-	-	-	-	-	-	-	-	-
			DS	5/8	1	100	1.70	4.20	0	2	8	5	25	55	5	28.2	51.3	40	40	30	30	>100	1	N	More open sections downstream unobstructed flow.	100	0	55	0	40	40	20	50	0	0	50	0	0	-	-	-	-	-	>2	<4	-	-	-	-	-	-	-	-	-
B3A1 (Bird Brook)	2456535.449	7487785.101	US2	8/24	1	100	3/20*	4/30*	0	0	5	15	10	40	30	30/200*	25	20	20	30	30	40	1/3*	N	Culvert washed out. first 30 m of reach wetland pond*.	40	60	15	0	60	30	10	50	0	0	50	0	0	8.10	5.9	26.4	12.4	16.0	<2	<4	-	-	-	2	a	2	-	-	0
			DS1	8/5	1	100	3.00	4.50	0	0	0	5	25	50	20	14.7	25	10	10	50	30	>100	1	N		100	0	65	0	50	40	10	50	0	0	50	0	0	-	-	-	-	-	>2	<4	-	-	-	-	-	-	-	-	-
			US1	8/24	1	100	3.00	4.00	0	0	5	15	10	40	30	30/200*	26	20	20	30	30	40	1/3*	N		40	60	15	0	60	30	10	50	0	0	50	0	0	-	-	-	-	-	<2	<4	-	-	-	2	a	2	-	-	0
B3A6 (Bird Brook)	2456818.218	7487540.418	US	8/13	1	100	2.50	3.50	0	15	5	0	20	40	20	90	60	15	15	30	30	40	3	N	More trees beaver dam.	100	0	30	10	40	40	10	50	0	0	50	0	0	8.90	6.4	24.3	14.2	18.0	<2	<4	-	-	-	-	-	-	-	-	-
			DS	8/13	1	100	4.50	7.00	0	5	20	0	20	35	20	80	60	15	15	30	30	>100	3	N	Beaver dams throughout, no suitable rocks to collect periphyton upstream or downstream.	100	0	60	0	40	40	20	50	0	0	50	0	0	-	-	-	-	-	>2	<4	-	-	-	-	-	-	-	-	-
B3A9 (Bird Brook)	2457894.730	7487451.122	US	4/8	1	100	3.50	5.00	0	10	30	20	20	10	10	56	29	10	10	20	20	20	1	N	0.0 sal. Nice watercourse; several hydraulic jumps upstream and downstream.	90	10	40	0	20	60	20	50	0	0	50	0	0	8.78	5.7	24.7	12.8	20.0	<2	≥4	-	-	-	3	b	1	-	-	100
			DS	4/8	1	100	3.50	5.00	0	10	30	20	20	10	10	54	32	10	10	20	20	20	1	N	Hydro station 60 m upstream of station mid point.	90	10	45	0	25	65	10	50	0	0	50	0	0	-	-	-	-	-	<2	≥4	-	-	-	3	b	1	-	-	100
S1C3 (Sisson Brook)	2457914.560	7486217.851	US/DS	8	1	200	0.42	0.85	0	25	20	0	0	60	5	50	8.5	15	15	10	10	>100	1	N	Stream consistent over 200 m.	100	0	80	0	50	10	40	50	0	0	50	0	0	9.27	5.6	21.5	12.0	17.0	<2	≤4	-	-	-	-	-	-	-	-	-
S1D3 (Sisson Brook)	2458263.803	7486511.532	US	4/8	1	100	0.60	0.65	0	15	30	5	0	10	40	45	10	85	85	60	60	10	3	N	Upstream has lots of braiding and predominately flows below ground - beginning of headwaters?	100	0	75	0	60	5	35	40	10	0	40	10	0	9.64	6.7	25.8	10.6	-	>2	<4	-	-	-	-	-	-	-	-	-
			DS	4/8	1	100	0.78	1.10	0	25	20	0	0	5	50	37	13	80	80	45	45	10	3	N		100	0	75	0	60	5	35	45	5	0	45	5	0	-	-	-	-	-	>2	<4	-	-	-	-	-	-	-	-	-
S2A2 (Sisson Brook)	2458402.356	7485666.087	US	4/8	1	100	1.16	2.93	0	15	35	20	10	10	10	56	19.6	5	5	10	10	20	1	N	Increase in grade as you go upstream open watercourse with few alders.	100	0	65	0	50	30	20	50	0	0	50	0	0	9.96	6.1	26.2	13.9	22.0	<2	≤4	-	-	-	-	-	-	-	-	-
			DS	3/8	1	100	2.75	3.64	5	15	30	20	10	10	10	47	15	5	5	15	15	30	1	N	Valley walls move away - more open.	100	0	60	0	50	25	25	50	0	0	50	0	0	-	-	-	-	-	<2	≤4	-	-	-	-	-	-	-	-	-
S2A3 (Sisson Brook)	2458553.516	7485983.699	DS	3/8	1	100	3.60	4.50	0	5	20	30	25	15	5	45	17	10	10	15	15	30	1	Y	Perched culvert. * deeper area at old road crossing/culvert.	100	0 *	70	0	30	50	20	45	0	5	45	0	5	10.42	6.6	28.3	14.3	24.0	<2	<4	-	-	-	-	-	-	-	-	-
			US	3/8	1	100	1.75	2.00	0	15	30	25	15	10	5	38	15	10	10	10	10	15	1	N	Water chemistry upstream of culvert, increased shrubs and lower grade downstream of site.	100	0	65	0	50	30	20	50	0	0	50	0	0	-	-	-	-	24.0	<2	≤4	-	-	-	-	-	-	-	-	-
S3A2 (Sisson Brook)	2459351.219	7486134.509	US/DS	4/8	1	200	5.00	7.00	15	25	15	15	10	15	5	0.4	0.85	15	15	30	30	>100	1	Y	Waterfall downstream appears flashy.	70	30	70	5	33	33	30	25	0	25	25	0	25	9.55	6.4	28.7	13.1	23.0	<2	>4	-	-	-	3	b	1	-	-	80
M1K4 (McBean Brook)	2456844.964	7485069.692	US	5/8	1	100	0.73	1.20	0	0	0	5	10	45	40	35	16	0	0	90	90	20	3	Y	Could not find the upstream end of culvert - possibly blocked? Stream widened above road.	100	0	70	0	20	70	10	50	0	0	50	0	0	7.42	6.3	22.7	14.3	17.0	>2	<4	-	-	-	-	-	-	-	-	-
			DS	4/8	1	100	0.67	0.74	0	15	10	5	0	25	45	47	17	20	20	40	40	10	2	Y		100	0	75	0	45	35	20	50	0	0	50	0	0	-	-	-	-	-	>2	<4	-	-	-	-	-	-	-	-	-
M1M2 (McBean Brook)	2457222.382	7484833.822	US	5	3 *	100	0.38	0.59	0	0	0	5	5	30	60	14	7	10	10	80	80	5	3	N	* Multiple drainages from beaver pond upstream - converge at start of downstream section. Upstream from site in woods and beaver pond at upstream point.	100	0	70	0	30	20	50	50	0	0	50	0	0	6.72	6.5	34.1	15.5	16.0	>2	≤4	-	-	-	-	-	-	-	-	-
			DS	1	1	100	1.60	2.75	0	0	0	0	0	20	80	39	45	0	0	10	10	0	4	N	Beaver pond at end of site. * still water.	100 *	0	10	0	100	0	0	50	0	0	50	0	0	-	-	-	-	-	>2	<4	-	-	-	-	-	-	-	-	-
M1N1 (McBean Brook)	2457506.591	7484432.104	US	5/8	1	100	1.20	1.64	0	0	5	0	0	30	65	21.5	9.5	20	20	15	15	5	4	N	Old beaver pond.	100	0	10	0	80	20	0	50	0	0	50	0	0	8.08	6.0	24.7	15.5	-	>2	<4	-	-	-	-	-	-	-	-	-
			DS	8/24	1	100	3.60	4.30	0	0	0	0	0	10	90	52	22	0	0	5	5	5	4	N	Deadwater in powerline cut - heavy silt.	0	100	0	0	60	40	0	50	0	0	50	0	0	-	-	-	-	-	<2	<4	-	-	-	-	-	-	-	-	-
M2E1 (McBean Brook)	2456460.467	7483956.468	US	5/13	1	100	3.50	4.50	0	5	5	5	15	40	30	40	25	5	5	25	25	>100	2	N	Looks like active beaver signs of fresh chewings.	80	20	75	0	45	30	25	45	0	5	45	0	5	6.30	5.2	21.7	15.4	19.0	<2	<2	-	-	-	4	b	2	-	-	0
			DS	3/5/8	1	100	3.50	4.50	0	5	5	5	15	40	30	40	25	5	5	25	25	>100	2	N		100	0	75	0	45	30	25	45	0	5	45	0	5	-	-	-	-	-	>2	<2	-	-	-	-	-	-	-	-	-
M3A1 (McBean Brook)	2453805.091	7485675.665	US	3/8	1	100	1.95	2.07	0	10	10	15	40	20	5	43	13	60	60	65	65	10	2	N	Lower part above bridge small pond, then narrows to riffle.	100	0	45	0	40	40	20	50	0	0	50	0	0	9.22	6.7	30.9	13.7	20.0	<2	<4	-	-	-	-	-	-	-	-	-
			DS	4/8	1	100	4.33	3.21	0	30	20	10	15	20	5	43	17	45	45	60	60	20	1	N		100	0	45	0	20	65	15	50	0	0	50	0	0	-	-	-	-	-	<2	<4	-	-	-	-	-	-	-	-	-
M3C3 (McBean Brook)	2456156.439	7483852.523	US	4/8	1	100	3.75	4.25	0	5	25	20	15	30	5	0.75	0.55	20	20	80	80	30	1	N	Clearcut right bank? Stream widens at culvert.	80	20	15	0	50	45	5	50	0	0	50	0	0	8.00	6.3	27.8	19.1	-	<2	<4	-	-	-	3	b	1	-	-	0
			DS	3/8	1	100	5.10	5.60	0	10	15	20	20	30	5	0.6	0.45	10	10	85	85	>100	1	N	Braiding approximately 30 m downstream - channel splits in two.	85	15	50	0	45	45	10	50	0	0	50	0	0	-	-	-	-	-	<2	<4	-	-	-	3	b	1	-	-	80
M4A9 (McBean Brook)	2454190.261	7482653.857	US/DS	24	1	200	30.00	40.00	0	0	0	0	0	0	100	-	>100	10	10	10	10	20	4	N	Note: site deep/deadwater (natural) comprised of 100% fines. Could not electrofish or collect rocks for periphyton. Set minnow traps at 11:30am. All deadwatered. Low to no flow assessed as one reach as there is minimal flow.	0	100	5	0	25	55	20	50	0	0	50	0	0	6.31	6.3	33.3	17.6	20.0	-	-	-	-	-	3	a	4	-	-	0
W1G5 (West Branch Napadogan Brook)	2455045.886	7489493.329	DS	5/8	1	100	1.11	1.41	0	0	10	15	20	30	25	36	16	80	80	55	55	25	2	N		100	0	65	0	40	40	20	50	0	0	50	0	0	10.50	7.0	30.5	9.1	17.0	<2	<4	-	-	-	-	-	-	-	-	-
			US	5/8	1	100	0.60	0.78	0	0	5	0	20	50	25	51	25	80	80	40	40	30	2	N	Culvert but not obstruction - slight perch.	100	0	70	0	60	10	30	50	0	0	50	0	0	-	-	-	-	-	<2	<4	-	-	-	-	-	-	-	-	-
W1N3 (West Branch Napadogan Brook)	2457734.525	7489162.982	US/DS	4/8	1	200	1.24	2.45	0	30	30	10	10	15	5	43	15	10	10	30	30	20	1	N	Beaver pond upstream of this site, large pond. Site is in higher grade riffle section.	100	0	85	5	35	50	10	40	10	0	40	10	0	7.83	5.3	22.9	16.7	20.0	>2	<4	-	-	-	-	-	-	-	-	-
W2A4 (West Branch Napadogan Brook)	2454505.013	7490306.891	DS	5/8	1	100	4.50	5.50	0	0	5	5	25	45	20	55	24	15	15	30	30	30	2	N	Below bridge old beaver pond and dam.	100	0	35	0	45	45	10	30	20	0	30	20	0	8.87	6.3	26.4	13.3	17.0	<2	<4	-	-	-	-	-	-	-	-	-
			US	3/8	1	100	3.40	3.90	0	10	10	10	20	40	10	60	30	30	30	30	30	20	2	N	Consistent, lots of alders.	100	0	55	0	30	60	10	45	5	0	45	5	0	-	-	-	-	-	<2	<4	-	-	-	-	-	-	-	-	-
W4A1 (West Branch Napadogan Brook)	2457577.223	7489837.279	US	13	1	100	25.00	27.00	0	0	0	5	25	40	30	-	>100	10	10	15	15	>100	0	N	Beaver backwater with solid bottom.	100	0	15	5	35	40	20	50	0	0	50	0	0	8.92	6.6	29.1	16.5	-	-	-	-	-	-	2	a	2	-	-	0
			DS	8/13	1	100	17.00	20.00	0	0	5	10	35	30	20	-	40	5	5	25	25	>100	2	N	Downstream of beaver dams some deep pools >1 m.	80	20	15	5	5	60	30	50	0	0	50	0	0	-	-	-	-	-	-	-	-	-	-	3	b	2	-	-	0
W4A17 (West Branch Napadogan Brook)	2459557.590	7488670.489	US/DS	3/8	1	200	5.00	5.50	0	5	20	30	15	30	0	80	70	0	0	15	15	10	1	N	Consistent across 200 m.	85	15	30	0	20	60	20	50	0	0	50	0	0	9.87	6.9	26.1	15.3	-	<2	<4	-	-	-	3	b	1	-	-	100
W4A21 (West Branch Napadogan Brook)	2459639.827	7486461.491	US	4/8	1	100	10.00	10.50	5	60	20	10	5	0	0	150	0.6	0	0	5	5	0	1	N	Overflow channel at turn.	85	15	45	5	30	20	45	40	10	0	45	0	5	10.38	7.0	24.9	15.3	18.0	>2	<4	-	-	-	2	b	1	-	-	95
			DS	4/8	1	100	5.00	6.00	20	50	10	5	10	5	0	150	0.6	0	0	5	5	0	1	N	Overflow channel at turn.	85	15	50	30	20	10	40	30	15	5	15	30	5	-	-	-	-	-	>2	<4	-	-	-	3	b	1	-	-	95
W4A25 (West Branch Napadogan Brook)	2459967.025	7484892.514	US	4/8	1	100	8.00	16.00	0	30	30	25	10	5	0	135	38	0	0	30	30	0	1	N		100	0	55	0	20	15	65	45	5	0	45	5	0	9.66	6.7	24.9	16.7	20.0	<2	>4	-	-	-	-	-	-	-	-	-
			DS	4/8	1	100	10.50	15.50	10	15	40	20	10	5	0	140	32	0	0	30	30	0	1	N		100	0	50	5	30	5	60	35	10	5	35	5	10	-	-	-	-	-	<2	>4	-	-	-	-	-	-	-	-	-
W4A31 (West Branch Napadogan Brook)	2460930.750	7484102.549	US	3/8	1	100	6.00	8.00	0	5	35	40	10	5	5	70	27	10	10	10	10	15	1	N	Atlantic salmon collected here; no BT. Alders on banks.	100	0	15	0	35	45	20	50	0	0	50	0	0	9.82	6.4	25.1	16.2	20.0	<2	≥4	-	-	-	-	-	-	-	-	-
			DS	3/8	1	100	10.00	12.00	5	5	30	40	10	5	5	70	43.5	10	10	10	10	15	1	N	Bridge at end of site likely only used by ATV.	100	0	15	0	40	40	20	50	0	0	50	0	0	-	-	-	-	-	<2	≥4	-	-	-	-	-	-	-	-	-
EBNB1 (East Branch Napadogan Brook)	2461524.725	7489544.522	US	3/8	1	100	6.50	10.00	10	15	20	35	17.5	2.5	0	71	23	5	10	60	30	15	1	N	Bedrock left bank and cedar above.	90	10	55	0	20	60	20	30	20	0	50	0	0	9.66	7.0	37.7	17.7	20.0	<2	<4	-	-	-	*(<0.5m)	-	1	-	-	60
			DS	3/8	1	100	9.60	12.60	0	20	25	30	20	5	0	97	34	0	5	30	30	20	1	N	Slower water / more shallow pools.	60	40	25	0	30	70	0	50	0	0	50	0	0	-	-	-	-	-	<2	<4	-	-	-	*(<0.5m)	-	1	-	-	80
EBNB2 (East Branch Napadogan Brook)	2462468.540	7486699.547	US/DS	3/8	1	200	9.50	11.50	0	10	20	40	20	5	5	17	45	5	5	20	20	30	1	N	Right bank wet and boggy; Atlantic salmon collected; not much large woody debris but stream structure looks good some lateral bars.	90	10	10	5	40	35	20	50	0	0	50	0	0	9.69	6.9	33.9	16.8	18.0	<2	2	-	-	-	3	b	1	-	-	80
EBNB3 (East Branch Napadogan Brook)	2461998.324	7485436.053	US	5/13/24	3	100	0.40 *	1.40	0	0	5	0	15	30	50	70	20	0	0	30	30	5	4	Y	* braided channels approximately 40 cm wide, upper beaver pond approximately 30 m wide, smaller ponds below approximately 10 m. Lots of beaver activity upstream and downstream. Culvert at road may be blocked - water flowing over road approximately 3-4 beaver dams in site.	100	0	40	0	20	40	40	50	0	0	50	0	0	8.82	6.1	19.8	16.8	-	>2	<4	-	-	-	-	-	-	-	-	-
			DS	5/13/24	1	100	0.60	1.30	0	0	5	5	10	20	60	70	30	0	0	35	35	10	4	Y	* % shade 20% shade in clearing/ former beaver pond area and 50% elsewhere - banks in clearing (30 of 100 m reach) are dominated by grass.	100	0	20/50 *	0	15	50	35	50	0	0	50	0	0	-	-	-	-	-	>2	<4	-	-	-	-	-	-	-	-	-
NRC (Nashwaak River)	2449385.424	7490120.152	US	3/8	1	100	14.00	15.00	0	2	10	25	50	10	3	100	35	20	30	45	45	0	1	N	Some aquatic plants.	100	0	10	5	25	60	10	50	0	0	50	0	0	9.35	6.8	27.9	9.7	11.0	<2	<4	-	-	-	-	-	-	-	-	-
			DS	3/8	1	100	12.00	12.00	0	2	10	30	40	15	3	110	40	10	10	45	45	0	1	N		100	0	10	5	20	60	15	50	0	0	50	0	0	-	-	-	-	-	<2	<4	-	-	-	-	-	-	-	-	-

Table D-1.2 Stream Discharge

Stream Name	Sampling Date	Wet Width (m)	Depth (m)			Average Depth^	Coefficient (0.9 smooth, 0.8 rough)	Length of Run (m)	Float Time (s)				Average Flow Time (s)	Average Velocity (m/s)	Discharge** m^3/s
			1/4 way	1/2 way	3/4 way				Run	1/4 way	2/4 way	3/4 way			
B1A5 (Bird Brook)	22-Jul-11	1.9	0.209	0.335	0.277	0.27	0.8	1	1st	6.0	6.0	4.0	4.56	0.22	0.091
									2nd	4.0	4.0	4.0			
									3rd	5.0	4.0	4.0			
									Avg	5.0	4.7	4.0			
B1C1 (Bird Brook)	21-Jul-11	0.51	0.06	0.09	0.08	0.08	0.9	1	1st	19.0	16.0	15.0	17.22	0.06	0.002
									2nd	22.0	15.0	14.0			
									3rd	24.0	16.0	14.0			
									Avg	21.7	15.7	14.3			
B1D3 (Bird Brook)	20-Jul-11	1.15	6.6	5.85	4.45	5.63	0.8	1	1st	16.0	22.0	22.0	19.22	0.05	0.270
									2nd	17.0	22.0	22.0			
									3rd	12.0	20.0	20.0			
									Avg	15.0	21.3	21.3			
B2A2 (Bird Brook)	22-Jul-11	1.10	0.23	0.28	0.23	0.25	0.8	1	1st	3.0	3.0	4.0	3.89	0.26	0.056
									2nd	3.0	4.0	5.0			
									3rd	3.0	3.0	7.0			
									Avg	3.0	3.3	5.3			
B3A1 (Bird Brook)	27-Jul-11	3.00	0.115	0.135	0.118	0.12	0.9	1	1st	4.0	3.0	4.9	4.47	0.22	0.074
									2nd	4.5	4.0	5.0			
									3rd	4.9	4.0	5.9			
									Avg	4.5	3.7	5.3			
B3A6 (Bird Brook)	3-Aug-11	10.00	0.65	NA	0.38	0.52	0.9	2	1st	7.0	NA	13.0	10.17	0.20	0.912
									2nd	9.0	NA	10.0			
									3rd	10.0	NA	12.0			
									Avg	8.7	0.0	11.7			
B3A9 (Bird Brook)	5-Aug-11	4.00	0.34	0.28	0.19	0.27	0.8	2	1st	6.0	3.0	4.0	4.33	0.46	0.399
									2nd	6.0	2.0	6.0			
									3rd	4.0	4.0	4.0			
									Avg	5.3	3.0	4.7			
S1C3 (Sisson Brook)	29-Jul-11	0.50	0.3	0.13	0.1	0.18	0.9	1	1st	NA	13.0	NA	13.33	0.08	0.006
									2nd	NA	13.0	NA			
									3rd	NA	14.0	NA			
									Avg	NA	13.3	NA			
S1D3 (Sisson Brook)	5-Aug-11	0.50	NA	0.122	NA	0.12	0.8	0.5	1st	NA	4.0	NA	3.33	0.15	0.007
									2nd	NA	3.0	NA			
									3rd	NA	3.0	NA			
									Avg	NA	3.3	NA			
S2A2 (Sisson Brook)	25-Jul-11	3.53	0.26	0.262	0.19	0.24	0.8	2	1st	10.0	9.0	7.0	8.89	0.23	0.151
									2nd	10.0	9.0	8.0			
									3rd	10.0	8.0	9.0			
									Avg	10.0	8.7	8.0			
S2A3 (Sisson Brook)	25-Jul-11	2.68	-	-	-	0.16	0.8	1	1st	10.0	6.0	4.0	5.89	0.17	0.058
									2nd	7.0	7.0	4.0			
									3rd	7.0	4.0	4.0			
									Avg	8.0	5.7	4.0			
S3A2 (Sisson Brook)	29-Jul-11	5.00	0.15	0.195	0.145	0.16	0.8	1	1st	17.0	8.0	9.0	10.89	0.09	0.060
									2nd	16.0	9.0	9.0			
									3rd	14.0	9.0	7.0			
									Avg	15.7	8.7	8.3			
M1K4 (McBean Brook)	27-Jul-11	0.95	6	7	7	6.67	0.8	1	1st	5.0	NA	4.0	4.50	0.22	1.126
									2nd	4.0	NA	5.0			
									3rd	5.0	NA	4.0			
									Avg	4.7	0.0	4.3			
M1M2 (McBean Brook)	27-Jul-11	0.55	0.03	0.07	0.04	0.05	0.9	1	1st	NA	25.0	NA	24.30	0.04	0.001
									2nd	NA	23.0	NA			
									3rd	NA	25.0	NA			
									Avg	NA	24.3	NA			
M1N1 (McBean Brook)	27-Jul-11	0.50	NA	0.18	NA	0.18	0.9	1	1st	NA	11.0	NA	11.00	0.09	0.007
									2nd	NA	11.0	NA			
									3rd	NA	11.0	NA			
									Avg	NA	11.0	NA			
M2E1 (McBean Brook)	28-Jul-11	2.50	0.23	0.245	0.21	0.23	0.8	1	1st	14.0	6.0	9.0	11.44	0.09	0.040
									2nd	15.0	7.0	18.0			
									3rd	16.0	7.0	11.0			
									Avg	15.0	6.7	12.7			
M3A1 (McBean Brook)	26-Jul-11	2.50	0.268	0.339	0.316	0.31	0.8	2	1st	29.5	26.0	36.0	29.67	0.07	0.041
									2nd	29.5	26.0	33.0			
									3rd	31.0	25.0	31.0			
									Avg	30.0	25.7	33.3			
M3C3 (McBean Brook)	28-Jul-11	1.50	0.31	0.37	0.29	0.32	0.8	2	1st	7.0	5.0	7.0	5.89	0.34	0.132
									2nd	6.0	5.0	6.0			
									3rd	7.0	4.0	6.0			
									Avg	6.7	4.7	6.3			
M4A9 (McBean Brook)	8-Aug-11	Natural deadwater - no flow assessed	-	-	-	-	-	-	1st				-	-	
									2nd						
									3rd						
									Avg	0.0	0.0	0.0			
W1G5 (West Branch Napadogan Brook)	26-Jul-11	1.40	-	9.5	-	9.50	0.8	1	1st	NA	9.0	NA	8.00	0.13	1.330
									2nd	NA	7.0	NA			
									3rd	NA	8.0	NA			
									Avg	NA	8.0	NA			
W1N3 (West Branch Napadogan Brook)	9-Aug-11	0.80	0.27	0.332	0.288	0.30	0.8	1	1st	7.0	6.0	NA	6.83	0.15	0.028
									2nd	9.0	6.0	NA			
									3rd	7.0	6.0	NA			
									Avg	7.7	6.0	NA			
W2A4 (West Branch Napadogan Brook)	26-Jul-11	6.20	0.345	0.258	0.16	0.25	0.9	2	1st	19.0	15.0	15.0	16.00	0.13	0.177
									2nd	18.0	14.0	15.0			
									3rd	17.0	17.0	14.0			
									Avg	18.0	15.3	14.7			
W4A1 (West Branch Napadogan Brook)	8-Aug-11	21.00	0.335	0.31	0.385	0.34	0.8	4	1st	52.0	26.0	28.0	33.89	0.12	0.681
									2nd	43.0	33.0	29.0			
									3rd	42.0	27.0	25.0			
									Avg	45.7	28.7	27.3			
W4A17 (West Branch Napadogan Brook)	4-Aug-11	5.00	0.37	0.37	0.37	0.37	0.8	2	1st	4.0	3.0	4.0	3.78	0.53	0.784
									2nd	4.0	3.0	4.0			
									3rd	6.0	2.0	4.0			
									Avg	4.7	2.7	4.0			
W4A21 (West Branch Napadogan Brook)	3-Aug-11	5.00	-	-	-	0.60	0.8	2	1st	6.0	4.0	3.0	4.89	0.41	0.982
									2nd	7.0	5.0	4.0			
									3rd	7.0	4.0	4.0			
									Avg	6.7	4.3	3.7			
W4A25 (West Branch Napadogan Brook)	2-Aug-11	10.00	0.5	0.46	0.6	0.52	0.8	4	1st	7.0	4.0	3.0	5.06	0.79	3.291
									2nd	8.0	5.0	4.0			
									3rd	8.0	3.5	3.0			
									Avg	7.7	4.2	3.3			
W4A31 (West Branch Napadogan Brook)	2-Aug-11	9.00	0.27	0.31	0.21	0.26	0.8	4	1st	7.2	6.7	5.6	6.49	0.62	1.169
									2nd	7.7	5.7	5.4			
									3rd	7.8	6.6	5.7			
									Avg	7.6	6.3	5.6			
EBNB1 (East Branch Napadogan Brook)	8-Aug-11	6.00	0.138	0.348	0.575	0.35	0.8	2	1st	6.0	6.0	9.0	6.78	0.30	0.501
									2nd	5.0	6.0	8.0			
									3rd	6.0	6.0	9.0			
									Avg	5.7	6.0	8.7			
EBNB2 (East Branch Napadogan Brook)	4-Aug-11	5.50	0.23	0.36	0.31	0.30	0.8	2	1st	7.0	4.0	3.0	4.56	0.44	0.580
									2nd	5.0	4.0	4.0			
									3rd	5.0	5.0	4.0			
									Avg	5.7	4.3	3.7			
EBNB3 (East Branch Napadogan Brook)	4-Aug-11	4.50	0.1	0.12	0.12	0.11	0.9	1	1st	10.0	4.0	13.0	8.78	0.11	0.052
									2nd	9.0	6.0	12.0			
									3rd	7.0	5.0	13.0			
									Avg	8.7	5.0	12.7			
NRC (Nashwaak River)	28-Sep-11	14.00	0.33	0.37	0.43	0.38	0.8	4	1st	9.5	10.0	8.5	9.83	2.46	1.716
									2nd	10.0	11.5	9.0			
									3rd	11.0	9.5	9.5			
									Avg	10.2	10.3	9.0			

Notes:

* Stations in Bold are EEM baseline

** Discharge = [W(m) x D(m) x A x L(m)] / T(s)
Where: W=wet width; D=average depth; L=Length; A=coefficient for stream bottom; and T=average float time.

^ Average Depth = sum of depths / number of depth measurements.

Table D-1.3 Catch Per Unit Effort (CPUE) for Qualitative Electrofishing

Station	Fish Species	Number of Captured Fish	Distance fished (m)	Effort (seconds)	CPUE (fish/100 sec)
B1A5	Brook Trout	45	80	651	6.91
B1A5	Slimy Sculpin	1	80	651	0.15
B1A5	**Total Fish**	**46**	**80**	**651**	**7.07**
B1C1	Brook Trout	10	100	441	2.27
B1D3	Brook Trout	21	30	630	3.33
B1H1	<not fish habitat>				
B2A2	American Eel	1	157	755	0.13
B2A2	Brook Trout	11	157	755	1.46
B2A2	Slimy Sculpin	6	157	755	0.79
B2A2	**Total Fish**	**18**	**157**	**755**	**2.38**
B3A1	American Eel	1	100	824	0.12
B3A1	Brook Trout	30	100	824	3.64
B3A1	**Total Fish**	**31**	**100**	**824**	**3.76**
B3A6	American Eel	1	100	596	0.17
B3A6	Brook Trout	10	100	596	1.68
B3A6	Slimy Sculpin	3	100	596	0.50
B3A6	**Total Fish**	**14**	**100**	**596**	**2.35**
B3A9	American Eel	1	150	855	0.12
B3A9	Atlantic Salmon	1	150	855	0.12
B3A9	Brook Trout	15	150	855	1.75
B3A9	Slimy Sculpin	10	150	855	1.17
B3A9	**Total Fish**	**27**	**150**	**855**	**3.16**
M1K4	Brook Trout	5	130	582	0.86
M1M2	Creek Chub	6	Minnow trap		
M1M2	Pearl Dace	8	Minnow trap		
M1N1	Creek Chub	13	Minnow trap		
M1N1	Pearl Dace	3	Minnow trap		
M2E1	American Eel	1	150	633	0.16
M2E1	Blacknose Dace	2	150	633	0.32
M2E1	Brook Trout	9	150	633	1.42
M2E1	**Total Fish**	**12**	**150**	**633**	**1.90**
M3A1	Blacknose Dace	2	1732	1121	0.18
M3A1	Brook Trout	51	1732	1121	4.55
M3A1	Sea Lamprey	1	1732	1121	0.09
M3A1	**Total Fish**	**54**	**1732**	**1121**	**4.82**
M3C3	American Eel	2	170	1080	0.19
M3C3	Blacknose Dace	32	170	1080	2.96
M3C3	Brook Trout	1	170	1080	0.09
M3C3	Creek Chub	8	170	1080	0.74
M3C3	Common Shiner	2	170	1080	0.19
M3C3	Sea Lamprey	1	170	1080	0.09
M3C3	Longnose Sucker	1	170	1080	0.09
M3C3	**Total Fish**	**47**	**170**	**1080**	**4.35**
M4A9	American Eel	1	Minnow trap		
M4A9	Blacknose Dace	13	Minnow trap		
M4A9	Creek Chub	6	Minnow trap		
M4A9	Common Shiner	36	Minnow trap		
M4A9	Longnose Sucker	1	Minnow trap		
S1C3	Brook Trout	9	100	470	1.91
S1D3	Brook Trout	11	90	468	2.35
S2A2	Brook Trout	12	150	1344	0.89
S2A3	American Eel	2	175	1524	0.13
S2A3	Brook trout	32	175	1524	2.10
S2A3	**Total Fish**	**34**	**175**	**1524**	**2.23**
S3A2	American Eel	1	141	1420	0.07
S3A2	Brook Trout	16	141	1420	1.13
S3A2	**Total Fish**	**17**	**141**	**1420**	**1.20**
W1G5	Brook Trout	54	120	749	7.21
W1N3	Brook Trout	14	100	698	2.01
W1N3	Slimy Sculpin	9	100	698	1.29
W1N3	**Total Fish**	**23**	**100**	**698**	**3.30**
W2A4	Brook Trout	14	160	821	1.71
W2A4	Sea Lamprey	15	160	821	1.83
W2A4	Slimy Sculpin	21	160	821	2.56
W2A4	**Total Fish**	**50**	**160**	**821**	**6.09**
W4A1	American Eel	5	60	1813	0.28
W4A1	Atlantic Salmon	1	60	1813	0.06
W4A1	Brook Trout	12	60	1813	0.66
W4A1	Sea Lamprey	2	60	1813	0.11
W4A1	Slimy Sculpin	18	60	1813	0.99
W4A1	White Sucker	5	60	1813	0.28
W4A1	**Total Fish**	**43**	**60**	**1813**	**2.37**
W4A17	American Eel	7	63	708	0.99
W4A17	Atlantic Salmon	3	63	708	0.42
W4A17	Brook Trout	2	63	708	0.28
W4A17	Slimy Sculpin	5	63	708	0.71
W4A17	**Total Fish**	**17**	**63**	**708**	**2.40**
W4A21	<No Fish collected due to equipment malfunction>				
W4A25	American Eel	3	100	847	0.35
W4A25	Atlantic Salmon	8	100	847	0.94
W4A25	Brook Trout	8	100	847	0.94
W4A25	Sea Lamprey	1	100	847	0.12
W4A25	**Total Fish**	**20**	**100**	**847**	**2.36**
W4A31	American Eel	2	60	665	0.30
W4A31	Atlantic Salmon	10	60	665	1.50
W4A31	Blacknose Dace	16	60	665	2.41
W4A31	Brook Trout	1	60	665	0.15
W4A31	**Total Fish**	**29**	**60**	**665**	**4.36**
EBNB1	American Eel	8	139	758	1.06
EBNB1	Atlantic Salmon	13	139	758	1.72
EBNB1	Blacknose Dace	12	139	758	1.58
EBNB1	Brook Trout	1	139	758	0.13
EBNB1	**Total Fish**	**34**	**139**	**758**	**4.49**
EBNB2	American Eel	7	167	1147	0.61
EBNB2	Atlantic Salmon	1	167	1147	0.09
EBNB2	Blacknose Dace	18	167	1147	1.57
EBNB2	Blacknose Shiner	1	167	1147	0.09
EBNB2	Sea Lamprey	4	167	1147	0.35
EBNB2	White Sucker	4	167	1147	0.35
EBNB2	**Total Fish**	**35**	**167**	**1147**	**3.05**
EBNB3	Brook Trout	4	151	463	0.86
NRC	<not surveyed>				

Nashwaak R.

Entered to Detailed survey data 2011 1005 MSS KMW

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: NRC **Date:** Sep. 28, 2011 **Job Number:** 1218103 56

Personnel: MSS/DB/DT/HF **Coordinates Start:** **Coordinates End:**

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *						Water (°C)	Air (°C)			No.	Letter	Embeddedness	% Turbulence
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding											
1	100	0	10	5	25	60	10	50	–	–	50	–	–	6.8	9.35	27.9	9.7°C	11°C	<2	<4	–	–	–	–
															82.0		Sal. 0.0 ppt							
2	100	0	10	5	20	60	15	50	–	–	50	–	–						<2	<4	–	–	–	–

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
1	14m	33	37	43	0.8	4	1st	9.5	10.0	8.5
							2nd	10	11.5	9.0
							3rd	11	9.5	9.5

✓

entered MJS

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Nashwaak R. NRC **Date:** Sep-28, 2011 **Job Number:** 121810356

Personnel: MJS/DB/HS/DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	1	3/8	1	100	14	15	0	2	10	25	50	10	3	100	35	20	30	45	45	0	1	NO	Some Aquatic Plants
DS	2	3/8	1	100	12	12	0	2	10	30	40	15	3	110	40	10	10	45	45	0	1	NO	

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: BIAS **Coordinates (x, y)** N. _____ E. _____

Personnel: EMW MJS, MF **Date:** July 21, 2011 **Center Line: (Chainage)** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Temp.		Embeddedness	Comments
				Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		L	R	L	R		Water	Air		
DS	6/8	1	100	2.3	2.7	0	5	5	0	5	40	45	15cm	5	5	40	40	35m	15.8	23	4	road culvert & old beaver dams ~ 25m d/s & 55m d/s
VS	6/8	1	100	1.5	1.8	0	10	5	0	15	45	25	34	0	0	70	70	20	/	23	2	first 30m above rd D/S open old pond, then enclosed shrubs narrower w/ course

BIAS flow Jul. 22, 2011

Trial	1/4	1/2	3/4
1	6	6	4
2	4	4	4
3	5	4	4

Depth

~~0.9 smooth~~
~~1.5 m wide?~~

MJS & JLL
121810356

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: BIA5 **Coordinates (x, y)** N. _____ E. _____

Personnel: EMW, MJS, MF **Date:** July 21, 2011 **Center Line: (Chainage)** _____

Reach No.	% Site		% Shade	Stream Banks										O_2 (mg/L)	pH	Specific Conductivity (µs/cm)	Depth			Pool Rating Critria		Pool Tail
				Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%						1/4 (cm)	1/2 (cm)	3/4 (cm)			
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Wet	Wet	Wet	No.	Letter	Embeddedness
DS	100	10	20	—	75	20	5	95	—	5	95	—	5	9.56	7.0	282	11	19	13	ta	ta	
US	100	0	35	—	50	50	0	100	—	—	100	—	—	—	—	—	37	40	27	—	—	—
								50			50											

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

MJS + JLL

Watercourse: BIC 1

Coordinates (x, y) N. _____ E. _____

Personnel: EMW MJS, MF

Date: ~~June~~ 21, 2011 July

Center Line: (Chainage) _____

BKFI 0.38

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Temp.		Embeddedness	Comments
				Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		L	R	L	R		Water	Air		
											35	25										
US	8	1	100	.51	.78	0	0	5	5	30	~~30~~	~~20~~	8.2	30	30	15	15	30	11.6	20.2	3	small headwaters Fish observed DS
DS	8	1	100	.29	.305	0	0	5	5	20	~~30~~	~~30~~	19.5	10	10	30	30	5	—	—	3	wet land opens into grass medow reach ends @ old beaver Dam
											35	35										

121810356

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: BIC1 **Coordinates (x, y)** N. _____ E. _____

Personnel: EMW MJS MF **Date:** ~~June~~ 21, 2011 July **Center Line: (Chainage)** _____

Reach No.	% Site		% Shade	Stream Banks										O_2 (mg/L)	pH	Specific Conductivity (µs/cm)	Depth			Pool Rating Critria		Pool Tail
				Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%						1/4 (cm)	1/2 (cm)	3/4 (cm)			
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Wet	Wet	Wet	No.	Letter	Embeddedness
														69.1%								
US	100	0	65	0	70	40	10	50	—	—	50	—	—	7.79	5.4	23.0	7.0	7.2	6.2	—	—	—
DS	100	0	45	0	60	30	10	50	—	—	50	—	—	—	—	—	14.6	16.0	14.5	—	—	—

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: B103 **Coordinates (x, y)** N. _____ E. _____ MOST OLL

Personnel: EMW MJS MF **Date:** July 20, 2011 **Center Line: (Chainage)** NA

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Temp.		Embeddedness	Comments
				Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		L	R	L	R		Water	Air		
US	S/8	1	100m	1.06	1.77	0	0	0	5	5	70	20	12	65	65	65	65	7/100	13.9	25	2	36cm - bank full height clear cut right bank
DS	S/8	1	100m	1.2	1.64	0	0	5	15	20	50	10	10 cm	95	95	25	25	20	/	/	1	channel is downcutting in lower end

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: BID3 **Coordinates (x, y)** N. _____ E. _____

Personnel: EMW MJS MP **Date:** July 20, 2011 **Center Line: (Chainage)** _____

Reach No.	% Site		% Shade	Stream Banks										O_2 (mg/L) 0.0ppt 83.9	pH	Specific Conductivity (µs/cm)	Depth			Pool Rating Critria		Pool Tail
				Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%						1/4 (cm)	1/2 (cm)	3/4 (cm)			
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Wet	Wet	Wet	No.	Letter	Embeddedness
US	100	0	80	0	50	40	10	50	0	0	50	0	0	8.62	6.2	246	5.0	6.1	4.3	/	/	/
DS	100	0	70	0	65	20	15	20	0	30	20	0	30	/	/	/	8.2	5.6	4.6	/	/	/

1/4 flow 16 secs

	1/4	1/2	3/4
1	16	22	22
2	17	22	22
3	12	20	20

MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: BHH1 **Date:** Aug 3, 2011 **Job Number:** 1218103356

Personnel: EMW MJS, HF, MF **Coordinates Start:** _____ **Coordinates End:** _____

0.0 ppt

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
BHH1	100	0		0	30	40	30	50	—	—	50	—	—	5.9	6.73 (66.7%)	35.1	15.2°C	17	<2	>4	—	—	—	—
		~60%	50%	MJS																				
		checked																						
		pics																						

Reach #	Wet width (m)	Depth (m) 1/4	1/2	3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: BlH1 **Date:** Aug 3, 2011 **Job Number:** 12181056

Personnel: EMW, MJS, HF, MF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
BlH1	4	1	200	0.37	0.40	0	15	10	5	30	30	10	10	19	0	0	80	80	80	3	N	Headwater channel like No defined Not Fish habitat until OS Further NO Fish form WC starts NE of road flowing underground

MJS + DLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: BZA2 **Date:** July 22, 2011 **Job Number:** 121810356

Personnel: EMW MS MF **Coordinates Start:** .. **Coordinates End:**

0.0 ppt

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	100	0	55	0	40	40	20	50	–	–	50	–	–	5.9	97.2%	20.9	13.6°C	21	>2	<4	–	–	–	–
DS	100	0	55	0	40	40	20	50	–	–	50	–	–	same as above					>2	<4	–	–	–	–

Reach #	Wet width (m)	Depth (m) 1/4	1/2	3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
DS	~~1.8~~ 1.10	~~0.2~~ 0.23	~~0.2~~ 0.28	~~0.2~~ 0.23	0.8	x 1	1st	3	3	4
							2nd	3	4	5
							3rd	3	3	7

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: BZA2 **Date:** July 22, 2011 **Job Number:** 121810356

Personnel: EMW MS MF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
				0.64-	0.75						50											
US	5B	1	100	1.45	3.5	0	2	3	10	25	50	10	13.5	32	35	35	40	40	>100	1	N	Braided multi channel
DS	5/8	1	100	1.70	4.2	0	2	8	5	25	55	5	28.2	51.3	40	40	30	30	>100	1	N	more open sections ds unobstructed flow

B3A1

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: *WZA4 ~~B0~~ **Date:** July 27, 2011 **Job Number:** 1218103556

Personnel: EMW MJS DTAL **Coordinates Start:** **Coordinates End:**

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *								Less than		No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
VS1	40	~~60~~	15	0	60	30	10	50	–	–	50	–	–	5.9	~~10.48~~	264	12.4	16	~~<2~~	~~<4~~	2	a	2	0
DS	100	–	65	0	50	40	10	50	–	–	50	–	–		8.10				~~<2~~	<4	–	–	–	–
VS2	40	60	15	0	60	30	10	50	–	–	50	–	–						<2	<4	2	a	2	0

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
WZA4 DS	3.0	11.5	13.5	11.6	0.9 sand	1.0 m	1st	~~4~~ 4.0	3.9	4.9
							2nd	4.5	4.0	~~5~~ 5.0
							3rd	4.9	4.0	5.9

* used for ave wet width DS

B3A | (formerly W24-B)

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

VMJS + JLL

Watercourse: ~~W24-B~~ **Date:** July 27, 2011 **Job Number:** 121810356

Personnel: EMW MJS OTAL **Coordinates Start:** **Coordinates End:**

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
				Pond (26m)	(30)								2*									
US2	8/24	1	100	3	4	✓	✓	5	15	10	40	30	30	25	20	20	30	30	40	1/3	N	Culvert washed out First 30m pond
DS~~A~~	8/5	1	100	3.0	4.5	✓	✓	✓	5	25	~~50~~	20	14.7	25	10	10	~~50~~	~~30~~	>100	1	N	~~second trib~~
~~DS2~~	~~8/5~~	~~1~~	~~100~~																			
US1	8/24	1	100	3	4	✓	✓	5	15	10	40	30	2* 30	26	20	20	30	30	40	1/3	N	

US channel splits into 2 tribs

MJS & JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: B376 **Date:** Aug 3, 2011 **Job Number:** 1218103561

Personnel: EMW MJS, HF, MF **Coordinates Start:** _____ **Coordinates End:** _____

00ppt

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
BUS.C	100	0	30	10	40	40	10	50	–	–	50	–	–	6.4	8.00	24.3	14.2	18°C	<2	<4	–	–	–	–
DS	100	0	60	0	40	40	20	50	–	–	50	–	–						>2	<4	–	–	–	–

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
DS	10	.65		.38	0.9	20	1st	13 7	–	13
							2nd	10 9	–	16
							3rd	12 10	–	17

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: B3A6 **Date:** Aug 3, 2017 **Job Number:** 1218103356

Personnel: EMW MJS HF MF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	8/13	I	100	2-3	3-4	0	15	5	0	20	40	20	.90	.60	15	15	30	30	40	3	N	many times beaver dams
DS	8/13	I	100	3-6	7	0	5	20	0	30	35	20	.80	.60	15	15	30	30	>100	3	N	Beaver dams throughout

No suitable rocks to collect pempt US or DS

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: B3A9 **Date:** Aug 5. 2011 **Job Number:** 121810356

Personnel: EMW MJS MF HF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	4/4	1	100	3.5	5	6	10	36	20	20	16	10	56	29	10	10	20	20	20	1	N	0.0 Sal. Nice wc several Hydraulic
DS	4/4	1	100	3.5	5	0	10	30	20	20	10	10	54	32	10	10	20	20	20	1	N	Jumps US + DS. Hydro station 60m US of station mid pt.

MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: B3A9 **Date:** Aug 5, 2011 **Job Number:** 121810356

Personnel: EMW HF MJS MF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion . 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	90	10	40	0	20	50	20	50	—	—	50	—	—	5.7	8.78	24.7	12.8	20	<2	≥4	3	b	2	100
DS	90	10	45	0	25	65	10	50	—	—	50	—	—	—	—	—	—	—	<2	≥4	3	b	2	100

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
1	4	34	28	19	0.8	2	1st	6	3	4
							2nd	6	2	6
							3rd	4	4	4

MFS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: EBNB2 **Date:** Aug 8/11 **Job Number:** 121810.356

Personnel: MF, DT, EW, MS **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	90	10	55	0	20	60	20	30	20 *	0	50	0	0	7.0	9.66 101.4%	377	17.7 Sal. 0.0	~20	<2	<4	* <0.5m	—	1	60
DS	60	40	25	0	30	70	0	50	0	0	50	0	0	—	—	—	—	—	<2	<4	* <0.5	—	1	80
									bedrock															

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

101.4 DO %
0.0 ppt

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: EBNB1 **Date:** Aug. 8, 2011 **Job Number:** 1218103S6

Personnel: EW/MJS/MF/DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	318	1	100	6.5	10.0	10	15	20	39	17.5	2.5	0	71	23	5	10	60	30	15	1	N	bedrock left bank + cedar abou
DS	318	1	100	9.6	12.6	0	20	25	30	20	5	0	97	34	0	5	30	30	20	1	N	-slower water/ more shallow pools

MJS & JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: MJS EMW HF MF → EBNB-2 **Date:** Aug 4, 2011 **Job Number:** 121810356

Personnel: **Coordinates Start:** 2462634.84 7486838.59 **Coordinates End:**

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
EBNB-2	90	10	10	5	90	35	20	50	-	-	50	-	-	6.9	9.89	33.9	16.8	18	<2	2%	3	b	1	80

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
1	5.5	23	36	31	0.8	2	1st	7	4	3
							2nd	5	4	4
							3rd	5	5	4

B3A1

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: *WZA4 ~~B0~~ **Date:** July 27, 2011 **Job Number:** 1218103556

Personnel: EMW MJS DTAL **Coordinates Start:** **Coordinates End:**

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *								Less than		No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
VS1	40	~~60~~	15	0	60	30	10	50	–	–	50	–	–	5.9	~~10.48~~	264	12.4	16	~~<2~~	~~<4~~	2	a	2	0
DS	100	–	65	0	50	40	10	50	–	–	50	–	–		8.10				~~<2~~	<4	–	–	–	–
VS2	40	60	15	0	60	30	10	50	–	–	50	–	–						<2	<4	2	a	2	0

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
WZA4 DS	3.0	11.5	13.5	11.6	0.9 sand	1.0 m	1st	~~4~~ 4.0	3.9	4.9
							2nd	4.5	4.0	~~5~~ 5.0
							3rd	4.9	4.0	5.9

* used for ave wet width DS

B3A | (formerly W24-B)

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

VMJS + JLL

Watercourse: ~~W24-B~~ **Date:** July 27, 2011 **Job Number:** 121810356

Personnel: EMW MJS OTAL **Coordinates Start:** **Coordinates End:**

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
				Pond (26m)	(30)								2*									
US2	8/24	1	100	3	4	✓	✓	5	15	10	40	30	30	25	20	20	30	30	40	1/3	N	Culvert washed out First 30m pond
DS~~A~~	8/5	1	100	3.0	4.5	✓	✓	✓	5	25	~~50~~	20	14.7	25	10	10	~~50~~	~~30~~	>100	1	N	~~second trib~~
~~DS2~~	~~8/5~~	~~1~~	~~100~~																			
US1	8/24	1	100	3	4	✓	✓	5	15	10	40	30	2* 30	26	20	20	30	30	40	1/3	N	

US channel splits into 2 tribs

MJS & JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: B376 **Date:** Aug 3, 2011 **Job Number:** 1218103561

Personnel: EMW MJS, HF, MF **Coordinates Start:** _____ **Coordinates End:** _____

00ppt

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
BUS.C	100	0	30	10	40	40	10	50	–	–	50	–	–	6.4	8.00	24.3	14.2	18°C	<2	<4	–	–	–	–
DS	100	0	60	0	40	40	20	50	–	–	50	–	–						>2	<4	–	–	–	–

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
DS	10	.65		.38	0.9	20	1st	13 7	–	13
							2nd	10 9	–	16
							3rd	12 10	–	17

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: B3A6 **Date:** Aug 3, 2017 **Job Number:** 1218103356

Personnel: EMW MJS HF MF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	8/13	I	100	2-3	3-4	0	15	5	0	20	40	20	.90	.60	15	15	30	30	40	3	N	many times beaver dams
DS	8/13	I	100	3-6	7	0	5	20	0	30	35	20	.80	.60	15	15	30	30	>100	3	N	Beaver dams throughout

No suitable rocks to collect pempt US or DS

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: B3A9 **Date:** Aug 5. 2011 **Job Number:** 121810356

Personnel: EMW MJS MF HF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	4/4	1	100	3.5	5	6	10	36	20	20	16	10	56	29	10	10	20	20	20	1	N	0.0 Sal. Nice wc several Hydraulic
DS	4/4	1	100	3.5	5	0	10	30	20	20	10	10	54	32	10	10	20	20	20	1	N	Jumps US + DS. Hydro station 60m US of station mid pt.

MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: B3A9 **Date:** Aug 5, 2011 **Job Number:** 121810356

Personnel: EMW HF MJS MF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion . 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	90	10	40	0	20	50	20	50	—	—	50	—	—	5.7	8.78	24.7	12.8	20	<2	≥4	3	b	2	100
DS	90	10	45	0	25	65	10	50	—	—	50	—	—	—	—	—	—	—	<2	≥4	3	b	2	100

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
1	4	34	28	19	0.8	2	1st	6	3	4
							2nd	6	2	6
							3rd	4	4	4

MFS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: EBNB2 **Date:** Aug 8/11 **Job Number:** 121810.356

Personnel: MF, DT, EW, MS **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	90	10	55	0	20	60	20	30	20 *	0	50	0	0	7.0	9.66 101.4%	377	17.7 Sal. 0.0	~20	<2	<4	* <0.5m	—	1	60
DS	60	40	25	0	30	70	0	50	0	0	50	0	0	—	—	—	—	—	<2	<4	* <0.5	—	1	80
									bedrock															

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

101.4 DO %
0.0 ppt

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: EBNB1 **Date:** Aug. 8, 2011 **Job Number:** 1218103S6

Personnel: EW/MJS/MF/DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	318	1	100	6.5	10.0	10	15	20	39	17.5	2.5	0	71	23	5	10	60	30	15	1	N	bedrock left bank + cedar abou
DS	318	1	100	9.6	12.6	0	20	25	30	20	5	0	97	34	0	5	30	30	20	1	N	-slower water/ more shallow pools

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: EBNB-2 **Date:** Aug 4, 2021 **Job Number:** 121810356

Personnel: EMW MJS, HF, MF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
EBNB-2	3/4	1	200	7.5	8	0	10	20	30	20	5	5	17	45	5	5	20	20	30	1	N	RB wet + boggy As collected 16+ much TWD but stream structure looks good some lateral bars.
				11.5	15																	
				Ave 9.5	Ave 11.5																	

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

MJS + OLL

Watercourse: EBNB3 **Date:** Aug. 4, 2011 **Job Number:** 1218 10356

Personnel: EW/MJS/ME/HF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	100	0	40	/	20	40	40	50	–	–	50	–	–	6.1	8.82	198	16.8	–	>2	<4	–	–	–	–
DS	100	0	20/50	/	15	50	35	50	–	–	50	–	–	–	–	–	–	–	>2	<4	–	–	–	–
		clearing	elsewhere																					
		↳ all grass in clearing / former beaver pond ~ 30 / 100 m																						

Reach #	Wet width (m)	Depth (m) 1/4	1/2	3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
	4.5M	10	12	12	0.9	1M	1st	10	4	13
							2nd	9	6	12
							3rd	7	5	13

↳ flow done using water crossing road

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: EB NB 3 **Date:** Aug. 4, 2011 **Job Number:** 121810356

Personnel: GW/MJS/MF/HF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	5/13/24	B	100	*40cm	1.40m	—	—	5	—	15	30	50	70	20	0	0	30	30	5	4	Y?	Lots of beaver activity US + DS
DS	5/13/24	1	100	0.60m	1.3m	—	—	5	5	10	20	60	70	30	0	0	35	35	10	4	Y?	

* braided channels ~ 40m wide, upper beaver pond ~ 30m wide, smaller ponds below ~ 10m

culvert @ road may be blocked – water flowing over road

~ 3-4 beaver dams in site

MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: MIK 4 **Date:** Jul. 27, 2011 **Job Number:** 1218103356

Personnel: MJS + DJ + AL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site: Riffle / Run	% Site: Pools	% Shade	Stream Banks: Vegetation %: Bare Ground	Grasses	Shrubs	Trees	Bank Erosion 0-50% Left Bank*: Stable	Bare Stable	Eroding	Bank Erosion 0-50% Right Bank *: Stable	Bare Stable	Eroding	ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp: Water (°C)	Temp: Air (°C)	Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria: No.	Pool Rating Critria: Letter	Pool Tail: Embeddedness	Pool Tail: % Turbulence
US	100	—	70	—	20	70	10	50	—	—	50	—	—	6.3	7.42 (72.4)	22.7	14.3 (sal: 0.0)	17	>2	<4	—	—	—	—
DS	100	—	75	—	~~40~~ 45	~~30~~ 35	20	50	—	—	50	—	—	—	—	—	—	—	>2	<4	—	—	—	—

1110
1114

Reach #	Wet width (m)	Depth (m): 1/4	Depth (m): 1/2	Depth (m): 3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec): Run	1/4 way	1/2 way	3/4 way
—	~~0.95~~	6cm	7cm	7cm	0.8	1m	1st	5		4
							2nd	4		5
							3rd	5		4

rocks

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: MIK4 **Date:** Jul. 27, 2011 **Job Number:** 1218/0356

Personnel: MJS + DJ + AL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	5/8	-1	100	0.73	1.20	–	–	–	5	10	45	40	35	16	0	0	90	90	20	3	Y?	culvert
DS	4/8	1	100	0.67	0.74	–	15	10	5	–	25	45	47	17	20	20	40	40	10	2	Y?	

MJS & JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: MIMZ **Date:** Jul. 27, 2011 **Job Number:** 1218 10356

Personnel: MJS + DJ + AL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (>4% or <4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *						Water (°C)	Air (°C)			No.	Letter	Embeddedness	% Turbulence
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding												
US	100	—	70	—	30	20	50	50	—	—	50	—	—	6.5	67.6	34.1	15.5	16	>2	≤4	—	—	—	—
DS	100	—	10	—	100	—	—	50	—	—	50	—	—	—	—	—	—	—	~~>2~~	~~<4~~	—	—	—	—
	Still water																							

Reach #	Wet width (m)	Depth (m) 1/4	Depth (m) 1/2	Depth (m) 3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
—	0.55	3	7	4	0.9	1 m	1st		~~255~~	
							2nd		235	
							3rd		255	

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: MIMZ **Date:** Jul. 27, 2011 **Job Number:** 1218103S6

Personnel: MJS + DT + AL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	5	~~3~~ *	100	38 cm	59 cm	—	—	—	5	5	30	60	14 cm	7 cm	10	10	80	80	5	3	N	upstream from site in woods & beaver pond @ upstream point
DS	1	1	100	1.60 m	2.75 m	—	—	—	—	—	20	80	39 cm	45 cm	0	0	10	10	0	4	N	beaver pond @ end of site

* multiple drainages from beaver pond upstream - converge @ start of U/S section

MJS + DLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: MINI **Date:** Jul. 27, 2011 **Job Number:** 121810356

Personnel: MJS + DT + AL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
															mg/L									
US	100	~	10	–	80	20	–	50	–	–	50	–	–	6.0	% 80.5	247	15.5		>2	<4	–	–	–	–
DS	~~100~~	(#24) 100	0	–	60	40	–	50	–	–	50	–	–	–	–	–	+	–	<2	<4	–	–	–	–
		dead	water																					

Reach #	Wet width (m)	Depth (m) 1/4	Depth (m) 1/2	Depth (m) 3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
	0.50	–	18cm	–	0.9	1m	1st			
							2nd			
							3rd			

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: MINI **Date:** Jul. 27, 2011 **Job Number:** 12181056

Personnel: MJS+DT+AL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	5/8	1	100	1.20	1.64	—	—	5	—	—	30	65	21.5	9.5	20	20	15	15	5	4	N	old beaver pond
DS	8/24	1	100	3.60	4.30	—	—	—	—	—	10	90	52	22	0	0	5	5	5	4	N	deadwater in powerline cut — heavy silt

MJS & JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: MZE1 **Date:** Jul. 28, 2011 **Job Number:** 1218 10356

Personnel: MJS/EW/DT/AL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L) 65.3%	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	80	20	75	0	45	30	35	45	–	5	45	–	5	5.2	6.30	21.7	15.4	19°C	<2	<2	4	b	2	0
DS	100	0	75	0	45	30	25	45	–	5	45	–	5	–	–	–	–	–	>2	<2	–	–	–	–

Reach #	Wet width (m)	Depth (m) 1/4	1/2	3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
DS	2.5	23	24.5	21	0.8	1.0m	1st	14	6	9
							2nd	15	7	18
							3rd	16	7	11

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: M2E1 **Date:** Jul. 28, 2011 **Job Number:** 121810356

Personnel: EW/MJS/DT/AL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	5/13	1	100	3.5	4.5	0	5	5	5	15	40	30	40	25	5	5	25	25	>100	2	N	looks like active beaver signs of fresh dam
DS	3/5/18	1	100	3.5	4.5	0	5	5	5	15	40	30	40	25	5	5	25	25	>100	2	N	

MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: M3A1 **Date:** July 26, 2011 **Job Number:** 1218 10356

Personnel: MJS EW DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	100	–	45	–	40	40	20	50	–	–	50	–	–	6.7	9.22 88.5 %	30.9	13.7	20	<2	<4	–	–	–	–
DS	100	–	45	–	20	65	15	50	–	–	50	–	–	–	–	–	–	–	<2	<4	–	–	–	–

Reach #	Wet width (m)	Depth (m) 1/4	Depth (m) 1/2	Depth (m) 3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
Mid	2.5	26.8	33.9	31.6	0.8	2	1st	29.5	26.0	36.0
							2nd	29.5	26.0	33.0
							3rd	31.0	25.0	45.0 ?

31.0

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: M3A1 **Date:** Jul. 26, 2011 **Job Number:** 1218 10356

Personnel: MJS EW DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	3/8	1	100	1.99	2.07	—	10	10	15	40	20	5	43cm	13cm	60	60	65	65	10	2	N	lower part above bridge small pond, the name to ri
DS	4/8	1	100	4.33	3.21	—	30	20	10	15	20	5	43	17cm	45	45	60	60	20	1	N	

MJS & JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: M3C3 **Date:** Jul. 28, 2011 **Job Number:** 121810356

Personnel: MJS / DT / EW / AL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
															84.6									
US	80	20	15	–	50	45	5	50	–	–	50	–	–	6.3	8.00	278	19.1		<2	<4	3	b	1	0
DS	85	15	50	–	45	45	10	50	–	–	50	–	–	?	✓	✓	✓	✓	<2	<4	3	b	1	80

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
✓	1.50m	0.31	0.37	0.29	rough	2 m	1st	7	5	7
							2nd	6	5	6
							3rd	7	4	6

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: M3C3 **Date:** Jul. 28, 2011 **Job Number:** 121810356

Personnel: EW/MJS/DT/AL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
				Ave 3.75	Ave 4.25																	
US	4/8	1	100	3.5 4.0	4.0 -4.5	—	5	25	20	15	30	5	0.75	0.55	20%	20%	80	80	30	1	N	-clear cut right bank -stream widens @ culve
DS	3/8	1	100	5.1	5.6	—	10	~~20~~ 15	~~20~~	20	30	5	0.60	0.30 -0.60 Ave 0.45	10%	10%	85	85	7100	1	N	-braiding ~ 30mds - chann splits in tu

peri 1.
phyton 2.

3.

MJS & JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: SID3 **Date:** Aug 5, 2011 **Job Number:** 121810356

Personnel: MJS/EW/MF/HF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	100	0	75	0	60	5	35	40	10	0	40	10	0	6.7	9.84	258	10.6		72	24	—	—	—	—
DS	100	0	75	0	60	5	35	45	5	0	45	5	0	—	—	—	—		72	24	—	—	—	—

Reach #	Wet width (m)	Depth (m) 1/4	Depth (m) 1/2	Depth (m) 3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
	0.5	—	12.2cm	—	0.8	≈0.5m	1st		4	
							2nd		3	
							3rd		3	

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: SID3 **Date:** Aug. 5, 2011 **Job Number:** 121810356

Personnel: MJS/EW/MF/HF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	4/8	1	100	0.6	0.65	0	15	30	5	0	10	40	45cm	10cm	85	85	60	60	10	3	N	*
DS	4/8	1	100	0.78	1.10	0	25	20	0	0	5	50	37cm	13cm	80	80	45	45	10	3	N	

* US has lots of braiding and predominately flows below ground - beginning of headwaters?

MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: SZAZ **Date:** July 25, 2011 **Job Number:** 121810356

Personnel: EMW MJS DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	100	0	65	0	50	30	20	50	—	—	50	—	—	6.1	9.96	262	13.9	22	<2	≥4	—	—	—	—
DS	100	0	60	0	50	35	25	50	—	—	50	—	—						<2	≤4	—	—	—	—

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
US	3.53	26	26.2	19	0.8	2.00	1st	10	9	7
							2nd	10	9	8
							3rd	10	8	9

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: SZAZ **Date:** July 25, 2011 **Job Number:** 121810356

Personnel: EMW MJS DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	4/8	1	100	1.16	2.93	0	15	35	20	10	10	10	56	19.6	5	5	10	10	20	1	N	↑ in grade as you go US; open w/ few side
DS	3/8	1	100	2.75	3.64	5	15	30	20	10	10	10	47	15.0	5	5	15	15	30	1	N	valley walls make angle more open

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: S2A3 **Date:** July 25, 2011 **Job Number:** 1218 10356

Personnel: EM & MJS & DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
DS	3	1	100	3.60	4.50	0	5	20	30	25	15	5	45	17	10	10	15	15	30	1	Y	perched culvert
US	3	1	100	1.75	2.00	0	15	30	25	15	10	5	38cm	15cm	10	10	10	10	15	1	N	~~increased shubs~~

water chem. us of culver

increased shubs & lower grade DS of site

MJS & JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: S2A3 **Date:** July 25, 2011 **Job Number:** 1218103356

Personnel: EW MJS DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
DS	100	0*	76	0	30	50	20	45	—	5	45	—	5	6.6	10.42 101.6%	283	14.3	24	<2	<4	—	—	—	—
US	100	0	65	0	50	30	20	50	—	—	50	—	—	/	/	/	/	24	<2	<4	—	—	—	—

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st	10	6	4
							2nd	7	7	4
							3rd	7	4	4

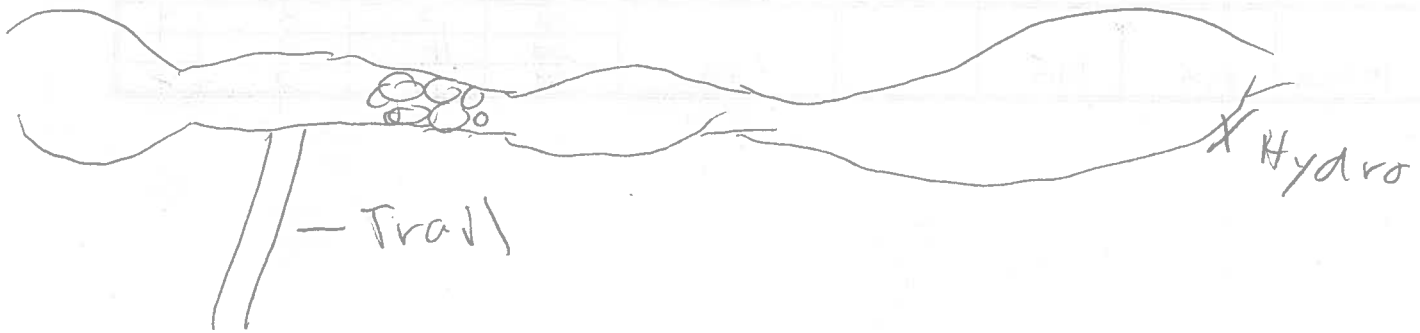
* Deeper area @ old road crossing / culvert

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: SBAZ **Date:** July 29, 2011 **Job Number:** 121810356

Personnel: EMM MTS OTAL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
51C3	4/4	1	200	5	7	15	25	15	15	10	15	5	60	.85	15	15	30	30	7100	1	Y	waterfall DS Appears Flashy



MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: SBAB **Date:** July 29, 2011 **Job Number:** 121810356

Personnel: EW, MJS, DT, AL **Coordinates Start:** **Coordinates End:**

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
SBAB	70	30	70	5	33	33	30	25	–	25	25	–	25	6.4	9.55 (91.0)	28.7	13.1	23	<2	>4	3	b	1	80

Reach #	Wet width (m)	Depth (m) 1/4	Depth (m) 1/2	Depth (m) 3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
		15.0 cm	19.5	14.5		1 m	1st	17	8	9
							2nd	16	9	9
							3rd	14	9	7

MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: WILMOTS **Date:** July 26, 2011 **Job Number:** 121816356

Personnel: EMW MJS DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
DS	100	—	65	—	40	40	20	50	—	—	50	—	—	7.0	10.50 91.4	30.9	9.1	17	<2	<4	—	—	—	—
US	100	—	70	—	60	10	30	50	—	—	50	—	—	—	—	—	—	—	2	<4	—	—	—	—

Reach #	Wet width (m)	Depth (m) 1/4	Depth (m) 1/2	Depth (m) 3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
			9.5cm		0.8		1st		9	
							2nd		7	
							3rd		8	

small - just did 1/2

W1G5 or ~~W1A4 or W1G5~~

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: ~~(W1A4)~~ ? W1A4 or W1G5 **Date:** July 26, 2011 **Job Number:** 121810356

Personnel: EMW MJS PT **Coordinates Start:** **Coordinates End:**

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
DS ~~518~~	518	1	100	1.11	1.41	–	–	10	15	20	30	25	36	16	80	80	55	55	25	2	N	~~culvert~~
US	518	1	100	0.60	0.78	–	–	5	0	20	50	25	51	25	80	80	40	40	30	2	N	culvert but not obstruction - slight perch

MJS + DLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: WNW3 **Date:** Aug 9, 2011 **Job Number:** 1218/0356

Personnel: EMW MJS, MF, DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion . 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
WW3	100	0	85	5	35	50	10	40	10	–	40	10	–	5.3	7.8	22.9	16.7	20	>2	<4	–	–	–	–
															80.6%									

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
WW3	80cm	27	33.2	28.8	0.8	1.0	1st	7	6	–
							2nd	9	6	–
							3rd	7	6	–

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: WTN3 **Date:** Aug 9, 2011 **Job Number:** 121810356

Personnel: EMW, MJS, MF, DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
WN3	4/4	1	200	1.24	2.45	0	30	30	10	10	15	5	43	15	10	10	30	30	20	1	N	Beaver pond at end of this site, large pond site is in higher grade riffle section

MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: WRA4 – A **Date:** July 26, 2011 **Job Number:** 121610356

Personnel: EMW MJS DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
DS	100	—	35	—	~~45~~ 45	45	10	~~30~~ 30	20	~~25~~ 25	30	20	—	6.3	8.87 85.2	264	13.3	17	<2	<4	—	—	—	—
VS	100	—	55	—	30	60	10	45	5	—	45	5	—	—	—	—	—	—	<2	<4	—	—	—	—

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
—	—	34.5	25.8	16.0	Smooth	2 m	1st	19.0	15.0	15.0
							2nd	18.0	14.0	15.0
							3rd	17.0	17.0	14.0

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: ~~WZA4~~ WZA4 (formerly WZA4-a) **Date:** July 26, 2011 **Job Number:** 121610356

Personnel: EMW MJS DT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
DS	5/8	1	100	4.5	5.5	0	0	5	5	25	45	20	55	24cm	15	15	30	30	30	2	N	bll bridge o to beaver pond * dam
US	3/8	1	100	3.4	3.9	0	10	10	10	20	40	LO B	60	30cm	30	30	30	30	20	2	N	consistent lots of alders

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Temp 16.5°C
Ppt 0.0
% 91.9 MTS of OLL

Watercourse: W4A1 **Coordinates (x, y)** N. _____ E. _____

Personnel: MF, EW, MS, DT **Date:** _____ **Center Line: (Chainage)** _____

Reach No.	% Site		% Shade	Stream Banks										O_2 (mg/L)	pH	Specific Conductivity (µs/cm)	Depth			Pool Rating Critria		Pool Tail
				Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%						1/4 (cm)	1/2 (cm)	3/4 (cm)			
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Wet	Wet	Wet	No.	Letter	Embeddedness
US	100	–	15	5	35	40	20	50	–	–	50	–	–	8.92	6.6	29.1				2	A	2 / Turbulence 0
DS	80	20	15	5	5	60	30	50	–	–	50	–	–							3	b	2 0

Width =

1/4 depth	1/2 depth	3/4 depth
33.5	31.0	38.5

4 meter length

1/4	1/2	3/4
52sec	26sec	28sec
43sec	33sec	29sec

121816356

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: W4A1 **Coordinates (x, y)** N. _____ E. _____

Personnel: EMW MJS, DT MF **Date:** ~~Aug~~ 8, 2011 **Center Line: (Chainage)** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Temp.		Embeddedness	Comments
				Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		L	R	L	R		Water	Air		
US	13	1	160	~~25~~	27	0	0	0	5	25	40	30	>100	10	10	15	15	>100	16.5		0	Beaver backwater is solid bottom
DS	9/13	1	100	17	20	0	0	5	10	35	30	20	40	5	5	25	25	>100			2	DS of beaver Dams some deep pools >1m
													40									

1.69 × 10

MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: W4A17 **Date:** Aug 4, 2011 **Job Number:** 121810356

Personnel: EMW MJS, HP, MF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
W4A17	85	15	30	0	20	60	20	50	0	0	50	0	0	6.9	9.87	26.1	15.3	—	<2	<4	3	b	1	100
																	Sa/1.0							

Reach #	Wet width (m)	Depth (m) 1/4	Depth (m) 1/2	Depth (m) 3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
✓	5.0	37	37	37	0.8	2m	1st	4	3	4
							2nd	4	3	4
							3rd	6	2	4

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: W4A17 **Date:** Aug. 4, 2011 **Job Number:** 121810356

Personnel: EW/MJS/MF/HF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US+DS	3/8	1	200	5.0	5.5	0	5	20	30	15	30	0	0-8	0.4 1.0	0	0	15	95	10	1	N	consistent across 200m

MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: W4A21 **Date:** Aug. 3, 2011 **Job Number:** 1218 10356

Personnel: EW/MJS/HF/MF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *						Water (°C)	Air (°C)			No.	Letter	Embeddedness	% Turbulence
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding											
US	85	15	45	5	30	20	45	40	10	—	45	—	5	7.0	10.38	24.9	15.3	18	>2	<4	2	b	1	95
DS	85	15	50	30	20	10	40	30	15	5	45	30	5	—	—	—	—	—	>2	<4	3	b	1	95

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
	5m				0.8	2m	1st	6	4	3
							2nd	7	5	4
							3rd	7	4	4

note: collected clams @ u/s end.

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: W4A21 **Date:** Aug. 3, 2011 **Job Number:** 121810356

Personnel: _____ **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	4/8	1	100	10	10.5	5	60	20	10	5	/	/	1.5 (1.60)	0.60	0	0	5	5	0	1	N	0.0 sat overflow channel @ turn
DS	4/8	1	100	4-6m	5-7m	20	50	10	5	10	5	/	1.5 (1.60)	0.20 (1.00) Ave 0.60	0	0	5	5	0	1	N	overflow channel @ turn

MJS + JL 2

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: W4A25 **Date:** Aug. 2, 2011 **Job Number:** 12181035G

Personnel: MJS/MF/HF/~~MJS~~ EW **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
US	100	—	55	0	20	15	65	~~50~~ 45	5	—	45	5	—	6.7	9.66 99.4%	24.9	16.7 Sal 0.0 PPT.	20	<2	>4	—	—	—	—
DS	100	—	50	5	30	5	60	~~85~~ 35	~~10~~ 10	~~5~~ 5	~~40~~ 35	~~10~~ 5	~~20~~ 10	—	—	—	—	—	<2	>4	—	—	—	—

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
Mid	10	50	46	60	0.9	4.0	1st	7:07	4:17	3:15
							2nd	4:15	5:26	3:98
							3rd	7:97	3:47	3:17

↑ stick

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: W4A25 **Date:** ~~8~~ Aug. 2, 2011 **Job Number:** 121810356

Personnel: EON/MJS/MF/HF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	4/8	1	100	8.0	16.0	0	30	30	25	10	5	—	135	38	0	0	30	30	0	1	N	
DS	4/8	1	100	10.5	15.5	10	~~20~~	40	20	10	5	—	140	32	0	0	20	30	0	1	N	
							15										30	30				

S P
140
043
044
047

25.1 wts 9.82 mg/L 16.2 100.1% MJS + JLL

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

0.0 ppt

Watercourse: W4A31 **Date:** Aug. 2, 2011 **Job Number:** 121810356

Personnel: EW, MJS, MF, HF **Coordinates Start:** **Coordinates End:**

Reach No.	% Site: Riffle / Run	% Site: Pools	% Shade	Stream Banks: Vegetation %: Bare Ground	Grasses	Shrubs	Trees	Bank Erosion 0-50% Left Bank*: Stable	Bare Stable	Eroding	Bank Erosion 0-50% Right Bank *: Stable	Bare Stable	Eroding	ph	O_2 (mg/L) 100.1%	Specific Conductivity (µs/cm)	Temp: Water (°C)	Air (°C)	Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria: No.	Letter	Pool Tail: Embeddedness	% Turbulence
US	100	0	15	0	35	45	20	50	—	—	50	—	—	6.4	9.82	251	16.2	20	<2	>4	—	—	—	—
DS	100	0	15	0	40	40	20	50	—	—	50	—	—	—	—	—	—	—	<2	>4	—	—	—	—

Reach #	Wet width (m)	Depth (m) 1/4	1/2	3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
DS	9	27	31	21	0.8	4.0	1st	7.17	6.73	5.60
							2nd	7.70	5.66	5.37
							3rd	7.80	6.61	5.65

0.0 ppt
100.1%

163

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: W4A31 **Date:** Aug 2, 2011 **Job Number:** 12181035G

Personnel: GMW, MJS, HF, MF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
US	3/4	1	100	6	8	0	5	35	40	10	5	5	70	27	10	10	10	10	15	1	N	As collected there no BT Alders on Banks
DS	3/4	1	166	10	12	5	5	30	40	10	5	5	70	27, 60	10	10	10	10	15	1	N	Bridge @ and of site likely only used by ATV
														Ave 43.5								

Appendix D-2

Photos of Habitat and Representative Fish Species Per Station

Bird Brook	
Photo 1 Reach B1A5 Upstream	**Photo 2** Reach B1A5 Downstream
Photo 3 Brook Trout at Reach B1A5	**Photo 4** Slimy Sculpin at Reach B1A5

Bird Brook	
Photo 5 Reach B1C1 Upstream	**Photo 6 Reach B1C1 Downstream**
Photo 7 Brook Trout at Reach B1C1	**Photo 8 Reach B1D3 Upstream**

Bird Brook	
Photo 9 Reach B1D3 Downstream	**Photo 10 Brook Trout at Reach B1D3**
Photo 11 Reach B1H1 Upstream	**Photo 12 Reach B1H1 Downstream**

Bird Brook	
Photo 13 Reach B2A2 Upstream	**Photo 14 Reach B2A2 Downstream**
Photo 15 American Eel at Reach B2A2	**Photo 16 Atlantic Salmon at Reach B2A2**

Bird Brook	
Photo 17 Slimy Sculpin at Reach B2A2	**Photo 18 Reach B3A1 Upstream**
Photo 19 Reach B3A1 Downstream	**Photo 20 Brook Trout at Reach B3A1**

Bird Brook	
Photo 21 American Eel at Reach B3A1	**Photo 22 Brook Trout at Reach B3A6**
Photo 23 Slimy Sculpin at Reach B3A6	**Photo 24 American Eel at Reach B3A6**

Bird Brook	

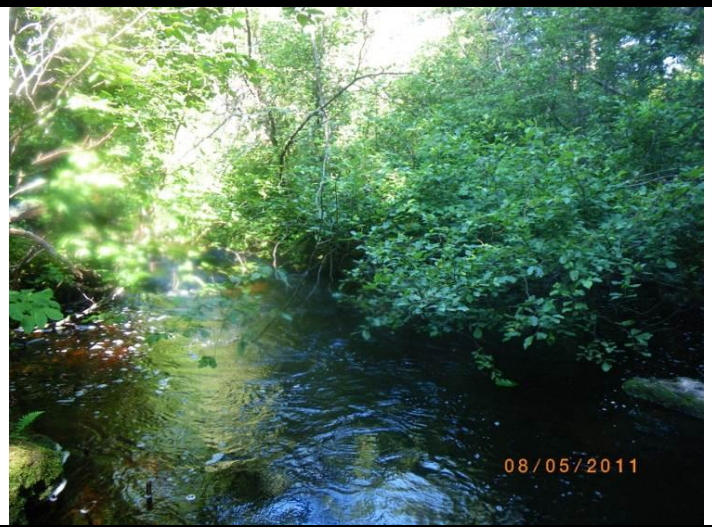
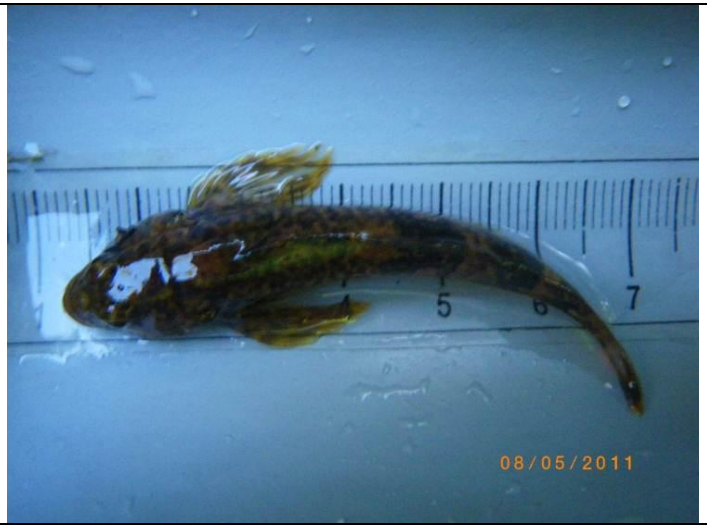



Photo 25 Reach B3A9 Upstream	**Photo 26 Reach B3A9 Downstream**
	
Photo 27 Atlantic Salmon at Reach B3A9	**Photo 28 Slimy Sculpin at Reach B3A9**

Bird Brook
Photo 29 American Eel at Reach B3A9

Sisson Brook	
Photo 30 Reach S1C3 downstream	**Photo 31 Reach S1C3 upstream**
Photo 32 Brook trout S1C3	**Photo 33 Reach S1D3 upstream**

Sisson Brook	
Photo 34 Reach S1D3 downstream	**Photo 35 Brook trout S1D3**
Photo 36 Reach S2A2 downstream	**Photo 37 Reach S2A2 upstream**

Sisson Brook	
Photo 38 Brook trout S2A2	**Photo 39 Salamander S2A3**
Photo 40 American eels S2A3	**Photo 41 Brook trout S2A3**

Sisson Brook	

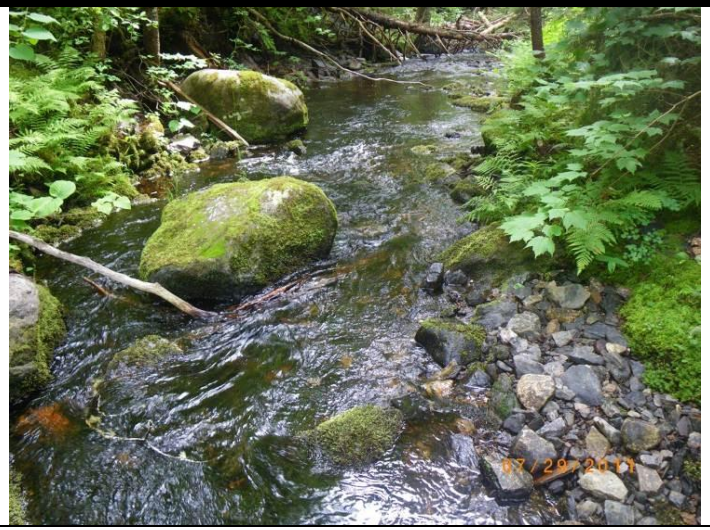
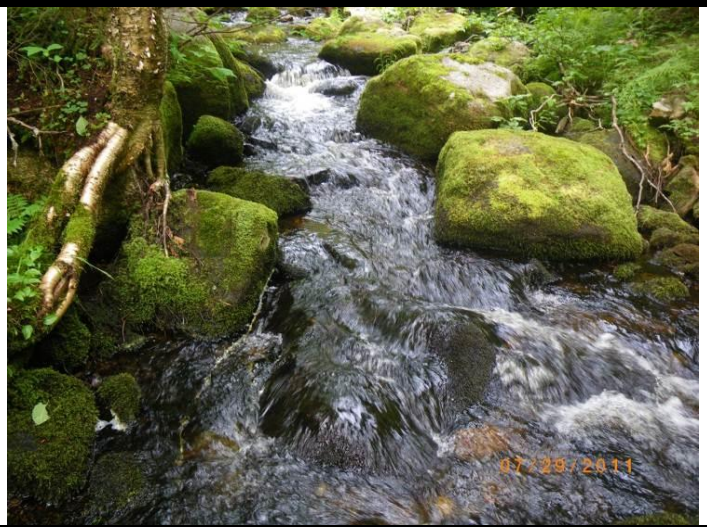

	

Photo 42 Reach S3A2 downstream	**Photo 43 Reach S3A2 upstream**
Photo 44 American eel S3A2	**Photo 45 Brook Trout S3A2**

McBean Brook	
Photo 46 Reach M1K4 Upstream	**Photo 47 Reach M1K4 Downstream**
Photo 48 Atlantic Salmon at Reach M1K4	**Photo 49 Reach M1M2 Upstream**

McBean Brook	
Photo 50 Reach M1M2 Downstream	**Photo 51 Pearl dace M1M2**
Photo 52 Reach M1N1 downstream	**Photo 53 Reach M1N1 upstream**

McBean Brook	
Photo 54 Pearl dace M1N1	**Photo 55 Pearl dace M1N1**
Photo 56 Reach M2E1 downstream	**Photo 57 Reach M2E1 upstream**

McBean Brook	
Photo 58 American eel M2E1	**Photo 59 Blacknose dace M2E1**
Photo 60 Brook trout M2E1	**Photo 61 Reach M3A1 upstream**

McBean Brook	
Photo 62 Reach M3A1 downstream	**Photo 63 Brook trout M3A1**
Photo 64 Sea lamprey M3A1	**Photo 65 Blacknose dace M3A1**

McBean Brook	
Photo 66 Blacknose dace M3A1	**Photo 67 Brook trout M3A1**
Photo 68 Reach M3C3 downstream	**Photo 69 Reach M3C3 upstream**

McBean Brook	
Photo 70 Reach M3C3 downsteam	**Photo 71 Common Shiner M3C3**
Photo 72 Creek Chub M3C3	**Photo 73 American Eel M3C3**

McBean Brook	
Photo 74 Creek Chub M3C3	**Photo 75 Sea Lamprey M3C3**
Photo 76 Reach M4A9 downstream	**Photo 77 Reach M4A9 upstream**

McBean Brook	
Photo 78 Longnose sucker M4A9	**Photo 79 Creek chub M4A9**
Photo 80 Blacknose Dace M4A9	**Photo 81 Common shiner M4A9**

McBean Brook

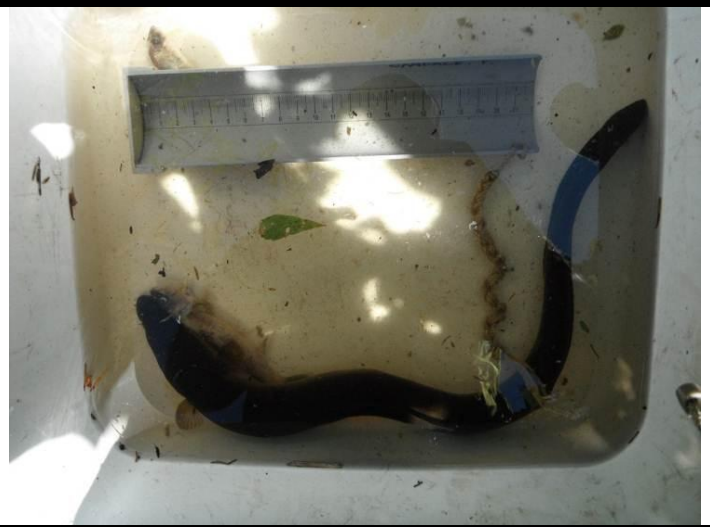



Photo 82 American eel M4A9

West Branch Napadogan Brook	
Photo 83 Reach W1G5 upstream	**Photo 84 Reach W1G5 downstream**
Photo 85 Brook trout W1G5	**Photo 86 Reach W1N3 upstream**

West Branch Napadogan Brook	
Photo 87 Reach W1N3 downstream	**Photo 88 Brook trout W1N3**
Photo 89 Slimy sculpin W1N3	**Photo 90 Reach W2A4 downstream**

West Branch Napadogan Brook	
Photo 91 Reach W2A4 upstream	**Photo 92 Brook trout W2A4**
Photo 93 Slimy sculpin W2A4	**Photo 94 Sea lamprey W2A4**

West Branch Napadogan Brook	
Photo 95 Reach W4A1 upstream (ponded)	**Photo 96** Reach W4A1 upstream (below pond)
Photo 97 Reach W4A1 upstream	**Photo 98** Reach W4A1 downstream

West Branch Napadogan Brook	
Photo 99 White Sucker W4A1	**Photo 100 White Sucker W4A1**
Photo 101 Sea lamprey W4A1	**Photo 102 Sea lamprey W4A1**

West Branch Napadogan Brook	
Photo 103 Atlantic salmon W4A1	**Photo 104 Slimy sculpin W4A1**
Photo 105 Brook trout W4A1	**Photo 106 Reach W4A17 upstream**

West Branch Napadogan Brook	
Photo 107 Reach W4A17 upstream	**Photo 108 Slimy sculpin W4A17**
Photo 109 Brook trout W4A17	**Photo 110 Atlantic Salmon W4A17**

West Branch Napadogan Brook	
Photo 111 Reach W4A21 downstream	**Photo 112 Reach W4A21 upstream**

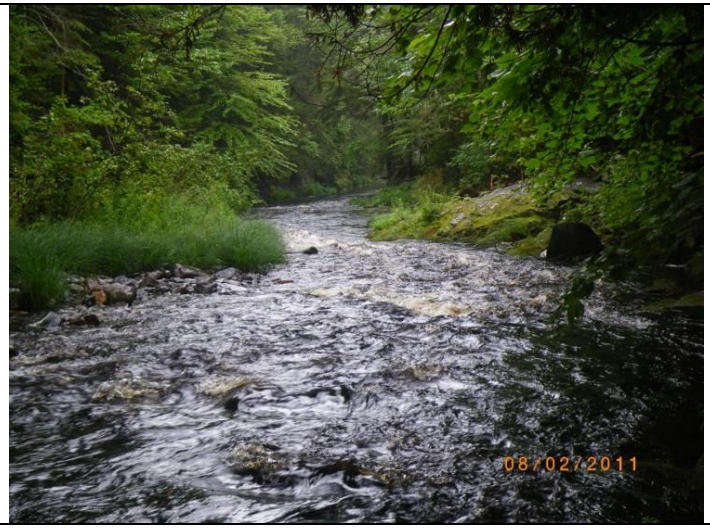



Photo 113 Reach W4A25 upstream	**Photo 114 Reach W4A25 downstream**

West Branch Napadogan Brook	
Photo 115 Crayfish W4A25	**Photo 116 Brook trout W4A25**
Photo 117 Atlantic salmon W4A25	**Photo 118 Brook trout W4A25**

West Branch Napadogan Brook	
Photo 119 Sea lamprey W4A25	**Photo 120 Reach W4A31 downstream**
Photo 121 Reach W4A31 downstream at ATV bridge	**Photo 122 Brook trout W4A31**

West Branch Napadogan Brook	
Photo 123 American eel W4A31	**Photo 124 Atlantic salmon W4A31**

East Branch Napadogan Brook	
Photo 125 Reach EBNB1 Upstream	**Photo 126 Reach EBNB1 Downstream**
Photo 127 Brook Trout at Reach EBNB1	**Photo 128 Atlantic Salmon at Reach EBNB1**

East Branch Napadogan Brook	
Photo 129 Black-nose Dace at Reach EBNB1	**Photo 130 American Eel at Reach EBNB1**
Photo 131 Reach EBNB2 Upstream	**Photo 132 Reach EBNB2 Downstream**

East Branch Napadogan Brook	
Photo 133 Creek Chub at Reach EBNB2	**Photo 134 Lamprey Eel at Reach EBNB2**
Photo 135 Atlantic Salmon at Reach EBNB2	**Photo 136 Reach EBNB3 Upstream**

East Branch Napadogan Brook	
Photo 137 Reach EBNB3 Downstream	**Photo 138 Brook Trout at Reach EBNB3**

Appendix D-3

Electrofishing Field Forms

√MJS & JLL

Fish Survey Data Collection Form

Job No. 121810356

GENERAL DATA			
Watercourse Name:	BIAS	Date: (mm/dd/yyyy)	July 21, 2011
Coordinates: (UTM: X Y)		Personnel	EMW, MJS, MF
Weather:	Sunny, Clear, Partial Cloud Calm, Breezy, Windy Wind Direction: N, NW, W, SW, S, SE, E, NE or NA		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
If BP E-Fish:	Voltage: 900	Amps: 35 Hz	Duty Cycle: 12%	Seconds: 65 s
If Seining:	# of hauls:		Length of Hauls (m):	
If Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)		Water Temp.: (°C)	15.1
Sp. Conductivity: (µS/sec)	28.2	Salinity: (ppt)	0.0
DO: (mg/l): 94.4%	9.56 mg/l	pH:	7.0

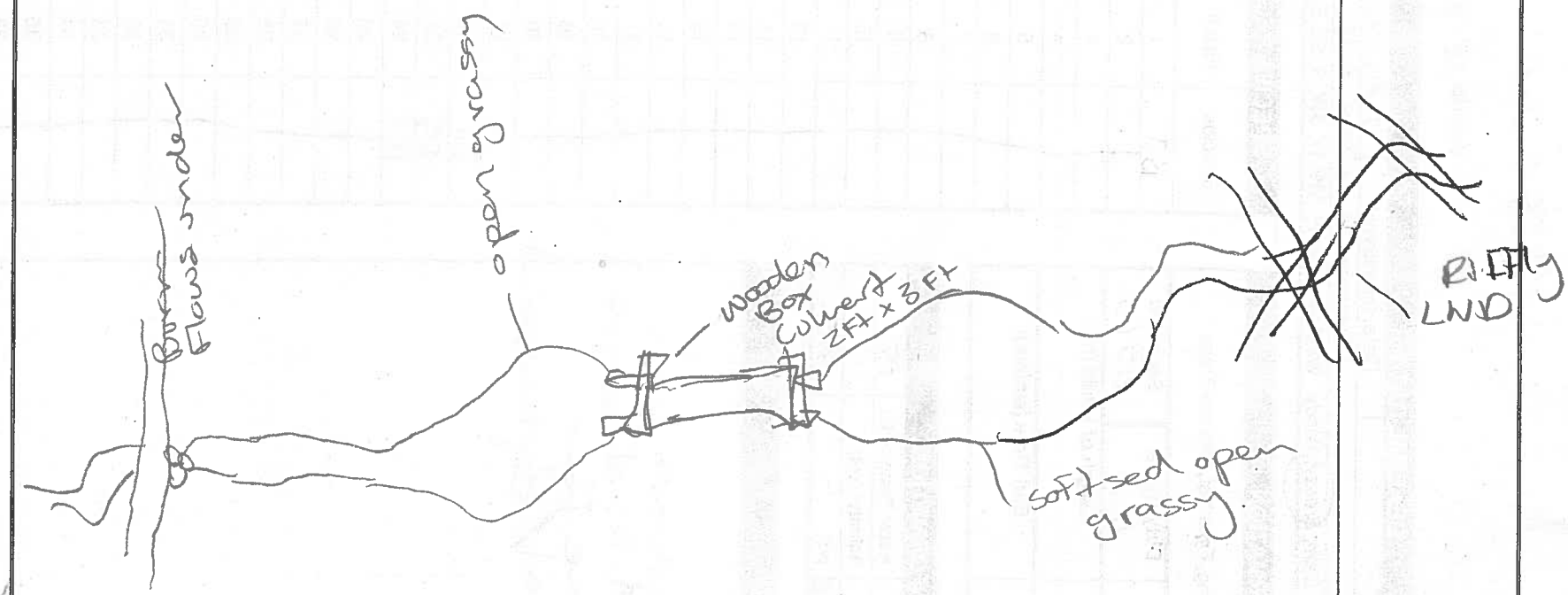
NOTES

Photo 886-887

Fished US + DS of culvert
Sculpin collected DS of culvert
Possibly good Place For
culvert Removal / Replacement
HADD

SPECIES RECORD		
Species	Fish #	Forked Length (cm)
BT	1	9.7
	2	8.5
	3	9.5
	4	7.6
	5	8.0
	6	7.9
	7	8.6
	8	8.0
	9	7.6
	10	9.7
	11	9.1
	12	9.4
	13	9.7
	14	8.2
	15	10.3
	16	8.9
	17	7.5
	18	7.1
	19	5.3
	20	5.2 mort
	21	12.1
BT	22	13.0
SS	23	6.3
BT	24	7.0
	25	7.4
	26	9.7
	27	7.2
	28	7.0
	29	4.8
	30	4.7
	31	5.7
	32	8.1
	33	7.5
	34	5.0
	35	4.6
	36	7.0
	37	7.5
BT		5.3
		4.2
		4.3
		5.5
		5.6
BT		4.5

SP	FL
BT	4.4
BT	4.3
BT	5.0

Site Sketch	Ledgend
	

Fish Survey Data Collection Form

✓ JLL + MJS

Job No. 121810356 Tu/4

GENERAL DATA

Watercourse Name:	BIC	Date: (mm/dd/yyyy)	June 21, 2011
Coordinates: (UTM: X Y)		Personnel	EMW MJS MF
Weather:	Sunny, Clear, Partial Cloud, Calm, Breezy, Windy	Wind Direction: N, NW, W, SW, S, SE, E, NE or NA	

SAMPLING INFORMATION

Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
If BP E-Fish:	Voltage: 990V	Amps: 40HZ	Duty Cycle: 15%	Seconds: 441
If Seining:	# of hauls:		Length of Hauls (m):	
If Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION

Air Temp.: (°C)	20.2	Water Temp.: (°C)	11.6
Sp. Conductivity: (µS/sec)	23.0 ms	Salinity: (ppt)	0.0
DO: (mg/l): 69.1%	7.79 mg/L	pH:	5.4

NOTES

Fish observed when we arrived @ Reach.

depth: 6cm 9cm 8cm

Flow	1/4	1/2	3/4
1	19	16	15
2	22	15	14
3	24	16	14

1m, 0.5l width

SPECIES RECORD

Species	Fish #	Forked Length (cm)
Brk Tr.	1	8.3
"	2	13.2
"	3	8.6
"	4	7.3
"	5	4.6
"	6	7.9
"	7	7.1
"	8	7.0
"	9	4.5
"	10	4.5
	11	
	12	
	13	
	14	
	15	
	16	
	17	
	18	
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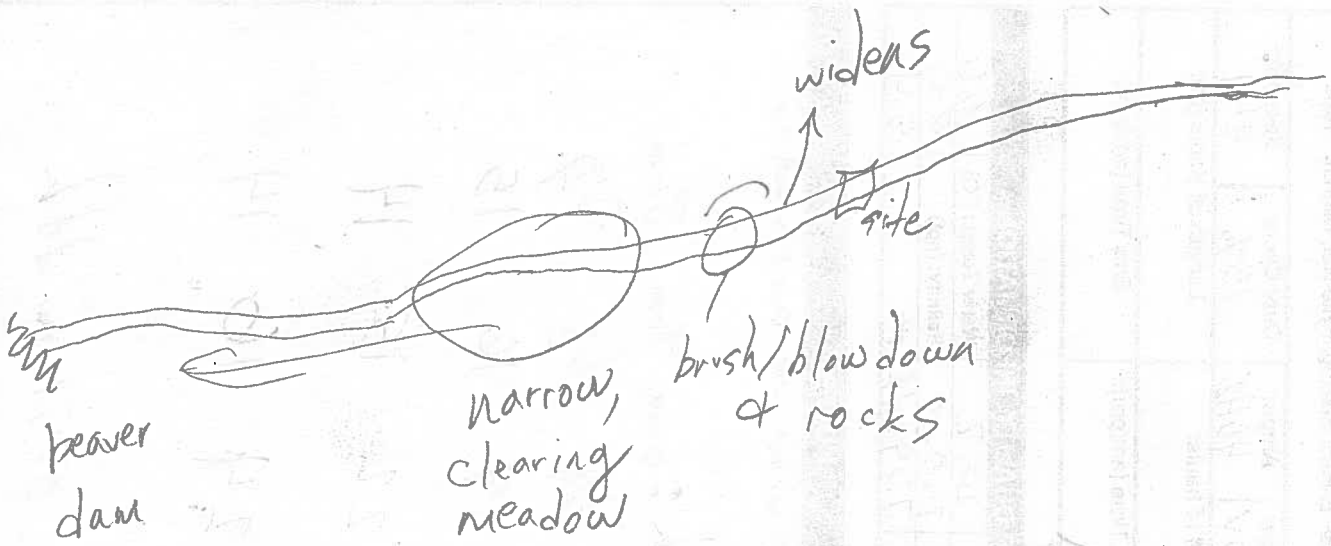
	36	
	37	

8.3

Site Sketch

Ledgend



Fish Survey Data Collection Form

Job No. 12180356

GENERAL DATA

Watercourse Name:	BID3	Date: (mm/dd/yyyy)	July 29, 2011
Coordinates: (UTM: X Y)		Personnel	GMW MJS MF
Weather:	Sunny, Clear, Partial Cloud) Calm, Breezy, Windy	Wind Direction: N, NW, W, SW, S, SE, E, NE or NA	

SAMPLING INFORMATION

Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
If BP E-Fish:	Voltage: 290	Amps: 4042	Duty Cycle: 16	Seconds: 630
If Seining:	# of hauls:		Length of Hauls (m):	
If Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION

Air Temp.: (°C)	25	Water Temp.: (°C)	13.8
Sp. Conductivity: (µS/sec)	24.6	Salinity: (ppt)	0.0
DO: (mg/l): 83.9%	8.62	pH:	6.2

NOTES

e-Fished DS of current 1st periphiton collected US, along w wq + sed Q

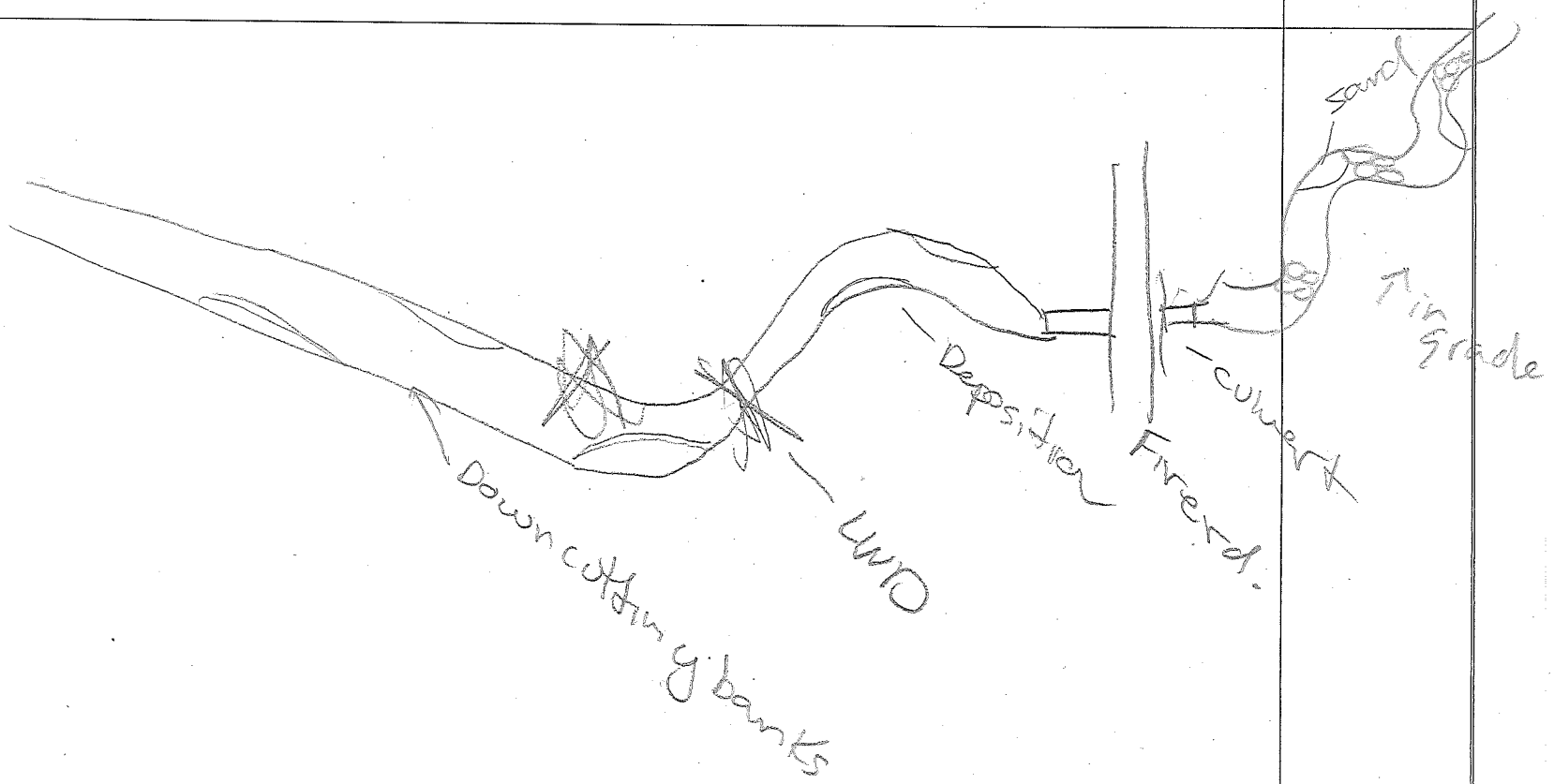
Fished ~ 30m

SPECIES RECORD

Species	Fish #	Forked Length (cm)
BT	1	15.1
BT	2	13.8
	3	9.5
	4	11.7
	5	10.7
	6	7.0
	7	8.7
	8	7.2
	9	8.4
	10	7.5
	11	4.5
	12	8.9
	13	8.7
	14	11.9
	15	4.5
	16	4.5
	17	4.4
	18	4.3
	19	3.8
	20	11.6
	21	4.5
	22	
	23	
	24	
	25	
	26	
	27	
	28	
	29	
	30	
	31	
	32	
	33	
	34	
	35	
	36	
	37	

Site Sketch

Ledgend



Fish Survey Data Collection Form

Job No. 12810356

GENERAL DATA

Watercourse Name:	BZA2	Date: (mm/dd/yyyy)	June 22, 2011
Coordinates: (UTM: X Y)		Personnel	EMW MS MT
Weather:	Sunny, Clear, Partial Cloud	Calm, Breezy, Windy	Wind Direction: N, NW, W, SW, S, SE, E, NE or NA

SAMPLING INFORMATION

Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
If BP E-Fish:	Voltage: 990	Amps: 35	Duty Cycle: 14	Seconds: 755
If Seining:	# of hauls:		Length of Hauls (m):	
If Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION

Air Temp.: (°C)	21° C.	Water Temp.: (°C)	13,6
Sp. Conductivity: (µS/sec)	70.9	Salinity: (ppt)	0.0
DO: (mg/l): 92.2%	9.72	pH:	5.7

NOTES

missed several Fish BT, SS maybe lamprey?!!
Really Mossy but nice habitat
Low conductivity
Fish Photos on Eva's camera.

SPECIES RECORD

Species	Fish #	Forked Length (cm)
BT	1	7.7
BT	2	8.8
AE	3	26.2
BT	4	8.6
BT	5	10.3
BT	6	9.4
BT	7	8.6
SS	8	4.3
SS	9	4.4
SS	10	3.8
SS	11	4.5
SS	12	4.5
BT	13	7.1
SS	14	4.3
BT	15	4.3
BT	16	4.9
BT	17	4.6
BT	18	3.3
	19	
	20	
	21	
	22	
	23	
	24	
	25	
	26	
	27	
	28	
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	31	
	32	
	33	
	34	
	35	
	36	
	37	

Site Sketch	Ledgend

JMSS + JLL

Fish Survey Data Collection Form

Job No. 12180356

GENERAL DATA

Watercourse Name:	BID3	Date: (mm/dd/yyyy)	July 20, 2017
Coordinates: (UTM: X Y)		Personnel	EMW JMS MF
Weather:	Sunny, Clear, Partial Cloud, Calm, Breezy, Windy	Wind Direction: N, NW, W, SW, S, SE, E, NE or NA	

SAMPLING INFORMATION

Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
If BP E-Fish:	Voltage: 290	Amps: 4	Duty Cycle: 40Hz 16	Seconds: 630
If Seining:	# of hauls:		Length of Hauls (m):	
If Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION

Air Temp.: (°C)	25	Water Temp.: (°C)	13.4
Sp. Conductivity: (µS/sec)	24.6	Salinity: (ppt)	0.0
DO: (mg/l): 83.9%	8.67	pH:	6.2

NOTES

e-Fished DS of culvert 1st periphiton collected US, along w wq + sedQ

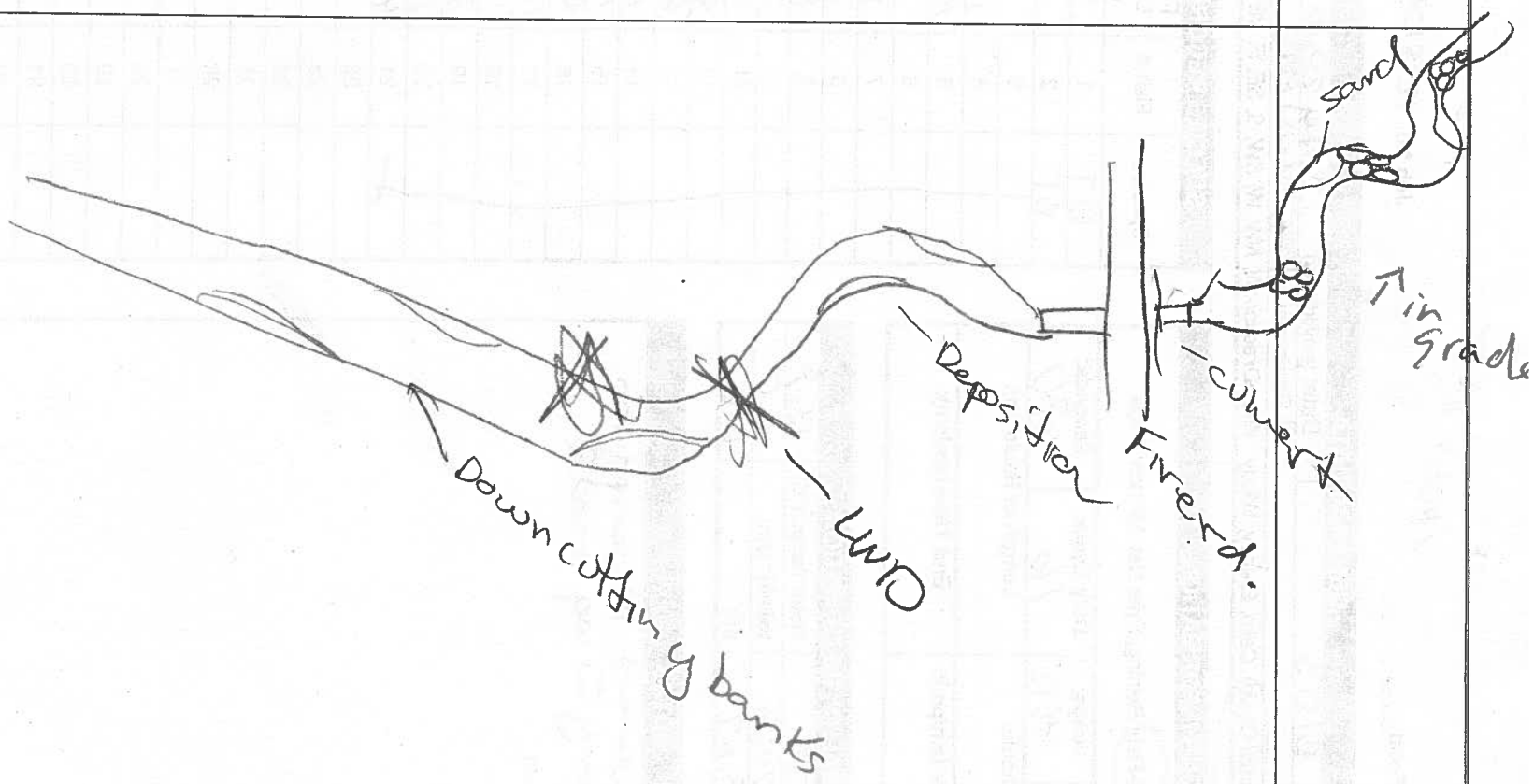
Fished ≈ 30m

SPECIES RECORD

Species	Fish #	Forked Length (cm)
BT	1	15.1
BT	2	13.8
	3	9.5
	4	11.7
	5	10.7
	6	7.0
	7	8.7
	8	7.2
	9	8.4
	10	7.5
	11	4.5
	12	7.9
	13	8.7
	14	11.9
	15	4.5
	16	4.5
	17	4.4
	18	4.3
	19	3.8
	20	11.6
	21	4.5
	22	
	23	
	24	
	25	
	26	
	27	
	28	
	29	
	30	
	31	
	32	
	33	
	34	
	35	
	36	
	37	

Site Sketch

Ledgend



MJS + JLL

Fish Survey Data Collection Form

Job No. 1218103S6

GENERAL DATA			
Watercourse Name:	B3A6	Date: (mm/dd/yyyy)	08/03/2018
Coordinates: (dd.dd)		Personnel:	MJS/EW/MF/HF
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 30	Duty Cycle: 14	Seconds 596
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	18°C	**Water Temp.:** (°C)	14.2°C
Sp. Conductivity: (µS/sec)	24.3	**Salinity:** (ppt)	0.0
DO: (mg/L): 86.4	8.90	**pH:**	6.4

NOTES

SPECIES RECORD			
Species	Fish #	Fork Length (cm)	
SS	1	8.4	
BT	2	13.6	
BT	3	10.6	
BT	4	13.0	Adipose Partial
BT	5	14.7	
BT	6	11.9	
BT	7	10.7	
BT	8	11.5	
BT	9	6.1	
SS	10	6.1	
BT	11	9.1	
BT	12	5.1	
SS	13	6.1	
AE	14	28	
	15		
	16		
-	17		
	18		
	19		
	20		
	21		
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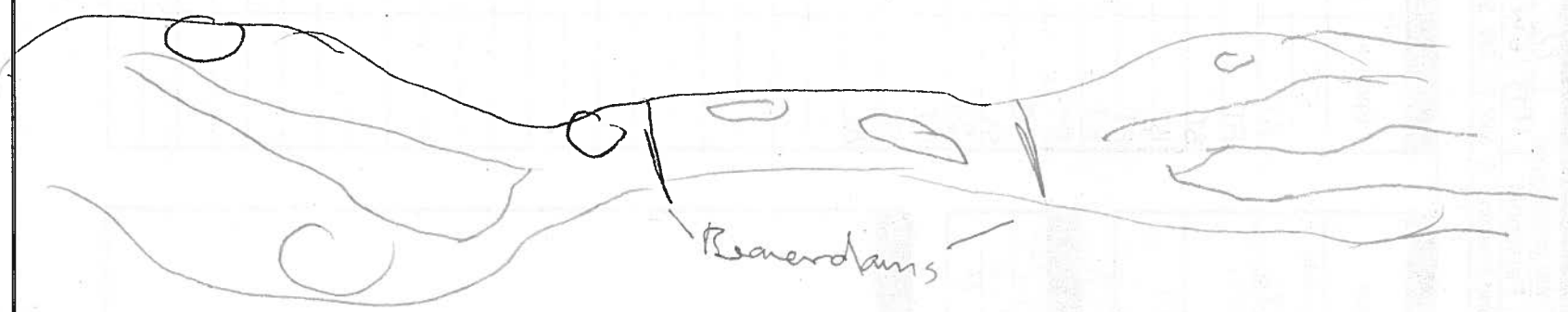
	33		
	34		
	35		

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

√MJS + JLL

Fish Survey Data Collection Form **Job No.** 121610356

GENERAL DATA			
Watercourse Name:	BSA9	Date: (mm/dd/yyyy)	Aug 5 2011
Coordinates: (dd.dd)		Personnel:	CMW MJS HF JMF
Weather:	(Sunny), Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA		

SAMPLING INFORMATION				
Gear Type:	(BP E-Fish), Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 40	Duty Cycle: 14	Seconds 855
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	20	**Water Temp.:** (°C)	12.8
Sp. Conductivity: (µS/sec)	24.7	**Salinity:** (ppt)	0.0
DO: (mg/L):	8.78	**pH:**	5.7

NOTES

High grade BT may be good as a long term monitoring location
e-Fished ≈ 150 m streach

SPECIES RECORD			
Species	Fish #	Fork Length (cm)	
AS	1	12.6	Fin is mun
SS	2	6.2	
BT	3	18.7	
BT	4	14.0	
BT	5	13.7	
BT	6	13.8	
BT	7	14.1	
BT	8	10.7	Parasite adipose dorsal P. adipo
BT	9	8.4	
BT	10	9.5	
BT	11	11.7	
BT	12	5.2	
BT	13	8.5	
BT	14	8.5	
SS	15	5.7	
SS	16	6.8	
SS	17	5.5	
BT	18	6.4	
SS	19	5.0	
SS	20	5.6	
BT	21	5.2	
SS	22	5.6	
BT	23	5.6	
SS	24	5.2	
SS	25	5.1	
SS	26	4.7	
AE	27	16.0	
	28		
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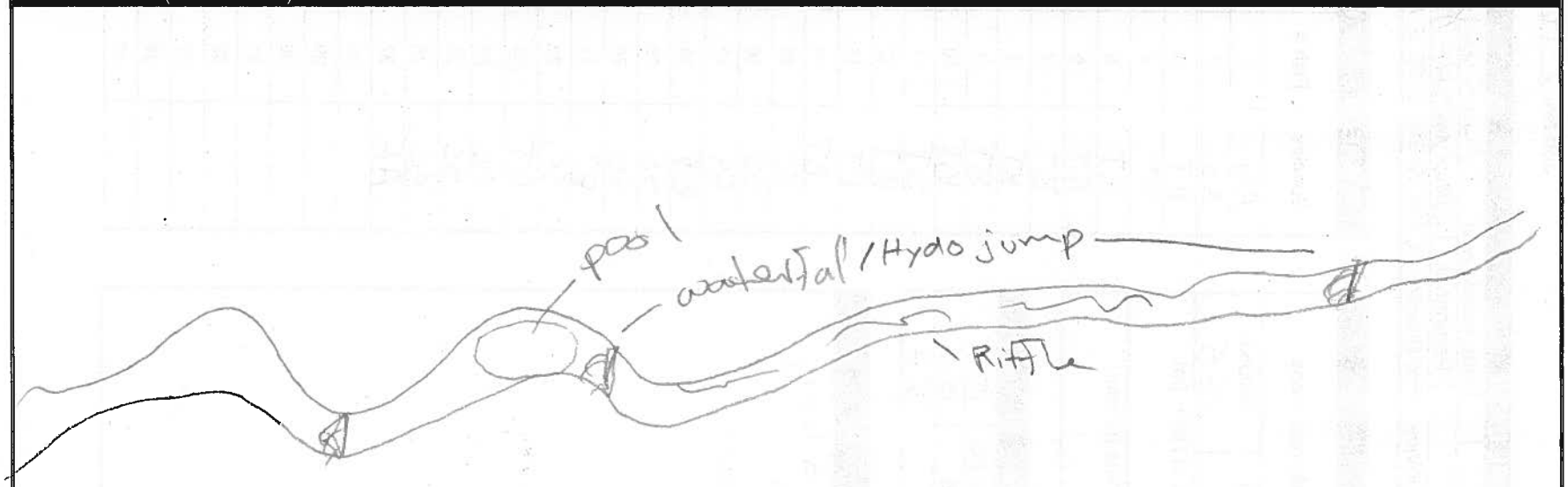
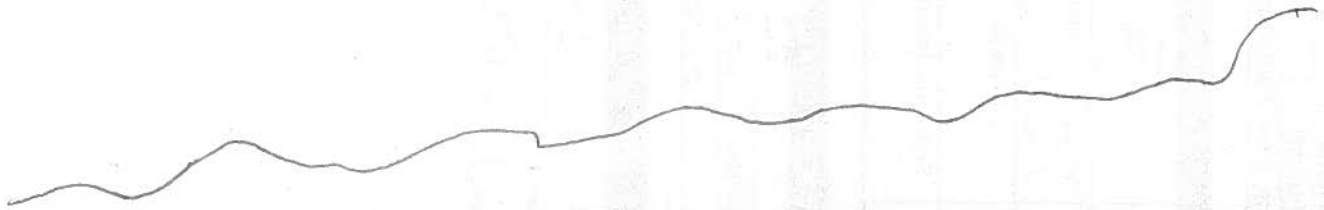
	31		
	32		
	33		
	34		
	35		

Site Sketch (Plan View)



Site Sketch (Profile View)



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MJS + JLL

Fish Survey Data Collection Form **Job No.** 12810356

GENERAL DATA			
Watercourse Name:	EBNB1	Date: (mm/dd/yyyy)	08/08/2011
Coordinates: (dd.dd)		Personnel:	EW/MJS/DT/MF
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 35	Duty Cycle: 12	Seconds 758
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	~20°C	**Water Temp.:** (°C)	17.7
Sp. Conductivity: (µS/sec)	37.7	**Salinity:** (ppt)	0.0
DO: (mg/L):	9.66	**pH:**	7.0

NOTES

- Missed ~ 4 American eels.

Depth

		Width	Length
1/4	LB 57.5cm	6meters	2meters
1/2	Center 34.8cm		
3/4	RB 13.8cm		

	1/4	1/2	3/4
1	6 sec	6 sec	9 sec
2	5 sec	6 sec	8 sec
3	6 sec	6 sec	9 sec

SPECIES RECORD

Species	Fish #	Fork Length (cm)	
At. Sal.	1	10.1	Photo
"	2	9.4	
"	3	9.8	
"	4	9.8	
"	5	10.7	
"	6	9.3	
"	7	9.7	
"	8	10.2	
"	9	9.9	
"	10	10.3	
"	11	12.7	
Br Trout	12	14.3	Photo
At. Sal.	13	13.4	
"	14	8.4	
BND	15	4.5	Mort. Phot
"	16	7.3	
"	17	6.8	
"	18	4.5	
"	19	5.2	
"	20	3.9	
"	21	4.2	
"	22	5.4	
"	23	4.2	
"	24	4.8	
"	25	4.2	
"	26	4.4	
Am. Eel	27	32.3	
	28	34.0	
	29	26.1	
	30	25.0	
	31	17.2	
	32	16.8	
	33	15.3	
	34	13.4	
	35		

Site Sketch (Plan View)

Site Sketch (Profile View)

Ledged

✓ MJS & JLL

Fish Survey Data Collection Form Job No. 121810356

GENERAL DATA			
Watercourse Name:	EBNB2	Date: (mm/dd/yyyy)	08/04/11
Coordinates: (dd.dd)		Personnel:	EW/MJS/HF/MF
Weather:	Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 755	Amps: 30 Hz	Duty Cycle: 12%	Seconds 1147
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	18°C	Water Temp.: (°C)	16.8
Sp. Conductivity: (µS/sec)	33.9	Salinity: (ppt)	0.0
DO: (mg/L):	9.69	pH:	6.9

NOTES

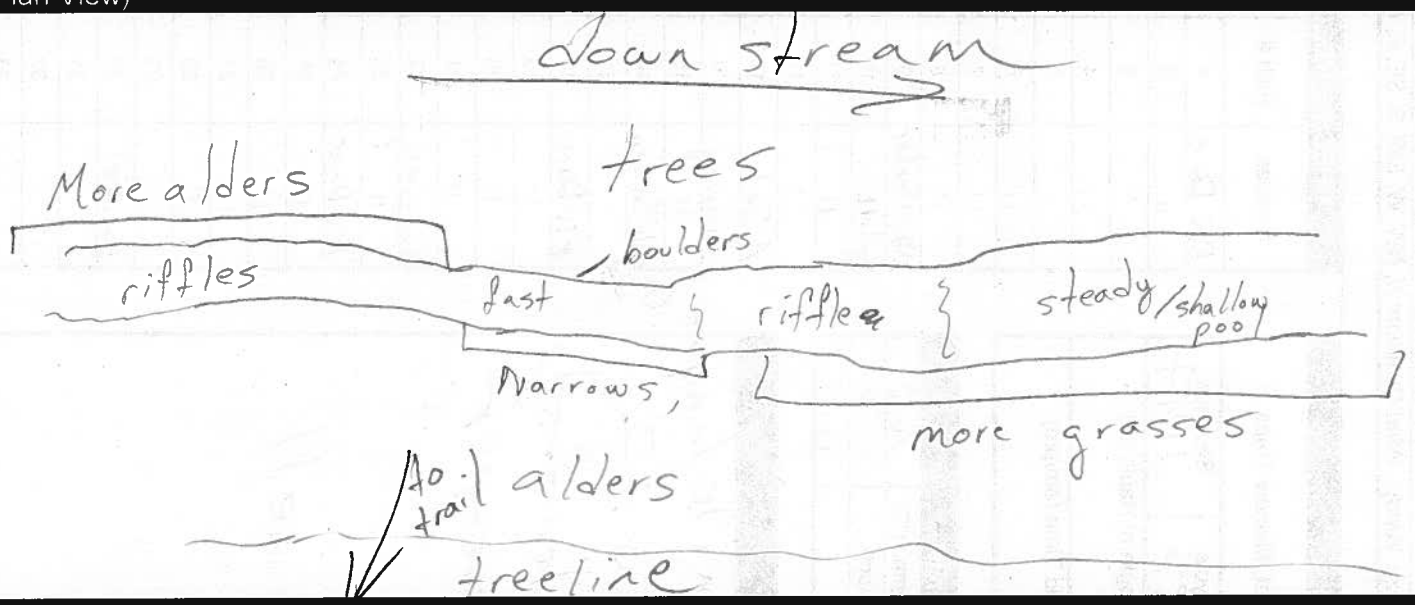
- saw many juvenile lamprey
- missed but saw ~7
  At. Sal. → water fast/deeper
- missed ~4
  Am. eel as well

SPECIES RECORD

Species	Fish #	Fork Length (cm)	
BN Dace	1	4.8	Photo (P)
"	2	6.5	
"	3	6.4	
"	4	4.0	
"	5	4.1	
"	6	5.8	
"	7	6.8	P
"	8	7.2	
White Sucker	9	3.2	P
"	10	2.4	
" ?	11	8.4	P
"	12	2.9	
A Sal	13	12.3	P
Lamprey	14	7.9	P
"	15	12.5	
? BN Shiner	16	4.6	P
MJS	17		
BN Dace	18	4.4	
"	19	4.2	
"	20	6.9	
"	21	4.4	
Lamprey	22	7.5	
"	23	8.8	
BN Dace	24	6.5	
"	25	5.4	
"	26	4.4	
"	27	3.9	
"	28	4.9	
"	29	3.6	
Am. Eel	30	30.3	
	31	31.4	
	32	27.5	
	33	25.5	
	34	16.3	
	35	15.4	

13.9

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

Fish Survey Data Collection Form **Job No.** 21810356

GENERAL DATA			
Watercourse Name:	EBNB-3	Date: (mm/dd/yyyy)	Aug 4, 2021
Coordinates: (dd.dd)		Personnel:	EMW, MJS, BF, MF
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 700	Amps: 30	Duty Cycle: 12	Seconds 463
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)		**Water Temp.:** (°C)	16.8
Sp. Conductivity: (µS/sec)	19.8	**Salinity:** (ppt)	
DO: (mg/L):	8.82	**pH:**	6.1

NOTES

WC starts in pond + flows over the road ds is grass wetland disorganized channel that unifies.

missed 2 BT

SPECIES RECORD		
Species	Fish #	Fork Length (cm)
BT	1	6.1
BT	2	13.1
BT	3	9.7
BT	4	6.2
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	
	15	
	16	
	17	
	18	
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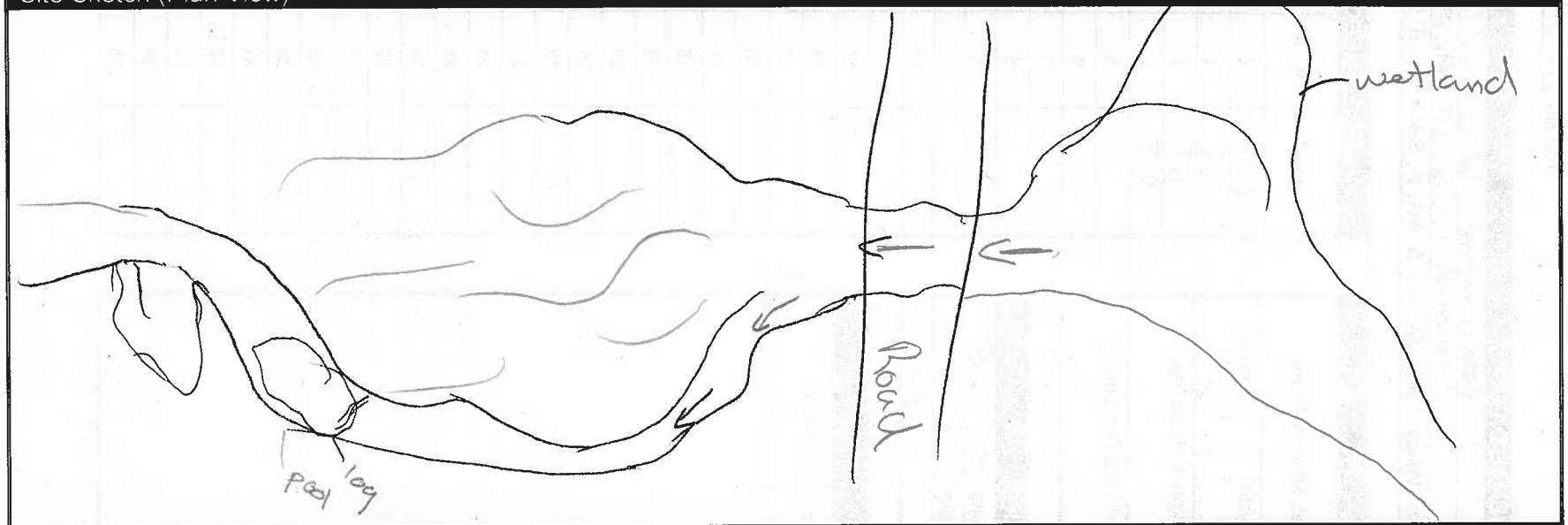
Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

MJS + JLL

Fish Survey Data Collection Form **Job No.** 1218103S6

GENERAL DATA			
Watercourse Name:	M1K4	Date: (mm/dd/yyyy)	Jul. 27, 2011
Coordinates: (dd.dd)		Personnel:	MJS + DT + AL
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 30	Duty Cycle: 12	Seconds 582
~~Seining~~:	# of hauls:		Length of Hauls (m):	
~~Fyke Netting~~:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	17°C	**Water Temp.:** (°C)	14.3
Sp. Conductivity: (µS/sec)	22.7	**Salinity:** (ppt)	0.0
DO: (mg/L): 72.4	7.42	**pH:**	6.3

NOTES

efished first 30m d/s of culvert. flows below grad below that point.
E-fished 100m u/s of culvert.
Small water course. Few fish. Scale would not turn on. → no weights

SPECIES RECORD			
Species	Fish #	Fork Length (cm)	
BT	1	10.5	u/s of culver
	2	10.1	
	3	10.8	
	4	5.2	d/s of culver
	5	14.3	
	6		
	7		
	8		
	9		
	10		
	11		
	12		
	13		
	14		
	15		
	16		
	17		
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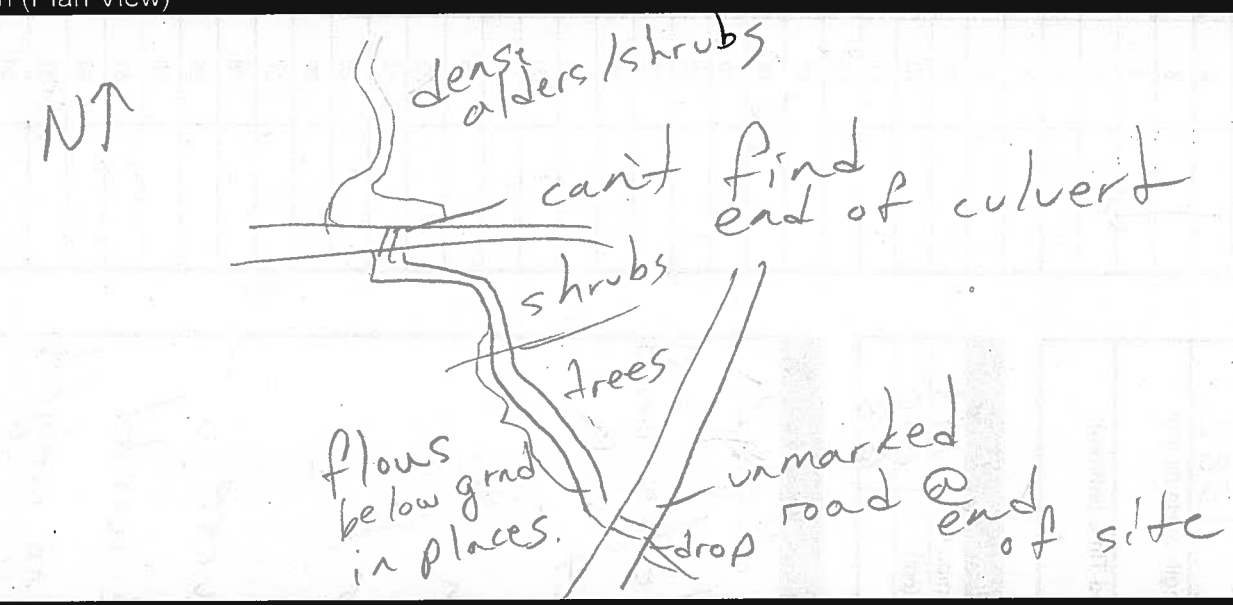
	35		

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

Fish Survey Data Collection Form

✓ MJS + JLL

Job No. 121811356

GENERAL DATA

Watercourse Name:	M1M2	Date: (mm/dd/yyyy)	Jul. 27, 2011
Coordinates: (UTM: X Y)		Personnel	MJS, DT, AL
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy*	*Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*	

SAMPLING INFORMATION

Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
If BP E-Fish:	Voltage:	Amps:	Duty Cycle:	*Seconds:*
If Seining:	# of hauls:		Length of Hauls (m):	
If Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION

Air Temp.: (°C)	16.0°C	Water Temp.: (°C)	15.5
Sp. Conductivity: (µS/sec)	34.1	Salinity: (ppt)	0.0
DO: (mg/l):	67.6%	pH:	6.5
	6.72 mg/L		

NOTES

- Minnow traps (3) set July 27, 2011

SPECIES RECORD

Species	Fish #	Forked Length (cm)
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	
	15	
	16	
	17	
	18	
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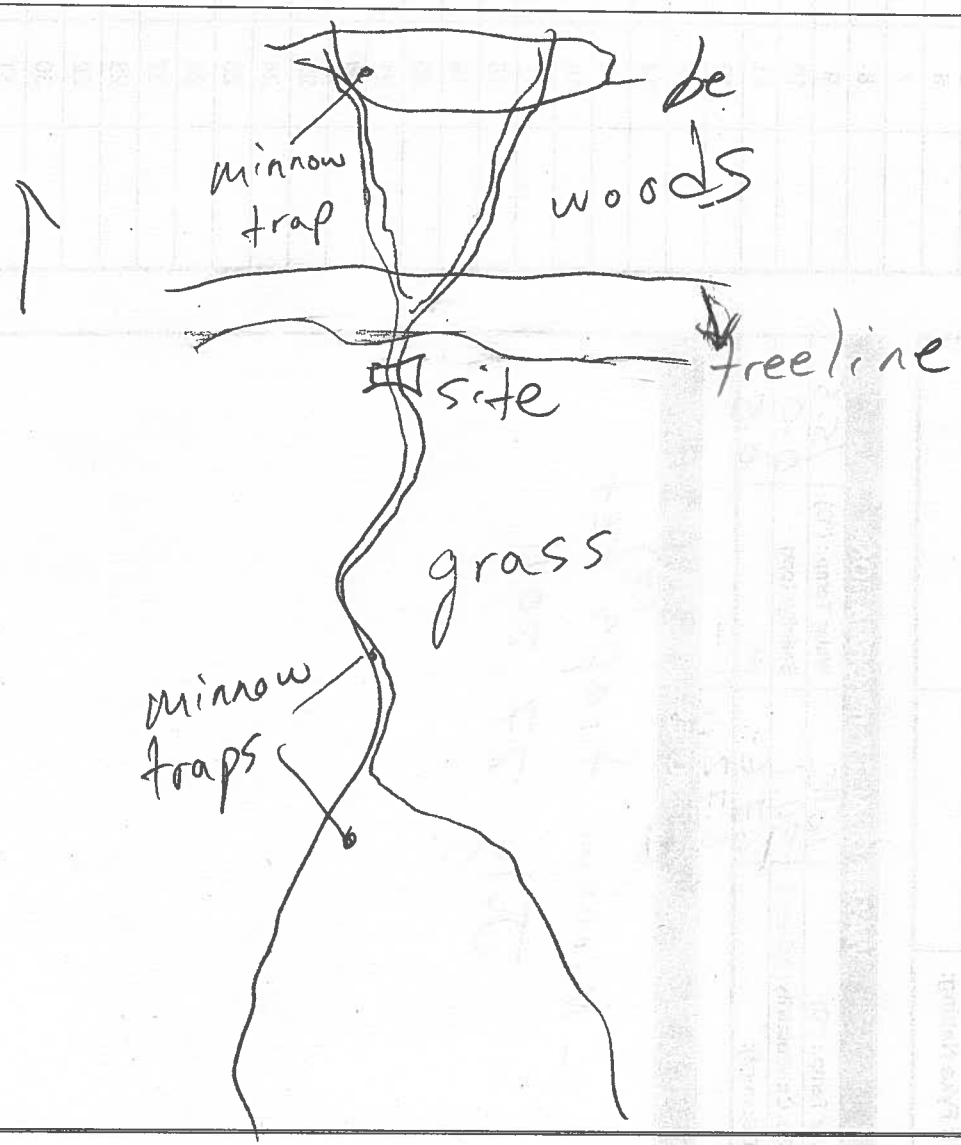
	36	
	37	

Site Sketch

Ledgend



MJS + JLL

pg 2

Fish Survey Data Collection Form

Job No. 121810356

GENERAL DATA			
Watercourse Name:	M1M2	Date: (mm/dd/yyyy)	07/28/2011
Coordinates: (dd.dd)		Personnel:	MJS/EW/DT/AL
Weather:	Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage:	Amps:	Duty Cycle:	Seconds
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)		Water Temp.: (°C)	17.8°C
Sp. Conductivity: (µS/sec)	30.9	Salinity: (ppt)	0.0 ppt
DO: (mg/L): 39.2%	3.74 mg/L	pH:	5.6

NOTES

- fished trap in stream
- no fish
- large pond
- & upper pond
creek chubb

SPECIES RECORD		
Species	Fish #	Fork Length (cm)
Creek Chubb	1	~~10.9~~ 9.9
"	2	9.2
"	3	9.3
"	4	7.8
"	5	8.7
"	6	9.6
PD	7	9.6
"	8	8.4
"	9	8.2
"	10	8.8
"	11	9.7
"	12	7.1
"	13	7.2
"	14	8.8
	15	
	16	
	17	
	18	
	19	
	20	
	21	
	22	
	23	
	24	
	25	
	26	
	27	
	28	
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	31	
	32	
	33	
	34	
	35	

lower large pond

upper beau po

Spawn colou

* some of the coarse Pearl Dace miss ID

Site Sketch (Plan View)

Site Sketch (Profile View)

Ledged

✓MJS & JLL

Fish Survey Data Collection Form **Job No.** 121810356

GENERAL DATA			
Watercourse Name:	MINI	Date: (mm/dd/yyyy)	Jul. 27, 2011
Coordinates: (dd.dd)		Personnel:	MJS + DT & AL
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps (3)			
BP E-Fish:	Voltage:	Amps:	Duty Cycle:	Seconds
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	[illegible]	**Water Temp.:** (°C)	15.5
Sp. Conductivity: (µS/sec)	24.7	**Salinity:** (ppt)	0.00
DO: (mg/L):	80.5 / 8.08	**pH:**	6.0

NOTES

- minnow traps (3) set July 27, 2011

July 28, 2011 collecting MT
25.7 µS
13.7°C
77.8% DO
8.02 mg/l
0.0 ppt
5.6 pH
16°C air temp.

SPECIES RECORD

Species	Fish #	Fork Length (cm)	
PD Creek Chub	1	11.0	(pic)
PD	2	8.4	Male
CK	3	6.3	
"	4	8.2	
"	5	7.6	
"	6	7.4	
"	7	8.4	
"	8	9.4	black spo[illegible] (fungus?
↓	9	6.3	
CK	10	9.5	
* PD	11	7.4	- very brigh[illegible] reds (pic
CK	12	7.5	
CK	13	7.7	
CK	14	7.0	Fine scale dace
CK	15	6.9	
CK	16	6.7	(6)
	17		
	18		
	19		
	20		
	21		
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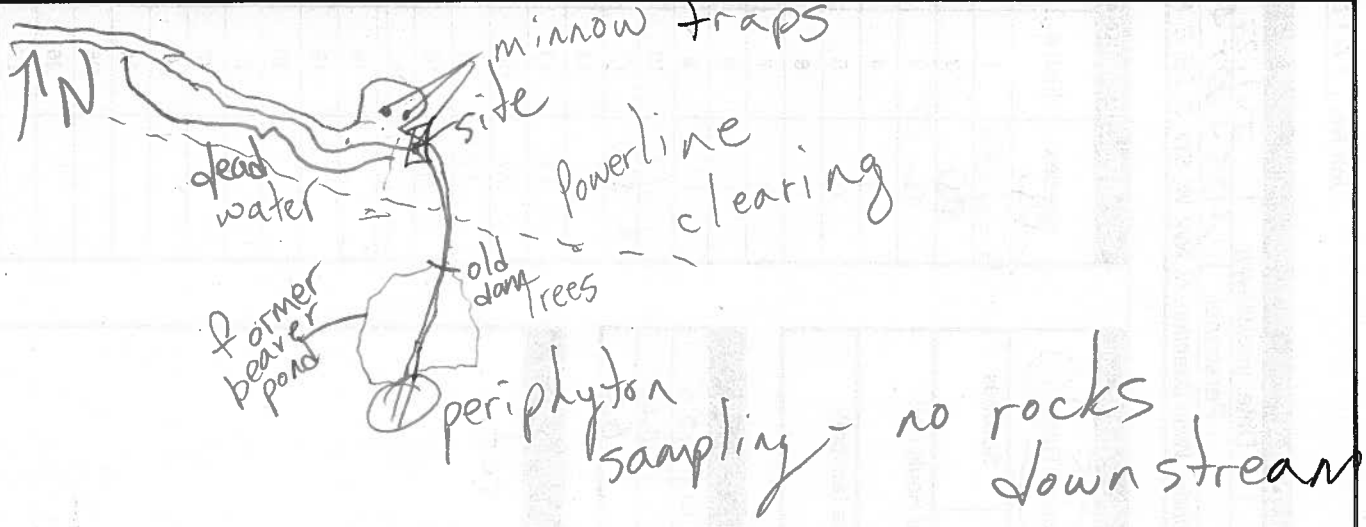
Miss ID-ed

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

V MJS + SLL

Fish Survey Data Collection Form **Job No.** 121810356

GENERAL DATA			
Watercourse Name:	M2E1	Date: (mm/dd/yyyy)	07/28/2011
Coordinates: (dd.dd)		Personnel:	EMW MJS
Weather:	*Sunny, Clear, Partial Cloud, Cam, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 40	Duty Cycle: 16	Seconds 633
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	19°C	**Water Temp.:** (°C)	15.4
Sp. Conductivity: (µS/sec)	21.7	**Salinity:** (ppt)	0.0
DO: (mg/L): 6.30 mg/L	65.3%	**pH:** 5.2	5.2

NOTES

Beaver dam #6 with new chewing
Missed at least 4 BT between the
9 + 12 cm range

SPECIES RECORD		
Species	Fish #	Fork Length (cm)
BT	1	17.0
BT	2	12.2
BND	3	7.1
BT	4	8.3
BT	5	9.7
BT	6	11.3
BND	7	7.9
BT	8	6.4
BT	9	5.6
BT	10	4.1
AE	11	25.0
BT	12	5.8
	13	
	14	
	15	
	16	
	17	
	18	
	19	
	20	
	21	
	22	
	23	
	24	
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	34	
	35	

Site Sketch (Plan View)

Site Sketch (Profile View)

Ledged

MJS + JLL

Fish Survey Data Collection Form

Job No. 121810356

GENERAL DATA

Watercourse Name:	M3A1	Date: (mm/dd/yyyy)	07/26/2011
Coordinates: (dd.dd)		Personnel:	MJS DT EW
Weather:	Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA		

SAMPLING INFORMATION

Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 35	Duty Cycle: 14	Seconds 121
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION

Air Temp.: (°C)	20°C	**Water Temp.:** (°C)	13.7
Sp. Conductivity: (µS/sec)	30.9	**Salinity:** (ppt)	0.0
DO: (mg/L):	88.5% / 9.22 mg/L	**pH:**	6.7

NOTES

* denotes possible parasite.

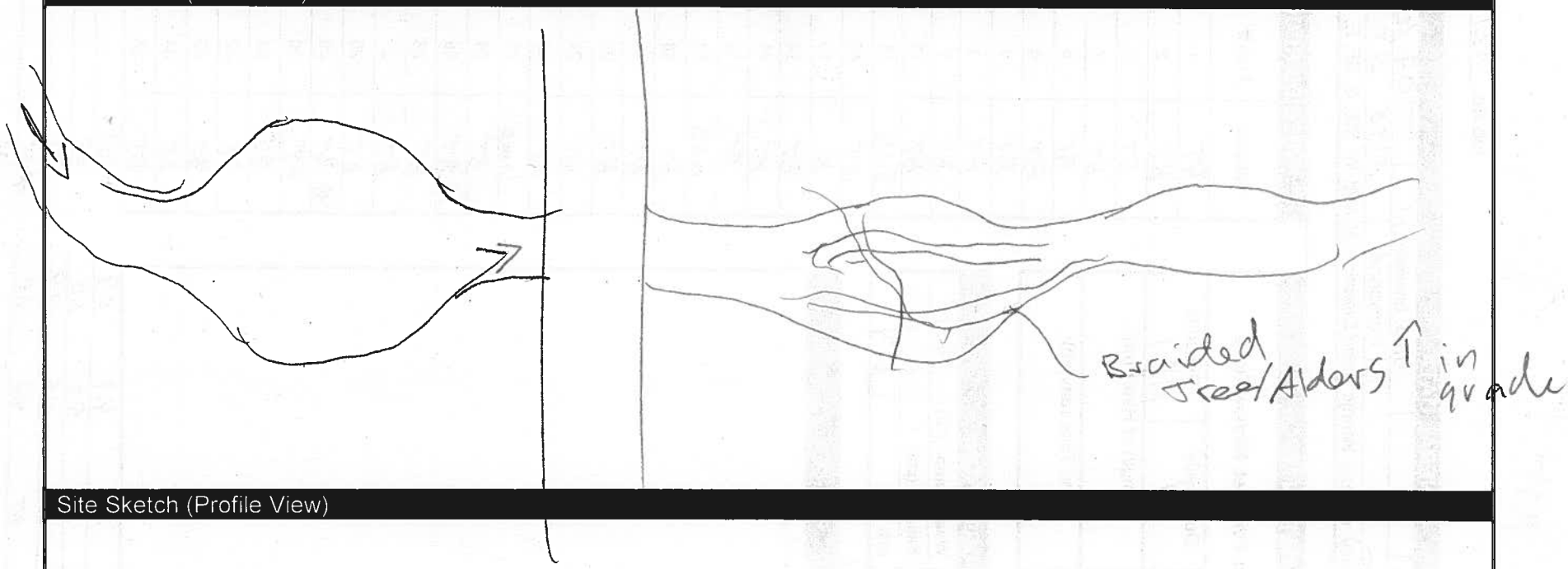
SPECIES RECORD

Species	Fish #	Fork Length (cm)	Wt (g)
BT	1	9.2	7.7
BT	2	15.7	44.1
BT	3	16.3	>50
BT	4	16.9	>50
BT	5	13.8	23.8
BT	6	12.6	20.7
BT	7	5.9	2.2
BT	8	14.6	24.2
BT	9	13.2	25.5
BT	10	8.8	7.1
BND	11	7.6	4.9
BT	12	4.3	0.5
BT	13	12.2	—
BT	14	9.3	9.2
BT	15	12.0	19.1
BT	16	10.4	13.0
BND	17	7.3	3.8
BT	18	12.1	18.6
BT	19	8.6	6.7
BT	20	9.4	8.3
BT	21	9.8	10.3
BT	22	9.3	8.4
lamp	23	9.2	—
BT	24	9.4	9.0
* BT	25	8.4	6.4 → adipose fin paras
BT	26	5.9	2.1
BT	27	8.5	6.7
BT	28	9.8	8.9
* BT	29	7.7	4.8
BT	30	9.4 (9.4)	8.1
BT	31	8.4	6.4
BT	32	5.9	2.1
BT	33	5.8	2.0
BT	34	5.4	1.6
BT	35	9.8	8.6

BT	5.8	2.3	BT	4.7	0.9
BT	5.6	1.8	BT	5.7	1.8
BT	5.7	1.9	BT	4.6	0.9
BT	4.8	1.1	BT	4.7	1.0
BT	5.4	1.7			
BT	6.2	2.5			

BT	5.1	1.3
BT	5.6	1.9
BT	7.8	4.9
* BT	5.4	1.7
BT	5.4	1.5
BT	5.4	1.7
BT	5.2	1.6
BT		

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

✓MJS+JLL

Fish Survey Data Collection Form Job No. 121810 356

GENERAL DATA			
Watercourse Name:	M3C 3	Date: (mm/dd/yyyy)	July 28, 2011
Coordinates: (dd.dd)		Personnel:	EMW MJS OT AL
Weather:	Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 40Hz	Duty Cycle: 14%	Seconds 1080s
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)		Water Temp.: (°C)	19.1
Sp. Conductivity: (µS/sec)	27.8	Salinity: (ppt)	0.00
DO: (mg/L):	84.6 / 8.00	pH:	6.3

NOTES

- & observed multiple juvenile lamprey (<4cm, ~5)

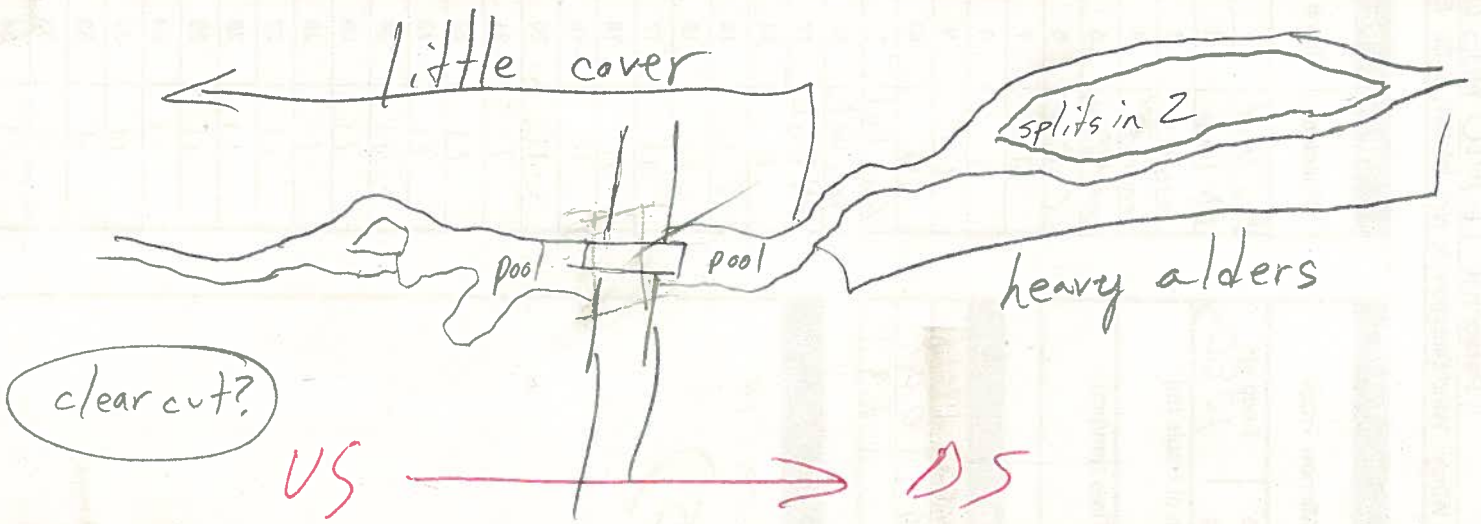
SPECIES RECORD

Species	Fish #	Fork Length (cm)
Brk Trout	1	20.3
BN Dace	2	4.5
lamprey	3	16.5
longnose sucker	4	16.0 ✓
common shiner	5	6.4 ✓
CC	6	8.5
"	7	6.6
"	8	4.5
"	9	5.1
"	10	6.6
Am. Eel	11	12.3
Am. Eel	12	25.1
BN Dace	13	5.8
"	14	5.6
"	15	6.1
"	16	6.1
"	17	4.4
"	18	5.8
"	19	7.1
"	20	6.1
"	21	4.4
"	22	6.1
"	23	6.1
"	24	5.9
"	25	4.8
"	26	5.9
"	27	4.2
"	28	4.6
"	29	4.4
"	30	6.2
"	31	5.8
"	32	6.6
"	33	4.7
"	34	4.4
"	35	4.5

CC? ~~BN Shiner~~

BN Dace	36	5.0	BN Dace	40	6.2	BN Dace	44	4.0
"	37	4.4	"	41	4.2	Pics 1172-1173	45	5.8
CC	38	5.3	"	42	4.6	BN Dace	46	4.4
CC	39	6.2	"	43	4.3	common shiner? ✓	47	4.5

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

Fish Survey Data Collection Form ✓MJSE JLL **Job No.** 12/810356

GENERAL DATA			
Watercourse Name:	SID3	Date: (mm/dd/yyyy)	Aug 5, 2011
Coordinates: (dd.dd)		Personnel:	EMW MJS AF, MF
Weather: (Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA			

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 750	Amps: 30	Duty Cycle: 12	Seconds 468
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	23	**Water Temp.:** (°C)	10.6
Sp. Conductivity: (µS/sec)	25.8	**Salinity:** (ppt)	0.0
DO: (mg/L):	9.64	**pH:**	6.7

NOTES

- Missed 3 BT
- lots of Aquatic Veg in the wc substrate very soft in places.

	½
1	4s
2	3s
3	3s

Depth.. 12.2cm

Length : ~~1m~~ 0.5m

SPECIES RECORD		
Species	Fish #	Fork Length (cm)
BT	1	8.2
BT	2	5.7
BT	3	6.5
BT	4	6.8
BT	5	3.6
BT	6	7.1
BT	7	3.0
BT	8	4.1
BT	9	3.7
BT	10	3.4
BT	11	3.8
	12	
	13	
	14	
	15	
	16	
	17	
	18	
	19	
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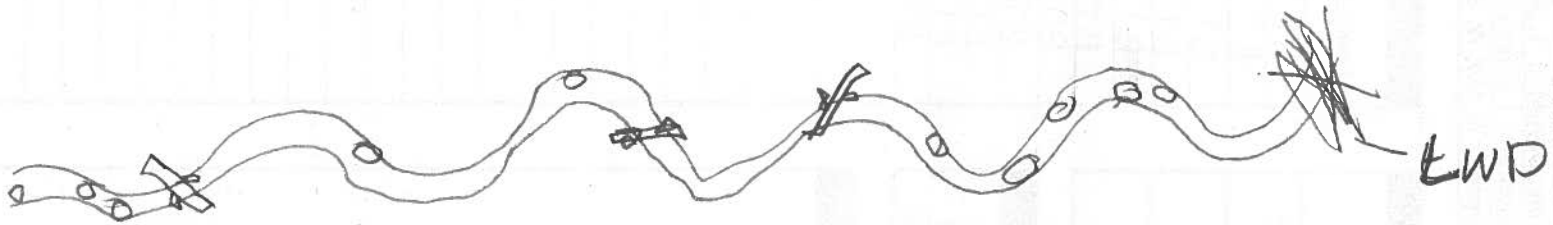
	35	

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

c/MJS + JLL

Fish Survey Data Collection Form

Job No. 12460356

GENERAL DATA

Watercourse Name:	52A2	Date: (mm/dd/yyyy)	July 25, 2011
Coordinates: (UTM: X Y)		Personnel	EMC MJS DT
Weather:	Sunny, Clear, Partial Cloud Calm, Breezy, Windy	Wind Direction: N, NW, W, SW, S, SE, E, NE or NA	

SAMPLING INFORMATION

Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
If BP E-Fish:	Voltage: 900	Amps: 14	Duty Cycle: 14%	Seconds: 1344
If Seining:	# of hauls:		Length of Hauls (m):	
If Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION

Air Temp.: (°C)	22	Water Temp.: (°C)	13.9°C
Sp. Conductivity: (µS/sec)	76.2	Salinity: (ppt)	0.0 ppt
DO: (mg/l): 96.5%	9.96	pH:	6.1

NOTES

Really low conductivity + faster water made hard to catch fish missed at least 5.

SPECIES RECORD

Species	Fish #	Forked Length (cm)	wt
BT	1	11.9	17.8
BT	2	10.8	16.5
BT	3	9.6	8.1
BT	4	8.7	7.1
BT	5	8.4	5.8
BT	6	8.8	7.2
BT	7	7.7	4.8
BT	8	8.3	5.8
BT	9	5.0	1.4
BT	10	5.3	1.7
BT	11	5.3	1.6
BT	12	4.9	1.3
	13		
	14		
	15		
	16		
	17		
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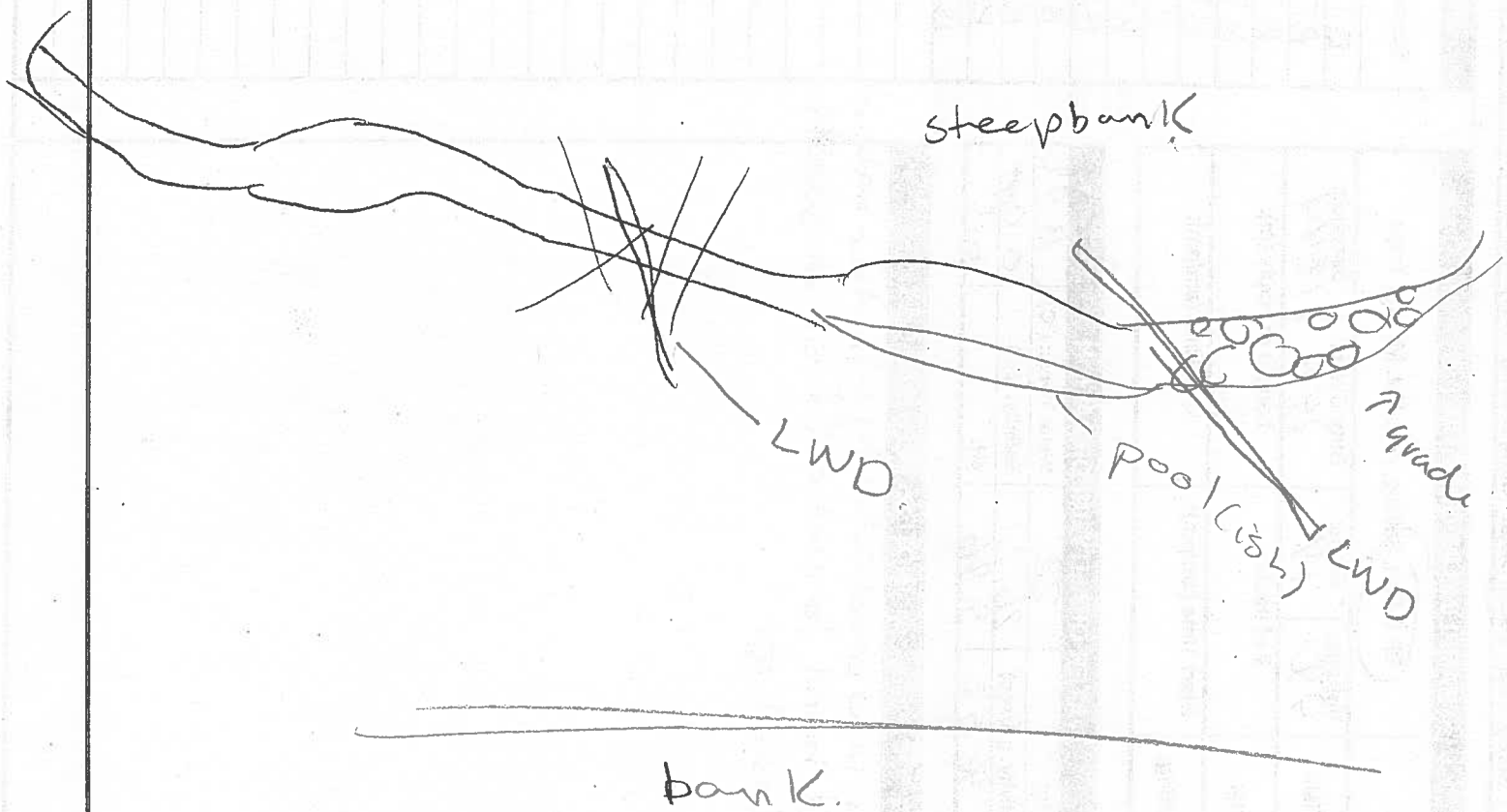
	37		

Road

Site Sketch



Ledgend

Road

✓MJS + JLL

Fish Survey Data Collection Form

Job No. 1218103856

GENERAL DATA

Watercourse Name:	SZA3	Date: (mm/dd/yyyy)	July 25, 2011
Coordinates: (UTM: X Y)		Personnel	EMW MJS, DT

Weather: (Sunny, Clear, Partial Cloud) Calm, Breezy, Windy Wind Direction: N, NW, W, SW, S, SE, E, NE or NA

SAMPLING INFORMATION

Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
If BP E-Fish: DS	Voltage: 990	Amps: 40	Duty Cycle: 16	Seconds: 769/755
US	990	40	16	
If Seining:	# of hauls:		Length of Hauls (m):	
If Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION

Air Temp.: (°C)		Water Temp.: (°C)	14.3
Sp. Conductivity: (µS/sec)	28.3	Salinity: (ppt)	0.0 ppt
DO: (mg/l): 10.16	10.47	pH:	6.6

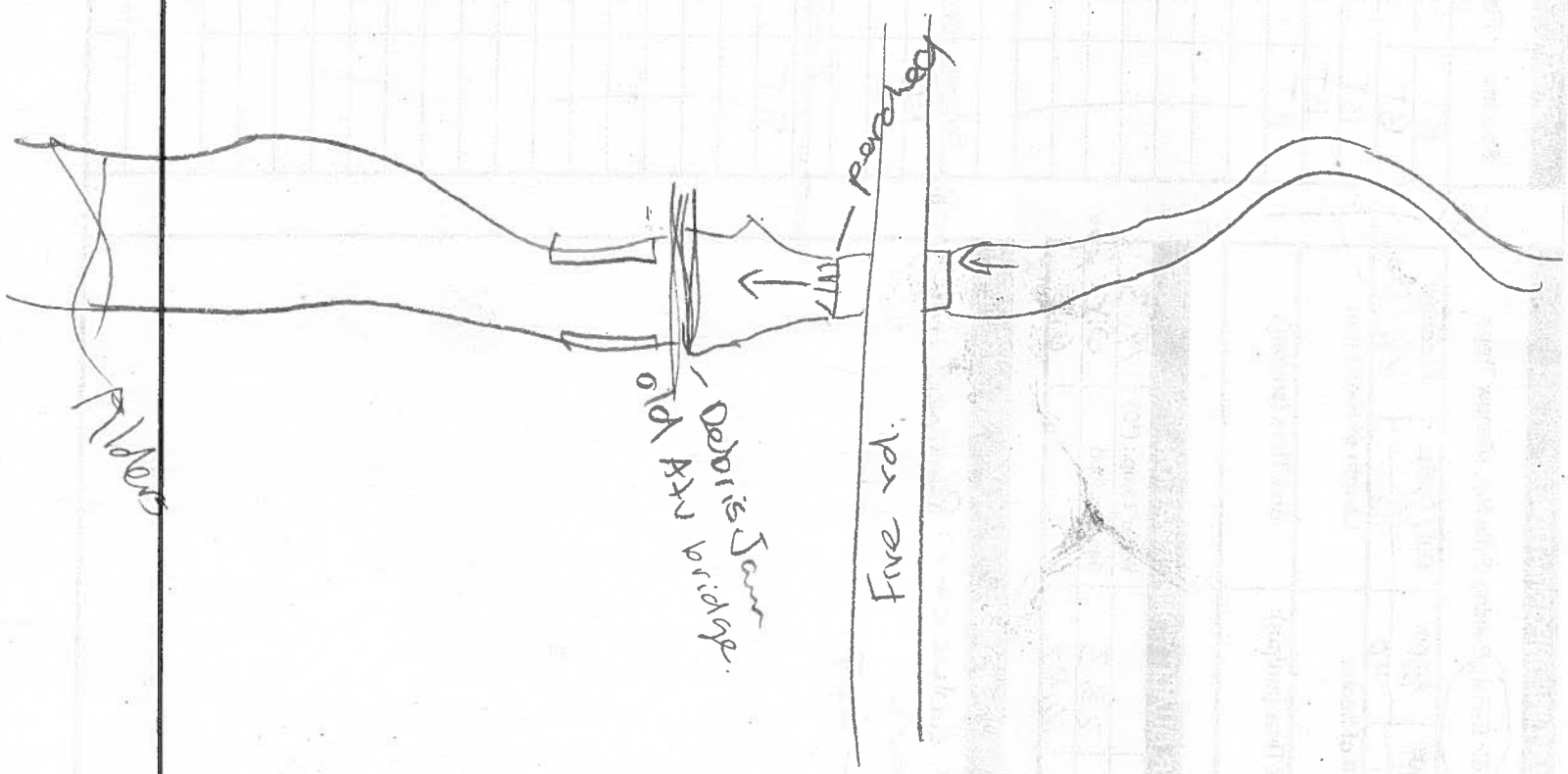
NOTES

EFished DS of culvert => Perched impassable
+ US of culvert
Photos# 980 – 977

SPECIES RECORD

Species	Fish #	Forked Length (cm)	WT (g)
BT	1	11.6	16.2
BT	2	15.4	40.4
BT	3	13.1	23.1
BT	4	11.7	17.6
BT	5	10.4	6.9
	6	8.1	5.6
	7	7.0	3.8
	8	9.5	9.6
	9	7.9	5.4
	10	8.6	7.2
	11	10.0	10.3
	12	7.6	5.1
	13	4.6	0.9
Salamander	14	3.8	(978, 979)
AE	15	24	980-981
AE	16	19	Photos
	17		
	18		
BT	19	13.1	US of culvert
	20	24.1	
	21	7.2	
	22	3.9	
	23	8.9	
	24	8.7	
	25	7.3	
	26	9.0	
	27	7.8	
	28	12.1	
	29	17.5	
	30	11.2	
	31	15.1	
	32	7.7	
	33	4.6	
	34	8.0	
	35	5.7	
	36	5.4	
	37	1.6	

Site Sketch



Ledgend

√ MJS + JLL

Fish Survey Data Collection Form **Job No.** 12810356

GENERAL DATA			
Watercourse Name:	S3A2	Date: (mm/dd/yyyy)	July 29, 2011
Coordinates: (dd.dd)		Personnel:	EMW MJS DT AL
Weather:	(Sunny) Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA		

SAMPLING INFORMATION				
Gear Type:	(BP E-Fish), Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 35	Duty Cycle: 14	Seconds 1420
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	23	**Water Temp.:** (°C)	13.1
Sp. Conductivity: (µS/sec)	28.7	**Salinity:** (ppt)	0.0
DO: (mg/L): 91.0 %	9.55	**pH:**	6.4

NOTES

above waterfall, missed 1 AE ~19cm
site sketch on Habitat Form

SPECIES RECORD		
Species	Fish #	Fork Length (cm)
BT	1	11.5
BT	2	11.5
	3	11.7
	4	11.3
	5	10.8
	6	11.4
	7	8.3
	8	7.7
	9	9.1
	10	11.1
	11	7.4
	12	8.5
	13	5.3
	14	5.0
	15	8.5
BT	16	4.9
AE	17	35
	18	
	19	
	20	
	21	
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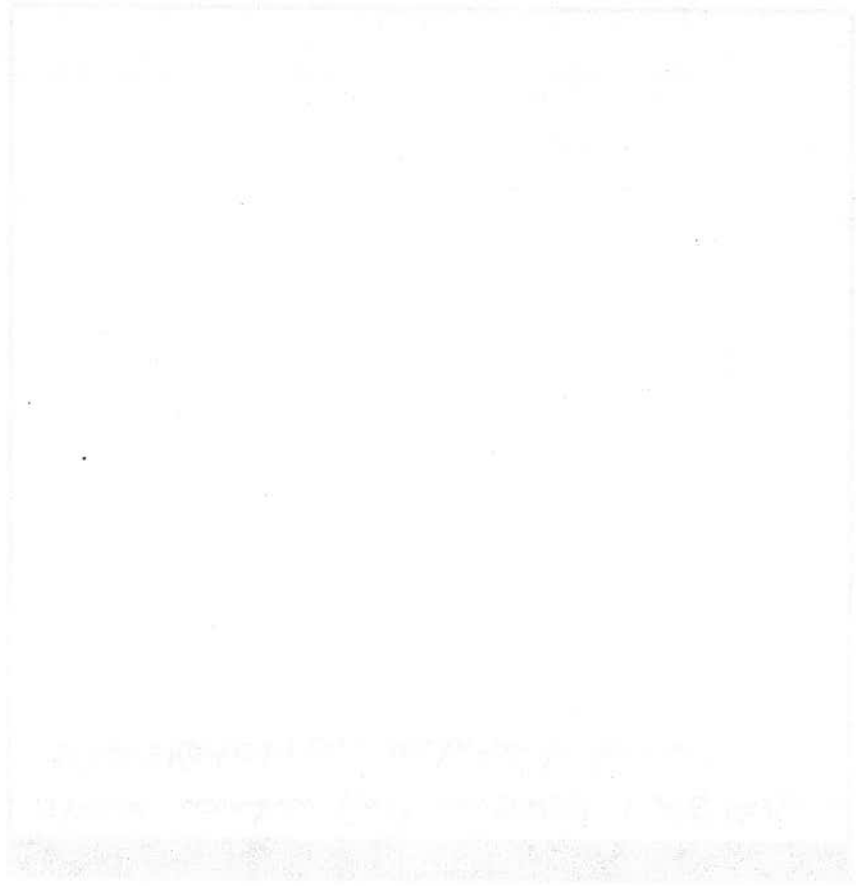

✓ MJS + JLL

Fish Survey Data Collection Form Job No. 121810356

GENERAL DATA			
Watercourse Name:	WIAHGS	Date: (mm/dd/yyyy)	July 26, 2011
Coordinates: (dd.dd)		Personnel:	EMW/MJS DT
Weather:	Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 30HZ	Duty Cycle: 12%	Seconds 749
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	17.0	Water Temp.: (°C)	9.1
Sp. Conductivity: (µS/sec)	30.5	Salinity: (ppt)	0.0
DO: (mg/L): 91.4%	10.50	pH:	7.0

NOTES

- only brook trout found
- culvert perched

SPECIES RECORD			
Species	Fish #	Fork Length (cm)	up stream of culvert
BT	1	18.9	1-7
	2	7.3	—
	3	12.5	21.1 (21.1)
	4	4.4	0.8 (mort)
	5	4.4	1.2
	6	4.5	1.1
	7	5.0	1.1
	8	11.8	16.5 Down
	9	7.1	3.8 Stream
	10	4.7	0.8
	11	10.6	13.6 Culvert
	12	11.8	16.2
	13	10.5	13.3 — 8-end
	14	13.7	27.6
	* 15	11.4	15.9 - Fin *
	16	9.0	7.7 parasite
	17	5.5	1.9 pic
	* 18	8.1	5.3 1014-1015
	19	13.5	25.4
	20	5.1	0.9
	21	10.6	13.4
	22	7.3	3.3
	23	7.8	4.7
	* 24	7.3	4.6
	25	5.1	1.4
	26	8.2	5.1
	27	5.1	1.2
	28	4.5	0.6
	29	7.6	4.5
	30	7.0	4.5
	31	5.5	1.7
	32	5.7	1.4
	33	7.2	3.2
	34	5.7	1.7
	35	12.8	23.9
	36	5.0	1.5
	37	4.0	0.7
	38	5.5 (5.5)	1.7
	39	4.9	1.3
	40	5.3	1.5
	41	4.7	1.0
			0.8

#50	4.2	0.9
51	5.7	2.0
52	4.6	1.0
53	4.0	0.7
54	2.3	0.4

	(cm)	(g)
#43	5.3	1.3
44	4.5	0.9
45	5.7	2.0
46	4.7	1.2
47	5.5	1.7
48	5.2	1.4

Site Sketch (Plan View)

Site Sketch (Profile View)

Ledged

V/MJS+JLL

Fish Survey Data Collection Form **Job No.** 1218103S6

GENERAL DATA			
Watercourse Name:	WIN3	Date: (mm/dd/yyyy)	08/09/2011
Coordinates: (dd.dd)		Personnel:	MJS/EW/MF/DT
Weather:	Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 3.5Hz	Duty Cycle: 15%	Seconds 698
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	20	**Water Temp.:** (°C)	16.7
Sp. Conductivity: (µS/sec)	22.9	**Salinity:** (ppt)	
DO: (mg/L): 80.6	7.83	**pH:**	5.3

NOTES

SPECIES RECORD		
Species	Fish #	Fork Length (cm)
SC	1	6.9
BT	2	9.4
BT	3	10.3
BT	4	9.5
BT	5	8.9
BT	6	12.9
BT	7	14.1
BT	8	7.3
BT	9	5.9
BT	10	6.8
BT	11	6.5
BT	12	5.5
BT	13	6.2
BT	14	6.3
BT	15	5.5
SC	16	6.8
SC	17	5.7
SC	18	7.1
SC	19	6.1
SC	20	6.4
SC	21	5.5
SC	22	5.5
SC	23	4.7
	24	
	25	
	26	
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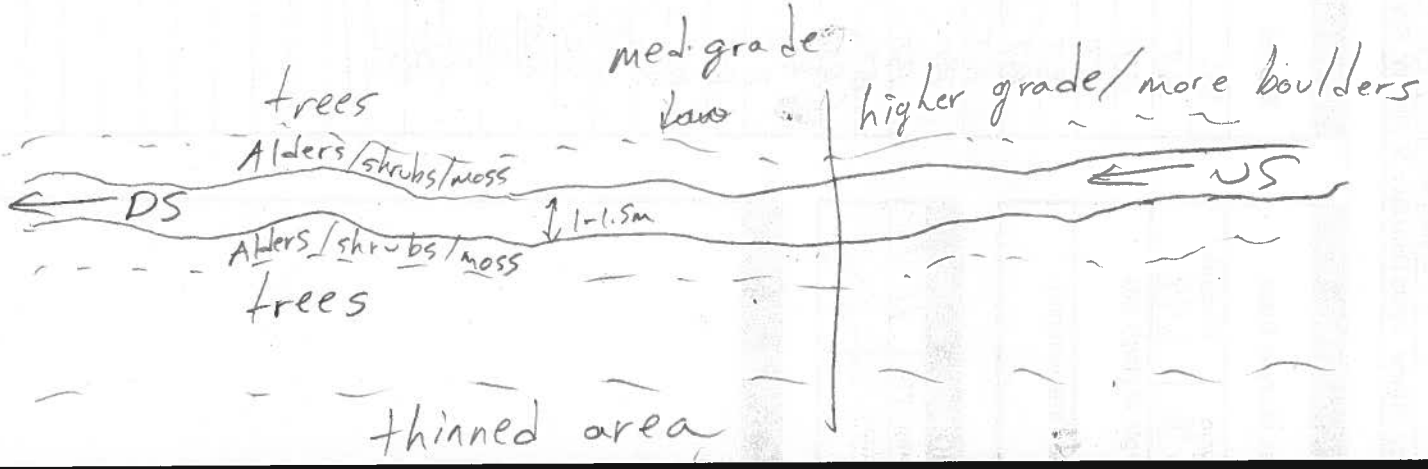
	33	
	34	
	35	

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

√MJS + JLL

Fish Survey Data Collection Form W2A4 (formerly W2A4-a) **Job No.** 12810356

GENERAL DATA

Watercourse Name:	~~W2A4-a~~	Date: (mm/dd/yyyy)	July 26, 2011
Coordinates: (dd.dd)		Personnel:	MJS + EW + DT
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION

Gear Type:	(BP E-Fish), Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 30Hz	Duty Cycle: 12%	Seconds 821
~~Seining~~:	# of hauls:		Length of Hauls (m):	
~~Fyke Netting~~:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION

Air Temp.: (°C)	17	**Water Temp.:** (°C)	13.3
Sp. Conductivity: (µS/sec)	26.4	**Salinity:** (ppt)	0.0
DO: (mg/L): 85.2%	8.87	**pH:**	6.3

NOTES

- saw & missed many small lamprey buried in fines

SPECIES RECORD

Species	Fish #	Fork Length (cm)	wt (gram
lamp	1	16.4	—
BT	2	11.0	13.7
lamp	3	6.3	0.6
SC	4	5.8	2.2
SC	5	7.9	5.7
lamp	6	11.5	3.7
SC	7	8.7	7.6
lamp	8	11.4	3.6
SC	9	6.6	3.4
lamp	10	9.1	1.5
lamp	11	14.6	5.1
lamp	12	14.3	—
BT	13	18.7	—
SC	14	8.3	6.9
SC	15	6.2	2.8
SC	16	7.5	5.4
lamp	17	14.1	5.4
BT	18	10.9	13.4
SC	19	5.6	2.0
SC	20	6.8	3.0
SC	21	6.8	3.2 sca
BT	22	9.2	— brok
SC	23	8.0	—
SC	24	7.1	—
SC	25	6.8	—
SC	26	6.1	—
lamp	27	8.3	—
lamp	28	13.4	—
lamp	29	10.6	—
BT	30	9.3	—
SC	31	7.1	—
lamp	32	12.6	—
SC	33	6.0	—
BT	34	7.6	—
SC	35	4.5	—

SC - Sculpin
BT - Brook trout
lamp - lamprey eel

Site Sketch (Plan View)

Site Sketch (Profile View)

Ledged

BT-8.1 —
BT-6.1 —
SC-4.9 —
lamp-12.9 —
SC-6.1 —

B.T-8.1
BT.6.1
SC-4.9
lamp-12.9
SC-6.1
BT-5.1
BT-6.6
BT-7.8
BT-5.8
lamp-7.4
lamp
lamp
lamp
lamp
lamp
lamp
lamp
lamp
1
saw + missed
~20 lamper

JMJS
#JLL

Fish Survey Data Collection Form **Job No.** 12810356

GENERAL DATA			
Watercourse Name:	W4A1	Date: (mm/dd/yyyy)	Aug 8, 2011
Coordinates: (dd.dd)		Personnel:	EMW ~~MJS~~, MF, DT
Weather:	Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 800	Amps: 30	Duty Cycle: 12	Seconds 1813
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)		Water Temp.: (°C)	16.5
Sp. Conductivity: (µS/sec)	29.1	Salinity: (ppt)	0.0
DO: (mg/L): 91.9%	8.92	pH:	6.6

NOTES

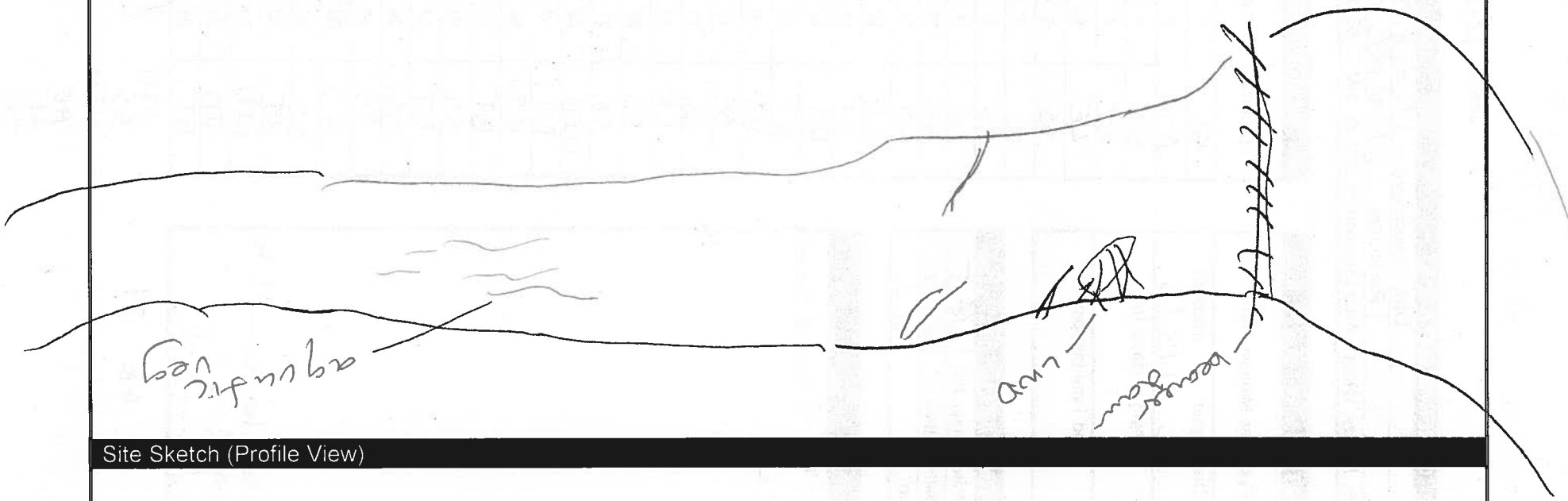
Beaver dam directly us of e-Fished area
1x 60m long 10m wide

*UID - unidentified Fish too small to ID. Non salmonids WS?
- white sucker

AE 21

SPECIES RECORD			
Species	Fish #	Fork Length (cm)	
SS	1	7.8	
AS	2	10.4	
SS	3	8.4	
BT	4	13.7	
LE	5	17.8	
SS	6	7.2	
SS	7	5.9	
SS	8	5.9	
SS	9	5.9	
SS	10	5.8	
SS	11	5.7	
BT	12	16.6	
BT	13	9.3	
BT	14	5.5	
BT	15	6.6	
BT	16	5.6	
SS	17	5.8	
SS	18	5.5	
LE	19	13.4	
SS	20	5.7	
SS	21	5.9	
UID	22	2.3	
BT	23	10.5	Dorsal + adipose Parrsi
BT	24	13.8	
BT	25	12.6	
SS	26	6.2	
BT	27	5.8	
SS	28	5.5	
SS	29	6.5	
SS	30	6.5	
SS	31	5.8	
BT	32	6.4	
UID	33	3.1	
UID	34	2.4	
BT	35	5.5	
UID		2.4	
SS		3.2	
UID		2.1	
AE		2.7	
AE		1.4	
AE		1.5	
AE		1.8	

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

MSS + JLL

Fish Survey Data Collection Form **Job No.** 12410356

GENERAL DATA			
Watercourse Name:	W4A17	Date: (mm/dd/yyyy)	Aug 4, 2011
Coordinates: (dd.dd)		Personnel:	EMW MSS HF, MF
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 35	Duty Cycle: 14%	Seconds 708
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)		**Water Temp.:** (°C)	15.3
Sp. Conductivity: (µS/sec)	26.1	**Salinity:** (ppt)	0.0
DO: (mg/L):	9.87	**pH:**	6.9

NOTES

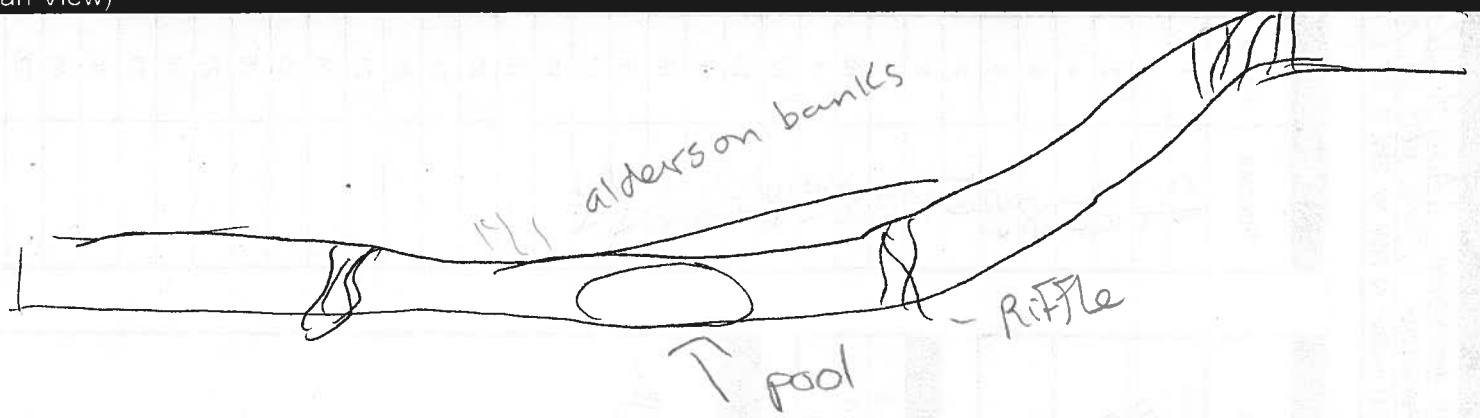
missed ~ 4 AS High + Fast Flow
Also missed 3 or 4 AE ~ 30 cm in Length

	1/4	1/2	3/4	
1	4	3	4	
2	4	3	4	
3	6	2	4	
	Depth: 37	33	31	

Rough 0.8
Distance : 2m

SPECIES RECORD		
Species	Fish #	Fork Length (cm)
AS	1	9.7
AS	2	10.8
AS	3	11.0
BT	4	10.4
SS	5	10.1
SS	6	8.1
BT	7	6.2
SS	8	7.8
SS	9	7.0
SS	10	6.2
AE	11	19
AE	12	27
AE	13	26
AE	14	24
AE	15	18
AE	16	21
AE	17	23
	18	
	19	
	20	
	21	
	22	
	23	
	24	
	25	
	26	
	27	
	28	
	29	
	30	
	31	
	32	
	33	
	34	
	35	

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

VMJS + JLL

Fish Survey Data Collection Form

Job No. 121810356

GENERAL DATA			
Watercourse Name:	W4A25	Date: (mm/dd/yyyy)	Aug 5, 2011
Coordinates: (dd.dd)		Personnel:	EMW MJS HF MF
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 35	Duty Cycle: 14%	Seconds 847
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	20	**Water Temp.:** (°C)	16.7
Sp. Conductivity: (µS/sec)	24.9	**Salinity:** (ppt)	0.0
DO: (mg/L): 99.4%	9.66	**pH:**	6.7

NOTES

Rain Prior to e-Fishing
weird trout collected ID - likely hybrid Tiger trout? - no, brook trout

SPECIES RECORD			
Species	Fish #	Fork Length (cm)	
BT	1	11.8	Parasite on adapose
AS	2	14.1	
LE	3	7.2	
BT	4	9.0	
AS	5	10.7	
BT	6	13.8	FF
AS	7	8.7	Parasite on adapose
AS	8	10.3	
BT	9	9.8	Parasite
BT	10	12.2	Parasite
AS	11	11.9	
BT	12	10.3	
?T	13	7.9	* Photo
BT	14	6.9	
AS	15	5.4	
AS	16	4.4	
AS	17	5.0	
AE	18	28	
AE	19	12	
AE	20	21	
	21		
	22		
	23		
	24		
	25		
	26		
	27		
	28		
	29		
	30		
	31		
	32		
	33		
	34		
	35		

Site Sketch (Plan View)

Site Sketch (Profile View)

Ledged

VMJS & JLL

Fish Survey Data Collection Form **Job No.** 12181055 6

GENERAL DATA			
Watercourse Name:	WHA 31	Date: (mm/dd/yyyy)	Aug 2, 2021
Coordinates: (dd.dd)		Personnel:	EMW MJS HF MF
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 990	Amps: 35	Duty Cycle: 14	Seconds 668
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)	16	**Water Temp.:** (°C)	16.2
Sp. Conductivity: (µS/sec)	25.1	**Salinity:** (ppt)	0.0
DO: (mg/L): 16.1 %	9.82 mg/l	**pH:**	6.4

NOTES

SPECIES RECORD		
Species	Fish #	Fork Length (cm)
AS	1	10.1
AS	2	9.7
AS	3	9.5
BND	4	5.0
BND	5	7.2
BND	6	6.3
AS	7	9.6
AS	8	8.3
BND	9	6.4
BND	10	7.4
BND	11	6.3
AS	12	8.1
AS	13	10.1
BND	14	4.4
AS	15	8.2
BND	16	4.2
AS	17	8.6
BND	18	6.7
BND	19	6.6
BND	20	6.9
BND	21	6.4
BND	22	4.6
BND	23	6.2
BT	24	6.0
BND	25	4.4
BND	26	4.3
AE	27	34
AE	28	17.5
AS	29	125 (mort)
	30	
	31	
	32	
	33	
	34	
	35	

Appendix D-4

Data Summary Table and RPC Water Quality Reports

Table D-4.1 Summary of Water Quality - Qualitative Fish Surveys

Qualitative	Lab ID	Sample ID	Date Sampled	Alkalinity (as CaCO3)	Ammonia (as N)	Calcium	Chloride	Conductivity	Copper	Hardness (as CaCO3)	Iron	Magnesium	Manganese	Nitrate + Nitrite (as N)	o-Phosphate (as P)	pH
Units				mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	units
Analysis Type				Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water
	122511-6	B1A5	21-Jul-11	10	0.025	2.66	1.1	29	0.0005	9	0.15	0.58	0.004	0.07	0.005	6.8
	122511-7	B1C1	21-Jul-11	6	0.025	1.55	1	23	0.0005	6	0.07	0.51	0.008	0.025	0.005	6.1
	122511-8	B1D3	20-Jul-11	7	0.025	2.18	0.9	26	0.001	7.7	0.39	0.54	0.026	0.11	0.005	6.6
	123154-02	B1H1	3-Aug-11	10	0.025	3.12	0.8	29	0.0005	10.2	0.15	0.59	0.211	0.025	0.005	6.4
	122511-5	B2A2	22-Jul-11	6	0.025	2.12	1.4	21	0.001	7.6	0.25	0.57	0.02	0.025	0.005	6.1
	122741-06	B3A1	27-Jul-11	8	0.025	2.82	0.95	26	0.00125	9.45	0.315	0.59	0.021	0.025	0.005	6.25
	123154-04	B3A6	3-Aug-11	6.5	0.025	2.87	1.6	24	0.00125	9.35	0.43	0.52	0.018	0.025	0.005	6.25
	123289-01	B3A9	5-Aug-11	7	0.025	2.83	1.3	25	0.0005	9.3	0.25	0.54	0.012	0.025	0.005	6.7
	123389-02	EBNB1	8-Aug-11	12	0.025	4.86	2.1	39	0.001	14.8	0.38	0.64	0.02	0.12	0.005	7.1
	123289-05	EBNB2	4-Aug-11	11	0.08	4.74	1.7	35	0.0005	14.3	0.48	0.6	0.06	0.05	0.005	6.9
	123289-04	EBNB3	4-Aug-11	6	0.12	2.13	1.2	19	0.002	8.5	10.4	0.77	0.073	0.025	0.005	6.3
	122917-05	M1K4	27-Jul-11	6	0.025	2.37	0.8	23	0.004	7.5	0.19	0.39	0.067	0.025	0.005	6.2
	122917-06	M1M2	27-Jul-11	16	0.025	5.97	1.4	42	0.003	18.3	1.73	0.83	1.66	0.025	0.005	6.4
	122917-07	M1N1	27-Jul-11	9	0.025	3.88	1.5	25	0.001	12	0.51	0.57	0.047	0.025	0.005	5.9
	122917-02	M2E1	28-Jul-11	5	0.025	2.66	1.9	21	0.001	8.4	0.48	0.42	0.078	0.025	0.01	5.5
	122741-05	M3A1	26-Jul-11	10	0.025	3.75	0.7	31	0.0005	12.9	0.22	0.86	0.018	0.09	0.005	6.7
	122917-03	M3C3	28-Jul-11	8	0.025	4.07	1.4	28	0.0005	12.6	0.22	0.58	0.018	0.025	0.005	6.2
	123389-09	M4A9	8-Aug-11	11	0.025	4.26	1.7	34	0.003	13.6	0.24	0.71	0.025	0.06	0.005	6.4
	122917-04	S1C3	29-Jul-11	3	0.025	1.75	1.2	21	0.001	5.7	0.14	0.33	0.012	0.13	0.005	6.2
	122741-04	S2A2	25-Jul-11	8	0.08	2.82	0.8	28	0.002	10	0.28	0.72	0.017	0.11	0.005	6.9
	122741-01	S2A3	25-Jul-11	8	0.66	2.73	0.7	26	0.001	9.9	0.4	0.74	0.029	0.22	0.005	6.2
	122917-01	S3A2	29-Jul-11	8	0.025	2.94	1	29	0.002	9.9	0.26	0.63	0.045	0.14	0.005	6.6
	123289-02	SID3	5-Aug-11	6	0.025	2.77	0.8	25	0.003	8.4	0.1	0.36	0.063	0.27	0.005	6.4
	122741-02	W1G5	26-Jul-11	10	0.19	3.36	0.7	31	0.0005	10.4	0.12	0.49	0.01	0.32	0.01	6.6
	123389-01	W1N3	9-Aug-11	6.5	0.0825	2.435	1.9	23	0.0005	7.6	0.31	0.37	0.021	0.09	0.025	6.35
	122741-03	W2A4	26-Jul-11	9	0.12	3.15	1	27	0.0005	9.8	0.32	0.48	0.011	0.06	0.02	6.4
	123389-03	W4A1	8-Aug-11	10	0.025	3.22	1.6	30	0.002	9.9	0.24	0.44	0.025	0.09	0.005	6.7
	123289-03	W4A17	4-Aug-11	9	0.09	3.29	1.4	26	0.0005	10.1	0.26	0.46	0.018	0.025	0.005	6.6
	123154-01	W4A21	3-Aug-11	9	0.025	3.18	1.3	25	0.002	9.9	0.3	0.48	0.015	0.025	0.005	6.7
	123154-03	W4A25	2-Aug-11	8	0.025	3.07	1.1	25	0.002	9.6	0.27	0.48	0.014	0.025	0.005	6.6
	123154-06	W4A31	2-Aug-11	7	0.025	3.14	1.1	25	0.0005	9.8	0.31	0.48	0.031	0.025	0.005	6.6

Table D-4.1 Summary of Water Quality - Qualitative Fish Surveys

Qualitative	Lab ID	Sample ID	Potassium	r-Silica (as SiO2)	Sodium	Sulfate	Total Kjeldahl Nitrogen	Total Organic Carbon	Total Phosphorus	Total Suspended Solids	Turbidity	Zinc	Aluminum	Antimony	Arsenic
Units			mg/L	mg/L	mg/L	mg/L		mg/L			NTU	mg/L	µg/L	µg/L	µg/L
Analysis Type			Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water
	122511-6	B1A5	0.32	10.8	2.1	0.5	---	6.6	---	---	0.5	0.002	73	0.05	0.5
	122511-7	B1C1	0.24	10.8	1.85	0.5	---	5.6	---	---	0.3	0.001	132	0.05	2
	122511-8	B1D3	0.28	9.3	1.99	0.5	---	8	---	---	1.5	0.005	226	0.05	5
	123154-02	B1H1	0.19	7.9	2.22	0.5	---	6.2	---	---	1.5	0.005	174	0.05	0.5
	122511-5	B2A2	0.2	6.7	1.46	0.5	---	16.8	---	---	0.8	0.004	371	0.05	2
	122741-06	B3A1	0.4	9.2	2.335	0.5	---	10.6	---	---	0.95	0.0045	154	0.05	1.5
	123154-04	B3A6	0.325	8.3	1.695	0.5	---	13.75	---	---	0.95	0.0075	234	0.05	2
	123289-01	B3A9	0.33	8.9	1.7	0.5	---	11.4	---	---	1.2	0.006	195	0.05	2
	123389-02	EBNB1	0.28	5.1	1.64	0.5	---	7.2	---	---	1.4	0.003	86	0.05	0.5
	123289-05	EBNB2	0.25	4.6	1.58	0.5	---	9.3	---	---	1.6	0.002	83	0.05	0.5
	123289-04	EBNB3	0.13	4.4	1.4	0.5	---	13.6	---	---	1.3	0.028	194	0.05	0.5
	122917-05	M1K4	0.23	8.1	1.31	0.5	---	7.1	---	---	0.5	0.008	179	0.05	0.5
	122917-06	M1M2	0.42	6.9	1.94	0.5	---	11.7	---	---	3.7	0.011	442	0.05	3
	122917-07	M1N1	0.13	7.3	1.15	2	---	21	---	---	0.6	0.007	283	0.05	3
	122917-02	M2E1	0.36	5	1.33	2	---	23	---	---	1	0.009	218	0.1	2
	122741-05	M3A1	0.54	7.6	1.68	0.5	---	8.9	---	---	0.6	0.008	144	0.05	2
	122917-03	M3C3	0.27	5.7	1.6	1	---	15.4	---	---	0.6	0.005	186	0.05	1
	123389-09	M4A9	0.44	7.5	1.76	0.5	---	11.7	---	---	1.2	0.007	157	0.05	1
	122917-04	S1C3	0.41	8.6	1.39	0.5	---	5.4	---	---	0.3	0.007	169	0.05	0.5
	122741-04	S2A2	0.32	7.3	1.68	0.5	---	7.6	---	---	0.8	0.003	112	0.05	2
	122741-01	S2A3	0.32	7.2	1.6	0.5	---	8.5	---	---	1	0.003	128	0.05	2
	122917-01	S3A2	0.33	7.8	1.65	0.5	---	5.4	---	---	0.9	0.004	129	0.05	4
	123289-02	SID3	0.3	8.7	1.36	0.5	---	2.7	---	---	9.2	0.007	179	0.05	0.5
	122741-02	W1G5	0.3	10.8	2.17	0.5	---	4.9	---	---	0.4	0.004	111	0.05	0.5
	123389-01	W1N3	0.59	7.4	1.59	0.5	---	13.4	---	---	1.1	0.005	206	0.05	2
	122741-03	W2A4	0.33	9.2	2.17	0.5	---	12.8	---	---	0.8	0.002	175	0.05	0.5
	123389-03	W4A1	0.31	9.5	1.95	0.5	---	8.3	---	---	1.4	0.005	123	0.05	0.5
	123289-03	W4A17	0.3	8.7	1.78	0.5	---	12.1	---	---	1.1	0.003	203	0.05	1
	123154-01	W4A21	0.3	8.5	1.78	0.5	---	12.1	---	---	1.2	0.004	283	0.05	1
	123154-03	W4A25	0.3	8.2	1.65	0.5	---	10.5	---	---	1.1	0.004	173	0.05	2
	123154-06	W4A31	0.3	8.1	1.62	0.5	---	10.5	---	---	1.7	0.014	191	0.05	2

Table D-4.1 Summary of Water Quality - Qualitative Fish Surveys

Qualitative	Lab ID	Sample ID	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Analysis Type			Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water
	122511-6	B1A5	3	0.05	0.5	2	0.01	2660	0.5	0.05	0.5	150	0.2	0.7
	122511-7	B1C1	2	0.05	0.5	2	0.005	1550	0.5	0.05	0.5	70	0.2	0.7
	122511-8	B1D3	3	0.05	0.5	2	0.05	2180	0.5	0.2	1	390	0.4	0.5
	123154-02	B1H1	5	0.05	0.5	2	0.06	3120	0.5	0.2	0.5	150	0.7	0.4
	122511-5	B2A2	5	0.05	0.5	3	0.03	2120	0.5	0.1	1	250	0.5	0.6
	122741-06	B3A1	3	0.05	0.5	2	0.035	2820	0.5	0.15	1.25	315	0.6	0.65
	123154-04	B3A6	4	0.05	0.5	2.5	0.06	2870	0.5	0.1	1.25	430	0.5	0.6
	123289-01	B3A9	3	0.05	0.5	2	0.07	2830	0.5	0.05	0.5	250	0.4	0.6
	123389-02	EBNB1	6	0.05	0.5	2	0.01	4860	0.5	0.1	1	380	0.2	0.4
	123289-05	EBNB2	6	0.05	0.5	2	0.01	4740	0.5	0.2	0.5	480	0.4	0.4
	123289-04	EBNB3	5	0.05	0.5	3	0.05	2130	0.5	0.8	2	10400	0.6	0.4
	122917-05	M1K4	4	0.05	0.5	2	0.13	2370	0.5	0.3	4	190	0.4	0.3
	122917-06	M1M2	11	0.05	0.5	2	0.17	5970	0.5	1.5	3	1730	1	0.4
	122917-07	M1N1	4	0.05	0.5	2	0.1	3880	0.5	0.3	1	510	0.5	0.2
	122917-02	M2E1	4	0.05	0.5	3	0.08	2660	0.5	0.1	1	480	1.3	0.4
	122741-05	M3A1	4	0.05	0.5	3	0.02	3750	0.5	0.05	0.5	220	0.4	0.6
	122917-03	M3C3	4	0.05	0.5	3	0.08	4070	0.5	0.05	0.5	220	0.5	0.4
	123389-09	M4A9	5	0.05	0.5	3	0.05	4260	0.5	0.1	3	240	0.6	0.6
	122917-04	S1C3	4	0.05	0.5	3	0.14	1750	0.5	0.05	1	140	0.4	0.3
	122741-04	S2A2	2	0.05	0.5	2	0.04	2820	0.5	0.05	2	280	0.4	0.4
	122741-01	S2A3	2	0.05	0.5	2	0.03	2730	0.5	0.05	1	400	0.3	0.4
	122917-01	S3A2	3	0.05	0.5	2	0.07	2940	0.5	0.3	2	260	0.3	0.4
	123289-02	SID3	3	0.05	0.5	3	0.13	2770	0.5	0.3	3	100	0.6	0.2
	122741-02	W1G5	3	0.05	0.5	2	0.02	3360	0.5	0.05	0.5	120	0.5	1.7
	123389-01	W1N3	3	0.05	0.5	3	0.02	2435	0.5	0.1	0.5	310	0.35	0.7
	122741-03	W2A4	2	0.05	0.5	2	0.02	3150	0.5	0.05	0.5	320	0.5	2.5
	123389-03	W4A1	2	0.05	0.5	2	0.05	3220	0.5	0.05	2	240	0.3	2.1
	123289-03	W4A17	3	0.05	0.5	2	0.04	3290	0.5	0.1	0.5	260	0.4	1.7
	123154-01	W4A21	4	0.05	0.5	3	0.04	3180	0.5	0.2	2	300	0.4	1.5
	123154-03	W4A25	5	0.05	0.5	3	0.05	3070	0.5	0.1	2	270	0.4	1.2
	123154-06	W4A31	6	0.05	0.5	2	0.04	3140	0.5	0.2	0.5	310	0.4	1.1

Table D-4.1 Summary of Water Quality - Qualitative Fish Surveys

Qualitative	Lab ID	Sample ID	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Analysis Type			Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water
	122511-6	B1A5	580	4	0.0125	0.2	0.5	320	0.5	0.5	0.05	2100	14	0.05
	122511-7	B1C1	510	8	0.0125	0.05	0.5	240	0.4	0.5	0.05	1850	9	0.05
	122511-8	B1D3	540	26	0.0125	0.2	0.5	280	0.9	0.5	0.05	1990	15	0.05
	123154-02	B1H1	590	211	0.0125	0.1	0.5	190	0.6	0.5	0.05	2220	19	0.05
	122511-5	B2A2	570	20	0.0125	0.2	0.5	200	0.5	0.5	0.05	1460	13	0.05
	122741-06	B3A1	590	21	0.0125	0.15	0.5	400	0.85	0.5	0.05	2335	13	0.05
	123154-04	B3A6	520	18	0.0125	0.1	0.5	325	0.9	0.5	0.05	1695	14	0.05
	123289-01	B3A9	540	12	0.0125	0.1	0.5	330	0.9	0.5	0.05	1700	14	0.05
	123389-02	EBNB1	640	20	0.0125	0.05	0.5	280	1	0.5	0.05	1640	20	0.05
	123289-05	EBNB2	600	60	0.03	0.05	0.5	250	0.9	0.5	0.05	1580	19	0.05
	123289-04	EBNB3	770	73	0.04	0.2	4	130	0.5	0.5	0.05	1400	13	0.05
	122917-05	M1K4	390	67	0.0125	0.2	0.5	230	1.4	0.5	0.05	1310	15	0.05
	122917-06	M1M2	830	1660	0.0125	23.7	0.5	420	2.6	0.5	0.05	1940	32	0.05
	122917-07	M1N1	570	47	0.0125	1.9	1	130	0.8	0.5	0.05	1150	27	0.05
	122917-02	M2E1	420	78	0.0125	4.4	0.5	360	1.6	0.5	0.05	1330	17	0.05
	122741-05	M3A1	860	18	0.0125	0.4	0.5	540	1.6	0.5	0.05	1680	18	0.05
	122917-03	M3C3	580	18	0.0125	1	0.5	270	0.9	0.5	0.05	1600	21	0.05
	123389-09	M4A9	710	25	0.0125	0.6	0.5	440	1.2	0.5	0.05	1760	18	0.05
	122917-04	S1C3	330	12	0.0125	0.1	0.5	410	2	0.5	0.05	1390	12	0.05
	122741-04	S2A2	720	17	0.0125	6.7	0.5	320	1.5	0.5	0.05	1680	17	0.05
	122741-01	S2A3	740	29	0.0125	4.4	0.5	320	1.4	0.5	0.05	1600	17	0.05
	122917-01	S3A2	630	45	0.0125	3.5	0.5	330	1.7	0.5	0.05	1650	17	0.05
	123289-02	SID3	360	63	0.0125	0.05	0.5	300	1.3	0.5	0.05	1360	15	0.05
	122741-02	W1G5	490	10	0.0125	0.3	0.5	300	1.3	0.5	0.05	2170	21	0.05
	123389-01	W1N3	370	21	0.0125	0.3	0.5	590	2.15	0.5	0.05	1590	9	0.05
	122741-03	W2A4	480	11	0.0125	0.2	0.5	330	1.7	0.5	0.05	2170	17	0.05
	123389-03	W4A1	440	25	0.0125	0.2	0.5	310	1.5	0.5	0.05	1950	15	0.05
	123289-03	W4A17	460	18	0.03	0.1	0.5	300	1.4	0.5	0.05	1780	15	0.05
	123154-01	W4A21	480	15	0.0125	0.1	0.5	300	1.3	0.5	0.05	1780	15	0.05
	123154-03	W4A25	480	14	0.0125	0.4	0.5	300	1.3	0.5	0.05	1650	15	0.05
	123154-06	W4A31	480	31	0.0125	0.4	0.5	300	1.3	0.5	0.05	1620	15	0.05

Table D-4.1 Summary of Water Quality - Qualitative Fish Surveys

Qualitative	Lab ID	Sample ID	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
Units			µg/L	µg/L		µg/L	µg/L	µg/L
Analysis Type			Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water
	122511-6	B1A5	0.05	0.05	---	0.05	0.5	2
	122511-7	B1C1	0.05	0.05	---	0.05	0.5	1
	122511-8	B1D3	0.05	0.05	---	0.05	0.5	5
	123154-02	B1H1	0.05	0.05	---	0.05	0.5	5
	122511-5	B2A2	0.05	0.05	---	0.05	0.5	4
	122741-06	B3A1	0.05	0.05	---	0.05	0.5	4.5
	123154-04	B3A6	0.05	0.05	---	0.05	0.5	7.5
	123289-01	B3A9	0.05	0.05	---	0.05	0.5	6
	123389-02	EBNB1	0.05	0.05	---	0.05	0.5	3
	123289-05	EBNB2	0.05	0.05	---	0.05	0.5	2
	123289-04	EBNB3	0.05	0.05	---	0.05	0.5	28
	122917-05	M1K4	0.05	0.05	---	0.05	0.5	8
	122917-06	M1M2	0.05	0.05	---	0.05	1	11
	122917-07	M1N1	0.05	0.05	---	0.05	0.5	7
	122917-02	M2E1	0.05	0.05	---	0.05	0.5	9
	122741-05	M3A1	0.05	0.05	---	0.05	0.5	8
	122917-03	M3C3	0.05	0.05	---	0.05	0.5	5
	123389-09	M4A9	0.05	0.05	---	0.1	0.5	7
	122917-04	S1C3	0.05	0.05	---	0.05	0.5	7
	122741-04	S2A2	0.05	0.05	---	0.05	0.5	3
	122741-01	S2A3	0.05	0.05	---	0.05	0.5	3
	122917-01	S3A2	0.05	0.05	---	0.05	0.5	4
	123289-02	SID3	0.05	0.05	---	0.05	0.5	7
	122741-02	W1G5	0.05	0.05	---	0.5	0.5	4
	123389-01	W1N3	0.05	0.05	---	0.2	0.5	5
	122741-03	W2A4	0.05	0.05	---	0.4	0.5	2
	123389-03	W4A1	0.05	0.05	---	0.4	0.5	5
	123289-03	W4A17	0.05	0.05	---	0.5	0.5	3
	123154-01	W4A21	0.05	0.05	---	0.3	0.5	4
	123154-03	W4A25	0.05	0.05	---	0.3	0.5	4
	123154-06	W4A31	0.05	0.05	---	0.3	0.5	14

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

CERTIFICATE OF ANALYSIS

for
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Fredericton, NB E3B 2T7

rpc
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Canada E3B 6Z9
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Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			124082-1
Client Sample ID:			NRC
Date Sampled:			15-Aug-11
Analytes	**Units**	**RL**	
Sodium	mg/L	0.05	1.46
Potassium	mg/L	0.02	0.25
Calcium	mg/L	0.05	3.46
Magnesium	mg/L	0.01	0.66
Iron	mg/L	0.02	0.25
Manganese	mg/L	0.001	0.011
Copper	mg/L	0.001	< 0.001
Zinc	mg/L	0.001	0.002
Ammonia (as N)	mg/L	0.05	< 0.05
pH	units	-	6.9
Alkalinity (as $CaCO_3$)	mg/L	2	14
Chloride	mg/L	0.5	1.1
Sulfate	mg/L	1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	6.9
Carbon - Total Organic	mg/L	0.5	7.9
Turbidity	NTU	0.1	1.0
Conductivity	µS/cm	1	30
Calculated Parameters			
Bicarbonate (as $CaCO_3$)	mg/L	-	14.0
Carbonate (as $CaCO_3$)	mg/L	-	0.010
Hydroxide (as $CaCO_3$)	mg/L	-	0.004
Cation Sum	meq/L	-	0.311
Anion Sum	meq/L	-	0.311
Percent Difference	%	-	0.00
Theoretical Conductivity	µS/cm	-	30
Hardness (as $CaCO_3$)	mg/L	0.2	11.4
Ion Sum	mg/L	-	23
Saturation pH (5°C)	units	-	9.8
Langelier Index (5°C)		-	-2.92

Report ID: 124082-IAS
Report Date: 02-Sep-11
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CERTIFICATE OF ANALYSIS

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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			124082-1
Client Sample ID:			NRC
Date Sampled:			15-Aug-11
Analytes	**Units**	**RL**	
Aluminum	µg/L	1	90
Antimony	µg/L	0.1	< 0.1
Arsenic	µg/L	1	1
Barium	µg/L	1	3
Beryllium	µg/L	0.1	< 0.1
Bismuth	µg/L	1	< 1
Boron	µg/L	1	3
Cadmium	µg/L	0.01	0.01
Calcium	µg/L	50	3460
Chromium	µg/L	1	< 1
Cobalt	µg/L	0.1	< 0.1
Copper	µg/L	1	< 1
Iron	µg/L	20	250
Lead	µg/L	0.1	0.2
Lithium	µg/L	0.1	1.0
Magnesium	µg/L	10	660
Manganese	µg/L	1	11
Mercury	µg/L	0.025	< 0.025
Molybdenum	µg/L	0.1	0.2
Nickel	µg/L	1	< 1
Potassium	µg/L	20	250
Rubidium	µg/L	0.1	0.9
Selenium	µg/L	1	< 1
Silver	µg/L	0.1	< 0.1
Sodium	µg/L	50	1460
Strontium	µg/L	1	14
Tellurium	µg/L	0.1	< 0.1
Thallium	µg/L	0.1	< 0.1
Tin	µg/L	0.1	< 0.1
Uranium	µg/L	0.1	0.1
Vanadium	µg/L	1	< 1
Zinc	µg/L	1	2

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

CERTIFICATE OF ANALYSIS
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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 122741-IAS Rev01
Report Date: 01-Sep-11
Date Received: 27-Jul-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			122741-01	122741-02	122741-03
Client Sample ID:			S2A3	W1G5	W2A4
Date Sampled:			-	-	26-Jul-11
Analytes	**Units**	**RL**			
Sodium	mg/L	0.05	1.60	2.17	2.17
Potassium	mg/L	0.02	0.32	0.30	0.33
Calcium	mg/L	0.05	2.73	3.36	3.15
Magnesium	mg/L	0.01	0.74	0.49	0.48
Iron	mg/L	0.02	0.40	0.12	0.32
Manganese	mg/L	0.001	0.029	0.010	0.011
Copper	mg/L	0.001	0.001	< 0.001	< 0.001
Zinc	mg/L	0.001	0.003	0.004	0.002
Ammonia (as N)	mg/L	0.05	0.66	0.19	0.12
pH	units	-	6.2	6.6	6.4
Alkalinity (as $CaCO_3$)	mg/L	2	8	10	9
Chloride	mg/L	0.5	0.7	0.7	1.0
Sulfate	mg/L	1	< 1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	0.22	0.32	0.06
o-Phosphate (as P)	mg/L	0.01	< 0.01	0.01	0.02
r-Silica (as SiO_2)	mg/L	0.1	7.2	10.8	9.2
Carbon - Total Organic	mg/L	0.5	8.5	4.9	12.8
Turbidity	NTU	0.1	1.0	0.4	0.8
Conductivity	µS/cm	1	26	31	27
Calculated Parameters					
Bicarbonate (as $CaCO_3$)	mg/L	-	8.0	10.0	9.0
Carbonate (as $CaCO_3$)	mg/L	-	0.001	0.004	0.002
Hydroxide (as $CaCO_3$)	mg/L	-	0.001	0.002	0.001
Cation Sum	meq/L	-	0.345	0.331	0.326
Anion Sum	meq/L	-	0.195	0.243	0.214
Percent Difference	%	-	27.8	15.3	20.7
Theoretical Conductivity	µS/cm	-	27	29	27
Hardness (as $CaCO_3$)	mg/L	0.2	9.9	10.4	9.8
Ion Sum	mg/L	-	20	26	23
Saturation pH (5°C)	units	-	10.2	10.0	10.1
Langelier Index (5°C)		-	-3.97	-3.38	-3.66

Report ID: 122741-IAS Rev01
Report Date: 01-Sep-11
Date Received: 27-Jul-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			122741-04	122741-05	122741-06
Client Sample ID:			S2A2	M3A1	B3A1
Date Sampled:			-	-	27-Jul-11
Analytes	**Units**	**RL**			
Sodium	mg/L	0.05	1.68	1.68	2.15
Potassium	mg/L	0.02	0.32	0.54	0.43
Calcium	mg/L	0.05	2.82	3.75	2.89
Magnesium	mg/L	0.01	0.72	0.86	0.59
Iron	mg/L	0.02	0.28	0.22	0.33
Manganese	mg/L	0.001	0.017	0.018	0.017
Copper	mg/L	0.001	0.002	< 0.001	0.002
Zinc	mg/L	0.001	0.003	0.008	0.005
Ammonia (as N)	mg/L	0.05	0.08	< 0.05	< 0.05
pH	units	-	6.9	6.7	6.2
Alkalinity (as $CaCO_3$)	mg/L	2	8	10	8
Chloride	mg/L	0.5	0.8	0.7	1.0
Sulfate	mg/L	1	< 1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	0.11	0.09	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	7.3	7.6	9.2
Carbon - Total Organic	mg/L	0.5	7.6	8.9	11.9
Turbidity	NTU	0.1	0.8	0.6	0.8
Conductivity	µS/cm	1	28	31	26
Calculated Parameters					
Bicarbonate (as $CaCO_3$)	mg/L	-	8.0	10.0	8.0
Carbonate (as $CaCO_3$)	mg/L	-	0.006	0.005	0.001
Hydroxide (as $CaCO_3$)	mg/L	-	0.004	0.003	0.001
Cation Sum	meq/L	-	0.303	0.358	0.316
Anion Sum	meq/L	-	0.190	0.226	0.188
Percent Difference	%	-	22.9	22.6	25.4
Theoretical Conductivity	µS/cm	-	25	29	25
Hardness (as $CaCO_3$)	mg/L	0.2	10.0	12.9	9.6
Ion Sum	mg/L	-	19	22	21
Saturation pH (5°C)	units	-	10.2	9.9	10.1
Langelier Index (5°C)		-	-3.25	-3.24	-3.94

Report ID: 122741-IAS Rev01
Report Date: 01-Sep-11
Date Received: 27-Jul-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			122741-07	122741-08
Client Sample ID:			B3A1 D5 Dup	B3A1 Blank
Date Sampled:			-	-
Analytes	**Units**	**RL**		
Sodium	mg/L	0.05	2.52	0.20
Potassium	mg/L	0.02	0.37	< 0.02
Calcium	mg/L	0.05	2.75	0.11
Magnesium	mg/L	0.01	0.59	0.02
Iron	mg/L	0.02	0.30	0.07
Manganese	mg/L	0.001	0.025	0.004
Copper	mg/L	0.001	< 0.001	0.006
Zinc	mg/L	0.001	0.004	0.010
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05
pH	units	-	6.3	5.7
Alkalinity (as $CaCO_3$)	mg/L	2	8	< 2
Chloride	mg/L	0.5	0.9	< 0.5
Sulfate	mg/L	1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	9.2	< 0.1
Carbon - Total Organic	mg/L	0.5	9.3	0.5
Turbidity	NTU	0.1	1.1	< 0.1
Conductivity	µS/cm	1	26	1
Calculated Parameters				
Bicarbonate (as $CaCO_3$)	mg/L	-	8.0	0.0
Carbonate (as $CaCO_3$)	mg/L	-	0.002	0.000
Hydroxide (as $CaCO_3$)	mg/L	-	0.001	0.000
Cation Sum	meq/L	-	0.322	0.020
Anion Sum	meq/L	-	0.185	0.000
Percent Difference	%	-	27.0	100.
Theoretical Conductivity	µS/cm	-	25	1
Hardness (as $CaCO_3$)	mg/L	0.2	9.3	0.4
Ion Sum	mg/L	-	22	0
Saturation pH (5°C)	units	-	10.2	-
Langelier Index (5°C)		-	-3.86	-

Report ID: 122741-IAS Rev01
Report Date: 01-Sep-11
Date Received: 27-Jul-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			122741-01	122741-02	122741-03
Client Sample ID:			S2A3	W1G5	W2A4
Date Sampled:			-	-	26-Jul-11
Analytes	**Units**	**RL**			
Aluminum	µg/L	1	128	111	175
Antimony	µg/L	0.1	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	2	< 1	< 1
Barium	µg/L	1	2	3	2
Beryllium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1	< 1
Boron	µg/L	1	2	2	2
Cadmium	µg/L	0.01	0.03	0.02	0.02
Calcium	µg/L	50	2730	3360	3150
Chromium	µg/L	1	< 1	< 1	< 1
Cobalt	µg/L	0.1	< 0.1	< 0.1	< 0.1
Copper	µg/L	1	1	< 1	< 1
Iron	µg/L	20	400	120	320
Lead	µg/L	0.1	0.3	0.5	0.5
Lithium	µg/L	0.1	0.4	1.7	2.5
Magnesium	µg/L	10	740	490	480
Manganese	µg/L	1	29	10	11
Mercury	µg/L	0.025	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	4.4	0.3	0.2
Nickel	µg/L	1	< 1	< 1	< 1
Potassium	µg/L	20	320	300	330
Rubidium	µg/L	0.1	1.4	1.3	1.7
Selenium	µg/L	1	< 1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	1600	2170	2170
Strontium	µg/L	1	17	21	17
Tellurium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	0.5	0.4
Vanadium	µg/L	1	< 1	< 1	< 1
Zinc	µg/L	1	3	4	2

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			122741-04	122741-05	122741-06
Client Sample ID:			S2A2	M3A1	B3A1
Date Sampled:			-	-	27-Jul-11
Analytes	**Units**	**RL**			
Aluminum	µg/L	1	112	144	157
Antimony	µg/L	0.1	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	2	2	1
Barium	µg/L	1	2	4	3
Beryllium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1	< 1
Boron	µg/L	1	2	3	2
Cadmium	µg/L	0.01	0.04	0.02	0.05
Calcium	µg/L	50	2820	3750	2890
Chromium	µg/L	1	< 1	< 1	< 1
Cobalt	µg/L	0.1	< 0.1	< 0.1	0.1
Copper	µg/L	1	2	< 1	2
Iron	µg/L	20	280	220	330
Lead	µg/L	0.1	0.4	0.4	0.6
Lithium	µg/L	0.1	0.4	0.6	0.7
Magnesium	µg/L	10	720	860	590
Manganese	µg/L	1	17	18	17
Mercury	µg/L	0.025	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	6.7	0.4	0.2
Nickel	µg/L	1	< 1	< 1	< 1
Potassium	µg/L	20	320	540	430
Rubidium	µg/L	0.1	1.5	1.6	0.9
Selenium	µg/L	1	< 1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	1680	1680	2150
Strontium	µg/L	1	17	18	13
Tellurium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Vanadium	µg/L	1	< 1	< 1	< 1
Zinc	µg/L	1	3	8	5

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			122741-07	122741-08
Client Sample ID:			B3A1 D5 Dup	B3A1 Blank
Date Sampled:			-	-
Analytes	**Units**	**RL**		
Aluminum	µg/L	1	151	53
Antimony	µg/L	0.1	< 0.1	< 0.1
Arsenic	µg/L	1	2	< 1
Barium	µg/L	1	3	1
Beryllium	µg/L	0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1
Boron	µg/L	1	2	< 1
Cadmium	µg/L	0.01	0.02	0.03
Calcium	µg/L	50	2750	110
Chromium	µg/L	1	< 1	< 1
Cobalt	µg/L	0.1	0.2	0.1
Copper	µg/L	1	< 1	6
Iron	µg/L	20	300	70
Lead	µg/L	0.1	0.6	1.0
Lithium	µg/L	0.1	0.6	< 0.1
Magnesium	µg/L	10	590	20
Manganese	µg/L	1	25	4
Mercury	µg/L	0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	0.1	< 0.1
Nickel	µg/L	1	< 1	< 1
Potassium	µg/L	20	370	< 20
Rubidium	µg/L	0.1	0.8	< 0.1
Selenium	µg/L	1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1
Sodium	µg/L	50	2520	200
Strontium	µg/L	1	13	< 1
Tellurium	µg/L	0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1
Vanadium	µg/L	1	< 1	< 1
Zinc	µg/L	1	4	10

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 122917-IAS
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Attention: Eva Walker
Project #: 121810356

Analysis of Water

RPC Sample ID:			122917-01	122917-02	122917-03
Client Sample ID:			S3A2	M2E1	M3C3
Analytes	**Units**	**RL**			
Sodium	mg/L	0.05	1.65	1.33	1.60
Potassium	mg/L	0.02	0.33	0.36	0.27
Calcium	mg/L	0.05	2.94	2.66	4.07
Magnesium	mg/L	0.01	0.63	0.42	0.58
Iron	mg/L	0.02	0.26	0.48	0.22
Manganese	mg/L	0.001	0.045	0.078	0.018
Copper	mg/L	0.001	0.002	0.001	< 0.001
Zinc	mg/L	0.001	0.004	0.009	0.005
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05	< 0.05
pH	units	-	6.6	5.5	6.2
Alkalinity (as $CaCO_3$)	mg/L	2	8	5	8
Chloride	mg/L	0.5	1.0	1.9	1.4
Sulfate	mg/L	1	< 1	2	1
Nitrate + Nitrite (as N)	mg/L	0.05	0.14	< 0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	7.8	5.0	5.7
Carbon - Total Organic	mg/L	0.5	5.4	23	15.4
Turbidity	NTU	0.1	0.9	1.0	0.6
Conductivity	µS/cm	1	29	21	28
Calculated Parameters					
Bicarbonate (as $CaCO_3$)	mg/L	-	8.0	5.0	8.0
Carbonate (as $CaCO_3$)	mg/L	-	0.003	0.000	0.001
Hydroxide (as $CaCO_3$)	mg/L	-	0.002	0.000	0.001
Cation Sum	meq/L	-	0.295	0.263	0.340
Anion Sum	meq/L	-	0.198	0.196	0.220
Percent Difference	%	-	19.7	14.6	21.4
Theoretical Conductivity	µS/cm	-	25	24	29
Hardness (as $CaCO_3$)	mg/L	0.2	9.9	8.4	12.6
Ion Sum	mg/L	-	20	17	20
Saturation pH (5°C)	units	-	10.1	10.4	10.0
Langelier Index (5°C)		-	-3.53	-4.88	-3.80

Report ID: 122917-IAS
Report Date: 10-Aug-11
Date Received: 29-Jul-11

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for

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Attention: Eva Walker
Project #: 121810356

Analysis of Water

RPC Sample ID:			122917-04	122917-05	122917-06
Client Sample ID:			S1C3	M1K4	M1M2
Analytes	**Units**	**RL**			
Sodium	mg/L	0.05	1.39	1.31	1.94
Potassium	mg/L	0.02	0.41	0.23	0.42
Calcium	mg/L	0.05	1.75	2.37	5.97
Magnesium	mg/L	0.01	0.33	0.39	0.83
Iron	mg/L	0.02	0.14	0.19	1.73
Manganese	mg/L	0.001	0.012	0.067	1.66
Copper	mg/L	0.001	0.001	0.004	0.003
Zinc	mg/L	0.001	0.007	0.008	0.011
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05	< 0.05
pH	units	-	6.2	6.2	6.4
Alkalinity (as $CaCO_3$)	mg/L	2	3	6	16
Chloride	mg/L	0.5	1.2	0.8	1.4
Sulfate	mg/L	1	< 1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	0.13	< 0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	8.6	8.1	6.9
Carbon - Total Organic	mg/L	0.5	5.4	7.1	11.7
Turbidity	NTU	0.1	0.3	0.5	3.7
Conductivity	µS/cm	1	21	23	42
Calculated Parameters					
Bicarbonate (as $CaCO_3$)	mg/L	-	3.0	6.0	16.0
Carbonate (as $CaCO_3$)	mg/L	-	0.000	0.001	0.004
Hydroxide (as $CaCO_3$)	mg/L	-	0.001	0.001	0.001
Cation Sum	meq/L	-	0.194	0.226	0.615
Anion Sum	meq/L	-	0.103	0.142	0.359
Percent Difference	%	-	30.6	22.8	26.3
Theoretical Conductivity	µS/cm	-	16	18	41
Hardness (as $CaCO_3$)	mg/L	0.2	5.7	7.5	18.3
Ion Sum	mg/L	-	16	17	31
Saturation pH (5°C)	units	-	10.8	10.4	9.5
Langelier Index (5°C)		-	-4.58	-4.15	-3.14

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Attention: Eva Walker
Project #: 121810356

Analysis of Water

RPC Sample ID:			122917-07
Client Sample ID:			M1N1
Analytes	**Units**	**RL**	
Sodium	mg/L	0.05	1.15
Potassium	mg/L	0.02	0.13
Calcium	mg/L	0.05	3.88
Magnesium	mg/L	0.01	0.57
Iron	mg/L	0.02	0.51
Manganese	mg/L	0.001	0.047
Copper	mg/L	0.001	0.001
Zinc	mg/L	0.001	0.007
Ammonia (as N)	mg/L	0.05	< 0.05
pH	units	-	5.9
Alkalinity (as $CaCO_3$)	mg/L	2	9
Chloride	mg/L	0.5	1.5
Sulfate	mg/L	1	2
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	7.3
Carbon - Total Organic	mg/L	0.5	21
Turbidity	NTU	0.1	0.6
Conductivity	µS/cm	1	25
Calculated Parameters			
Bicarbonate (as $CaCO_3$)	mg/L	-	9.0
Carbonate (as $CaCO_3$)	mg/L	-	0.001
Hydroxide (as $CaCO_3$)	mg/L	-	0.000
Cation Sum	meq/L	-	0.323
Anion Sum	meq/L	-	0.264
Percent Difference	%	-	10.0
Theoretical Conductivity	µS/cm	-	30
Hardness (as $CaCO_3$)	mg/L	0.2	12.0
Ion Sum	mg/L	-	23
Saturation pH (5°C)	units	-	10.0
Langelier Index (5°C)		-	-4.07

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Attention: Eva Walker
Project #: 121810356

Analysis of Metals in Water

RPC Sample ID:			122917-01	122917-02	122917-03
Client Sample ID:			S3A2	M2E1	M3C3
Analytes	**Units**	**RL**			
Aluminum	µg/L	1	129	218	186
Antimony	µg/L	0.1	< 0.1	0.1	< 0.1
Arsenic	µg/L	1	4	2	1
Barium	µg/L	1	3	4	4
Beryllium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1	< 1
Boron	µg/L	1	2	3	3
Cadmium	µg/L	0.01	0.07	0.08	0.08
Calcium	µg/L	50	2940	2660	4070
Chromium	µg/L	1	< 1	< 1	< 1
Cobalt	µg/L	0.1	0.3	0.1	< 0.1
Copper	µg/L	1	2	1	< 1
Iron	µg/L	20	260	480	220
Lead	µg/L	0.1	0.3	1.3	0.5
Lithium	µg/L	0.1	0.4	0.4	0.4
Magnesium	µg/L	10	630	420	580
Manganese	µg/L	1	45	78	18
Mercury	µg/L	0.025	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	3.5	4.4	1.0
Nickel	µg/L	1	< 1	< 1	< 1
Potassium	µg/L	20	330	360	270
Rubidium	µg/L	0.1	1.7	1.6	0.9
Selenium	µg/L	1	< 1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	1650	1330	1600
Strontium	µg/L	1	17	17	21
Tellurium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Vanadium	µg/L	1	< 1	< 1	< 1
Zinc	µg/L	1	4	9	5

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Attention: Eva Walker
Project #: 121810356

Analysis of Metals in Water

RPC Sample ID:			122917-04	122917-05	122917-06
Client Sample ID:			S1C3	M1K4	M1M2
Analytes	**Units**	**RL**			
Aluminum	µg/L	1	169	179	442
Antimony	µg/L	0.1	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	< 1	< 1	3
Barium	µg/L	1	4	4	11
Beryllium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1	< 1
Boron	µg/L	1	3	2	2
Cadmium	µg/L	0.01	0.14	0.13	0.17
Calcium	µg/L	50	1750	2370	5970
Chromium	µg/L	1	< 1	< 1	< 1
Cobalt	µg/L	0.1	< 0.1	0.3	1.5
Copper	µg/L	1	1	4	3
Iron	µg/L	20	140	190	1730
Lead	µg/L	0.1	0.4	0.4	1.0
Lithium	µg/L	0.1	0.3	0.3	0.4
Magnesium	µg/L	10	330	390	830
Manganese	µg/L	1	12	67	1660
Mercury	µg/L	0.025	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	0.1	0.2	23.7
Nickel	µg/L	1	< 1	< 1	< 1
Potassium	µg/L	20	410	230	420
Rubidium	µg/L	0.1	2.0	1.4	2.6
Selenium	µg/L	1	< 1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	1390	1310	1940
Strontium	µg/L	1	12	15	32
Tellurium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Vanadium	µg/L	1	< 1	< 1	1
Zinc	µg/L	1	7	8	11

Report ID: 122917-IAS
Report Date: 10-Aug-11
Date Received: 29-Jul-11

CERTIFICATE OF ANALYSIS

for

Stantec Consulting Ltd
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Attention: Eva Walker
Project #: 121810356

Analysis of Metals in Water

RPC Sample ID:			122917-07
Client Sample ID:			M1N1
Analytes	**Units**	**RL**	
Aluminum	µg/L	1	283
Antimony	µg/L	0.1	< 0.1
Arsenic	µg/L	1	3
Barium	µg/L	1	4
Beryllium	µg/L	0.1	< 0.1
Bismuth	µg/L	1	< 1
Boron	µg/L	1	2
Cadmium	µg/L	0.01	0.10
Calcium	µg/L	50	3880
Chromium	µg/L	1	< 1
Cobalt	µg/L	0.1	0.3
Copper	µg/L	1	1
Iron	µg/L	20	510
Lead	µg/L	0.1	0.5
Lithium	µg/L	0.1	0.2
Magnesium	µg/L	10	570
Manganese	µg/L	1	47
Mercury	µg/L	0.025	< 0.025
Molybdenum	µg/L	0.1	1.9
Nickel	µg/L	1	1
Potassium	µg/L	20	130
Rubidium	µg/L	0.1	0.8
Selenium	µg/L	1	< 1
Silver	µg/L	0.1	< 0.1
Sodium	µg/L	50	1150
Strontium	µg/L	1	27
Tellurium	µg/L	0.1	< 0.1
Thallium	µg/L	0.1	< 0.1
Tin	µg/L	0.1	< 0.1
Uranium	µg/L	0.1	< 0.1
Vanadium	µg/L	1	< 1
Zinc	µg/L	1	7

Report ID: 122917-IAS
Report Date: 10-Aug-11
Date Received: 29-Jul-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			123154-01	123154-02	123154-03
Client Sample ID:			W4A21	B1H1	W4A25
Analytes	**Units**	**RL**			
Sodium	mg/L	0.05	1.78	2.22	1.65
Potassium	mg/L	0.02	0.30	0.19	0.30
Calcium	mg/L	0.05	3.18	3.12	3.07
Magnesium	mg/L	0.01	0.48	0.59	0.48
Iron	mg/L	0.02	0.30	0.15	0.27
Manganese	mg/L	0.001	0.015	0.211	0.014
Copper	mg/L	0.001	0.002	< 0.001	0.002
Zinc	mg/L	0.001	0.004	0.005	0.004
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05	< 0.05
pH	units	-	6.7	6.4	6.6
Alkalinity (as $CaCO_3$)	mg/L	2	9	10	8
Chloride	mg/L	0.5	1.3	0.8	1.1
Sulfate	mg/L	1	< 1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05	< 0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	8.5	7.9	8.2
Carbon - Total Organic	mg/L	0.5	12.1	6.2	10.5
Turbidity	NTU	0.1	1.2	1.5	1.1
Conductivity	µS/cm	1	25	29	25
Calculated Parameters					
Bicarbonate (as $CaCO_3$)	mg/L	-	9.0	10.0	8.0
Carbonate (as $CaCO_3$)	mg/L	-	0.004	0.002	0.003
Hydroxide (as $CaCO_3$)	mg/L	-	0.003	0.001	0.002
Cation Sum	meq/L	-	0.300	0.322	0.287
Anion Sum	meq/L	-	0.217	0.222	0.191
Percent Difference	%	-	16.0	18.4	20.1
Theoretical Conductivity	µS/cm	-	26	26	24
Hardness (as $CaCO_3$)	mg/L	0.2	9.9	10.2	9.6
Ion Sum	mg/L	-	21	21	20
Saturation pH (5°C)	units	-	10.0	10.0	10.1
Langelier Index (5°C)		-	-3.35	-3.62	-3.51

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			123154-04	123154-05	123154-06
Client Sample ID:			B3A6	B3A6 dup	W4A31
Analytes	**Units**	**RL**			
Sodium	mg/L	0.05	1.71	1.68	1.62
Potassium	mg/L	0.02	0.33	0.32	0.30
Calcium	mg/L	0.05	2.89	2.85	3.14
Magnesium	mg/L	0.01	0.52	0.52	0.48
Iron	mg/L	0.02	0.44	0.42	0.31
Manganese	mg/L	0.001	0.018	0.018	0.031
Copper	mg/L	0.001	0.002	< 0.001	< 0.001
Zinc	mg/L	0.001	0.009	0.006	0.014
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05	< 0.05
pH	units	-	6.3	6.2	6.6
Alkalinity (as $CaCO_3$)	mg/L	2	6	7	7
Chloride	mg/L	0.5	1.7	1.5	1.1
Sulfate	mg/L	1	< 1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05	< 0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	8.3	8.3	8.1
Carbon - Total Organic	mg/L	0.5	13.8	13.7	10.5
Turbidity	NTU	0.1	1.0	0.9	1.7
Conductivity	µS/cm	1	24	24	25
Calculated Parameters					
Bicarbonate (as $CaCO_3$)	mg/L	-	6.0	7.0	7.0
Carbonate (as $CaCO_3$)	mg/L	-	0.001	0.001	0.003
Hydroxide (as $CaCO_3$)	mg/L	-	0.001	0.001	0.002
Cation Sum	meq/L	-	0.294	0.290	0.293
Anion Sum	meq/L	-	0.168	0.182	0.171
Percent Difference	%	-	27.3	22.9	26.3
Theoretical Conductivity	µS/cm	-	23	24	23
Hardness (as $CaCO_3$)	mg/L	0.2	9.4	9.3	9.8
Ion Sum	mg/L	-	20	20	19
Saturation pH (5°C)	units	-	10.3	10.2	10.2
Langelier Index (5°C)		-	-3.96	-4.00	-3.56

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

CERTIFICATE OF ANALYSIS

for

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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			123154-07
Client Sample ID:			Blank
Analytes	**Units**	**RL**	
Sodium	mg/L	0.05	< 0.05
Potassium	mg/L	0.02	< 0.02
Calcium	mg/L	0.05	< 0.05
Magnesium	mg/L	0.01	< 0.01
Iron	mg/L	0.02	< 0.02
Manganese	mg/L	0.001	< 0.001
Copper	mg/L	0.001	< 0.001
Zinc	mg/L	0.001	< 0.001
Ammonia (as N)	mg/L	0.05	0.06
pH	units	-	5.7
Alkalinity (as $CaCO_3$)	mg/L	2	< 2
Chloride	mg/L	0.5	< 0.5
Sulfate	mg/L	1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	0.02
r-Silica (as SiO_2)	mg/L	0.1	< 0.1
Carbon - Total Organic	mg/L	0.5	< 0.5
Turbidity	NTU	0.1	0.2
Conductivity	µS/cm	1	1
Calculated Parameters			
Bicarbonate (as $CaCO_3$)	mg/L	-	-
Carbonate (as $CaCO_3$)	mg/L	-	-
Hydroxide (as $CaCO_3$)	mg/L	-	-
Cation Sum	meq/L	-	-
Anion Sum	meq/L	-	-
Percent Difference	%	-	-
Theoretical Conductivity	µS/cm	-	-
Hardness (as $CaCO_3$)	mg/L	0.2	-
Ion Sum	mg/L	-	-
Saturation pH (5°C)	units	-	-
Langelier Index (5°C)		-	-

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			123154-01	123154-02	123154-03
Client Sample ID:			W4A21	B1H1	W4A25
Analytes	**Units**	**RL**			
Aluminum	µg/L	1	283	174	173
Antimony	µg/L	0.1	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	1	< 1	2
Barium	µg/L	1	4	5	5
Beryllium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1	< 1
Boron	µg/L	1	3	2	3
Cadmium	µg/L	0.01	0.04	0.06	0.05
Calcium	µg/L	50	3180	3120	3070
Chromium	µg/L	1	< 1	< 1	< 1
Cobalt	µg/L	0.1	0.2	0.2	0.1
Copper	µg/L	1	2	< 1	2
Iron	µg/L	20	300	150	270
Lead	µg/L	0.1	0.4	0.7	0.4
Lithium	µg/L	0.1	1.5	0.4	1.2
Magnesium	µg/L	10	480	590	480
Manganese	µg/L	1	15	211	14
Mercury	µg/L	0.025	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	0.1	0.1	0.4
Nickel	µg/L	1	< 1	< 1	< 1
Potassium	µg/L	20	300	190	300
Rubidium	µg/L	0.1	1.3	0.6	1.3
Selenium	µg/L	1	< 1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	1780	2220	1650
Strontium	µg/L	1	15	19	15
Tellurium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	0.3	< 0.1	0.3
Vanadium	µg/L	1	< 1	< 1	< 1
Zinc	µg/L	1	4	5	4

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			123154-04	123154-05	123154-06
Client Sample ID:			B3A6	B3A6 dup	W4A31
Analytes	**Units**	**RL**			
Aluminum	µg/L	1	237	231	191
Antimony	µg/L	0.1	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	2	2	2
Barium	µg/L	1	4	4	6
Beryllium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1	< 1
Boron	µg/L	1	2	3	2
Cadmium	µg/L	0.01	0.06	0.06	0.04
Calcium	µg/L	50	2890	2850	3140
Chromium	µg/L	1	< 1	< 1	< 1
Cobalt	µg/L	0.1	0.1	0.1	0.2
Copper	µg/L	1	2	< 1	< 1
Iron	µg/L	20	440	420	310
Lead	µg/L	0.1	0.6	0.4	0.4
Lithium	µg/L	0.1	0.6	0.6	1.1
Magnesium	µg/L	10	520	520	480
Manganese	µg/L	1	18	18	31
Mercury	µg/L	0.025	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	0.1	0.1	0.4
Nickel	µg/L	1	< 1	< 1	< 1
Potassium	µg/L	20	330	320	300
Rubidium	µg/L	0.1	0.9	0.9	1.3
Selenium	µg/L	1	< 1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	1710	1680	1620
Strontium	µg/L	1	14	14	15
Tellurium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1	0.3
Vanadium	µg/L	1	< 1	< 1	< 1
Zinc	µg/L	1	9	6	14

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			123154-07
Client Sample ID:			Blank
Analytes	**Units**	**RL**	
Aluminum	µg/L	1	< 1
Antimony	µg/L	0.1	< 0.1
Arsenic	µg/L	1	< 1
Barium	µg/L	1	< 1
Beryllium	µg/L	0.1	< 0.1
Bismuth	µg/L	1	< 1
Boron	µg/L	1	< 1
Cadmium	µg/L	0.01	< 0.01
Calcium	µg/L	50	< 50
Chromium	µg/L	1	< 1
Cobalt	µg/L	0.1	< 0.1
Copper	µg/L	1	< 1
Iron	µg/L	20	< 20
Lead	µg/L	0.1	< 0.1
Lithium	µg/L	0.1	< 0.1
Magnesium	µg/L	10	< 10
Manganese	µg/L	1	< 1
Mercury	µg/L	0.025	< 0.025
Molybdenum	µg/L	0.1	< 0.1
Nickel	µg/L	1	< 1
Potassium	µg/L	20	< 20
Rubidium	µg/L	0.1	< 0.1
Selenium	µg/L	1	< 1
Silver	µg/L	0.1	< 0.1
Sodium	µg/L	50	< 50
Strontium	µg/L	1	< 1
Tellurium	µg/L	0.1	< 0.1
Thallium	µg/L	0.1	< 0.1
Tin	µg/L	0.1	< 0.1
Uranium	µg/L	0.1	< 0.1
Vanadium	µg/L	1	< 1
Zinc	µg/L	1	< 1

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 123289-IAS
Report Date: 17-Aug-11
Date Received: 08-Aug-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			123289-01	123289-02	123289-03
Client Sample ID:			B3A9	SID3	W4A17
Date Sampled:			5-Aug-11	5-Aug-11	4-Aug-11
Analytes	**Units**	**RL**			
Sodium	mg/L	0.05	1.70	1.36	1.78
Potassium	mg/L	0.02	0.33	0.30	0.30
Calcium	mg/L	0.05	2.83	2.77	3.29
Magnesium	mg/L	0.01	0.54	0.36	0.46
Iron	mg/L	0.02	0.25	0.10	0.26
Manganese	mg/L	0.001	0.012	0.063	0.018
Copper	mg/L	0.001	< 0.001	0.003	< 0.001
Zinc	mg/L	0.001	0.006	0.007	0.003
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05	0.09
pH	units	-	6.7	6.4	6.6
Alkalinity (as $CaCO_3$)	mg/L	2	7	6	9
Chloride	mg/L	0.5	1.3	0.8	1.4
Sulfate	mg/L	1	< 1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05	0.27	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	8.9	8.7	8.7
Carbon - Total Organic	mg/L	0.5	11.4	2.7	12.1
Turbidity	NTU	0.1	1.2	9.2	1.1
Conductivity	µS/cm	1	25	25	26
Calculated Parameters					
Bicarbonate (as $CaCO_3$)	mg/L	-	7.0	6.0	9.0
Carbonate (as $CaCO_3$)	mg/L	-	0.003	0.001	0.003
Hydroxide (as $CaCO_3$)	mg/L	-	0.003	0.001	0.002
Cation Sum	meq/L	-	0.282	0.243	0.308
Anion Sum	meq/L	-	0.177	0.162	0.219
Percent Difference	%	-	22.9	20.0	16.9
Theoretical Conductivity	µS/cm	-	23	21	26
Hardness (as $CaCO_3$)	mg/L	0.2	9.3	8.4	10.1
Ion Sum	mg/L	-	20	19	22
Saturation pH (5°C)	units	-	10.2	10.3	10.0
Langelier Index (5°C)		-	-3.51	-3.88	-3.44

Report ID: 123289-IAS
Report Date: 17-Aug-11
Date Received: 08-Aug-11

CERTIFICATE OF ANALYSIS

for

Stantec Consulting Ltd
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rpc
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			123289-04	123289-05
Client Sample ID:			EBNB3	EBNB2
Date Sampled:			4-Aug-11	3-Aug-11
Analytes	**Units**	**RL**		
Sodium	mg/L	0.05	1.40	1.58
Potassium	mg/L	0.02	0.13	0.25
Calcium	mg/L	0.05	2.13	4.74
Magnesium	mg/L	0.01	0.77	0.60
Iron	mg/L	0.02	10.4	0.48
Manganese	mg/L	0.001	0.073	0.060
Copper	mg/L	0.001	0.002	< 0.001
Zinc	mg/L	0.001	0.028	0.002
Ammonia (as N)	mg/L	0.05	0.12	0.08
pH	units	-	6.3	6.9
Alkalinity (as $CaCO_3$)	mg/L	2	6	11
Chloride	mg/L	0.5	1.2	1.7
Sulfate	mg/L	1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05	0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	4.4	4.6
Carbon - Total Organic	mg/L	0.5	13.6	9.3
Turbidity	NTU	0.1	1.3	1.6
Conductivity	µS/cm	1	19	35
Calculated Parameters				
Bicarbonate (as $CaCO_3$)	mg/L	-	6.0	11.0
Carbonate (as $CaCO_3$)	mg/L	-	0.001	0.008
Hydroxide (as $CaCO_3$)	mg/L	-	0.001	0.004
Cation Sum	meq/L	-	0.805	0.395
Anion Sum	meq/L	-	0.154	0.271
Percent Difference	%	-	67.9	18.6
Theoretical Conductivity	µS/cm	-	21	33
Hardness (as $CaCO_3$)	mg/L	0.2	8.5	14.3
Ion Sum	mg/L	-	24	21
Saturation pH (5°C)	units	-	10.4	9.8
Langelier Index (5°C)		-	-4.10	-2.90

Report ID: 123289-IAS
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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			123289-01	123289-02	123289-03
Client Sample ID:			B3A9	SID3	W4A17
Date Sampled:			5-Aug-11	5-Aug-11	4-Aug-11
Analytes	**Units**	**RL**			
Aluminum	µg/L	1	195	179	203
Antimony	µg/L	0.1	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	2	< 1	1
Barium	µg/L	1	3	3	3
Beryllium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1	< 1
Boron	µg/L	1	2	3	2
Cadmium	µg/L	0.01	0.07	0.13	0.04
Calcium	µg/L	50	2830	2770	3290
Chromium	µg/L	1	< 1	< 1	< 1
Cobalt	µg/L	0.1	< 0.1	0.3	0.1
Copper	µg/L	1	< 1	3	< 1
Iron	µg/L	20	250	100	260
Lead	µg/L	0.1	0.4	0.6	0.4
Lithium	µg/L	0.1	0.6	0.2	1.7
Magnesium	µg/L	10	540	360	460
Manganese	µg/L	1	12	63	18
Mercury	µg/L	0.025	< 0.025	< 0.025	0.03
Molybdenum	µg/L	0.1	0.1	< 0.1	0.1
Nickel	µg/L	1	< 1	< 1	< 1
Potassium	µg/L	20	330	300	300
Rubidium	µg/L	0.1	0.9	1.3	1.4
Selenium	µg/L	1	< 1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	1700	1360	1780
Strontium	µg/L	1	14	15	15
Tellurium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1	0.5
Vanadium	µg/L	1	< 1	< 1	< 1
Zinc	µg/L	1	6	7	3

Report ID: 123289-IAS
Report Date: 17-Aug-11
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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			123289-04	123289-05
Client Sample ID:			EBNB3	EBNB2
Date Sampled:			4-Aug-11	3-Aug-11
Analytes	**Units**	**RL**		
Aluminum	µg/L	1	194	83
Antimony	µg/L	0.1	< 0.1	< 0.1
Arsenic	µg/L	1	< 1	< 1
Barium	µg/L	1	5	6
Beryllium	µg/L	0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1
Boron	µg/L	1	3	2
Cadmium	µg/L	0.01	0.05	0.01
Calcium	µg/L	50	2130	4740
Chromium	µg/L	1	< 1	< 1
Cobalt	µg/L	0.1	0.8	0.2
Copper	µg/L	1	2	< 1
Iron	µg/L	20	10400	480
Lead	µg/L	0.1	0.6	0.4
Lithium	µg/L	0.1	0.4	0.4
Magnesium	µg/L	10	770	600
Manganese	µg/L	1	73	60
Mercury	µg/L	0.025	0.04	0.03
Molybdenum	µg/L	0.1	0.2	< 0.1
Nickel	µg/L	1	4	< 1
Potassium	µg/L	20	130	250
Rubidium	µg/L	0.1	0.5	0.9
Selenium	µg/L	1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1
Sodium	µg/L	50	1400	1580
Strontium	µg/L	1	13	19
Tellurium	µg/L	0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1
Vanadium	µg/L	1	< 1	< 1
Zinc	µg/L	1	28	2

Report ID: 123289-IAS
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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 123389-IAS
Report Date: 18-Aug-11
Date Received: 09-Aug-11

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			123389-01	123389-02	123389-03
Client Sample ID:			W1N3	EBNB1	W4A1
Date Sampled:			9-Aug-11	9-Aug-11	9-Aug-11
Analytes	**Units**	**RL**			
Sodium	mg/L	0.05	1.59	1.64	1.95
Potassium	mg/L	0.02	0.60	0.28	0.31
Calcium	mg/L	0.05	2.44	4.86	3.22
Magnesium	mg/L	0.01	0.37	0.64	0.44
Iron	mg/L	0.02	0.31	0.38	0.24
Manganese	mg/L	0.001	0.021	0.020	0.025
Copper	mg/L	0.001	< 0.001	0.001	0.002
Zinc	mg/L	0.001	0.006	0.003	0.005
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05	< 0.05
pH	units	-	6.4	7.1	6.7
Alkalinity (as $CaCO_3$)	mg/L	2	6	12	10
Chloride	mg/L	0.5	1.9	2.1	1.6
Sulfate	mg/L	1	< 1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	0.08	0.12	0.09
o-Phosphate (as P)	mg/L	0.01	0.03	< 0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	7.4	5.1	9.5
Carbon - Total Organic	mg/L	0.5	13.4	7.2	8.3
Turbidity	NTU	0.1	1.5	1.4	1.4
Conductivity	µS/cm	1	23	39	30
Calculated Parameters					
Bicarbonate (as $CaCO_3$)	mg/L	-	6.0	12.0	10.0
Carbonate (as $CaCO_3$)	mg/L	-	0.001	0.014	0.005
Hydroxide (as $CaCO_3$)	mg/L	-	0.001	0.006	0.003
Cation Sum	meq/L	-	0.254	0.395	0.304
Anion Sum	meq/L	-	0.181	0.308	0.251
Percent Difference	%	-	16.8	12.4	9.55
Theoretical Conductivity	µS/cm	-	22	35	28
Hardness (as $CaCO_3$)	mg/L	0.2	7.6	14.8	9.9
Ion Sum	mg/L	-	19	23	24
Saturation pH (5°C)	units	-	10.3	9.7	10.0
Langelier Index (5°C)		-	-3.94	-2.65	-3.30

Report ID: 123389-IAS
Report Date: 18-Aug-11
Date Received: 09-Aug-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			123389-04	123389-09
Client Sample ID:			W1N3 DUP	M4A9
Date Sampled:			9-Aug-11	9-Aug-11
Analytes	**Units**	**RL**		
Sodium	mg/L	0.05	1.59	1.76
Potassium	mg/L	0.02	0.58	0.44
Calcium	mg/L	0.05	2.43	4.26
Magnesium	mg/L	0.01	0.37	0.71
Iron	mg/L	0.02	0.31	0.24
Manganese	mg/L	0.001	0.021	0.025
Copper	mg/L	0.001	< 0.001	0.003
Zinc	mg/L	0.001	0.004	0.007
Ammonia (as N)	mg/L	0.05	0.14	< 0.05
pH	units	-	6.3	6.4
Alkalinity (as $CaCO_3$)	mg/L	2	7	11
Chloride	mg/L	0.5	1.9	1.7
Sulfate	mg/L	1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	0.10	0.06
o-Phosphate (as P)	mg/L	0.01	0.02	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	7.4	7.5
Carbon - Total Organic	mg/L	0.5	13.4	11.7
Turbidity	NTU	0.1	0.7	1.2
Conductivity	µS/cm	1	23	34
Calculated Parameters				
Bicarbonate (as $CaCO_3$)	mg/L	-	7.0	11.0
Carbonate (as $CaCO_3$)	mg/L	-	0.001	0.003
Hydroxide (as $CaCO_3$)	mg/L	-	0.001	0.001
Cation Sum	meq/L	-	0.263	0.373
Anion Sum	meq/L	-	0.202	0.272
Percent Difference	%	-	13.1	15.7
Theoretical Conductivity	µS/cm	-	24	33
Hardness (as $CaCO_3$)	mg/L	0.2	7.6	13.6
Ion Sum	mg/L	-	20	24
Saturation pH (5°C)	units	-	10.3	9.8
Langelier Index (5°C)		-	-3.97	-3.44

Report ID: 123389-IAS
Report Date: 18-Aug-11
Date Received: 09-Aug-11

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			123389-01	123389-02	123389-03
Client Sample ID:			W1N3	EBNB1	W4A1
Date Sampled:			9-Aug-11	9-Aug-11	9-Aug-11
Analytes	**Units**	**RL**			
Aluminum	µg/L	1	205	86	123
Antimony	µg/L	0.1	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	2	< 1	< 1
Barium	µg/L	1	3	6	2
Beryllium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1	< 1
Boron	µg/L	1	3	2	2
Cadmium	µg/L	0.01	0.02	0.01	0.05
Calcium	µg/L	50	2440	4860	3220
Chromium	µg/L	1	< 1	< 1	< 1
Cobalt	µg/L	0.1	0.1	0.1	< 0.1
Copper	µg/L	1	< 1	1	2
Iron	µg/L	20	310	380	240
Lead	µg/L	0.1	0.4	0.2	0.3
Lithium	µg/L	0.1	0.7	0.4	2.1
Magnesium	µg/L	10	370	640	440
Manganese	µg/L	1	21	20	25
Mercury	µg/L	0.025	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	0.3	< 0.1	0.2
Nickel	µg/L	1	< 1	< 1	< 1
Potassium	µg/L	20	600	280	310
Rubidium	µg/L	0.1	2.2	1.0	1.5
Selenium	µg/L	1	< 1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	1590	1640	1950
Strontium	µg/L	1	9	20	15
Tellurium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	0.2	< 0.1	0.4
Vanadium	µg/L	1	< 1	< 1	< 1
Zinc	µg/L	1	6	3	5

Report ID: 123389-IAS
Report Date: 18-Aug-11
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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			123389-04	123389-09
Client Sample ID:			W1N3 DUP	M4A9
Date Sampled:			9-Aug-11	9-Aug-11
Analytes	**Units**	**RL**		
Aluminum	µg/L	1	207	157
Antimony	µg/L	0.1	< 0.1	< 0.1
Arsenic	µg/L	1	2	1
Barium	µg/L	1	3	5
Beryllium	µg/L	0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1
Boron	µg/L	1	3	3
Cadmium	µg/L	0.01	0.02	0.05
Calcium	µg/L	50	2430	4260
Chromium	µg/L	1	< 1	< 1
Cobalt	µg/L	0.1	0.1	0.1
Copper	µg/L	1	< 1	3
Iron	µg/L	20	310	240
Lead	µg/L	0.1	0.3	0.6
Lithium	µg/L	0.1	0.7	0.6
Magnesium	µg/L	10	370	710
Manganese	µg/L	1	21	25
Mercury	µg/L	0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	0.3	0.6
Nickel	µg/L	1	< 1	< 1
Potassium	µg/L	20	580	440
Rubidium	µg/L	0.1	2.1	1.2
Selenium	µg/L	1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1
Sodium	µg/L	50	1590	1760
Strontium	µg/L	1	9	18
Tellurium	µg/L	0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	0.2	0.1
Vanadium	µg/L	1	< 1	< 1
Zinc	µg/L	1	4	7

Report ID: 123389-IAS
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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			124082-1
Client Sample ID:			NRC
Date Sampled:			15-Aug-11
Analytes	**Units**	**RL**	
Sodium	mg/L	0.05	1.46
Potassium	mg/L	0.02	0.25
Calcium	mg/L	0.05	3.46
Magnesium	mg/L	0.01	0.66
Iron	mg/L	0.02	0.25
Manganese	mg/L	0.001	0.011
Copper	mg/L	0.001	< 0.001
Zinc	mg/L	0.001	0.002
Ammonia (as N)	mg/L	0.05	< 0.05
pH	units	-	6.9
Alkalinity (as $CaCO_3$)	mg/L	2	14
Chloride	mg/L	0.5	1.1
Sulfate	mg/L	1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	6.9
Carbon - Total Organic	mg/L	0.5	7.9
Turbidity	NTU	0.1	1.0
Conductivity	µS/cm	1	30
Calculated Parameters			
Bicarbonate (as $CaCO_3$)	mg/L	-	14.0
Carbonate (as $CaCO_3$)	mg/L	-	0.010
Hydroxide (as $CaCO_3$)	mg/L	-	0.004
Cation Sum	meq/L	-	0.311
Anion Sum	meq/L	-	0.311
Percent Difference	%	-	0.00
Theoretical Conductivity	µS/cm	-	30
Hardness (as $CaCO_3$)	mg/L	0.2	11.4
Ion Sum	mg/L	-	23
Saturation pH (5°C)	units	-	9.8
Langelier Index (5°C)		-	-2.92

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			124082-1
Client Sample ID:			NRC
Date Sampled:			15-Aug-11
Analytes	**Units**	**RL**	
Aluminum	µg/L	1	90
Antimony	µg/L	0.1	< 0.1
Arsenic	µg/L	1	1
Barium	µg/L	1	3
Beryllium	µg/L	0.1	< 0.1
Bismuth	µg/L	1	< 1
Boron	µg/L	1	3
Cadmium	µg/L	0.01	0.01
Calcium	µg/L	50	3460
Chromium	µg/L	1	< 1
Cobalt	µg/L	0.1	< 0.1
Copper	µg/L	1	< 1
Iron	µg/L	20	250
Lead	µg/L	0.1	0.2
Lithium	µg/L	0.1	1.0
Magnesium	µg/L	10	660
Manganese	µg/L	1	11
Mercury	µg/L	0.025	< 0.025
Molybdenum	µg/L	0.1	0.2
Nickel	µg/L	1	< 1
Potassium	µg/L	20	250
Rubidium	µg/L	0.1	0.9
Selenium	µg/L	1	< 1
Silver	µg/L	0.1	< 0.1
Sodium	µg/L	50	1460
Strontium	µg/L	1	14
Tellurium	µg/L	0.1	< 0.1
Thallium	µg/L	0.1	< 0.1
Tin	µg/L	0.1	< 0.1
Uranium	µg/L	0.1	0.1
Vanadium	µg/L	1	< 1
Zinc	µg/L	1	2

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

CERTIFICATE OF ANALYSIS
for
Stantec Consulting Ltd
845 Prospect Street
Fredericton, NB E3B 2T7

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Appendix D-5

Data Summary Table and RPC Sediment Quality Reports

Table D-5.1 General Sediment Chemistry for DFO/NBDNR Habitat Survey(Qualitative Sites)

Qualitative	Lab ID	Sample ID	Date Sampled	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Units				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analysis Type				Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil
	122511-2	B1A5	21-Jul-11	6050	0.05	3	17	0.4	0.5	0.5	0.23	1620	7	2.9	4	7470
	122511-3	B1C1	21-Jul-11	5090	0.05	2	26	1.8	0.5	0.5	0.92	7880	7	6.4	5	680
	122511-4	B1D3	20-Jul-11	5410	0.05	7	16	0.4	0.5	0.5	0.29	660	6	3.8	2	6040
	123154-09	B1H1	3-Aug-11	10600	0.05	2	63	1	1	2	2.82	6750	11	4.5	8	5840
	122511-1	B2A2	22-Jul-11	8885	0.05	27.5	38	0.75	0.5	1	0.425	2655	10	12.15	3	8080
	122741-14	B3A1	27-Jul-11	5945	0.05	3	24	0.55	0.5	0.5	0.41	3975	7.5	2.7	4.5	6290
	123154-11	B3A6	3-Aug-11	4775	0.05	7	26	0.45	0.5	1	2.53	2955	5	4.15	3	4595
	123289-06	B3A9	5-Aug-11	4845	0.05	11	21.5	0.3	0.5	0.5	0.81	965	5	3.7	2	6570
	123389-07	EBNB1	8-Aug-11	12300	0.05	7	72	0.6	0.5	0.5	0.35	2400	24	13.2	11	16600
	123289-10	EBNB2	4-Aug-11	17100	0.05	8	82	0.9	0.5	2	0.7	4240	32	15.9	10	23500
	123289-09	EBNB3	4-Aug-11	11800	0.05	3	62	0.6	0.5	2	0.47	2540	12	9.8	7	9430
	122917-12	M1K4	27-Jul-11	17400	0.1	26	89	1.6	6	2	9.83	2550	14	27	91	9110
	122917-13	M1M2	27-Jul-11	17600	0.05	60	444	1.1	3	2	2.61	6070	20	50.8	27	42200
	122917-14	M1N1	27-Jul-11	10900	0.05	15	44	0.4	2	1	1.4	4990	13	9.3	18	8850
	122917-09	M2E1	28-Jul-11	3820	0.05	4	29	0.2	0.5	0.5	0.46	2100	5	3.1	8	3010
	122741-13	M3A1	26-Jul-11	7690	0.05	7	34	0.4	0.5	0.5	0.48	2200	10	4.2	3	7580
	122917-10	M3C3	28-Jul-11	5960	0.05	4	20	0.2	0.5	0.5	0.79	2050	7	4.1	4	7770
	123389-10	M4A9	8-Aug-11	2690	0.05	2	16	0.2	0.5	0.5	1.28	4550	4	0.8	4	1790
	122917-11	S1C3	29-Jul-11	16600	0.2	53	69	1.2	6	1	2.36	1540	14	18.6	35	15800
	122741-12	S2A2	25-Jul-11	6370	0.05	230	31	0.7	2	0.5	0.55	960	7	12.3	73	16400
	122741-09	S2A3	25-Jul-11	6450	0.05	32.5	46	0.35	0.5	1	1.285	1765	8	12.85	22	9830
	122917-08	S3A2	29-Jul-11	13950	0.075	48	50.5	0.95	5.5	2	1.035	2605	15	8	51	16050
	123289-07	SID3	5-Aug-11	9810	0.05	20	51	1.3	1	1	1.97	3150	8	9	53	8290
	122741-10	W1G5	26-Jul-11	6870	0.2	2	25	1.1	4	0.5	0.27	1600	6	3.7	2	5620
	123389-05	W1N3	9-Aug-11	7393	0.05	23.7	40.7	0.433	0.5	0.667	0.54	2830	6	12.4	3.33	12467
	122741-11	W2A4	26-Jul-11	3190	0.05	0.5	11	0.3	1	0.5	0.24	1250	3	1.1	0.5	1770
	123389-08	W4A1	8-Aug-11	6550	0.05	2	26	1	0.5	0.5	0.47	3630	7	2.8	2	5120
	123289-08	W4A17	4-Aug-11	3130	0.05	1	13	0.3	0.5	0.5	0.19	1000	3	2	1	3320
	123154-08	W4A21	3-Aug-11	10750	0.5	19.5	88	1.15	2	1.5	1.895	1855	16	10.8	17	27550
	123154-10	W4A25	2-Aug-11	9120	0.7	38	107	1	0.5	0.5	1.21	1140	13	21.8	28	18100
	123154-13	W4A31	2-Aug-11	6380	0.5	21	49	0.7	0.5	0.5	0.42	740	9	10.7	13	13200

Table D-5.1 General Sediment Chemistry for DFO/NBDNR Habitat Survey(Qualitative Sites)

Qualitative	Lab ID	Sample ID	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analysis Type			Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil
	122511-2	B1A5	11.2	11.7	1740	148	0.07	0.1	7	560	8	0.5	0.05	25	10	0.05
	122511-3	B1C1	15.4	4.2	1150	411	0.13	0.05	12	400	3.8	0.5	0.05	90	48	0.05
	122511-4	B1D3	5.9	10.9	1750	375	0.19	0.05	6	420	6.9	0.5	0.05	25	4	0.05
	123154-09	B1H1	50.3	8.9	1430	1260	0.2	2.2	6	500	8.6	1	0.2	90	47	0.05
	122511-1	B2A2	32.35	10.9	1530	978	0.1	0.55	5	520	6.75	1	0.05	60	19	0.05
	122741-14	B3A1	11.85	8.3	1535	175.5	0.1	0.6	5.5	655	8	0.5	0.05	25	22	0.05
	123154-11	B3A6	16.9	6.35	940	313.5	0.08	0.8	4	370	5.7	0.5	0.05	25	16	0.05
	123289-06	B3A9	12.8	7.15	1355	196	0.03	0.5	4	380	5.35	0.5	0.05	25	5	0.05
	123389-07	EBNB1	7.3	20.7	4920	341	0.04	0.8	33	650	8.2	0.5	0.05	50	10	0.05
	123289-10	EBNB2	16.7	25.2	5770	671	0.08	0.9	35	650	9.8	0.5	0.05	60	20	0.05
	123289-09	EBNB3	25.9	16	2240	251	1.1	0.4	16	820	18.4	0.5	0.05	25	22	0.05
	122917-12	M1K4	77.2	18.3	1590	952	0.3	6.5	13	670	13.5	3	0.6	25	23	0.05
	122917-13	M1M2	27.4	18.8	3100	41400	0.17	503	20	1140	19	1	0.1	25	60	0.05
	122917-14	M1N1	25.6	12.1	2260	631	0.15	13.9	10	710	13.6	0.5	0.1	25	37	0.05
	122917-09	M2E1	12	3.8	960	333	0.06	20.5	4	420	5.9	0.5	0.1	25	15	0.05
	122741-13	M3A1	10.8	16.2	2180	296	0.07	0.6	6	520	7.8	0.5	0.05	25	13	0.05
	122917-10	M3C3	16	9.2	2210	305	0.04	1.8	6	380	5.2	0.5	0.05	25	10	0.05
	123389-10	M4A9	3.3	1.5	500	54	0.03	2.6	2	100	1.3	0.5	0.05	25	19	0.05
	122917-11	S1C3	51.9	20.3	2660	1570	0.11	2.7	13	780	12	0.5	0.6	25	13	0.05
	122741-12	S2A2	10.9	10.1	2020	1240	0.02	27.8	8	780	10.2	0.5	0.05	25	6	0.05
	122741-09	S2A3	19.85	9.35	1595	2220	0.08	31.4	7	505	8.1	0.75	0.075	25	12.5	0.05
	122917-08	S3A2	30.9	15.15	2890	353.5	0.145	12.4	11	625	10.9	1.5	0.25	25	19.5	0.05
	123289-07	SID3	25.7	12.2	1480	861	0.1	1.9	8	490	7.2	0.5	0.1	25	24	0.05
	122741-10	W1G5	12.8	20.1	1120	335	0.04	0.5	4	540	9.8	0.5	0.05	25	11	0.05
	123389-05	W1N3	44.5	8.7	1200	1750	0.113	3.73	3.33	743	10.9	0.5	0.05	25	13.7	0.05
	122741-11	W2A4	7.4	6.3	370	121	0.04	0.4	2	260	4.8	0.5	0.05	25	8	0.05
	123389-08	W4A1	15.4	13.3	980	222	0.07	0.7	4	520	7.9	0.5	0.05	25	17	0.05
	123289-08	W4A17	5.7	8.2	720	205	0.02	0.1	3	310	5.7	0.5	0.05	25	5	0.05
	123154-08	W4A21	34.55	17.45	2400	332	0.09	3.6	23.5	580	10.25	2.5	0.05	25	11	0.05
	123154-10	W4A25	27.4	15.1	2120	244	0.04	4.1	22	440	7.9	0.5	0.05	25	6	0.05
	123154-13	W4A31	30.3	12.3	1870	251	0.05	3	12	290	4.7	0.5	0.05	25	5	0.05

Table D-5.1 General Sediment Chemistry for DFO/NBDNR Habitat Survey(Qualitative Sites)

Qualitative	Lab ID	Sample ID	Thallium	Tin	Uranium	Vanadium	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analysis Type			Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil
	122511-2	B1A5	0.05	0.5	1.9	10	27
	122511-3	B1C1	0.05	0.5	1.9	1	24
	122511-4	B1D3	0.05	0.5	0.8	7	31
	123154-09	B1H1	0.3	0.5	1.3	14	87
	122511-1	B2A2	0.2	0.5	1.35	14.5	31
	122741-14	B3A1	0.05	0.5	2.05	10	31
	123154-11	B3A6	0.1	0.5	1.85	9	66.5
	123289-06	B3A9	0.1	0.5	0.8	10.5	46
	123389-07	EBNB1	0.5	0.5	1	28	76
	123289-10	EBNB2	0.5	0.5	1.2	39	112
	123289-09	EBNB3	0.3	0.5	1	15	56
	122917-12	M1K4	1.2	0.5	1.6	21	199
	122917-13	M1M2	0.6	0.5	1.8	34	154
	122917-14	M1N1	0.4	0.5	1	18	66
	122917-09	M2E1	0.2	0.5	0.5	7	25
	122741-13	M3A1	0.1	0.5	2.1	12	44
	122917-10	M3C3	0.1	0.5	0.8	14	52
	123389-10	M4A9	0.05	0.5	3.1	5	33
	122917-11	S1C3	0.6	0.5	1.3	24	250
	122741-12	S2A2	0.3	0.5	0.5	20	46
	122741-09	S2A3	0.45	0.5	0.7	17	56
	122917-08	S3A2	0.5	0.5	1.25	24	83.5
	123289-07	SID3	0.3	0.5	2.2	14	75
	122741-10	W1G5	0.1	0.5	7	7	32
	123389-05	W1N3	0.333	0.5	3.33	24.3	37.7
	122741-11	W2A4	0.05	0.5	2.8	3	12
	123389-08	W4A1	0.1	0.5	8.8	8	22
	123289-08	W4A17	0.05	0.5	1.6	4	18
	123154-08	W4A21	0.45	0.5	4.6	30.5	120.5
	123154-10	W4A25	0.5	0.5	3.9	24	84
	123154-13	W4A31	0.2	0.5	2.6	16	54

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			124082-2
Client Sample ID:			NRC
Date Sampled:			15-Aug-11
Analytes	**Units**	**RL**	
Aluminum	mg/kg	1	12900
Antimony	mg/kg	0.1	< 0.1
Arsenic	mg/kg	1	7
Barium	mg/kg	1	34
Beryllium	mg/kg	0.1	0.5
Bismuth	mg/kg	1	< 1
Boron	mg/kg	1	1
Cadmium	mg/kg	0.01	0.10
Calcium	mg/kg	50	1390
Chromium	mg/kg	1	23
Cobalt	mg/kg	0.1	6.0
Copper	mg/kg	1	8
Iron	mg/kg	20	18400
Lead	mg/kg	0.1	12.6
Lithium	mg/kg	0.1	22.0
Magnesium	mg/kg	10	4470
Manganese	mg/kg	1	368
Mercury	mg/kg	0.01	0.02
Molybdenum	mg/kg	0.1	0.5
Nickel	mg/kg	1	18
Potassium	mg/kg	20	910
Rubidium	mg/kg	0.1	12.7
Selenium	mg/kg	1	< 1
Silver	mg/kg	0.1	< 0.1
Sodium	mg/kg	50	70
Strontium	mg/kg	1	6
Tellurium	mg/kg	0.1	< 0.1
Thallium	mg/kg	0.1	0.1
Tin	mg/kg	1	< 1
Uranium	mg/kg	0.1	1.2
Vanadium	mg/kg	1	39
Zinc	mg/kg	1	46

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Krista Skinner

Krista Skinner
Chemical Technician
Inorganic Analytical Chemistry

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

CERTIFICATE OF ANALYSIS

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General Report Comments

124082-02
Sample was air dried and sieved at 2 mm. A portion was digested according to EPA Method 3050B.
The resulting solution was analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

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Fax: 506.452.0594
www.rpc.ca

Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000580	RB001897
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	24500	< 1
Antimony	mg/kg	0.1	< 0.1	0.2
Arsenic	mg/kg	1	8	< 1
Barium	mg/kg	1	415	< 1
Beryllium	mg/kg	0.1	0.7	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	35	< 1
Cadmium	mg/kg	0.01	0.32	< 0.01
Calcium	mg/kg	50	13800	< 50
Chromium	mg/kg	1	72	< 1
Cobalt	mg/kg	0.1	11.0	< 0.1
Copper	mg/kg	1	29	< 1
Iron	mg/kg	20	27900	< 20
Lead	mg/kg	0.1	10.7	< 0.1
Lithium	mg/kg	0.1	34.9	< 0.1
Magnesium	mg/kg	10	12100	< 10
Manganese	mg/kg	1	446	< 1
Mercury	mg/kg	0.01	0.90	< 0.01
Molybdenum	mg/kg	0.1	0.7	< 0.1
Nickel	mg/kg	1	72	< 1
Potassium	mg/kg	20	3800	< 20
Rubidium	mg/kg	0.1	31.7	< 0.1
Selenium	mg/kg	1	1	< 1
Silver	mg/kg	0.1	0.2	< 0.1
Sodium	mg/kg	50	530	< 50
Strontium	mg/kg	1	102	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	3
Uranium	mg/kg	0.1	1.7	< 0.1
Vanadium	mg/kg	1	67	< 1
Zinc	mg/kg	1	86	< 1

Report ID: 124082-IAS
Report Date: 02-Sep-11
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CERTIFICATE OF ANALYSIS

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 122741-IAS Rev01
Report Date: 01-Sep-11
Date Received: 27-Jul-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
845 Prospect Street
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rpc
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			122741-09	122741-09 Dup	122741-10
Client Sample ID:			S2A3	Lab Duplicate	W1G5
Date Sampled:			-	-	-
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	6460	6440	6870
Antimony	mg/kg	0.1	< 0.1	< 0.1	0.2
Arsenic	mg/kg	1	33	32	2
Barium	mg/kg	1	41	51	25
Beryllium	mg/kg	0.1	0.3	0.4	1.1
Bismuth	mg/kg	1	< 1	< 1	4
Boron	mg/kg	1	1	1	< 1
Cadmium	mg/kg	0.01	1.00	1.57	0.27
Calcium	mg/kg	50	1720	1810	1600
Chromium	mg/kg	1	8	8	6
Cobalt	mg/kg	0.1	11.6	14.1	3.7
Copper	mg/kg	1	22	22	2
Iron	mg/kg	20	9710	9950	5620
Lead	mg/kg	0.1	19.4	20.3	12.8
Lithium	mg/kg	0.1	9.7	9.0	20.1
Magnesium	mg/kg	10	1640	1550	1120
Manganese	mg/kg	1	1820	2620	335
Mercury	mg/kg	0.01	0.08	0.08	0.04
Molybdenum	mg/kg	0.1	27.5	35.3	0.5
Nickel	mg/kg	1	7	7	4
Potassium	mg/kg	20	520	490	540
Rubidium	mg/kg	0.1	8.4	7.8	9.8
Selenium	mg/kg	1	1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	0.1	< 0.1
Sodium	mg/kg	50	< 50	< 50	< 50
Strontium	mg/kg	1	12	13	11
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.4	0.5	0.1
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	0.7	0.7	7.0
Vanadium	mg/kg	1	17	17	7
Zinc	mg/kg	1	53	59	32

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Krista Skinner

Krista Skinner
Chemical Technician
Inorganic Analytical Chemistry

Report ID: 122741-IAS Rev01
Report Date: 01-Sep-11
Date Received: 27-Jul-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			122741-11	122741-12	122741-13
Client Sample ID:			W2A4	S2A2	M3A1
Date Sampled:			26-Jul-11	-	-
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	3190	6370	7690
Antimony	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Arsenic	mg/kg	1	< 1	230	7
Barium	mg/kg	1	11	31	34
Beryllium	mg/kg	0.1	0.3	0.7	0.4
Bismuth	mg/kg	1	1	2	< 1
Boron	mg/kg	1	< 1	< 1	< 1
Cadmium	mg/kg	0.01	0.24	0.55	0.48
Calcium	mg/kg	50	1250	960	2200
Chromium	mg/kg	1	3	7	10
Cobalt	mg/kg	0.1	1.1	12.3	4.2
Copper	mg/kg	1	< 1	73	3
Iron	mg/kg	20	1770	16400	7580
Lead	mg/kg	0.1	7.4	10.9	10.8
Lithium	mg/kg	0.1	6.3	10.1	16.2
Magnesium	mg/kg	10	370	2020	2180
Manganese	mg/kg	1	121	1240	296
Mercury	mg/kg	0.01	0.04	0.02	0.07
Molybdenum	mg/kg	0.1	0.4	27.8	0.6
Nickel	mg/kg	1	2	8	6
Potassium	mg/kg	20	260	780	520
Rubidium	mg/kg	0.1	4.8	10.2	7.8
Selenium	mg/kg	1	< 1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Sodium	mg/kg	50	< 50	< 50	< 50
Strontium	mg/kg	1	8	6	13
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	< 0.1	0.3	0.1
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	2.8	0.5	2.1
Vanadium	mg/kg	1	3	20	12
Zinc	mg/kg	1	12	46	44

Report ID: 122741-IAS Rev01
Report Date: 01-Sep-11
Date Received: 27-Jul-11

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			122741-14	122741-15
Client Sample ID:			B3A1	B3A1 D5 Dup
Date Sampled:			27-Jul-11	-
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	4640	7250
Antimony	mg/kg	0.1	< 0.1	< 0.1
Arsenic	mg/kg	1	2	4
Barium	mg/kg	1	27	21
Beryllium	mg/kg	0.1	0.4	0.7
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	< 1	< 1
Cadmium	mg/kg	0.01	0.64	0.18
Calcium	mg/kg	50	5950	2000
Chromium	mg/kg	1	6	9
Cobalt	mg/kg	0.1	2.4	3.0
Copper	mg/kg	1	4	5
Iron	mg/kg	20	3220	9360
Lead	mg/kg	0.1	15.6	8.1
Lithium	mg/kg	0.1	3.6	13.0
Magnesium	mg/kg	10	870	2200
Manganese	mg/kg	1	200	151
Mercury	mg/kg	0.01	0.17	0.03
Molybdenum	mg/kg	0.1	0.9	0.3
Nickel	mg/kg	1	4	7
Potassium	mg/kg	20	290	1020
Rubidium	mg/kg	0.1	3.5	12.5
Selenium	mg/kg	1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	< 50	< 50
Strontium	mg/kg	1	33	11
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	< 0.1	< 0.1
Tin	mg/kg	1	< 1	< 1
Uranium	mg/kg	0.1	2.4	1.7
Vanadium	mg/kg	1	8	12
Zinc	mg/kg	1	36	26

Report ID: 122741-IAS Rev01
Report Date: 01-Sep-11
Date Received: 27-Jul-11

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General Report Comments

122741-01 to 122741-08
Ion imbalances are most likely due to species associated with the high organic carbon (relative to the total ionic strength of the sample) cation calculations but may not be present in ionic form.

122741-09 to 122741-15
Samples were air dried and sieved at 2 mm. A portion of each was digested according to EPA Method 3050B.
The resulting solutions were analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

Revision Comments

Sample ID change for 122741-02 (at customer's request)
Sample ID change for 122741-03 (at customer's request)
Sample ID change for 122741-06 (at customer's request)
Sample ID change for 122741-07 (at customer's request)
Sample ID change for 122741-08 (at customer's request)
Sample ID change for 122741-11 (at customer's request)
Sample ID change for 122741-14 (at customer's request)
Sample ID change for 122741-15 (at customer's request)

Report ID: 122741-IAS Rev01
Report Date: 01-Sep-11
Date Received: 27-Jul-11

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Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000545	RB001805
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	24700	< 1
Antimony	mg/kg	0.1	< 0.1	0.1
Arsenic	mg/kg	1	9	< 1
Barium	mg/kg	1	422	< 1
Beryllium	mg/kg	0.1	0.7	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	36	< 1
Cadmium	mg/kg	0.01	0.34	< 0.01
Calcium	mg/kg	50	14100	< 50
Chromium	mg/kg	1	72	< 1
Cobalt	mg/kg	0.1	11.3	< 0.1
Copper	mg/kg	1	29	< 1
Iron	mg/kg	20	28500	< 20
Lead	mg/kg	0.1	10.7	< 0.1
Lithium	mg/kg	0.1	35.2	< 0.1
Magnesium	mg/kg	10	12300	< 10
Manganese	mg/kg	1	473	< 1
Mercury	mg/kg	0.01	0.76	< 0.01
Molybdenum	mg/kg	0.1	0.7	< 0.1
Nickel	mg/kg	1	73	< 1
Potassium	mg/kg	20	3790	< 20
Rubidium	mg/kg	0.1	31.7	< 0.1
Selenium	mg/kg	1	2	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	580	< 50
Strontium	mg/kg	1	105	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	3
Uranium	mg/kg	0.1	1.6	< 0.1
Vanadium	mg/kg	1	67	< 1
Zinc	mg/kg	1	89	< 1

Report ID: 122741-IAS Rev01
Report Date: 01-Sep-11
Date Received: 27-Jul-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 122917-IAS
Report Date: 10-Aug-11
Date Received: 29-Jul-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356

Analysis of Metals in Soil

RPC Sample ID:			122917-08	122917-08 Dup	122917-09
Client Sample ID:			S3A2	Lab Duplicate	M2E1
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	14400	13500	3820
Antimony	mg/kg	0.1	< 0.1	0.1	< 0.1
Arsenic	mg/kg	1	44	52	4
Barium	mg/kg	1	49	52	29
Beryllium	mg/kg	0.1	0.9	1.0	0.2
Bismuth	mg/kg	1	4	7	< 1
Boron	mg/kg	1	2	2	< 1
Cadmium	mg/kg	0.01	1.05	1.02	0.46
Calcium	mg/kg	50	2570	2640	2100
Chromium	mg/kg	1	15	15	5
Cobalt	mg/kg	0.1	8.2	7.8	3.1
Copper	mg/kg	1	49	53	8
Iron	mg/kg	20	15900	16200	3010
Lead	mg/kg	0.1	30.4	31.4	12.0
Lithium	mg/kg	0.1	15.3	15.0	3.8
Magnesium	mg/kg	10	3170	2610	960
Manganese	mg/kg	1	371	336	333
Mercury	mg/kg	0.01	0.15	0.14	0.06
Molybdenum	mg/kg	0.1	12.0	12.8	20.5
Nickel	mg/kg	1	11	11	4
Potassium	mg/kg	20	610	640	420
Rubidium	mg/kg	0.1	10.7	11.1	5.9
Selenium	mg/kg	1	1	2	< 1
Silver	mg/kg	0.1	0.2	0.3	0.1
Sodium	mg/kg	50	< 50	< 50	< 50
Strontium	mg/kg	1	19	20	15
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.5	0.5	0.2
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	1.2	1.3	0.5
Vanadium	mg/kg	1	23	25	7
Zinc	mg/kg	1	85	82	25

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 122917-IAS
Report Date: 10-Aug-11
Date Received: 29-Jul-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356

Analysis of Metals in Soil

RPC Sample ID:			122917-10	122917-11	122917-12
Client Sample ID:			M3C3	S1C3	M1K4
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	5960	16600	17400
Antimony	mg/kg	0.1	< 0.1	0.2	0.1
Arsenic	mg/kg	1	4	53	26
Barium	mg/kg	1	20	69	89
Beryllium	mg/kg	0.1	0.2	1.2	1.6
Bismuth	mg/kg	1	< 1	6	6
Boron	mg/kg	1	< 1	1	2
Cadmium	mg/kg	0.01	0.79	2.36	9.83
Calcium	mg/kg	50	2050	1540	2550
Chromium	mg/kg	1	7	14	14
Cobalt	mg/kg	0.1	4.1	18.6	27.0
Copper	mg/kg	1	4	35	91
Iron	mg/kg	20	7770	15800	9110
Lead	mg/kg	0.1	16.0	51.9	77.2
Lithium	mg/kg	0.1	9.2	20.3	18.3
Magnesium	mg/kg	10	2210	2660	1590
Manganese	mg/kg	1	305	1570	952
Mercury	mg/kg	0.01	0.04	0.11	0.30
Molybdenum	mg/kg	0.1	1.8	2.7	6.5
Nickel	mg/kg	1	6	13	13
Potassium	mg/kg	20	380	780	670
Rubidium	mg/kg	0.1	5.2	12.0	13.5
Selenium	mg/kg	1	< 1	< 1	3
Silver	mg/kg	0.1	< 0.1	0.6	0.6
Sodium	mg/kg	50	< 50	< 50	< 50
Strontium	mg/kg	1	10	13	23
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.1	0.6	1.2
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	0.8	1.3	1.6
Vanadium	mg/kg	1	14	24	21
Zinc	mg/kg	1	52	250	199

Report ID: 122917-IAS
Report Date: 10-Aug-11
Date Received: 29-Jul-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356

Analysis of Metals in Soil

RPC Sample ID:			122917-13	122917-14
Client Sample ID:			M1M2	M1N1
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	17600	10900
Antimony	mg/kg	0.1	< 0.1	< 0.1
Arsenic	mg/kg	1	60	15
Barium	mg/kg	1	444	44
Beryllium	mg/kg	0.1	1.1	0.4
Bismuth	mg/kg	1	3	2
Boron	mg/kg	1	2	1
Cadmium	mg/kg	0.01	2.61	1.40
Calcium	mg/kg	50	6070	4990
Chromium	mg/kg	1	20	13
Cobalt	mg/kg	0.1	50.8	9.3
Copper	mg/kg	1	27	18
Iron	mg/kg	20	42200	8850
Lead	mg/kg	0.1	27.4	25.6
Lithium	mg/kg	0.1	18.8	12.1
Magnesium	mg/kg	10	3100	2260
Manganese	mg/kg	1	41400	631
Mercury	mg/kg	0.01	0.17	0.15
Molybdenum	mg/kg	0.1	503.	13.9
Nickel	mg/kg	1	20	10
Potassium	mg/kg	20	1140	710
Rubidium	mg/kg	0.1	19.0	13.6
Selenium	mg/kg	1	1	< 1
Silver	mg/kg	0.1	0.1	0.1
Sodium	mg/kg	50	< 50	< 50
Strontium	mg/kg	1	60	37
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.6	0.4
Tin	mg/kg	1	< 1	< 1
Uranium	mg/kg	0.1	1.8	1.0
Vanadium	mg/kg	1	34	18
Zinc	mg/kg	1	154	66

Report ID: 122917-IAS
Report Date: 10-Aug-11
Date Received: 29-Jul-11

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General Report Comments

122917-08 to 122917-14
Samples were air dried and sieved at 2 mm. A portion of each was digested according to EPA Method 3050B.
The resulting solutions were analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

122917-01 to 122917-07
Ion imbalances are most likely due to species associated with the high organic carbon (relative to the total ionic strength of the sample) which are not accounted for in the anion calculations. In addition the iron and manganese in the samples are included in the cation calculations but may not be present in ionic form.

Report ID: 122917-IAS
Report Date: 10-Aug-11
Date Received: 29-Jul-11

CERTIFICATE OF ANALYSIS

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Project #: 121810356

QA/QC Report

RPC Sample ID:			CRM000545	RB001805
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	24700	< 1
Antimony	mg/kg	0.1	< 0.1	0.1
Arsenic	mg/kg	1	9	< 1
Barium	mg/kg	1	422	< 1
Beryllium	mg/kg	0.1	0.7	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	36	< 1
Cadmium	mg/kg	0.01	0.34	< 0.01
Calcium	mg/kg	50	14100	< 50
Chromium	mg/kg	1	72	< 1
Cobalt	mg/kg	0.1	11.3	< 0.1
Copper	mg/kg	1	29	< 1
Iron	mg/kg	20	28500	< 20
Lead	mg/kg	0.1	10.7	< 0.1
Lithium	mg/kg	0.1	35.2	< 0.1
Magnesium	mg/kg	10	12300	< 10
Manganese	mg/kg	1	473	< 1
Mercury	mg/kg	0.01	0.76	< 0.01
Molybdenum	mg/kg	0.1	0.7	< 0.1
Nickel	mg/kg	1	73	< 1
Potassium	mg/kg	20	3790	< 20
Rubidium	mg/kg	0.1	31.7	< 0.1
Selenium	mg/kg	1	2	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	580	< 50
Strontium	mg/kg	1	105	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	3
Uranium	mg/kg	0.1	1.6	< 0.1
Vanadium	mg/kg	1	67	< 1
Zinc	mg/kg	1	89	< 1

Report ID: 122917-IAS
Report Date: 10-Aug-11
Date Received: 29-Jul-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			123154-08	123154-08 Dup	123154-09
Client Sample ID:			W4A21	Lab Duplicate	B1H1
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	10800	10700	10600
Antimony	mg/kg	0.1	0.5	0.5	< 0.1
Arsenic	mg/kg	1	18	21	2
Barium	mg/kg	1	90	86	63
Beryllium	mg/kg	0.1	1.1	1.2	1.0
Bismuth	mg/kg	1	3	1	1
Boron	mg/kg	1	2	1	2
Cadmium	mg/kg	0.01	1.99	1.80	2.82
Calcium	mg/kg	50	1910	1800	6750
Chromium	mg/kg	1	15	17	11
Cobalt	mg/kg	0.1	10.2	11.4	4.5
Copper	mg/kg	1	15	19	8
Iron	mg/kg	20	25100	30000	5840
Lead	mg/kg	0.1	34.8	34.3	50.3
Lithium	mg/kg	0.1	17.7	17.2	8.9
Magnesium	mg/kg	10	2320	2480	1430
Manganese	mg/kg	1	318	346	1260
Mercury	mg/kg	0.01	0.10	0.08	0.20
Molybdenum	mg/kg	0.1	3.4	3.8	2.2
Nickel	mg/kg	1	23	24	6
Potassium	mg/kg	20	580	580	500
Rubidium	mg/kg	0.1	10.4	10.1	8.6
Selenium	mg/kg	1	2	3	1
Silver	mg/kg	0.1	< 0.1	< 0.1	0.2
Sodium	mg/kg	50	< 50	< 50	90
Strontium	mg/kg	1	11	11	47
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.5	0.4	0.3
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	4.6	4.6	1.3
Vanadium	mg/kg	1	31	30	14
Zinc	mg/kg	1	108	133	87

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
845 Prospect Street
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rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			123154-10	123154-11	123154-12
Client Sample ID:			W4A25	B3A6	B3A6 dup
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	9120	4690	4860
Antimony	mg/kg	0.1	0.7	< 0.1	< 0.1
Arsenic	mg/kg	1	38	7	7
Barium	mg/kg	1	107	26	26
Beryllium	mg/kg	0.1	1.0	0.5	0.4
Bismuth	mg/kg	1	< 1	< 1	< 1
Boron	mg/kg	1	< 1	1	1
Cadmium	mg/kg	0.01	1.21	2.59	2.47
Calcium	mg/kg	50	1140	2980	2930
Chromium	mg/kg	1	13	5	5
Cobalt	mg/kg	0.1	21.8	4.3	4.0
Copper	mg/kg	1	28	3	3
Iron	mg/kg	20	18100	4500	4690
Lead	mg/kg	0.1	27.4	17.4	16.4
Lithium	mg/kg	0.1	15.1	6.1	6.6
Magnesium	mg/kg	10	2120	860	1020
Manganese	mg/kg	1	244	315	312
Mercury	mg/kg	0.01	0.04	0.09	0.07
Molybdenum	mg/kg	0.1	4.1	0.9	0.7
Nickel	mg/kg	1	22	4	4
Potassium	mg/kg	20	440	360	380
Rubidium	mg/kg	0.1	7.9	5.5	5.9
Selenium	mg/kg	1	< 1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Sodium	mg/kg	50	< 50	< 50	< 50
Strontium	mg/kg	1	6	16	16
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.5	0.1	0.1
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	3.9	1.9	1.8
Vanadium	mg/kg	1	24	9	9
Zinc	mg/kg	1	84	67	66

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

CERTIFICATE OF ANALYSIS

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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			123154-13
Client Sample ID:			W4A31
Analytes	**Units**	**RL**	
Aluminum	mg/kg	1	6380
Antimony	mg/kg	0.1	0.5
Arsenic	mg/kg	1	21
Barium	mg/kg	1	49
Beryllium	mg/kg	0.1	0.7
Bismuth	mg/kg	1	< 1
Boron	mg/kg	1	< 1
Cadmium	mg/kg	0.01	0.42
Calcium	mg/kg	50	740
Chromium	mg/kg	1	9
Cobalt	mg/kg	0.1	10.7
Copper	mg/kg	1	13
Iron	mg/kg	20	13200
Lead	mg/kg	0.1	30.3
Lithium	mg/kg	0.1	12.3
Magnesium	mg/kg	10	1870
Manganese	mg/kg	1	251
Mercury	mg/kg	0.01	0.05
Molybdenum	mg/kg	0.1	3.0
Nickel	mg/kg	1	12
Potassium	mg/kg	20	290
Rubidium	mg/kg	0.1	4.7
Selenium	mg/kg	1	< 1
Silver	mg/kg	0.1	< 0.1
Sodium	mg/kg	50	< 50
Strontium	mg/kg	1	5
Tellurium	mg/kg	0.1	< 0.1
Thallium	mg/kg	0.1	0.2
Tin	mg/kg	1	< 1
Uranium	mg/kg	0.1	2.6
Vanadium	mg/kg	1	16
Zinc	mg/kg	1	54

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

CERTIFICATE OF ANALYSIS

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General Report Comments

123154-08 to 123154-13
Samples were air dried and sieved at 2 mm. A portion of each was digested according to EPA Method 3050B.
The resulting solutions were analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

123154-01 to 123154-07
Ion imbalances are most likely due to species associated with the high organic carbon (relative to the total ionic strength of the sample) which are not accounted for in the anion calculations. In addition the iron and manganese in the samples are included in the cation calculations but may not be present in ionic form.

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

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Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000549	RB001815
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	23600	< 1
Antimony	mg/kg	0.1	0.1	0.1
Arsenic	mg/kg	1	8	< 1
Barium	mg/kg	1	415	< 1
Beryllium	mg/kg	0.1	0.7	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	36	< 1
Cadmium	mg/kg	0.01	0.35	< 0.01
Calcium	mg/kg	50	13900	< 50
Chromium	mg/kg	1	72	< 1
Cobalt	mg/kg	0.1	11.2	< 0.1
Copper	mg/kg	1	29	< 1
Iron	mg/kg	20	27800	< 20
Lead	mg/kg	0.1	11.1	< 0.1
Lithium	mg/kg	0.1	34.7	< 0.1
Magnesium	mg/kg	10	11800	< 10
Manganese	mg/kg	1	463	< 1
Mercury	mg/kg	0.01	0.81	< 0.01
Molybdenum	mg/kg	0.1	0.7	< 0.1
Nickel	mg/kg	1	72	< 1
Potassium	mg/kg	20	3650	< 20
Rubidium	mg/kg	0.1	31.4	< 0.1
Selenium	mg/kg	1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	560	< 50
Strontium	mg/kg	1	103	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	3
Uranium	mg/kg	0.1	1.7	< 0.1
Vanadium	mg/kg	1	66	< 1
Zinc	mg/kg	1	88	< 1

Report ID: 123154-IAS
Report Date: 12-Aug-11
Date Received: 04-Aug-11

CERTIFICATE OF ANALYSIS

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 123289-IAS
Report Date: 17-Aug-11
Date Received: 08-Aug-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			123289-06	123289-06 Dup	123289-07
Client Sample ID:			B3A9	Lab Duplicate	SID3
Date Sampled:			4-Aug-11	4-Aug-11	5-Aug-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	5100	4590	9810
Antimony	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Arsenic	mg/kg	1	11	11	20
Barium	mg/kg	1	22	21	51
Beryllium	mg/kg	0.1	0.3	0.3	1.3
Bismuth	mg/kg	1	< 1	< 1	1
Boron	mg/kg	1	< 1	< 1	1
Cadmium	mg/kg	0.01	0.89	0.73	1.97
Calcium	mg/kg	50	930	1000	3150
Chromium	mg/kg	1	5	5	8
Cobalt	mg/kg	0.1	3.9	3.5	9.0
Copper	mg/kg	1	2	2	53
Iron	mg/kg	20	6960	6180	8290
Lead	mg/kg	0.1	13.0	12.6	25.7
Lithium	mg/kg	0.1	7.6	6.7	12.2
Magnesium	mg/kg	10	1440	1270	1480
Manganese	mg/kg	1	203	189	861
Mercury	mg/kg	0.01	0.03	0.03	0.1
Molybdenum	mg/kg	0.1	0.5	0.5	1.9
Nickel	mg/kg	1	4	4	8
Potassium	mg/kg	20	380	380	490
Rubidium	mg/kg	0.1	5.6	5.1	7.2
Selenium	mg/kg	1	< 1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1	0.1
Sodium	mg/kg	50	< 50	< 50	< 50
Strontium	mg/kg	1	5	5	24
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.1	0.1	0.3
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	0.8	0.8	2.2
Vanadium	mg/kg	1	11	10	14
Zinc	mg/kg	1	48	44	75

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Krista Skinner
Chemical Technician
Inorganic Analytical Chemistry

Report ID: 123289-IAS
Report Date: 17-Aug-11
Date Received: 08-Aug-11

CERTIFICATE OF ANALYSIS

for

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Tel: 506.452.1212
Fax: 506.452.0594
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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			123289-08	123289-09	123289-10
Client Sample ID:			W4A17	EBNB3	EBNB2
Date Sampled:			4-Aug-11	4-Aug-11	3-Aug-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	3130	11800	17100
Antimony	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Arsenic	mg/kg	1	1	3	8
Barium	mg/kg	1	13	62	82
Beryllium	mg/kg	0.1	0.3	0.6	0.9
Bismuth	mg/kg	1	< 1	< 1	< 1
Boron	mg/kg	1	< 1	2	2
Cadmium	mg/kg	0.01	0.19	0.47	0.70
Calcium	mg/kg	50	1000	2540	4240
Chromium	mg/kg	1	3	12	32
Cobalt	mg/kg	0.1	2.0	9.8	15.9
Copper	mg/kg	1	1	7	10
Iron	mg/kg	20	3320	9430	23500
Lead	mg/kg	0.1	5.7	25.9	16.7
Lithium	mg/kg	0.1	8.2	16.0	25.2
Magnesium	mg/kg	10	720	2240	5770
Manganese	mg/kg	1	205	251	671
Mercury	mg/kg	0.01	0.02	1.1	0.08
Molybdenum	mg/kg	0.1	0.1	0.4	0.9
Nickel	mg/kg	1	3	16	35
Potassium	mg/kg	20	310	820	650
Rubidium	mg/kg	0.1	5.7	18.4	9.8
Selenium	mg/kg	1	< 1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Sodium	mg/kg	50	< 50	< 50	60
Strontium	mg/kg	1	5	22	20
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	< 0.1	0.3	0.5
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	1.6	1.0	1.2
Vanadium	mg/kg	1	4	15	39
Zinc	mg/kg	1	18	56	112

Report ID: 123289-IAS
Report Date: 17-Aug-11
Date Received: 08-Aug-11

CERTIFICATE OF ANALYSIS

for

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Fredericton, NB E3B 2T7

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General Report Comments

123289-06 to 123289-10
Samples were air dried and sieved at 2 mm. A portion of each was digested according to EPA Method 3050B.
The resulting solutions were analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

Ion imbalances are most likely due to species associated with the high organic carbon (relative to the total ionic strength of the sample) which are not accounted for in the anion calculations. In addition the iron and manganese in the samples are included in the cation calculations but may not be present in ionic form.

Report ID: 123289-IAS
Report Date: 17-Aug-11
Date Received: 08-Aug-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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www.rpc.ca

Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000554	RB001823
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	26200	< 1
Antimony	mg/kg	0.1	< 0.1	0.2
Arsenic	mg/kg	1	8	< 1
Barium	mg/kg	1	419	< 1
Beryllium	mg/kg	0.1	0.7	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	39	< 1
Cadmium	mg/kg	0.01	0.33	< 0.01
Calcium	mg/kg	50	13900	< 50
Chromium	mg/kg	1	74	< 1
Cobalt	mg/kg	0.1	11.3	< 0.1
Copper	mg/kg	1	29	< 1
Iron	mg/kg	20	28900	< 20
Lead	mg/kg	0.1	10.9	< 0.1
Lithium	mg/kg	0.1	36.3	< 0.1
Magnesium	mg/kg	10	12400	< 10
Manganese	mg/kg	1	469	< 1
Mercury	mg/kg	0.01	0.82	< 0.01
Molybdenum	mg/kg	0.1	0.8	< 0.1
Nickel	mg/kg	1	73	< 1
Potassium	mg/kg	20	3920	< 20
Rubidium	mg/kg	0.1	33.8	< 0.1
Selenium	mg/kg	1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	570	< 50
Strontium	mg/kg	1	107	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	4
Uranium	mg/kg	0.1	1.7	< 0.1
Vanadium	mg/kg	1	71	< 1
Zinc	mg/kg	1	88	< 1

Report ID: 123289-IAS
Report Date: 17-Aug-11
Date Received: 08-Aug-11

CERTIFICATE OF ANALYSIS

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 123389-IAS
Report Date: 18-Aug-11
Date Received: 09-Aug-11

CERTIFICATE OF ANALYSIS

for
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Fax: 506.452.0594
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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			123389-05	123389-05 Dup	123389-06
Client Sample ID:			W1N3	Lab Duplicate	W1N3 DUP
Date Sampled:			9-Aug-11	9-Aug-11	9-Aug-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	7050	6510	8620
Antimony	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Arsenic	mg/kg	1	28	22	21
Barium	mg/kg	1	39	34	49
Beryllium	mg/kg	0.1	0.4	0.4	0.5
Bismuth	mg/kg	1	< 1	< 1	< 1
Boron	mg/kg	1	< 1	< 1	1
Cadmium	mg/kg	0.01	0.46	0.52	0.64
Calcium	mg/kg	50	2730	2860	2900
Chromium	mg/kg	1	6	5	7
Cobalt	mg/kg	0.1	11.2	10.6	15.4
Copper	mg/kg	1	3	3	4
Iron	mg/kg	20	13700	10800	12900
Lead	mg/kg	0.1	37.9	38.5	57.1
Lithium	mg/kg	0.1	9.1	8.0	9.0
Magnesium	mg/kg	10	1370	1130	1100
Manganese	mg/kg	1	1670	1620	1960
Mercury	mg/kg	0.01	0.11	0.10	0.13
Molybdenum	mg/kg	0.1	4.2	3.7	3.3
Nickel	mg/kg	1	3	3	4
Potassium	mg/kg	20	770	720	740
Rubidium	mg/kg	0.1	12.3	10.0	10.3
Selenium	mg/kg	1	< 1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Sodium	mg/kg	50	< 50	< 50	< 50
Strontium	mg/kg	1	13	13	15
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.3	0.3	0.4
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	2.8	2.9	4.3
Vanadium	mg/kg	1	24	21	28
Zinc	mg/kg	1	38	36	39

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Krista Skinner
Chemical Technician
Inorganic Analytical Chemistry

Report ID: 123389-IAS
Report Date: 18-Aug-11
Date Received: 09-Aug-11

CERTIFICATE OF ANALYSIS

for

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			123389-07	123389-08	123389-10
Client Sample ID:			EBNB1	W4A1	M4A9
Date Sampled:			9-Aug-11	9-Aug-11	9-Aug-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	12300	6550	2690
Antimony	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Arsenic	mg/kg	1	7	2	2
Barium	mg/kg	1	72	26	16
Beryllium	mg/kg	0.1	0.6	1.0	0.2
Bismuth	mg/kg	1	< 1	< 1	< 1
Boron	mg/kg	1	< 1	< 1	< 1
Cadmium	mg/kg	0.01	0.35	0.47	1.28
Calcium	mg/kg	50	2400	3630	4550
Chromium	mg/kg	1	24	7	4
Cobalt	mg/kg	0.1	13.2	2.8	0.8
Copper	mg/kg	1	11	2	4
Iron	mg/kg	20	16600	5120	1790
Lead	mg/kg	0.1	7.3	15.4	3.3
Lithium	mg/kg	0.1	20.7	13.3	1.5
Magnesium	mg/kg	10	4920	980	500
Manganese	mg/kg	1	341	222	54
Mercury	mg/kg	0.01	0.04	0.07	0.03
Molybdenum	mg/kg	0.1	0.8	0.7	2.6
Nickel	mg/kg	1	33	4	2
Potassium	mg/kg	20	650	520	100
Rubidium	mg/kg	0.1	8.2	7.9	1.3
Selenium	mg/kg	1	< 1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Sodium	mg/kg	50	50	< 50	< 50
Strontium	mg/kg	1	10	17	19
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.5	0.1	< 0.1
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	1.0	8.8	3.1
Vanadium	mg/kg	1	28	8	5
Zinc	mg/kg	1	76	22	33

Report ID: 123389-IAS
Report Date: 18-Aug-11
Date Received: 09-Aug-11

CERTIFICATE OF ANALYSIS

for

Stantec Consulting Ltd
845 Prospect Street
Fredericton, NB E3B 2T7

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

General Report Comments

Samples were air dried and sieved at 2 mm. A portion of each was digested according to EPA Method 3050B.
The resulting solutions were analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

Report ID: 123389-IAS
Report Date: 18-Aug-11
Date Received: 09-Aug-11

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Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000554	RB001823
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	26200	< 1
Antimony	mg/kg	0.1	< 0.1	0.2
Arsenic	mg/kg	1	8	< 1
Barium	mg/kg	1	419	< 1
Beryllium	mg/kg	0.1	0.7	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	39	< 1
Cadmium	mg/kg	0.01	0.33	< 0.01
Calcium	mg/kg	50	13900	< 50
Chromium	mg/kg	1	74	< 1
Cobalt	mg/kg	0.1	11.3	< 0.1
Copper	mg/kg	1	29	< 1
Iron	mg/kg	20	28900	< 20
Lead	mg/kg	0.1	10.9	< 0.1
Lithium	mg/kg	0.1	36.3	< 0.1
Magnesium	mg/kg	10	12400	< 10
Manganese	mg/kg	1	469	< 1
Mercury	mg/kg	0.01	0.82	< 0.01
Molybdenum	mg/kg	0.1	0.8	< 0.1
Nickel	mg/kg	1	73	< 1
Potassium	mg/kg	20	3920	< 20
Rubidium	mg/kg	0.1	33.8	< 0.1
Selenium	mg/kg	1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	570	< 50
Strontium	mg/kg	1	107	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	4
Uranium	mg/kg	0.1	1.7	< 0.1
Vanadium	mg/kg	1	71	< 1
Zinc	mg/kg	1	88	< 1

Report ID: 123389-IAS
Report Date: 18-Aug-11
Date Received: 09-Aug-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

CERTIFICATE OF ANALYSIS

for
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845 Prospect Street
Fredericton, NB E3B 2T7

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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			124082-2
Client Sample ID:			NRC
Date Sampled:			15-Aug-11
Analytes	**Units**	**RL**	
Aluminum	mg/kg	1	12900
Antimony	mg/kg	0.1	< 0.1
Arsenic	mg/kg	1	7
Barium	mg/kg	1	34
Beryllium	mg/kg	0.1	0.5
Bismuth	mg/kg	1	< 1
Boron	mg/kg	1	1
Cadmium	mg/kg	0.01	0.10
Calcium	mg/kg	50	1390
Chromium	mg/kg	1	23
Cobalt	mg/kg	0.1	6.0
Copper	mg/kg	1	8
Iron	mg/kg	20	18400
Lead	mg/kg	0.1	12.6
Lithium	mg/kg	0.1	22.0
Magnesium	mg/kg	10	4470
Manganese	mg/kg	1	368
Mercury	mg/kg	0.01	0.02
Molybdenum	mg/kg	0.1	0.5
Nickel	mg/kg	1	18
Potassium	mg/kg	20	910
Rubidium	mg/kg	0.1	12.7
Selenium	mg/kg	1	< 1
Silver	mg/kg	0.1	< 0.1
Sodium	mg/kg	50	70
Strontium	mg/kg	1	6
Tellurium	mg/kg	0.1	< 0.1
Thallium	mg/kg	0.1	0.1
Tin	mg/kg	1	< 1
Uranium	mg/kg	0.1	1.2
Vanadium	mg/kg	1	39
Zinc	mg/kg	1	46

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Krista Skinner

Krista Skinner
Chemical Technician
Inorganic Analytical Chemistry

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

CERTIFICATE OF ANALYSIS

for

Stantec Consulting Ltd
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

General Report Comments

124082-02
Sample was air dried and sieved at 2 mm. A portion was digested according to EPA Method 3050B.
The resulting solution was analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

CERTIFICATE OF ANALYSIS

for
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000580	RB001897
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	24500	< 1
Antimony	mg/kg	0.1	< 0.1	0.2
Arsenic	mg/kg	1	8	< 1
Barium	mg/kg	1	415	< 1
Beryllium	mg/kg	0.1	0.7	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	35	< 1
Cadmium	mg/kg	0.01	0.32	< 0.01
Calcium	mg/kg	50	13800	< 50
Chromium	mg/kg	1	72	< 1
Cobalt	mg/kg	0.1	11.0	< 0.1
Copper	mg/kg	1	29	< 1
Iron	mg/kg	20	27900	< 20
Lead	mg/kg	0.1	10.7	< 0.1
Lithium	mg/kg	0.1	34.9	< 0.1
Magnesium	mg/kg	10	12100	< 10
Manganese	mg/kg	1	446	< 1
Mercury	mg/kg	0.01	0.90	< 0.01
Molybdenum	mg/kg	0.1	0.7	< 0.1
Nickel	mg/kg	1	72	< 1
Potassium	mg/kg	20	3800	< 20
Rubidium	mg/kg	0.1	31.7	< 0.1
Selenium	mg/kg	1	1	< 1
Silver	mg/kg	0.1	0.2	< 0.1
Sodium	mg/kg	50	530	< 50
Strontium	mg/kg	1	102	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	3
Uranium	mg/kg	0.1	1.7	< 0.1
Vanadium	mg/kg	1	67	< 1
Zinc	mg/kg	1	86	< 1

Report ID: 124082-IAS
Report Date: 02-Sep-11
Date Received: 22-Aug-11

CERTIFICATE OF ANALYSIS

for
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Fredericton, NB E3B 2T7

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Tel: 506.452.1212
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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Appendix E

Baseline Environmental Effects Monitoring Data Collection

Appendix E-1

Photos of EEM Stations and Representative Fish Species

Bird Brook	
Photo 1 B2A2 looking downstream at barrier net at end of station.	**Photo 2** B2A2 looking downstream at barrier net start of station.

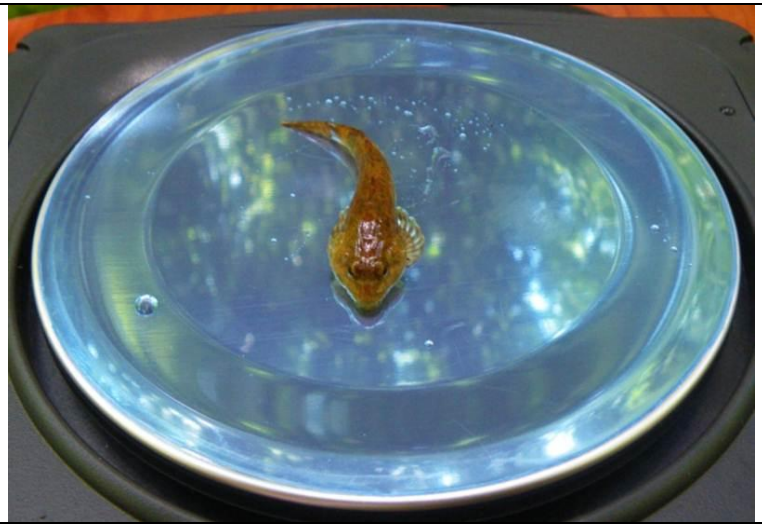



Photo 3 B2A2 Slimy sculpin on balance.	**Photo 4** B2A2 habitat mid-station.

Bird Brook

Photo 5 B3A9 looking downstream at barrier net at start of station.

Photo 6 B3A9 looking upstream at barrier net at end of station.

Photo 7 B3A9 habitat mid-reach.

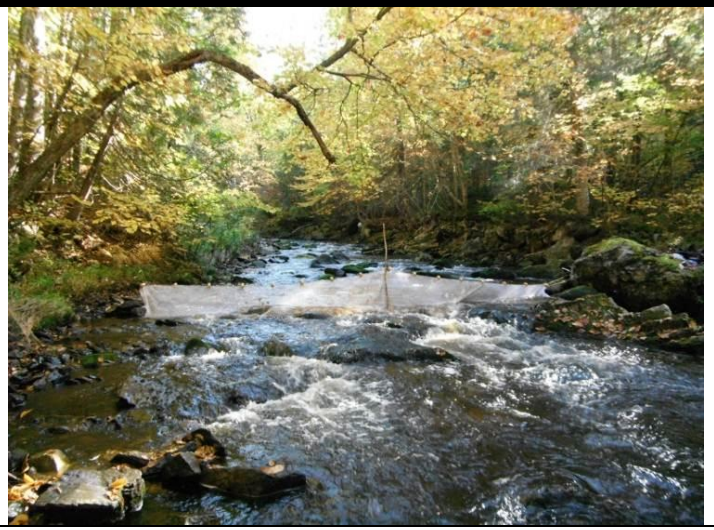
Sisson Brook	
Photo 8 S2A2 Photo looking upstream at barrier net end of station.	**Photo 9** S2A2 Photo looking upstream at barrier net start of station.
Photo 10 S2A2 mid station.	**Photo 11** S2A2 looking downstream from upstream end of station.

Sisson Brook	
Photo 12 S3A3 looking downstream at barrier net start of station.	**Photo 13** S3A3 looking down stream at barrier end of station.
Photo 14 S3A3 looking upstream mid station.	

McBean Brook	
Photo 15 M3C3 looking upstream at barrier net at end of station.	**Photo 16** M3C3 looking downstream at barrier net at start of station.
Photo 17 M3C3 Mid station collection of benthic invertebrates.	**Photo 18** M3C3 common shiner.

McBean Brook	
Photo 19 M3C3 white sucker.	**Photo 20 M3C3 salamander.**

West Branch Napadogan Brook	
Photo 21 W4A17 Looking downstream at barrier net at start of station.	**Photo 22** W4A17 looking downstream at barrier net at end of station.
Photo 23 W4A17 electrofishing mid reach.	**Photo 24** W4A17 weighing and measuring fish.

West Branch Napadogan Brook	
	
Photo 25 W4A21 looking downstream at barrier net at start of site.	**Photo 26** W4A21 view looking upstream at barrier net at end of site.
Photo 27 W4A21 Atlantic salmon.	**Photo 28** W4A17 looking upstream mid reach.

West Branch Napadogan Brook	
Photo 29 W4A31 Looking downstream at barrier net at start of station.	**Photo 30** W4A31 looking at right bank and barrier net at end of site.

East Branch Napadogan Brook	
Photo 31 EBNB1 looking downstream at barrier net at the start of station.	**Photo 32** EBNB looking downstream at barrier net at end of the station.

Nashwaak River	
Photo 33 NRC view of electrofishing station.	**Photo 34** NRC looking upstream at barrier net at end of station.
Photo 35 NRC White sucker.	**Photo 36** NRC view of left bank and pool above electrofishing station.

Appendix E-2

Data Summary Table and Electrofishing Field Forms

Table E-2.1 Quantitative Electrofishing Data for Baseline EEM

Station	Date Collected	Entry Number (field sheet order)	Species	Barrier Sweep # (0 is outside)	Fork Length (mm)	Fresh Weight (g)	External Condition	Comments
B2A2	September 8, 2011	1	BT	1-3	48		Normal	
B2A2	September 8, 2011	2	BT	1-3	62		Normal	
B2A2	September 8, 2011	3	BT	1-3	52		Normal	
B2A2	September 8, 2011	4	BT	1-3	81		Normal	
B2A2	September 8, 2011	5	BT	1-3	83		Normal	
B2A2	September 8, 2011	6	BT	1-3	85		Normal	
B2A2	September 8, 2011	7	BT	1-3	57		Normal	
B2A2	September 8, 2011	8	BT	1-3	84		Normal	
B2A2	September 8, 2011	9	BT	1-3	87		Normal	
B2A2	September 8, 2011	10	BT	1-3	86		Normal	
B2A2	September 8, 2011	11	BT	1-3	79		Normal	
B2A2	September 8, 2011	12	BT	1-3	66		Normal	
B2A2	September 8, 2011	13	BT	1-3	85		Normal	
B2A2	September 8, 2011	14	BT	1-3	72		Normal	
B2A2	September 8, 2011	15	BT	1-3	59		Normal	
B2A2	September 8, 2011	16	BT	1-3	61		Normal	
B2A2	September 8, 2011	17	BT	1-3	64		Normal	
B2A2	September 8, 2011	18	BT	1-3	72		Normal	
B2A2	September 8, 2011	19	BT	1-3	58		Normal	
B2A2	September 8, 2011	20	BT	1-3	57		Normal	
B2A2	September 8, 2011	21	BT	1-3	58		Normal	
B2A2	September 8, 2011	22	BT	1-3	62		Normal	
B2A2	September 8, 2011	23	BT	1-3	43		Normal	
B2A2	September 8, 2011	24	BT	1-3	63		Normal	
B2A2	September 8, 2011	25	BT	1-3	85		Normal	
B2A2	September 8, 2011	26	BT	1-3	57		Normal	
B2A2	September 8, 2011	27	BT	1-3	69		Normal	
B2A2	September 8, 2011	28	BT	1-3	79		Normal	
B2A2	September 8, 2011	29	BT	1-3	76		Normal	
B2A2	September 8, 2011	30	BT	1-3	50		Normal	
B2A2	September 8, 2011	31	BT	1-3	62		Normal	
B2A2	September 8, 2011	32	BT	1-3	82		Normal	
B2A2	September 8, 2011	33	BT	1-3	46		Normal	
B2A2	September 8, 2011	34	BT	1-3	58		Adipose parasite	
B2A2	September 8, 2011	35	BT	1-3	59		Normal	
B2A2	September 8, 2011	36	BT	1-3	64		Normal	
B2A2	September 8, 2011	37	BT	1-3	79		Normal	
B2A2	September 8, 2011	38	BT	1-3	84		Normal	
B2A2	September 8, 2011	39	BT	1-3	59		Normal	
B2A2	September 8, 2011	40	BT	1-3	49		Normal	
B2A2	September 8, 2011	41	BT	1-3	70		Normal	
B2A2	September 8, 2011	42	BT	1-3	54		Normal	
B2A2	September 8, 2011	43	BT	1-3	56		Normal	
B2A2	September 8, 2011	44	BT	1-3	41		Normal	
B2A2	September 8, 2011	45	BT	1-3	56		Normal	
B2A2	September 8, 2011	46	BT	1-3	46		Normal	
B2A2	September 8, 2011	47	BT	1-3	74		Normal	
B2A2	September 8, 2011	48	BT	1-3	52		Normal	
B2A2	September 8, 2011	49	BT	1-3	53		Normal	
B2A2	September 8, 2011	50	BT	1-3	73		Normal	
B2A2	September 8, 2011	51	BT	1-3	57		Normal	
B2A2	September 8, 2011	52	BT	1-3	59		Parasite on side	
B2A2	September 8, 2011	53	BT	1-3	48		Normal	
B2A2	September 8, 2011	54	BT	1-3	57		Normal	
B2A2	September 8, 2011	55	BT	1-3	68		Normal	
B2A2	September 8, 2011	56	BT	1-3	64		Normal	
B2A2	September 8, 2011	57	BT	1-3	59		Normal	
B2A2	September 8, 2011	58	BT	1-3	47		Normal	
B2A2	September 8, 2011	59	BT	1-3	58		Normal	
B2A2	September 8, 2011	72	BT	1-3	87	6.81	Normal	Immature
B2A2	September 8, 2011	73	BT	1-3	88	6.6	Normal	Immature
B2A2	September 8, 2011	74	BT	1-3	88	6.93	Normal	Immature, female
B2A2	September 8, 2011	71	BT	1-3	90	7.38	Normal	Immature
B2A2	September 8, 2011	70	BT	1-3	93	8.25	Normal	Check 93 mm, 8.22 g, Immature, female
B2A2	September 8, 2011	69	BT	1-3	94	9.4	Normal	Immature, female
B2A2	September 8, 2011	118	BT	0	96	9.6	Normal	
B2A2	September 8, 2011	68	BT	1-3	100	10.35	Normal	Male
B2A2	September 8, 2011	67	BT	1-3	105	12.15	Normal	Immature, female
B2A2	September 8, 2011	65	BT	1-3	112	15.92	Normal	Male
B2A2	September 8, 2011	64	BT	1-3	114	14.32	Normal	Female
B2A2	September 8, 2011	117	BT	0	114	15.09	Normal	
B2A2	September 8, 2011	66	BT	1-3	119	17.9	Adipose parasite	Male
B2A2	September 8, 2011	63	BT	1-3	122	19.48	Normal	Male
B2A2	September 8, 2011	97	BT	0	128	21.51	Normal	
B2A2	September 8, 2011	82	BT	0	52	1.34	Normal	
B2A2	September 8, 2011	83	BT	0	49	1.23	Normal	
B2A2	September 8, 2011	84	BT	0	67	2.95	Normal	
B2A2	September 8, 2011	85	BT	0	88	7.06	Normal	
B2A2	September 8, 2011	86	BT	0	62	2.41	Normal	
B2A2	September 8, 2011	87	BT	0	50	1.22	Normal	
B2A2	September 8, 2011	88	BT	0	48	1.01	Normal	
B2A2	September 8, 2011	89	BT	0	50	1.37	Normal	
B2A2	September 8, 2011	90	BT	0	43	0.69	Normal	
B2A2	September 8, 2011	91	BT	0	63	2.39	Normal	
B2A2	September 8, 2011	92	BT	0	74	3.7	Normal	
B2A2	September 8, 2011	93	BT	0	56	1.6	Normal	
B2A2	September 8, 2011	94	BT	0	54	1.66	Normal	
B2A2	September 8, 2011	95	BT	0	73	3.99	Normal	
B2A2	September 8, 2011	96	BT	0	83	5.03	Normal	
B2A2	September 8, 2011	116	BT	0	129	21.46	Normal	

Table E-2.1 Quantitative Electrofishing Data for Baseline EEM

Station	Date Collected	Entry Number (field sheet order)	Species	Barrier Sweep # (0 is outside)	Fork Length (mm)	Fresh Weight (g)	External Condition	Comments
B2A2	September 8, 2011	98	BT	0	82	5.27	Normal	
B2A2	September 8, 2011	99	BT	0	63	2.87	Normal	
B2A2	September 8, 2011	100	BT	0	78	4.43	Normal	
B2A2	September 8, 2011	101	BT	0	59	3.21	Normal	
B2A2	September 8, 2011	102	BT	0	57	1.76	Normal	
B2A2	September 8, 2011	103	BT	0	62	2.49	Normal	
B2A2	September 8, 2011	104	BT	0	64	2.53	Normal	
B2A2	September 8, 2011	105	BT	0	51	1.35	Normal	
B2A2	September 8, 2011	106	BT	0	66	2.47	Normal	
B2A2	September 8, 2011	107	BT	0	48	1.01	Normal	
B2A2	September 8, 2011	108	BT	0	49	1.03	Normal	
B2A2	September 8, 2011	109	BT	0	58	1.88	Normal	
B2A2	September 8, 2011	110	BT	0	64	2.62	Normal	
B2A2	September 8, 2011	111	BT	0	49	1.09	Normal	
B2A2	September 8, 2011	112	BT	0	51	1.33	Normal	
B2A2	September 8, 2011	115	BT	0	134	28.66	Normal	
B2A2	September 8, 2011	62	BT	1-3	157	44.43	Normal	Male
B2A2	September 8, 2011	61	BT	1-3	160	48.21	Normal	Male
B2A2	September 8, 2011	60	BT	1-3	168	51.54	Normal	Male
B2A2	September 8, 2011	119	BT	0	80	4.71	Normal	
B2A2	September 8, 2011	120	BT	0	63	2.08	Normal	
B2A2	September 8, 2011	121	BT	0	59	1.79	Normal	
B2A2	September 8, 2011	123	BT	0	84	5.76	Normal	
B2A2	September 8, 2011	124	BT	0	88	6.51	Normal	
B2A2	September 8, 2011	125	BT	0	59	1.89	Normal	
B2A2	September 8, 2011	126	BT	0	76	3.92	Normal	
B2A2	September 8, 2011	127	BT	0	53	1.34	Normal	
B2A2	September 8, 2011	128	BT	0	50	2.21	Normal	
B2A2	September 8, 2011	129	BT	0	48	1.04	Normal	
B2A2	September 8, 2011	130	BT	0	74	3.41	Normal	
B2A2	September 8, 2011	132	BT	0	44	0.78	Normal	
B2A2	September 8, 2011	133	BT	0	64	2.37	Normal	
B2A2	September 8, 2011	134	BT	0	48	1.11	Normal	
B2A2	September 8, 2011	135	BT	0	60	1.98	Normal	
B2A2	September 8, 2011	136	BT	0	50	1.21	Normal	
B2A2	September 8, 2011	137	BT	0	57	1.79	Normal	
B2A2	September 8, 2011	138	BT	0	54	1.49	Normal	
B2A2	September 8, 2011	139	BT	0	54	1.5	Normal	
B2A2	September 8, 2011	75	SS	1-3	56	1.73	Normal	
B2A2	September 8, 2011	76	SS	1-3	53	1.93	Normal	
B2A2	September 8, 2011	77	SS	1-3	75	4.84	Normal	
B2A2	September 8, 2011	78	SS	1-3	54	1.55	Normal	
B2A2	September 8, 2011	79	SS	1-3	85	5.93	Normal	
B2A2	September 8, 2011	80	SS	1-3	51	1.36	Normal	
B2A2	September 8, 2011	81	SS	1-3	50	1.23	Normal	
B2A2	September 8, 2011	113	SS	0	78	5.31	Normal	
B2A2	September 8, 2011	114	SS	0	60	2.13	Normal	
B2A2	September 8, 2011	122	SS	0	86	6.07	Normal	
B2A2	September 8, 2011	131	SS	0	63	2.65	Normal	
B3A9	September 14, 2011	16	AE	1	250		Normal	
B3A9	September 14, 2011	17	AE	1	300		Normal	
B3A9	September 14, 2011	45	AE	0	150		Normal	
B3A9	September 14, 2011	48	AE	0	600		Normal	
B3A9	September 14, 2011	1	AS	1	119	17.11	Normal	
B3A9	September 14, 2011	37	AS	0	128	21.53	Normal	
B3A9	September 14, 2011	2	BT	1	94	8.62	Normal	
B3A9	September 14, 2011	3	BT	1	89	7.31	Normal	
B3A9	September 14, 2011	4	BT	1	90	7.24	Normal	
B3A9	September 14, 2011	5	BT	1	88	7.01	Normal	
B3A9	September 14, 2011	6	BT	1	71	3.65	Normal	
B3A9	September 14, 2011	43	BT	0	67	3.13	Normal	Immature
B3A9	September 14, 2011	38	BT	0	85	6.28	Normal	Immature
B3A9	September 14, 2011	39	BT	0	89	8.19	Normal	Immature
B3A9	September 14, 2011	21	BT	2	69	3.32	Normal	
B3A9	September 14, 2011	22	BT	2	90	7.22	Normal	Immature
B3A9	September 14, 2011	23	BT	2	67	3.21	Normal	
B3A9	September 14, 2011	32	BT	3	94	8.43	Normal	Immature
B3A9	September 14, 2011	29	BT	2	102	10.64	Normal	Immature
B3A9	September 14, 2011	20	BT	1	112	13.26	Normal	Immature, female
B3A9	September 14, 2011	31	BT	3	49	1.36	Normal	
B3A9	September 14, 2011	19	BT	1	115	14.24	Normal	Immature
B3A9	September 14, 2011	33	BT	3	59	2.38	Normal	
B3A9	September 14, 2011	53	BT	0	116	17.59	Normal	
B3A9	September 14, 2011	28	BT	2	119	16.75	Normal	Immature
B3A9	September 14, 2011	56	BT	0	123	17.03	Normal	Immature
B3A9	September 14, 2011	40	BT	0	63	2.38	Normal	
B3A9	September 14, 2011	54	BT	0	124	18.21	Normal	Immature
B3A9	September 14, 2011	44	BT	0	66	2.9	Normal	
B3A9	September 14, 2011	30	BT	2	128	22	Normal	Immature, female
B3A9	September 14, 2011	55	BT	0	129	22.49	Normal	
B3A9	September 14, 2011	52	BT	0	133	21.73	Normal	
B3A9	September 14, 2011	36	BT	3	136	39.25	Normal	
B3A9	September 14, 2011	51	BT	0	146	26.14	Normal	Immature
B3A9	September 14, 2011	18	BT	1	147	35.08	Normal	
B3A9	September 14, 2011	49	BT	0	166	61.53	Normal	
B3A9	September 14, 2011	50	BT	0	169	57.79	Normal	
B3A9	September 14, 2011	7	SS	1	67	3.2	Normal	
B3A9	September 14, 2011	8	SS	1	30	0.29	Normal	
B3A9	September 14, 2011	9	SS	1	52	1.48	Normal	
B3A9	September 14, 2011	10	SS	1	74	4.54	Normal	

Table E-2.1 Quantitative Electrofishing Data for Baseline EEM

Station	Date Collected	Entry Number (field sheet order)	Species	Barrier Sweep # (0 is outside)	Fork Length (mm)	Fresh Weight (g)	External Condition	Comments
B3A9	September 14, 2011	11	SS	1	58	2.01	Normal	
B3A9	September 14, 2011	12	SS	1	61	2.49	Normal	
B3A9	September 14, 2011	13	SS	1	72	4.16	Normal	
B3A9	September 14, 2011	14	SS	1	30	0.28	Normal	
B3A9	September 14, 2011	15	SS	1	28	0.2	Normal	
B3A9	September 14, 2011	24	SS	2	71	4.08	Normal	
B3A9	September 14, 2011	25	SS	2	77	5.96	Normal	
B3A9	September 14, 2011	26	SS	2	57	2.22	Normal	
B3A9	September 14, 2011	27	SS	2	60	2.17	Normal	
B3A9	September 14, 2011	34	SS	3	77	5.56	Normal	
B3A9	September 14, 2011	35	SS	3	56	1.94	Normal	
B3A9	September 14, 2011	41	SS	0	63	2.76	Normal	
B3A9	September 14, 2011	42	SS	0	86	7.07	Normal	
B3A9	September 14, 2011	46	SS	0	76	4.46	Normal	
B3A9	September 14, 2011	47	SS	0	71	4.59	Normal	
S2A2	September 12, 2011	1	BT	0-3	134	24.33	Normal	
S2A2	September 12, 2011	2	BT	0-3	148	37.52	Normal	
S2A2	September 12, 2011	3	BT	0-3	113	14.33	Normal	
S2A2	September 12, 2011	4	BT	0-3	127	22.76	Normal	
S2A2	September 12, 2011	5	BT	0-3	132	25.25	Normal	
S2A2	September 12, 2011	6	BT	0-3	147	38.28	Normal	
S2A2	September 12, 2011	7	BT	0-3	183	36.86	Normal	
S2A2	September 12, 2011	8	BT	0-3	143	31.65	Normal	
S2A2	September 12, 2011	9	BT	0-3	114	13.67	Normal	
S2A2	September 12, 2011	10	BT	0-3	173	60.55	Normal	
S2A2	September 12, 2011	11	BT	0-3	143	35.83	Normal	
S2A2	September 12, 2011	12	BT	0-3	133	25.48	Normal	
S2A2	September 12, 2011	13	BT	0-3	109	12.19	Normal	
S2A2	September 12, 2011	14	BT	0-3	89	7.01	Normal	
S2A2	September 12, 2011	15	BT	0-3	165	46.6	Normal	
S2A2	September 12, 2011	16	BT	0-3	160	40.72	Normal	
S2A2	September 12, 2011	17	BT	0-3	109	12.49	Normal	
S2A2	September 12, 2011	18	BT	0-3	129	20.97	Normal	
S2A2	September 12, 2011	19	BT	0-3	106	11.18	Normal	
S2A2	September 12, 2011	20	BT	0-3	95	8.13	Normal	
S2A2	September 12, 2011	21	BT	0-3	99	9.6	Normal	
S2A2	September 12, 2011	22	BT	0-3	87	5.62	Normal	
S2A2	September 12, 2011	23	BT	0-3	90	7.34	Normal	
S2A2	September 12, 2011	24	BT	0-3	60	2.4	Normal	
S2A2	September 12, 2011	25	BT	0-3	59	2.21	Normal	
S2A2	September 12, 2011	26	BT	0-3	56	1.71	Normal	
S2A2	September 12, 2011	27	BT	0-3	64	2.63	Normal	
S2A2	September 12, 2011	28	BT	0-3	95	8.02	Normal	
S2A2	September 12, 2011	29	BT	0-3	92	7.41	Normal	
S2A2	September 12, 2011	30	BT	0-3	98	8.78	Normal	
S2A2	September 12, 2011	31	BT	0-3	49	1.12	Normal	
S2A2	September 12, 2011	32	BT	0-3	58	2.02	Normal	
S2A2	September 12, 2011	33	BT	0-3	84	5.94	Normal	
S2A2	September 12, 2011	34	BT	0-3	67	2.9	Normal	
S2A2	September 12, 2011	35	BT	0-3	53	1.46	Normal	
S2A2	September 12, 2011	36	BT	0-3	85	6.06	Normal	
S2A2	September 12, 2011	37	BT	0-3	59	2.14	Normal	
S2A2	September 12, 2011	38	BT	0-3	91	7.25	Normal	
S2A2	September 12, 2011	39	BT	0-3	60	2.3	Normal	
S2A2	September 12, 2011	40	BT	0-3	67	2.87	Normal	
S2A2	September 12, 2011	41	BT	0-3	61	2.28	Normal	
S2A2	September 12, 2011	42	BT	0-3	52	1.54	Normal	
S2A2	September 12, 2011	43	BT	0-3	52	1.48	Normal	
S2A2	September 12, 2011	44	BT	0-3	62	2.29	Normal	
S2A2	September 12, 2011	45	BT	0-3	78	4.41	Normal	
S2A2	September 12, 2011	46	BT	0-3	65	2.95	Normal	
S2A2	September 12, 2011	47	BT	0-3	59	2.12	Normal	
S2A2	September 12, 2011	48	BT	0-3	64	2.59	Normal	
S2A2	September 12, 2011	49	BT	0-3	62	2.43	Normal	
S2A2	September 12, 2011	50	BT	0-3	50	1.28	Normal	
S2A2	September 12, 2011	70	BT	0-3	87	7.28	Normal	Check 87 mm, 7.25 g, Immature, female
S2A2	September 12, 2011	56	BT	0-3	90	7.36	Normal	Immature, female
S2A2	September 12, 2011	62	BT	0-3	90	7.38	Normal	Immature, female
S2A2	September 12, 2011	57	BT	0-3	92	8.09	Normal	Immature, female
S2A2	September 12, 2011	66	BT	0-3	92	8.09	Normal	Immature, female
S2A2	September 12, 2011	69	BT	0-3	96	8.95	Normal	Immature, female
S2A2	September 12, 2011	67	BT	0-3	97	9.75	Normal	Immature
S2A2	September 12, 2011	74	BT	0-3	104	11.03	Normal	Immature
S2A2	September 12, 2011	68	BT	0-3	105	11.9	Normal	Immature, female
S2A2	September 12, 2011	63	BT	0-3	108	14.4	Normal	Immature, male
S2A2	September 12, 2011	55	BT	0-3	110	12.41	Normal	Immature, female
S2A2	September 12, 2011	72	BT	0-3	111	13.6	Normal	Immature, female
S2A2	September 12, 2011	60	BT	0-3	124	22.93	Normal	Check 124 mm, 22.90 g
S2A2	September 12, 2011	53	BT	0-3	128	20.84	Normal	
S2A2	September 12, 2011	54	BT	0-3	131	24.13	Normal	
S2A2	September 12, 2011	64	BT	0-3	131	25.45	Normal	
S2A2	September 12, 2011	59	BT	0-3	133	25.23	Normal	
S2A2	September 12, 2011	75	BT	0-3	140	31.73	Normal	
S2A2	September 12, 2011	51	BT	0-3	143	35.27	Normal	
S2A2	September 12, 2011	61	BT	0-3	145	37.37	Normal	
S2A2	September 12, 2011	71	BT	0-3	146	38.29	Normal	
S2A2	September 12, 2011	65	BT	0-3	160	44.84	Normal	
S2A2	September 12, 2011	58	BT	0-3	165	46.03	Normal	
S2A2	September 12, 2011	52	BT	0-3	174	60.4	Normal	
S2A2	September 12, 2011	73	BT	0-3	181	64.12	Normal	

Table E-2.1 Quantitative Electrofishing Data for Baseline EEM

Station	Date Collected	Entry Number (field sheet order)	Species	Barrier Sweep # (0 is outside)	Fork Length (mm)	Fresh Weight (g)	External Condition	Comments
S3A3	September 26, 2011	51	AE	0	300		Normal	
S3A3	September 26, 2011	60	AE	1	250		Normal	
S3A3	September 26, 2011	64	AE	2	200		Normal	
S3A3	September 26, 2011	1	BT	0	95	8.77	Normal	
S3A3	September 26, 2011	2	BT	0	97	8.47	Normal	
S3A3	September 26, 2011	3	BT	0	85	6.49	Normal	
S3A3	September 26, 2011	4	BT	0	87	6.2	Normal	
S3A3	September 26, 2011	5	BT	0	90	7	Normal	
S3A3	September 26, 2011	6	BT	0	87	6.34	Normal	
S3A3	September 26, 2011	7	BT	0	86	6.32	Normal	
S3A3	September 26, 2011	8	BT	0	79	4.91	Normal	
S3A3	September 26, 2011	9	BT	0	90	7.96	Normal	
S3A3	September 26, 2011	10	BT	0	95	8.74	Normal	Check 95 mm, 8.56 g
S3A3	September 26, 2011	11	BT	0	92	8.45	Normal	
S3A3	September 26, 2011	12	BT	0	93	7.44	Normal	
S3A3	September 26, 2011	13	BT	0	83	5.31	Normal	
S3A3	September 26, 2011	14	BT	0	83	5.5	Normal	
S3A3	September 26, 2011	15	BT	0	65	2.84	Normal	
S3A3	September 26, 2011	16	BT	0	96	9.1	Normal	
S3A3	September 26, 2011	17	BT	0	94	8	Normal	
S3A3	September 26, 2011	18	BT	0	84	5.71	Normal	
S3A3	September 26, 2011	19	BT	0	96	9.28	Normal	
S3A3	September 26, 2011	20	BT	0	91	7.36	Normal	Check 91 mm, 7.51 g
S3A3	September 26, 2011	21	BT	0	92	7.83	Normal	
S3A3	September 26, 2011	22	BT	0	79	4.71	Normal	
S3A3	September 26, 2011	23	BT	0	52	1.52	Normal	
S3A3	September 26, 2011	24	BT	0	83	5.79	Normal	
S3A3	September 26, 2011	25	BT	0	80	5.26	Normal	
S3A3	September 26, 2011	26	BT	0	94	7.31	Normal	
S3A3	September 26, 2011	27	BT	0	95	8.36	Normal	
S3A3	September 26, 2011	28	BT	0	68	3.34	Normal	
S3A3	September 26, 2011	29	BT	0	87	7.16	Normal	
S3A3	September 26, 2011	30	BT	0	90	7.2	Normal	
S3A3	September 26, 2011	31	BT	0	57	1.57	Normal	
S3A3	September 26, 2011	32	BT	0	84	5.74	Normal	Check 84 mm, 5.78 g
S3A3	September 26, 2011	63	BT	2	84	5.96	Normal	Check 84 mm, 5.95 g, unknown
S3A3	September 26, 2011	62	BT	2	89	7.09	Normal	Immature, unknown
S3A3	September 26, 2011	57	BT	1	95	9.13	Normal	Immature, unknown
S3A3	September 26, 2011	49	BT	0	98	9.8	Normal	Immature, unknown
S3A3	September 26, 2011	50	BT	0	98	9.13	Normal	Check 98 mm, 9.12 g, immature, unknown
S3A3	September 26, 2011	52	BT	0	98	10.28	Normal	Immature, unknown
S3A3	September 26, 2011	46	BT	0	100	10.52	Normal	Immature, unknown
S3A3	September 26, 2011	48	BT	0	100	10.9	Normal	Immature, female
S3A3	September 26, 2011	58	BT	1	100	10.55	Normal	Immature, unknown
S3A3	September 26, 2011	59	BT	1	101	10.17	Normal	Immature, female
S3A3	September 26, 2011	47	BT	0	108	12.45	Normal	Immature, unknown
S3A3	September 26, 2011	41	BT	0	110	13.5	Normal	Immature, female
S3A3	September 26, 2011	61	BT	2	110	14.07	Normal	Immature, female
S3A3	September 26, 2011	65	BT	3	110	14.08	Normal	Immature, female
S3A3	September 26, 2011	43	BT	0	111	14.78	Normal	Immature, unknown
S3A3	September 26, 2011	45	BT	0	111	13.36	Normal	Immature, female
S3A3	September 26, 2011	44	BT	0	112	13.77	Normal	Immature, female
S3A3	September 26, 2011	56	BT	1	114	14.97	Normal	Immature, unknown
S3A3	September 26, 2011	42	BT	0	116	18.88	Normal	
S3A3	September 26, 2011	53	BT	1	63	2.59	Normal	
S3A3	September 26, 2011	54	BT	1	57	2.15	Normal	
S3A3	September 26, 2011	39	BT	0	129	21.46	Normal	
S3A3	September 26, 2011	55	BT	1	129	20.94	Normal	Immature, unknown
S3A3	September 26, 2011	40	BT	0	130	19.93	Normal	Check 130 mm, 19.95 g
S3A3	September 26, 2011	34	BT	0	135	26.8	Normal	Immature, unknown
S3A3	September 26, 2011	38	BT	0	135	25.25	Normal	
S3A3	September 26, 2011	35	BT	0	136	30.12	Normal	
S3A3	September 26, 2011	37	BT	0	136	28.52	Normal	
S3A3	September 26, 2011	36	BT	0	140	26.99	Normal	
S3A3	September 26, 2011	33	BT	0	163	46.41	Normal	
M3C3	September 13, 2011	50	AE	1-3	400	120	Normal	
M3C3	September 13, 2011	54	AE	1-3	310	34	Normal	
M3C3	September 13, 2011	55	AE	1-3	174	7.75	Normal	
M3C3	September 13, 2011	64	AE	1-3	185	15	Normal	
M3C3	September 13, 2011	65	AE	1-3	240	29.1	Normal	
M3C3	September 13, 2011	66	AE	1-3	260	21.34	Normal	
M3C3	September 13, 2011	95	AE	0	260	22.73	No mucous membrane - scrape marks	
M3C3	September 13, 2011	141	AE	0	273	29.63	Normal	
M3C3	September 13, 2011	48	AS	1-3	147	38.87	Normal	
M3C3	September 13, 2011	49	AS	1-3	133	21.71	Normal	
M3C3	September 13, 2011	67	AS	0	134	21.54	Normal	May be salmon caught in barrier area
M3C3	September 13, 2011	1	BND	1-3	66	3.62	Normal	
M3C3	September 13, 2011	2	BND	1-3	53	1.66	Normal	
M3C3	September 13, 2011	3	BND	1-3	66	3.2	Normal	
M3C3	September 13, 2011	4	BND	1-3	66	3.6	Normal	
M3C3	September 13, 2011	5	BND	1-3	65	3.77	Normal	
M3C3	September 13, 2011	6	BND	1-3	60	2.34	Normal	
M3C3	September 13, 2011	7	BND	1-3	66	3.43	Normal	
M3C3	September 13, 2011	8	BND	1-3	30	0.29	Normal	
M3C3	September 13, 2011	9	BND	1-3	67	3.57	Normal	
M3C3	September 13, 2011	10	BND	1-3	64	2.95	Normal	
M3C3	September 13, 2011	11	BND	1-3	53	1.51	Normal	
M3C3	September 13, 2011	12	BND	1-3	31	0.37	Normal	

Table E-2.1 Quantitative Electrofishing Data for Baseline EEM

Station	Date Collected	Entry Number (field sheet order)	Species	Barrier Sweep # (0 is outside)	Fork Length (mm)	Fresh Weight (g)	External Condition	Comments
M3C3	September 13, 2011	13	BND	1-3	64	2.79	Normal	
M3C3	September 13, 2011	14	BND	1-3	65	3.01	Normal	
M3C3	September 13, 2011	15	BND	1-3	54	1.79	Normal	
M3C3	September 13, 2011	16	BND	1-3	56	2.62	Normal	
M3C3	September 13, 2011	17	BND	1-3	61	2.5	Normal	
M3C3	September 13, 2011	18	BND	1-3	50	1.42	Normal	
M3C3	September 13, 2011	19	BND	1-3	49	1.3	Normal	
M3C3	September 13, 2011	20	BND	1-3	50	1.39	Normal	Check 50 mm, 1.34 g
M3C3	September 13, 2011	21	BND	1-3	57	1.91	Normal	
M3C3	September 13, 2011	22	BND	1-3	45	1.07	Normal	
M3C3	September 13, 2011	23	BND	1-3	64	2.92	Normal	
M3C3	September 13, 2011	24	BND	1-3	46	1.16	Normal	
M3C3	September 13, 2011	25	BND	1-3	66	3.35	Normal	
M3C3	September 13, 2011	26	BND	1-3	52	1.58	Normal	
M3C3	September 13, 2011	27	BND	1-3	32	0.4	Normal	
M3C3	September 13, 2011	28	BND	1-3	34	0.46	Normal	
M3C3	September 13, 2011	29	BND	1-3	46	1.02	Normal	
M3C3	September 13, 2011	30	BND	1-3	46	0.9	Normal	Check 46 mm, 1.00 g
M3C3	September 13, 2011	31	BND	1-3	48	1.22	Normal	
M3C3	September 13, 2011	32	BND	1-3	43	0.83	Normal	
M3C3	September 13, 2011	51	BND	1-3	30	0.31	Normal	
M3C3	September 13, 2011	58	BND	1-3	48	1.27	Normal	
M3C3	September 13, 2011	59	BND	1-3	53	1.49	Normal	
M3C3	September 13, 2011	61	BND	1-3	49	1.37	Normal	
M3C3	September 13, 2011	63	BND	1-3	66	3.35	Normal	
M3C3	September 13, 2011	76	BND	0	52	1.52	Normal	Check 52 mm, 1.59 g
M3C3	September 13, 2011	77	BND	0	48	1.07	Normal	
M3C3	September 13, 2011	78	BND	0	67	3.52	Normal	
M3C3	September 13, 2011	79	BND	0	53	1.7	Normal	
M3C3	September 13, 2011	80	BND	0	41	0.72	Normal	
M3C3	September 13, 2011	81	BND	0	44	0.97	Normal	
M3C3	September 13, 2011	82	BND	0	66	3.18	Normal	
M3C3	September 13, 2011	97	BND	0	65	3.08	Normal	
M3C3	September 13, 2011	98	BND	0	52	1.45	Normal	
M3C3	September 13, 2011	99	BND	0	65	2.95	Normal	
M3C3	September 13, 2011	100	BND	0	51	1.29	Normal	
M3C3	September 13, 2011	101	BND	0	27	0.19	Normal	
M3C3	September 13, 2011	102	BND	0	60	2.69	Normal	
M3C3	September 13, 2011	103	BND	0	64	2.89	Normal	
M3C3	September 13, 2011	104	BND	0	53	1.8	Normal	
M3C3	September 13, 2011	105	BND	0	66	3.14	Normal	
M3C3	September 13, 2011	106	BND	0	50	1.26	Normal	Check 50 mm, 1.27 g
M3C3	September 13, 2011	107	BND	0	55	1.81	Normal	
M3C3	September 13, 2011	108	BND	0	35	0.46	Normal	
M3C3	September 13, 2011	109	BND	0	67	4.06	Normal	
M3C3	September 13, 2011	110	BND	0	23	0.25	Normal	
M3C3	September 13, 2011	111	BND	0	25	0.17	Normal	
M3C3	September 13, 2011	112	BND	0	47	1.08	Normal	
M3C3	September 13, 2011	113	BND	0	35	0.46	Normal	
M3C3	September 13, 2011	114	BND	0	30	0.3	Normal	
M3C3	September 13, 2011	115	BND	0	64	2.78	Normal	
M3C3	September 13, 2011	116	BND	0	51	1.45	Normal	Check 51 mm, 1.43 g
M3C3	September 13, 2011	117	BND	0	73	4.92	Normal	
M3C3	September 13, 2011	118	BND	0	63	2.62	Normal	
M3C3	September 13, 2011	119	BND	0	48	1	Normal	
M3C3	September 13, 2011	120	BND	0	32	0.37	Normal	
M3C3	September 13, 2011	121	BND	0	47	1.07	Normal	
M3C3	September 13, 2011	122	BND	0	58	2.18	Normal	
M3C3	September 13, 2011	123	BND	0	31	0.3	Normal	
M3C3	September 13, 2011	142	BND	0	23	0.1	Normal	
M3C3	September 13, 2011	33	BNS	1-3	88	8	Normal	
M3C3	September 13, 2011	34	BNS	1-3	61	2.36	Normal	
M3C3	September 13, 2011	35	BNS	1-3	71	4.58	Normal	
M3C3	September 13, 2011	36	BNS	1-3	54	1.71	Normal	
M3C3	September 13, 2011	37	BNS	1-3	61	2.54	Normal	
M3C3	September 13, 2011	38	BNS	1-3	53	1.59	Normal	
M3C3	September 13, 2011	39	BNS	1-3	66	3.14	Normal	
M3C3	September 13, 2011	53	BNS	1-3	58	2.4	Normal	
M3C3	September 13, 2011	56	BNS	1-3	54	1.84	Normal	
M3C3	September 13, 2011	57	BNS	1-3	64	2.7	Normal	
M3C3	September 13, 2011	60	BNS	1-3	84	6.15	Normal	
M3C3	September 13, 2011	83	BNS	0	34	0.4	Normal	
M3C3	September 13, 2011	84	BNS	0	51	1.44	Normal	
M3C3	September 13, 2011	85	BNS	0	45	0.89	Normal	
M3C3	September 13, 2011	86	BNS	0	30	0.3	Normal	
M3C3	September 13, 2011	87	BNS	0	36	0.47	Normal	
M3C3	September 13, 2011	88	BNS	0	54	1.62	Normal	
M3C3	September 13, 2011	89	BNS	0	52	1.52	Normal	
M3C3	September 13, 2011	90	BNS	0	77	5.01	Normal	
M3C3	September 13, 2011	91	BNS	0	64	2.76	Normal	
M3C3	September 13, 2011	92	BNS	0	56	1.8	Normal	
M3C3	September 13, 2011	93	BNS	0	62	2.7	Normal	
M3C3	September 13, 2011	94	BNS	0	29	0.24	Normal	
M3C3	September 13, 2011	124	BNS	0	32	0.37	Normal	
M3C3	September 13, 2011	125	BNS	0	28	0.23	Normal	
M3C3	September 13, 2011	126	BNS	0	32	0.38	Normal	
M3C3	September 13, 2011	127	BNS	0	32	0.48	Normal	
M3C3	September 13, 2011	128	BNS	0	33	0.37	Normal	
M3C3	September 13, 2011	137	BNS	0	27	0.31	Regurgitated?	
M3C3	September 13, 2011	138	BNS	0	25	0.17	Normal	

Table E-2.1 Quantitative Electrofishing Data for Baseline EEM

Station	Date Collected	Entry Number (field sheet order)	Species	Barrier Sweep # (0 is outside)	Fork Length (mm)	Fresh Weight (g)	External Condition	Comments
M3C3	September 13, 2011	139	BNS	0	62	2.56	Normal	
M3C3	September 13, 2011	140	BNS	0	30	0.33	Normal	
M3C3	September 13, 2011	145	BT	0-3	100	9.89	Normal	Immature
M3C3	September 13, 2011	147	BT	0-3	114	16.29	Normal	
M3C3	September 13, 2011	146	BT	0-3	116	16.02	Normal	Immature
M3C3	September 13, 2011	148	BT	0-3	122	19.96	Normal	Immature
M3C3	September 13, 2011	150	BT	0-3	123	21.66	Normal	
M3C3	September 13, 2011	152	BT	0-3	125	18.22	Normal	Check 125 mm, 18.20 g
M3C3	September 13, 2011	144	BT	0-3	129	22.32	Normal	Immature
M3C3	September 13, 2011	151	BT	0-3	143	33.05	Normal	
M3C3	September 13, 2011	149	BT	0-3	160	44.51	Normal	
M3C3	September 13, 2011	143	BT	0-3	165	50.61	Normal	
M3C3	September 13, 2011	40	CS	1-3	56	2.07	Normal	
M3C3	September 13, 2011	41	CS	1-3	52	1.53	Normal	
M3C3	September 13, 2011	42	CS	1-3	46	1.08	Normal	
M3C3	September 13, 2011	68	CS	0	51	1.51	Normal	
M3C3	September 13, 2011	69	CS	0	48	1.08	Normal	
M3C3	September 13, 2011	70	CS	0	68	3.73	Normal	
M3C3	September 13, 2011	71	CS	0	51	1.43	Normal	
M3C3	September 13, 2011	72	CS	0	50	1.42	Normal	
M3C3	September 13, 2011	73	CS	0	46	1.02	Normal	
M3C3	September 13, 2011	74	CS	0	52	1.42	Normal	
M3C3	September 13, 2011	129	CS	0	60	2.42	Normal	
M3C3	September 13, 2011	130	CS	0	51	1.45	Normal	
M3C3	September 13, 2011	131	CS	0	48	1.13	Normal	
M3C3	September 13, 2011	132	CS	0	52	1.64	Normal	
M3C3	September 13, 2011	133	CS	0	52	1.5	Normal	
M3C3	September 13, 2011	134	CS	0	50	1.34	Normal	
M3C3	September 13, 2011	43	SL	1-3	142	4.8	Normal	
M3C3	September 13, 2011	44	SL	1-3	125	4.03	Normal	
M3C3	September 13, 2011	45	SL	1-3	112	2.49	Normal	
M3C3	September 13, 2011	46	SL	1-3	62	0.49	Normal	
M3C3	September 13, 2011	47	SL	1-3	109	2.32	Normal	
M3C3	September 13, 2011	52	WS	1-3	42	0.92	Normal	
M3C3	September 13, 2011	62	WS	1-3	53	1.47	Normal	
M3C3	September 13, 2011	75	WS	0	125	22.44	Normal	
M3C3	September 13, 2011	96	WS	0	45	0.89	Normal	
M3C3	September 13, 2011	135	WS	0	47	1.13	Normal	
M3C3	September 13, 2011	136	WS	0	39	0.58	Normal	
EBNB1	September 19, 2011	15	AE	1	250		Normal	
EBNB1	September 19, 2011	38	AE	0	150		Normal	
EBNB1	September 19, 2011	41	AE	0	250		Normal	
EBNB1	September 19, 2011	42	AE	0	250		Normal	
EBNB1	September 19, 2011	43	AE	0	250		Normal	
EBNB1	September 19, 2011	44	AE	0	250		Normal	
EBNB1	September 19, 2011	45	AE	0	250		Normal	
EBNB1	September 19, 2011	46	AE	0	250		Normal	
EBNB1	September 19, 2011	47	AE	0	250		Normal	
EBNB1	September 19, 2011	48	AE	0	250		Normal	
EBNB1	September 19, 2011	49	AE	0	250		Normal	
EBNB1	September 19, 2011	50	AE	0	250		Normal	
EBNB1	September 19, 2011	3	AS	1	137	25.94	Normal	
EBNB1	September 19, 2011	6	AS	1	103	13.28	Normal	
EBNB1	September 19, 2011	17	AS	0	132	28.31	Normal	
EBNB1	September 19, 2011	19	AS	0	113	16.36	Normal	
EBNB1	September 19, 2011	20	AS	0	142	31.37	Normal	
EBNB1	September 19, 2011	21	AS	0	133	27.2	Normal	
EBNB1	September 19, 2011	22	AS	0	108	14.7	Normal	
EBNB1	September 19, 2011	25	AS	0	151	40.56	Normal	
EBNB1	September 19, 2011	26	AS	0	152	34.59	Normal	
EBNB1	September 19, 2011	27	AS	0	105	13.5	Normal	
EBNB1	September 19, 2011	28	AS	0	144	32.49	Normal	
EBNB1	September 19, 2011	29	AS	0	95	9.55	Normal	
EBNB1	September 19, 2011	30	AS	0	120	21.71	Normal	
EBNB1	September 19, 2011	32	AS	0	111	14.68	Normal	
EBNB1	September 19, 2011	33	AS	0	144	36.24	Normal	
EBNB1	September 19, 2011	35	AS	0	114	17.24	Normal	
EBNB1	September 19, 2011	5	BND	1	44	0.99	Normal	
EBNB1	September 19, 2011	11	BND	1	76	5.1	Normal	
EBNB1	September 19, 2011	12	BND	1	43	0.9	Normal	
EBNB1	September 19, 2011	13	BND	1	30	0.31	Normal	
EBNB1	September 19, 2011	14	BND	1	26	0.3	Normal	
EBNB1	September 19, 2011	16	BND	2	69	3.98	Normal	
EBNB1	September 19, 2011	23	BND	0	49	1.32	Normal	
EBNB1	September 19, 2011	24	BND	0	72	4.58	Normal	
EBNB1	September 19, 2011	31	BND	0	48	1.72	Normal	
EBNB1	September 19, 2011	34	BND	0	68	3.73	Normal	
EBNB1	September 19, 2011	37	BND	0	64	3.34	Normal	
EBNB1	September 19, 2011	40	BND	0	43	1.18	Normal	
EBNB1	September 19, 2011	10	BT	1	72	3.48	Normal	Immature
EBNB1	September 19, 2011	2	BT	1	127	19.13	Normal	Immature
EBNB1	September 19, 2011	1	BT	1	140	25.94	Normal	Immature
EBNB1	September 19, 2011	4	WS	1	96	9.31	Normal	
EBNB1	September 19, 2011	7	WS	1	86	6.64	Normal	
EBNB1	September 19, 2011	8	WS	1	83	6.31	Normal	
EBNB1	September 19, 2011	9	WS	1	90	8.16	Normal	
EBNB1	September 19, 2011	18	WS	0	82	6.12	Normal	
EBNB1	September 19, 2011	36	WS	0	105	13.05	Normal	
EBNB1	September 19, 2011	39	WS	0	80	6.07	Normal	
W4A17	September 29, 2011	23	AE	1	200		Normal	

Table E-2.1 Quantitative Electrofishing Data for Baseline EEM

Station	Date Collected	Entry Number (field sheet order)	Species	Barrier Sweep # (0 is outside)	Fork Length (mm)	Fresh Weight (g)	External Condition	Comments
W4A17	September 29, 2011	24	AE	1	300		Normal	
W4A17	September 29, 2011	64	AE	0	300		Normal	
W4A17	September 29, 2011	65	AE	0	150		Normal	
W4A17	September 29, 2011	106	AE	0	150		Normal	
W4A17	September 29, 2011	1	AS	1	138	26.7	Normal	
W4A17	September 29, 2011	4	AS	1	164	36.04	Normal	
W4A17	September 29, 2011	8	AS	1	105	11.82	Normal	
W4A17	September 29, 2011	12	AS	1	117	15.86	Normal	
W4A17	September 29, 2011	13	AS	1	143	30.01	Normal	
W4A17	September 29, 2011	14	AS	1	128	16.36	Normal	
W4A17	September 29, 2011	15	AS	1	105	14	Normal	
W4A17	September 29, 2011	27	AS	2	141	33.68	Normal	
W4A17	September 29, 2011	30	AS	2	120	19.95	Normal	
W4A17	September 29, 2011	32	AS	2	103	10.74	Normal	
W4A17	September 29, 2011	33	AS	2	102	11.11	Normal	
W4A17	September 29, 2011	34	AS	2	128	21.5	Normal	
W4A17	September 29, 2011	36	AS	2	100	10.62	Normal	
W4A17	September 29, 2011	40	AS	3	142	28.51	Normal	
W4A17	September 29, 2011	47	AS	3	71	4.21	Normal	
W4A17	September 29, 2011	51	AS	0	128	25.12	Normal	
W4A17	September 29, 2011	52	AS	0	149	37.22	Normal	
W4A17	September 29, 2011	67	AS	0	137	27	Normal	
W4A17	September 29, 2011	68	AS	0	141	34.23	Normal	
W4A17	September 29, 2011	70	AS	0	103	14.36	Normal	
W4A17	September 29, 2011	72	AS	0	130	24.26	Normal	
W4A17	September 29, 2011	74	AS	0	131	24.08	Normal	
W4A17	September 29, 2011	75	AS	0	157	36.54	Normal	
W4A17	September 29, 2011	78	AS	0	142	32.79	Normal	
W4A17	September 29, 2011	79	AS	0	137	24.35	Normal	
W4A17	September 29, 2011	80	AS	0	152	40.07	Normal	
W4A17	September 29, 2011	81	AS	0	142	29.15	Normal	
W4A17	September 29, 2011	84	AS	0	138	31.61	Normal	
W4A17	September 29, 2011	87	AS	0	125	23.5	Normal	
W4A17	September 29, 2011	88	AS	0	106	14.19	Normal	
W4A17	September 29, 2011	89	AS	0	111	13.99	Normal	
W4A17	September 29, 2011	92	AS	0	105	13.17	Normal	
W4A17	September 29, 2011	94	AS	0	114	15.59	Normal	
W4A17	September 29, 2011	97	AS	0	112	14.12	Normal	
W4A17	September 29, 2011	100	AS	0	95	10.62	Normal	
W4A17	September 29, 2011	101	AS	0	107	12.16	Normal	
W4A17	September 29, 2011	76	BT	0	98	10.47	Normal	
W4A17	September 29, 2011	73	BT	0	102	10.26	Normal	
W4A17	September 29, 2011	31	BT	2	103	10.22	Adipose parasite	
W4A17	September 29, 2011	71	BT	0	103	12.03	Normal	
W4A17	September 29, 2011	16	BT	1	73	3.9	Normal	
W4A17	September 29, 2011	18	BT	1	66	3.1	Normal	
W4A17	September 29, 2011	22	BT	1	63	2.76	Normal	
W4A17	September 29, 2011	60	BT	0	106	11.26	Normal	Check 106 mm, 11.24 g
W4A17	September 29, 2011	42	BT	3	107	12.74	Normal	
W4A17	September 29, 2011	95	BT	0	107	11.33	Normal	
W4A17	September 29, 2011	96	BT	0	110	12.64	Adipose parasite	
W4A17	September 29, 2011	46	BT	3	111	13.45	Normal	Check 111 mm, 13.45 g
W4A17	September 29, 2011	37	BT	2	97	8.59	Normal	
W4A17	September 29, 2011	39	BT	2	64	2.87	Normal	
W4A17	September 29, 2011	25	BT	2	112	14.42	Normal	Check 112 mm, 14.42 g
W4A17	September 29, 2011	43	BT	3	94	8.1	Normal	
W4A17	September 29, 2011	35	BT	2	114	12.22	Normal	Check 114 mm, 12.21 g
W4A17	September 29, 2011	82	BT	0	116	13.88	Adipose parasite	
W4A17	September 29, 2011	57	BT	0	70	3.33	Normal	
W4A17	September 29, 2011	54	BT	0	117	17.31	Normal	
W4A17	September 29, 2011	61	BT	0	65	2.89	Normal	
W4A17	September 29, 2011	62	BT	0	73	4.01	Normal	
W4A17	September 29, 2011	63	BT	0	70	3.79	Normal	
W4A17	September 29, 2011	3	BT	1	124	21.5	Normal	
W4A17	September 29, 2011	9	BT	1	127	18.54	Normal	Check 127 mm, 18.52 g
W4A17	September 29, 2011	26	BT	2	129	21.65	Normal	
W4A17	September 29, 2011	93	BT	0	129	19.83	Normal	
W4A17	September 29, 2011	10	BT	1	131	20.89	Normal	Check 131 mm, 20.94 g
W4A17	September 29, 2011	85	BT	0	132	22.11	Normal	Check 132 mm, 22.09 g
W4A17	September 29, 2011	86	BT	0	96	9.91	Normal	
W4A17	September 29, 2011	90	BT	0	134	24.48	Adipose parasite	
W4A17	September 29, 2011	69	BT	0	138	24.62	Normal	
W4A17	September 29, 2011	2	BT	1	145	31.38	Normal	Check 145 mm, 31.46 g
W4A17	September 29, 2011	29	BT	2	156	37.66	Normal	Check 156 mm, 37.62 g
W4A17	September 29, 2011	105	BT	0	54	1.83	Normal	
W4A17	September 29, 2011	107	BT	0	168	47.35	Normal	
W4A17	September 29, 2011	7	SL	1	100		Normal	
W4A17	September 29, 2011	48	SL	3	100		Normal	
W4A17	September 29, 2011	49	SL	3	100		Normal	
W4A17	September 29, 2011	5	SS	1	79	6.33	Normal	
W4A17	September 29, 2011	6	SS	1	96	8.8	Normal	
W4A17	September 29, 2011	11	SS	1	87	7.94	Normal	
W4A17	September 29, 2011	17	SS	1	91	8.57	Normal	
W4A17	September 29, 2011	19	SS	1	38	0.75	Normal	
W4A17	September 29, 2011	21	SS	1	82	6.44	Normal	
W4A17	September 29, 2011	38	SS	2	76	5.01	Normal	
W4A17	September 29, 2011	41	SS	3	75	5.49	Normal	
W4A17	September 29, 2011	44	SS	3	101	12.48	Normal	
W4A17	September 29, 2011	45	SS	3	75	5.33	Normal	
W4A17	September 29, 2011	53	SS	0	76	5.73	Normal	

Table E-2.1 Quantitative Electrofishing Data for Baseline EEM

Station	Date Collected	Entry Number (field sheet order)	Species	Barrier Sweep # (0 is outside)	Fork Length (mm)	Fresh Weight (g)	External Condition	Comments
W4A17	September 29, 2011	55	SS	0	81	6.06	Normal	
W4A17	September 29, 2011	56	SS	0	61	2.66	Normal	
W4A17	September 29, 2011	58	SS	0	80	6.81	Normal	
W4A17	September 29, 2011	59	SS	0	65	2.84	Normal	
W4A17	September 29, 2011	66	SS	0	37	0.56	Normal	
W4A17	September 29, 2011	77	SS	0	95	9.33	Normal	
W4A17	September 29, 2011	98	SS	0	82	7.08	Normal	
W4A17	September 29, 2011	99	SS	0	62	2.12	Normal	
W4A17	September 29, 2011	102	SS	0	37	0.75	Normal	
W4A17	September 29, 2011	103	SS	0	39	0.64	Normal	
W4A17	September 29, 2011	104	SS	0	37	0.65	Normal	
W4A17	September 29, 2011	20	WS	1	80	6.04	Normal	
W4A17	September 29, 2011	28	WS	2	85	6.54	Normal	
W4A17	September 29, 2011	50	WS	0	104	12.7	Normal	
W4A17	September 29, 2011	83	WS	0	143	32.64	Normal	
W4A17	September 29, 2011	91	WS	0	97	10.6	Normal	
W4A21	September 27, 2011	1	AE	1	300		Normal	
W4A21	September 27, 2011	2	AE	1	200		Normal	
W4A21	September 27, 2011	16	AE	3	150		Normal	
W4A21	September 27, 2011	4	AS	1	122	24.4	Normal	
W4A21	September 27, 2011	5	AS	1	143	31.64	Normal	
W4A21	September 27, 2011	6	AS	1	95	9.85	Normal	
W4A21	September 27, 2011	7	AS	1	113	15.6	Normal	
W4A21	September 27, 2011	8	AS	1	130	21.95	Normal	
W4A21	September 27, 2011	9	AS	1	129	21.46	Normal	
W4A21	September 27, 2011	11	AS	1	103	14.04	Normal	
W4A21	September 27, 2011	12	AS	1	104	11.55	Normal	Check 104 mm, 11.57 g
W4A21	September 27, 2011	13	AS	1	96	9.26	Normal	
W4A21	September 27, 2011	14	AS	2	130	24.36	Normal	
W4A21	September 27, 2011	15	AS	3	100	11.88	Normal	
W4A21	September 27, 2011	17	AS	3	137	27.55	Normal	
W4A21	September 27, 2011	22	AS	0	139	31.51	Normal	
W4A21	September 27, 2011	24	AS	0	120	20.87	Normal	
W4A21	September 27, 2011	27	AS	0	103	13.73	Normal	
W4A21	September 27, 2011	28	AS	0	112	15.26	Normal	
W4A21	September 27, 2011	30	AS	0	141	27.22	Normal	
W4A21	September 27, 2011	31	AS	0	101	12.9	Normal	
W4A21	September 27, 2011	32	AS	0	113	14.4	Normal	
W4A21	September 27, 2011	34	AS	0	134	27.82	Normal	
W4A21	September 27, 2011	36	AS	0	105	13.29	Normal	
W4A21	September 27, 2011	37	AS	0	109	13.48	Normal	
W4A21	September 27, 2011	40	AS	0	104	14.62	Normal	
W4A21	September 27, 2011	41	AS	0	72	3.69	Normal	
W4A21	September 27, 2011	42	AS	0	103	13.25	Normal	
W4A21	September 27, 2011	44	AS	0	92	8.81	Normal	
W4A21	September 27, 2011	29	BT	0	70	3.95	Normal	Immature, unknown
W4A21	September 27, 2011	39	BT	0	72	3.53	Normal	
W4A21	September 27, 2011	43	BT	0	73	4.09	Normal	
W4A21	September 27, 2011	38	BT	0	88	7.39	Normal	Check 88 mm, 7.39 g
W4A21	September 27, 2011	35	BT	0	91	8.1	Normal	Check 91 mm, 8.08 g
W4A21	September 27, 2011	25	BT	0	98	10.04	Normal	Immature, unknown
W4A21	September 27, 2011	23	BT	0	104	11.15	Adipose parasite	
W4A21	September 27, 2011	18	BT	3	107	11.74	Normal	
W4A21	September 27, 2011	33	BT	0	110	12.52	Normal	Immature, female
W4A21	September 27, 2011	10	BT	1	123	18.48	Normal	
W4A21	September 27, 2011	21	BT	0	128	22.64	Normal	Immature, unknown
W4A21	September 27, 2011	3	BT	1	145	32.31	Normal	
W4A21	September 27, 2011	19	BT	0	146	32.52	Adipose parasite	Check 146 mm, 32.50 g
W4A21	September 27, 2011	20	WS	0	122	18.4	Normal	
W4A21	September 27, 2011	26	WS	0	123	18.54	Normal	
W4A31	September 15, 2011	1	AS	1	136	28.79	Normal	
W4A31	September 15, 2011	4	AS	1	86	8.34	Normal	
W4A31	September 15, 2011	7	AS	1	130	25.57	Normal	
W4A31	September 15, 2011	8	AS	1	88	9.5	Normal	
W4A31	September 15, 2011	10	AS	1	87	7.95	Normal	
W4A31	September 15, 2011	11	AS	1	61	2.53	Normal	
W4A31	September 15, 2011	12	AS	1	97	11.94	Normal	
W4A31	September 15, 2011	13	AS	1	115	16.39	Normal	
W4A31	September 15, 2011	14	AS	1	59	2.61	Normal	
W4A31	September 15, 2011	15	AS	1	130	22.1	Normal	
W4A31	September 15, 2011	16	AS	1	88	9.15	Normal	
W4A31	September 15, 2011	17	AS	1	87	7.7	Normal	
W4A31	September 15, 2011	18	AS	1	76	5.02	Normal	
W4A31	September 15, 2011	19	AS	1	93	9.86	Normal	
W4A31	September 15, 2011	20	AS	1	118	18.88	Normal	
W4A31	September 15, 2011	21	AS	1	57	2.09	Normal	
W4A31	September 15, 2011	23	AS	1	57	2.15	Normal	
W4A31	September 15, 2011	24	AS	1	104	13.01	Normal	
W4A31	September 15, 2011	27	AS	1	110	18.39	Normal	
W4A31	September 15, 2011	29	AS	1	60	2.46	Normal	
W4A31	September 15, 2011	30	AS	1	97	10.32	Normal	
W4A31	September 15, 2011	31	AS	1	61	2.55	Normal	
W4A31	September 15, 2011	32	AS	1	99	11.08	Normal	
W4A31	September 15, 2011	33	AS	1	98	11.84	Normal	
W4A31	September 15, 2011	34	AS	1	64	2.73	Normal	
W4A31	September 15, 2011	36	AS	1	97	10.34	Normal	
W4A31	September 15, 2011	37	AS	1	103	14.73	Normal	
W4A31	September 15, 2011	38	AS	1	106	12.1	Normal	
W4A31	September 15, 2011	39	AS	1	98	10.72	Normal	
W4A31	September 15, 2011	43	AS	2	102	12.51	Normal	

Table E-2.1 Quantitative Electrofishing Data for Baseline EEM

Station	Date Collected	Entry Number (field sheet order)	Species	Barrier Sweep # (0 is outside)	Fork Length (mm)	Fresh Weight (g)	External Condition	Comments
W4A31	September 15, 2011	44	AS	2	84	7.19	Normal	
W4A31	September 15, 2011	45	AS	2	88	9.06	Normal	
W4A31	September 15, 2011	46	AS	2	103	12.64	Normal	
W4A31	September 15, 2011	47	AS	2	105	15.55	Normal	
W4A31	September 15, 2011	48	AS	2	93	8.14	Normal	
W4A31	September 15, 2011	51	AS	2	91	9.7	Normal	
W4A31	September 15, 2011	52	AS	2	75	5.24	Normal	
W4A31	September 15, 2011	53	AS	2	101	10.63	Normal	
W4A31	September 15, 2011	56	AS	2	62	2.4	Normal	
W4A31	September 15, 2011	58	AS	2	126	20.32	Normal	
W4A31	September 15, 2011	59	AS	2	103	12.68	Normal	
W4A31	September 15, 2011	61	AS	2	90	8.82	Normal	
W4A31	September 15, 2011	63	AS	2	89	8.63	Normal	
W4A31	September 15, 2011	64	AS	2	133	25.09	Normal	
W4A31	September 15, 2011	65	AS	2	117	17.13	Normal	
W4A31	September 15, 2011	67	AS	2	127	25.02	Normal	
W4A31	September 15, 2011	70	AS	3	122	20.8	Normal	
W4A31	September 15, 2011	71	AS	3	63	2.74	Normal	
W4A31	September 15, 2011	72	AS	3	123	24.33	Normal	
W4A31	September 15, 2011	73	AS	3	97	11.37	Normal	
W4A31	September 15, 2011	74	AS	3	50	1.41	Normal	
W4A31	September 15, 2011	75	AS	3	108	15.62	Normal	
W4A31	September 15, 2011	76	AS	3	86	7.59	Normal	
W4A31	September 15, 2011	77	AS	3	90	9.83	Normal	
W4A31	September 15, 2011	5	BND	1	53	1.52	Normal	
W4A31	September 15, 2011	9	BND	1	67	3.66	Normal	
W4A31	September 15, 2011	22	BND	1	73	5.01	Normal	
W4A31	September 15, 2011	25	BND	1	77	5.64	Normal	
W4A31	September 15, 2011	26	BND	1	52	1.74	Normal	
W4A31	September 15, 2011	35	BND	1	71	4.35	Normal	
W4A31	September 15, 2011	49	BND	2	64	2.94	Normal	
W4A31	September 15, 2011	54	BND	2	78	5.77	Normal	
W4A31	September 15, 2011	55	BND	2	67	3.52	Normal	
W4A31	September 15, 2011	57	BND	2	70	3.66	Normal	
W4A31	September 15, 2011	60	BND	2	68	4.05	Normal	
W4A31	September 15, 2011	62	BND	2	63	3.69	Normal	
W4A31	September 15, 2011	68	BND	2	78	6.07	Normal	
W4A31	September 15, 2011	78	BT	0	68	2.81	Normal	
W4A31	September 15, 2011	79	BT	0	70	3.29	Adipose parasite	
W4A31	September 15, 2011	80	BT	0	112	15.31	Normal	
W4A31	September 15, 2011	82	BT	0	114	15.28	Normal	Immature
W4A31	September 15, 2011	6	BT	1	119	14.98	Normal	Immature
W4A31	September 15, 2011	83	BT	0	123	15.23	Normal	Immature
W4A31	September 15, 2011	2	BT	1	139	25.36	Normal	Immature
W4A31	September 15, 2011	81	BT	0	140	25.97	Normal	
W4A31	September 15, 2011	50	BT	2	160	42.61	Normal	
W4A31	September 15, 2011	84	BT	0	186	70.64	Normal	
W4A31	September 15, 2011	3	SL	1	100		Normal	
W4A31	September 15, 2011	41	SL	1	100		Normal	
W4A31	September 15, 2011	42	SL	1	80		Normal	
W4A31	September 15, 2011	40	SS	1	40	0.81	Normal	
W4A31	September 15, 2011	66	SS	2	87	7.7	Normal	
W4A31	September 15, 2011	69	SS	2	68	3.48	Normal	
W4A31	September 15, 2011	28	WS	1	112	17.05	Normal	
NRC	September 28, 2011	1	AE	1	200		Normal	
NRC	September 28, 2011	36	AE	2	150		Normal	
NRC	September 28, 2011	81	AE	0	150		Normal	
NRC	September 28, 2011	90	AE	0	30		Normal	
NRC	September 28, 2011	3	AS	1	98	9.54	Normal	
NRC	September 28, 2011	9	AS	1	65	3.13	Normal	
NRC	September 28, 2011	15	AS	1	64	3.15	Normal	
NRC	September 28, 2011	16	AS	1	72	4.2	Normal	
NRC	September 28, 2011	18	AS	1	68	3.53	Normal	
NRC	September 28, 2011	19	AS	1	66	3.12	Normal	
NRC	September 28, 2011	23	AS	1	62	3.05	Normal	
NRC	September 28, 2011	26	AS	2	120	16.64	Normal	
NRC	September 28, 2011	30	AS	2	66	3.68	Normal	Check 67 mm, 3.59 g
NRC	September 28, 2011	31	AS	2	64	3.12	Normal	
NRC	September 28, 2011	32	AS	2	61	2.89	Normal	
NRC	September 28, 2011	34	AS	2	65	3.2	Normal	
NRC	September 28, 2011	42	AS	3	66	3.45	Normal	
NRC	September 28, 2011	43	AS	3	63	2.65	Normal	
NRC	September 28, 2011	44	AS	0	129	24.08	Normal	
NRC	September 28, 2011	45	AS	0	113	17.63	Normal	
NRC	September 28, 2011	46	AS	0	109	14.84	Normal	
NRC	September 28, 2011	47	AS	0	73	4.12	Normal	
NRC	September 28, 2011	48	AS	0	69	3.55	Normal	
NRC	September 28, 2011	49	AS	0	70	4.57	Normal	
NRC	September 28, 2011	50	AS	0	60	2.6	Normal	Check 60 mm, 2.81 g
NRC	September 28, 2011	84	AS	0	55	1.57	Normal	
NRC	September 28, 2011	85	AS	0	70	3.4	Normal	
NRC	September 28, 2011	98	AS	0	64	3.1	Normal	
NRC	September 28, 2011	99	AS	0	58	1.93	Normal	
NRC	September 28, 2011	2	BND	1	58	2.76	Normal	
NRC	September 28, 2011	4	BND	1	67	3.8	Normal	
NRC	September 28, 2011	5	BND	1	53	2.2	Normal	
NRC	September 28, 2011	6	BND	1	52	1.89	Normal	
NRC	September 28, 2011	7	BND	1	48	1.2	Normal	
NRC	September 28, 2011	8	BND	1	68	4.42	Normal	
NRC	September 28, 2011	10	BND	1	71	4.53	Normal	Check 71 mm, 4.01 g

Table E-2.1 Quantitative Electrofishing Data for Baseline EEM

Station	Date Collected	Entry Number (field sheet order)	Species	Barrier Sweep # (0 is outside)	Fork Length (mm)	Fresh Weight (g)	External Condition	Comments
NRC	September 28, 2011	11	BND	1	64	3.55	Normal	
NRC	September 28, 2011	12	BND	1	46	1.17	Normal	
NRC	September 28, 2011	13	BND	1	63	2.99	Normal	
NRC	September 28, 2011	14	BND	1	53	1.63	Normal	
NRC	September 28, 2011	17	BND	1	44	1.05	Normal	
NRC	September 28, 2011	20	BND	1	53	2.1	Normal	Check 53 mm, 2.18 g
NRC	September 28, 2011	21	BND	1	24	0.41	Normal	
NRC	September 28, 2011	22	BND	1	46	1.22	Normal	
NRC	September 28, 2011	24	BND	1	48	1.45	Normal	
NRC	September 28, 2011	25	BND	1	48	1.92	Normal	
NRC	September 28, 2011	27	BND	2	55	1.83	Normal	
NRC	September 28, 2011	28	BND	2	61	3.05	Normal	
NRC	September 28, 2011	29	BND	2	51	1.64	Normal	
NRC	September 28, 2011	33	BND	2	33	0.44	Normal	
NRC	September 28, 2011	35	BND	2	52	1.75	Normal	
NRC	September 28, 2011	39	BND	3	66	3.78	Normal	
NRC	September 28, 2011	40	BND	3	45	1.16	Normal	66 mm, 3.71 g
NRC	September 28, 2011	41	BND	3	48	1.54	Normal	
NRC	September 28, 2011	51	BND	0	55	2.32	Normal	
NRC	September 28, 2011	52	BND	0	27	0.23	Normal	
NRC	September 28, 2011	53	BND	0	46	1.05	Normal	
NRC	September 28, 2011	54	BND	0	53	1.66	Normal	
NRC	September 28, 2011	55	BND	0	46	1.14	Normal	
NRC	September 28, 2011	56	BND	0	58	2.53	Normal	
NRC	September 28, 2011	57	BND	0	64	3.52	Normal	
NRC	September 28, 2011	58	BND	0	66	3.18	Normal	
NRC	September 28, 2011	59	BND	0	65	3.56	Normal	
NRC	September 28, 2011	60	BND	0	72	4.36	Normal	Check 72 mm, 4.29 g
NRC	September 28, 2011	61	BND	0	67	3.84	Normal	
NRC	September 28, 2011	62	BND	0	62	3.17	Normal	
NRC	September 28, 2011	63	BND	0	26	0.37	Normal	
NRC	September 28, 2011	64	BND	0	65	3.19	Normal	
NRC	September 28, 2011	65	BND	0	55	2.03	Normal	
NRC	September 28, 2011	66	BND	0	53	1.7	Normal	
NRC	September 28, 2011	67	BND	0	66	3.47	Normal	
NRC	September 28, 2011	68	BND	0	55	2.51	Normal	
NRC	September 28, 2011	69	BND	0	64	3.68	Normal	
NRC	September 28, 2011	70	BND	0	63	2.84	Normal	Check 47 mm, 1.32 g
NRC	September 28, 2011	71	BND	0	47	1.26	Normal	
NRC	September 28, 2011	72	BND	0	51	1.57	Normal	
NRC	September 28, 2011	73	BND	0	57	2.01	Normal	
NRC	September 28, 2011	74	BND	0	45	1.05	Normal	
NRC	September 28, 2011	75	BND	0	50	1.69	Normal	
NRC	September 28, 2011	76	BND	0	51	1.6	Normal	
NRC	September 28, 2011	77	BND	0	43	1.27	Normal	
NRC	September 28, 2011	78	BND	0	23	0.22	Normal	
NRC	September 28, 2011	79	BND	0	48	1.41	Normal	
NRC	September 28, 2011	80	BND	0	50	1.65	Normal	Check 50 mm, 1.63 g
NRC	September 28, 2011	91	BND	0	45	1.1	Normal	
NRC	September 28, 2011	92	BND	0	26	0.24	Normal	
NRC	September 28, 2011	93	BND	0	22	0.14	Normal	
NRC	September 28, 2011	94	BND	0	23	0.25	Normal	
NRC	September 28, 2011	89	CC	0	61	2.58	Normal	
NRC	September 28, 2011	95	CC	0	56	2.3	Normal	Check 2.33 g
NRC	September 28, 2011	96	CC	0	52	1.64	Normal	
NRC	September 28, 2011	97	CC	0	33	0.25	Normal	
NRC	September 28, 2011	100	CS	0	54	1.5	Normal	
NRC	September 28, 2011	37	SL	3	60		Normal	
NRC	September 28, 2011	38	SL	3	100		Normal	
NRC	September 28, 2011	82	SL	0	250		Normal	
NRC	September 28, 2011	83	WS	0	110	14.64	Normal	
NRC	September 28, 2011	86	WS	0	94	9.46	Normal	
NRC	September 28, 2011	87	WS	0	99	12.47	Normal	
NRC	September 28, 2011	88	WS	0	98	10.95	Normal	
NRC	September 28, 2011	101	WS	0	39	0.61	Normal	

Table E-2.2 Sactificed Brook Trout Tissue Data for Baseline EEM Measures

Station	Lab-ID	Sex (Male/Female/ Indeterminate)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Scale Age (Years)	Number of Mature Eggs
B2A2	B2A2-BT13	I	87	6.81	0.02		2.26	4.23	1+	
B2A2	B2A2-BT14	I	88	6.6	0.07		2.22	4.02	1+	
B2A2	B2A2-BT15	F	88	6.93	0.05	0.02	1.94	4.57	1+	
B2A2	B2A2-BT12	I	90	7.38	0.06		2.42	4.6	1+	
B2A2	B2A2-BT11	F	93	8.25	0.07	0.01	2.41	5.48	1+	
B2A2	B2A2-BT10	F	94	9.4	0.09	0.05	2.81	6	1+	
B2A2	B2A2-BT18	F	96	9.6	0.16	0.93	2.86	5.33	1+	29
B2A2	B2A2-BT9	M	100	10.35	0.09	0.36	3.24	6.41	2+	
B2A2	B2A2-BT8	F	105	12.15	0.1	0.06	3.55	8.02	1+	
B2A2	B2A2-BT6	M	112	15.92	0.15	0.56	5.52	9.49	2+	
B2A2	B2A2-BT5	F	114	14.32	0.27	1.75	3.88	7.77	2+	55
B2A2	B2A2-BT17	M	114	15.09	0.15	0.41	5.34	9.05	1+	
B2A2	B2A2-BT7	M	119	17.9	0.2	0.52	5.83	10.9	1+	
B2A2	B2A2-BT4	M	122	19.48	0.17	0.47	6.81	11.76	2+	
B2A2	B2A2-BT19	M	128	21.51	0.22	0.67	7.35	13.51	1+	
B2A2	B2A2-BT16	M	129	21.46	0.14	0.71	6.94	14.06	2+	
B2A2	B2A2-BT20	F	134	28.66	0.37	4.95	6.94	15.41	1+	124
B2A2	B2A2-BT3	M	157	44.43	0.41	1.39	12.17	30.65	2+	
B2A2	B2A2-BT2	M	160	48.21	0.52	1.51	14.94	31.2	1+	
B2A2	B2A2-BT1	M	168	51.54	0.41	1.32	18.54	31	2+	
B3A9	B3A9-BT18	I	67	3.13	0.01		1.12	1.75	0+	
B3A9	B3A9-BT16	I	85	6.28	0.05		2.14	3.86	1+	
B3A9	B3A9-BT19	I	89	8.19	0.06		2.81	4.76	1+	
B3A9	B3A9-BT17	I	90	7.22	0.03		2.55	4.37	1+	
B3A9	B3A9-BT20	I	94	8.43	0.02		2.86	5.19	1+	
B3A9	B3A9-BT5	I	102	10.64	0.12		3.63	6.66	1+	
B3A9	B3A9-BT3	F	112	13.26	0.03	0.07	4.44	8.47	2+	
B3A9	B3A9-BT2	I	115	14.24	0.12		4.75	9.02	1+	
B3A9	B3A9-BT12	F	116	17.59	0.23	1.67	5.24	9.96	2+	62
B3A9	B3A9-BT4	I	119	16.75	0.1		5.88	10.49	2+	
B3A9	B3A9-BT15	I	123	17.03	0.12		5.95	10.48	2+	
B3A9	B3A9-BT13	I	124	18.21	0.18		6.3	11.1	2+	
B3A9	B3A9-BT6	F	128	22	0.18	0.04	7.13	14.29	2+	
B3A9	B3A9-BT14	F	129	22.49	0.4	3.03	6.29	12.16	2+	68
B3A9	B3A9-BT11	F	133	21.73	0.22	1.93	8.36	11.87	3+	52
B3A9	B3A9-BT7	F	136	39.25	0.58	5.46	9.96	22.69	2+	150
B3A9	B3A9-BT10	I	146	26.14	0.2		8.9	16.38	2+	
B3A9	B3A9-BT1	F	147	35.08	0.52	4.86	10.31	18.97	2+	78
B3A9	B3A9-BT8	M	166	61.53	0.48	1.94	22.48	37.74	2+	
B3A9	B3A9-BT9	M	169	57.79	0.53	1.58	20.89	35.6	2+	
S2A2	S2A2-BT20	F	87	7.28	0.08		2.23	4.68	1+	
S2A2	S2A2-BT6	F	90	7.36	0.06		2.15	4.93	1+	
S2A2	S2A2-BT12	F	90	7.38	0.06		2.34	4.55	1+	
S2A2	S2A2-BT7	F	92	8.09	0.09		2.57	5.17	1+	
S2A2	S2A2-BT16	F	92	8.09	0.06		2.58	5.13	1+	
S2A2	S2A2-BT19	F	96	8.95	0.08		2.95	5.6	1+	
S2A2	S2A2-BT17	I	97	9.75	0.09		2.96	6.34	1+	
S2A2	S2A2-BT24	I	104	11.03	0.08		3.19	7.52	1+	
S2A2	S2A2-BT18	F	105	11.9	0.07		3.53	8.04	1+	
S2A2	S2A2-BT13	M	108	14.4	0.14		4.44	9.44	1+	
S2A2	S2A2-BT5	F	110	12.41	0.09		3.57	8.31	1+	
S2A2	S2A2-BT22	F	111	13.6	0.11		3.88	9.15	1+	
S2A2	S2A2-BT10	F	124	22.93	0.41	2.46	6.04	13.49	2+	92
S2A2	S2A2-BT3	M	128	20.84	0.25	0.71	5.72	14.47	2+	

Table E-2.2 Sactificed Brook Trout Tissue Data for Baseline EEM Measures

Station	Lab-ID	Sex (Male/Female/ Indeterminate)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Scale Age (Years)	Number of Mature Eggs
S2A2	S2A2-BT4	F	131	24.13	0.41	2.41	6.65	14.02	2+	83
S2A2	S2A2-BT14	M	131	25.45	0.26	0.74	8.42	16.27	2+	
S2A2	S2A2-BT9	F	133	25.23	0.45	3.1	6.36	14.85	2+	90
S2A2	S2A2-BT25	M	140	31.73	0.31	1.08	10.25	20.46	1+	
S2A2	S2A2-BT1	M	143	35.27	0.37	1.21	9.81	24.66	2+	
S2A2	S2A2-BT11	M	145	37.37	0.33	0.95	11.02	25.24	2+	
S2A2	S2A2-BT21	F	146	38.29	1.18	3.05	8.71	24.53	2+	223
S2A2	S2A2-BT15	M	160	44.84	0.25	1.78	13.6	30.07	2+	
S2A2	S2A2-BT8	M	165	46.03	0.33	3.02	16.33	30.07	2+	
S2A2	S2A2-BT2	M	174	60.4	0.56	2.11	16.63	42.2	2+	
S2A2	S2A2-BT23	M	181	64.12	0.64	2.11	17.84	44.32	2+	
S3A3	S3A3-BT27	I	84	5.96	0.053		2.02	3.55	1+	
S3A3	S3A3-BT26	I	89	7.09	0.08		2.26	4.41	1+	
S3A3	S3A3-BT22	I	95	9.13	0.091		3.03	5.61	1+	
S3A3	S3A3-BT17	I	98	9.8	0.099		3.32	6.01	1+	
S3A3	S3A3-BT18	I	98	9.13	0.07		3.18	5.52	1+	
S3A3	S3A3-BT19	I	98	10.28	0.077		3.44	6.33	1+	
S3A3	S3A3-BT14	I	100	10.52	0.077		3.52	6.37	1+	
S3A3	S3A3-BT16	F	100	10.9	0.086	0.02	4.14	6.13	1+	
S3A3	S3A3-BT23	I	100	10.55	0.102		3.64	6.44	1+	
S3A3	S3A3-BT24	F	101	10.17	0.114	0.05	3.55	6.11	1+	
S3A3	S3A3-BT15	I	108	12.45	0.119		4.23	7.58	1+	
S3A3	S3A3-BT9	F	110	13.5	0.132	0.07	4.58	8.26	1+	
S3A3	S3A3-BT25	F	110	14.07	0.149	0.1	5.31	8.22	2+	
S3A3	S3A3-BT28	F	110	14.08	0.167	0.08	4.64	8.79	2+	
S3A3	S3A3-BT11	I	111	14.78	0.115		5.8	8.46	2+	
S3A3	S3A3-BT13	F	111	13.36	0.119	0.11	4.64	8.07	1+	
S3A3	S3A3-BT12	F	112	13.77	0.162	0.12	4.66	8.48	2+	
S3A3	S3A3-BT21	I	114	14.97	0.182		5.6	8.74	1+	
S3A3	S3A3-BT10	F	116	18.88	0.411	2.212	5.44	10.31	1+	62
S3A3	S3A3-BT7	F	129	21.46	0.262	2.99	6.64	10.89	2+	73
S3A3	S3A3-BT20	I	129	20.94	0.209		7.23	12.88	1+	
S3A3	S3A3-BT8	F	130	19.93	0.195	0.589	6.53	11.37	2+	8
S3A3	S3A3-BT2	I	135	26.8	0.199		9.62	16.16	2+	
S3A3	S3A3-BT6	F	135	25.25	0.215	3.225	7.81	13.03	1+	62
S3A3	S3A3-BT3	M	136	30.12	0.458	0.68	10.17	18.98	1+	
S3A3	S3A3-BT5	M	136	28.52	0.18	0.58	9.7	17.99	2+	
S3A3	S3A3-BT4	M	140	26.99	0.236	0.39	8.3	17.66	2+	
S3A3	S3A3-BT1	M	163	46.41	0.393	0.52	16.64	28.59	1+	
M3C3	M3C3-BT3	I	100	9.89	0.06		3.38	6.29	1+	
M3C3	M3C3-BT5	M	114	16.29	0.16	0.61	5.39	10.4	2+	
M3C3	M3C3-BT4	M	116	16.02	0.11		4.83	10.89	1+	
M3C3	M3C3-BT6	I	122	19.96	0.24		6.61	12.72	2+	
M3C3	M3C3-BT8	F	123	21.66	0.44	1.12	6.02	9.84	1+	100
M3C3	M3C3-BT10	I	125	18.22	0.17		6.02	11.6	2+	
M3C3	M3C3-BT2	I	129	22.32	0.17		7.33	14.47	3+	
M3C3	M3C3-BT9	M	143	33.05	0.24	1.55	11.39	20.83	2+	
M3C3	M3C3-BT7	F	160	44.51	0.86	2.63	11.84	28.4	2+	180
M3C3	M3C3-BT1	F	165	50.61	0.83	3.39	14.18	31.62	2+	181
W4A17	W4A17-BT17	F	98	10.47	0.132	0.04	3.97	6.12	2+	
W4A17	W4A17-BT16	I	102	10.26	0.074		3.87	6.06	1+	
W4A17	W4A17-BT8	F	103	10.22	0.083	0.02	3.7	6.02	1+	
W4A17	W4A17-BT15	I	103	12.03	0.083		4.5	7.23	1+	
W4A17	W4A17-BT13	F	106	11.26	0.088	0.04	3.93	6.94	1+	

Table E-2.2 Sactificed Brook Trout Tissue Data for Baseline EEM Measures

Station	Lab-ID	Sex (Male/Female/ Indeterminate)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Scale Age (Years)	Number of Mature Eggs
W4A17	W4A17-BT10	F	107	12.74	0.087	0.12	4.17	8.21	1+	
W4A17	W4A17-BT22	I	107	11.33	0.093		4.07	6.86	1+	
W4A17	W4A17-BT23	I	110	12.64	0.079		4.51	7.77	1+	
W4A17	W4A17-BT11	I	111	13.45	0.095		4.68	8.39	1+	
W4A17	W4A17-BT5	I	112	14.42	0.114		5.06	8.94	1+	
W4A17	W4A17-BT9	I	114	12.22	0.113		4.44	7.35	1+	
W4A17	W4A17-BT18	F	116	13.88	0.125	0.09	5.1	8.29	2+	
W4A17	W4A17-BT12	F	117	17.31	0.122	0.07	6.53	10.28	2+	
W4A17	W4A17-BT2	F	124	21.5	0.297	2.106	6.78	12.01	2+	78
W4A17	W4A17-BT3	I	127	18.54	0.199		6.48	11.38	1+	
W4A17	W4A17-BT6	I	129	21.65	0.135		7.54	13.58	2+	
W4A17	W4A17-BT21	I	129	19.83	0.14		6.69	12.64	1+	
W4A17	W4A17-BT4	F	131	20.89	0.35	2.299	6.58	11.26	2+	65
W4A17	W4A17-BT19	F	132	22.11	0.355	2.568	6.07	12.55	2+	82
W4A17	W4A17-BT20	I	134	24.48	0.187		9.04	14.79	2+	
W4A17	W4A17-BT14	F	138	24.62	0.296	3.349	7.18	12.75	2+	87
W4A17	W4A17-BT1	I	145	31.38	0.221		10.53	20.17	2+	
W4A17	W4A17-BT7	F	156	37.66	0.518	4.516	10.93	21.02	2+	134
W4A17	W4A17-BT24	F	168	47.35	0.748	6.797	11.98	26.62	2+	164
W4A21	W4A21-BT8	I	70	3.95	0.041		1.22	2.55	0+	
W4A21	W4A21-BT12	I	72	3.53	0.035		1.23	2.12	0+	
W4A21	W4A21-BT13	I	73	4.09	0.057		1.4	2.42	0+	
W4A21	W4A21-BT11	I	88	7.39	0.053		2.78	4.29	1+	
W4A21	W4A21-BT10	F	91	8.1	0.068	0.02	2.6	4.99	1+	
W4A21	W4A21-BT7	I	98	10.04	0.088		3.33	6.26	1+	
W4A21	W4A21-BT6	I	104	11.15	0.129		4.1	6.58	1+	
W4A21	W4A21-BT3	I	107	11.74	0.093		3.66	7.58	1+	
W4A21	W4A21-BT9	F	110	12.52	0.141	0.06	4.2	7.82	1+	
W4A21	W4A21-BT2	F	123	18.48	0.192	0.03	6.14	11.47	1+	
W4A21	W4A21-BT5	I	128	22.64	0.178		7.64	14.42	2+	
W4A21	W4A21-BT1	M	145	32.31	0.218	0.83	10.94	20.79	2+	
W4A21	W4A21-BT4	I	146	32.52	0.261		11.96	19.78	1+	
W4A31	W4A31-BT4	I	68	2.81	0.026		0.97	1.69	0+	
W4A31	W4A31-BT5	I	70	3.29	0.027		1.02	2.13	0+	
W4A31	W4A31-BT6	I	112	15.31	0.108		5.14	9.61	2+	
W4A31	W4A31-BT8	F	114	15.28	0.141	0.06	4.81	9.97	1+	
W4A31	W4A31-BT2	I	119	14.98	0.1		5.23	9.19	1+	
W4A31	W4A31-BT9	F	123	15.23	0.084	0.06	4.93	9.84	1+	
W4A31	W4A31-BT1	I	139	25.36	0.2		7.58	16.99	1+	
W4A31	W4A31-BT7	I	140	25.97	0.216		8.06	17.22	2+	
W4A31	W4A31-BT3	F	160	42.61	0.52	3.71	11.61	25.98	2+	119
W4A31	W4A31-BT10	F	186	70.64	1.32	10.277	17.16	40.48	2+	254
EBNB1	EBNB1-BT3	I	72	3.48	0.034		1.16	2.12	0+	
EBNB1	EBNB1-BT2	I	127	19.13	0.132		6.27	12.09	1+	
EBNB1	EBNB1-BT1	F	140	25.94	0.192	0.03	8.54	16.57	1+	

entered MJS ✓ DMW Pg 1 / 2

Watercourse/Site: S2A2 | Quantitative Site Survey | Job #: 121810356

Personnel: CMW MJS DT | Brook Trout | Date: Sept 12, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
1			13.4	24.33					
2			14.8	37.52					
3			11.3	14.33					
4			12.7	22.76					
5			13.2	25.25					
6			14.7	38.28					
7			18.3	36.86	* outlier.				
8			14.3	31.65					
9			11.4	13.67					
10			17.3	60.55					Check
11			14.3	35.83					
12			13.3	25.48					
13			10.9	12.19					
14			8.9	7.01					
15			16.5	46.60					
16			16.0	40.72					
17			10.9	12.49					
18			12.9	20.97					
19			10.6	11.18					
20			9.5	8.13					Check
21			9.9	9.60					
22			8.7	5.62					
23			9.0	7.34					
24			6.0	2.40					
25			5.9	2.21					
26			5.6	1.71					
27			6.4	2.63					
28			9.5	8.02					
29			9.2	7.41					
30			9.8	~~8.78~~					Check
31			4.9	1.12					
32			5.8	2.02					
33			8.4	5.94					
34			6.7	2.90					
35			5.3	1.46					
36			8.5	6.06					
37			5.9	2.14					
38			9.1	7.25					
39			6.0	2.30					
40			6.7	2.87					Check
41			6.1	2.28					
42			5.2	1.54					
43			5.2	1.48					
44			6.2	2.29					
45			7.8	4.41					
46			6.5	2.95					
47			5.9	2.12					
48			6.4	2.59					
49			6.2	2.43					
50			5.0	1.38					Check

Sweep 1

Sweep 2

Sweep 3

Captured BT only

need to return & release (50 – 100 fish)

average 20 to 40 fish

not this site, B2A2 MJS

Watercourse/Site: SLA2 | Quantitative Site Survey | Job #: 121810356

Personnel: EMW MJS DT | Brook Trout | Date: ~~Aug~~ Sept 12, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									Check
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									Check
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									Check
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									Check

Electrofisher Settings	Time (s)	Voltage	Amps	Duty Cycle	Total BT	Total SS	Total BT	Total ___
Sweep 1	942	990	40	12	14	0	14 +2	
Sweep 2	1635	990	40	12	5	0	19 +4	7 ~~75~~ BT
Sweep 3	824	990	40	12	6	0	25	~~in total~~
~~Sweep 4~~	1526	990	40	12	27	0	52	
Sweep 5								

US outside station

Water Quality						
Air Temp. (ºC)	18°C	Salinity (ppt)	0.0	ORP(mv)	205	
Water Temp.	11.6	DO (mg/L)	10.15	93.4%		2 extra
Sp. Conductivity (µS/sec)	225	pH (water)	6.1			

site is > 100m² & 140 m² due to Alders + pinch pts.

Entered MJS

pg. 2/2

Watercourse/Site: SZAZ

Quantitative Site Survey

Job #: 121810356

Personnel: EMW MJS DT

Brook Trout

Date: Sept 12 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
1		M	14.3	35.27	0.37	1.21	9.81	24.66	
2		M	17.4	60.40	0.56	2.11	16.63	42.20	
3		M	12.8	20.84	0.25	0.71	5.72	14.47	
4		F	13.1	24.13	0.41	2.41	6.65	14.02	
5		F	11.0	12.41	0.09	—	3.57	8.31	Immature Female
6		F	9.0	7.36	0.06	—	2.15	4.93	Immature Female
7		F	9.2	8.09	0.09	~~2.57~~	2.57	5.17	Immature female
8		M	16.5	46.03	0.33	3.02	16.33	30.07	
9		F	13.3	25.23	0.45	3.10	6.36	14.85	
10		F	12.4	22.93	0.41	2.46	6.04	13.49	Check 22.90g
11		M	14.5	37.37	0.33	0.95	11.02	25.24	
12		F	9.0	7.38	0.06	—	2.34	4.55	Immature Female
13		M	10.8	14.40	0.14	—	4.44	9.44	Immature Male
14		M	13.1	25.45	0.26	0.74	8.42	16.27	
15		M	16.0	44.84	0.25	1.78	13.60	30.07	
16		F	9.2	8.09	0.06	—	2.58	5.13	Immature female
17		I	9.7	9.75	0.09	—	2.96	6.34	Immature
18		F	10.5	11.90	0.07	—	3.53	8.04	Immature female
19		F	9.6	8.95	0.08	—	2.95	5.60	Immature female
20		IF	8.7	7.28	0.08	—	2.23	4.68	Check 7.25g; Immature female
21		F	14.6	38.29	1.18	3.05	8.71	24.53	
22		F	11.1	13.60	0.11	—	3.88	9.15	Immature female
23		M	18.1	64.12	0.64	2.11	17.84	44.32	
24		I	10.4	11.03	0.08	—	3.19	7.52	Immature
25		M	14.0	31.73	0.31	1.08	10.25	20.46	
26									
27									
28									
29									
30									Check
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									Check
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									Check

M. Sweezey ✓ S3A3 121810356 Sep. 26, 2011

- completed S3A3 w/ Mike Sweezey, Dave Blanchard, & Dave Turnbull (Quantitative assessment)
- Placed barriers approx. 40m apart. Stream 23.5m average width (140m²).
- completed 3 sweeps & ID'd Brook Trout (11) & Ameel (2).
- completed additional electrofishing upstream (2618s) 180m above barriers & captured 51 additional brook trout & 3 American eel.
- 62 Brook Trout total weighed & measured 28 sacrificed for further examination (9.8-16.3cm, w/ exception of 3 BT (8.4-9.5cm) sacrificed prior to additional e-fishing.
- of the 28 sequenced 8 were found to be mature (4 male / 4 female) ranging between 11.6 and 16.3cm

Watercourse/Site: S3A3 | Quantitative Site Survey | Job #: 121810356

Personnel: MJS, D.B, D.J. | Brook Trout | Date: 26/09/11

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
Add. Sleep 1	Br. Tr.		9.5	8.77					
2			9.7	8.47					
3			8.5	6.49					
4			8.7	6.20					
5			9.0	7.00					
6			8.7	6.34					
7			8.6	6.32					
8			7.9	4.91					
9			9.0	7.96					
10			9.5	8.74					Check 9.5, 8.56
11			9.2	8.45					
12			9.3	7.44					
13			8.3	5.31					
14			8.3	5.50					
15			6.5	2.84					
16			9.6	9.10					
17			9.4	8.00					
18			8.4	5.71					
19			9.6	9.28					
20			9.1	7.36					Check 9.1, 7.51
21			9.2	7.83					
22			7.9	4.71					
23			5.2	1.52					
24			8.3	5.79					
25			8.0	5.26					
26			9.4	7.31					
27			9.5	8.36					
28			6.8	3.32					
29			8.7	7.16					
30			9.0	7.20					Check
31			5.7	1.57					
32			8.4	5.74					→ 8.4, 5.78
33	BT-1	M	16.3	46.41	0.393	0.52	16.64	28.59	
34	BT-2	I	13.5	26.80	0.199	—	9.62	16.16	Immature unknown
35	BT-3	M	13.6	30.12	0.458	0.68	10.17	18.98	
36	BT-4	M	14.0	26.99	0.236	0.39	8.30	17.66	
37	BT-5	M	13.6	28.52	0.180	0.58	9.70	17.99	
38	BT-6	F	13.5	25.25	0.215	3.225	7.81	13.03	
39	BT-7	F	12.9	21.46	0.262	2.990	6.64	10.89	
40	BT-8	F	13.0	19.93	0.195	0.589	6.53	11.37	Check 19.95 gm
41	BT-9	IF	11.0	13.50	0.132	0.07	4.58	8.26	Immature female
42	BT-10	F	11.6	18.88	0.411	2.212	5.44	10.31	
43	BT-11	I	11.1	14.78	0.115	—	5.80	8.46	Immature Unknown
44	BT-12	IF	11.2	13.77	0.162	0.12	4.66	8.48	Immature female
45	BT-13	IF	11.1	13.36	0.119	0.11	4.64	8.07	Immature female
46	BT-14	I	10.0	10.52	0.077	—	3.52	6.37	Immature Unknown
47	BT-15	I	10.8	12.45	0.119	—	4.23	7.58	Immature Unknown
48	BT-16	IF	10.0	10.90	0.086	0.02	4.14	6.13	Immature female
49	BT-17	I	9.8	9.80	0.099	—	3.32	6.01	Immature Unknown
50	BT-18	I	9.8	9.13	0.070	—	3.18	5.52	Check 9.12 g Immature Unknown fin included w scale sample

Am. eel (SW1) ~25 cm
(SW2) ~20 cm
(Add.) ~30 cm, ~25 cm, ~20 cm } not kept.

Watercourse/Site: 53A3 | Quantitative Site Survey | Job #: 121810356

Personnel: MJS/DB/LRT | Brook Trout | Date: Sep. 26, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
Add 19									
51	BT-19	I	9.8	10.28	0.077	—	3.44	6.33	Immature/Unknown
52	BT-		6.3	2.59					
53	"		5.7	2.15					
54	BT-20	I	12.9	20.94	0.209	—	7.23	12.88	Immature Unknown
55	BT-21	I	11.4	14.97	0.182	—	5.60	8.74	Immature Unknown
56	BT-22	I	9.5	9.13	0.091	—	3.03	5.61	Immature unknown
57	BT-23	I	10.0	10.55	0.102	—	3.64	6.44	Immature unknown
58	BT-24	IF	10.1	10.17	0.114	0.05	3.55	6.11	Immature female
59	BT-25	IF	11.0	14.07	0.149	0.10	5.31	8.22	Immature female
60	BT-26	I	8.9	7.09	0.080	—	2.26	4.41	Check Immature Unknown
61	BT-27	I	8.4	5.96	0.053	—	2.02	3.55	5.95g unknown
62	BT-28	IF	11.0	14.08	0.167	0.08	4.64	8.79	Immature female
63									
64									
65									
66	28 fish		total			killed			
67									
68									
69									
70									Check
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									Check
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									Check

SW 1 ↓ SW 2 ↓ SW 3

Electrofisher Settings	Time (s)	Voltage	Amps	Duty Cycle	Total BT	Total SS	Total ___	Total ___
Sweep 1	737	950	12	30	7			
Sweep 2	640	990	14	35	3			
Sweep 3	615	990	14	35	1			
Add Sweep 4	2618	990	14	35				
Sweep 5								

Water Quality					
Air Temp. (ºC)	22.4	Salinity (ppt)	0	ORP(mv)	27
Water Temp.	13.0	DO (mg/L)	94.3%	9.97 mg/L	
Sp. Conductivity (µS/sec)	26.1	pH (water)	6.4		

Pg. 1/2

Watercourse/Site: B2A2 | Quantitative Site Survey | Job #: 121810356

Personnel: MJS/EMW/DB | Brook Trout | Date: Sep 8, 2011

	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Condition Factor (W/(L^3))/100	Filet Weight	Comments
1	4.8 cm						
2	6.2						
3	5.2						
4	8.1						
5	8.3						
6	8.5						
7	5.7						
8	8.4						
9	8.7						
10	8.6						Check
11	7.9						
12	6.6						
13	8.5						
14	7.2						
15	5.9						
16	6.1						
17	6.4						
18	7.2						
19	5.8						
20	5.7						Check
21	5.8						
22	6.2						
23	4.3						
24	6.3						
25	8.5						
26	5.7						
27	6.9						
28	7.9						
29	7.6						
30	5.0						Check
31	6.2						
32	8.2						
33	4.6						
34	5.8						Adip. parisite
35	5.9						
36	6.4						
37	7.9						
38	8.4						
39	5.9						
40	4.9						Check
41	7.0						
42	5.4						
43	5.6						
44	4.1						
45	5.6						
46	4.6						
47	7.4						
48	5.2						
49	5.3						
50	7.3						Check

Pg. 2 of 2

Watercourse/Site: B2A2 | Quantitative Site Survey | Job #: 121810356

Personnel: M | Brook Trout | Date: Sep. 8, 2011

	Fork Length (mm) cm	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Condition Factor (W/(L^3))/100	Filet Weight	Comments
S 1	5.7						
S 2	5.9						Parasite ~~cyst~~ on side
S 3	4.8						
S 4	5.7						
S 5	6.8						
S 6	6.4						
S 7	5.9						
S 8	4.7						
S 9	5.8						
10							Check
11							
12							
13							
14							
15							
16							
17							
18							
19							
20					Viscera	carcass	Check
BT 1 21	16.8	51.54	0.41	1.32	18.54	30.00	Male
BT 2 22	16.0	48.21	0.52	1.51	14.99	31.20	Male
BT 3 23	15.7	44.43	0.41	1.39	12.17	30.65	Male
BT 4 24	12.2	19.48	0.17	0.47	6.81	11.76	Male
BT 5 25	11.4	14.32	0.27	1.75	3.88	7.77	Female
BT 6 26	11.2	15.92	0.15	0.56	5.52	9.49	Male
BT 7 27	11.9	17.90	0.20	0.52	~~5.85~~	10.90	Male - Adipose parasite
BT 8 28	10.5	12.15	0.10	0.06	3.55	8.02	Female - immature
BT 9 29	10.0	10.35	0.09	0.36	3.24	6.41	Male
BT 10 30	9.4	9.40	0.09	0.05	2.81	6.00	Check Female - immature
BT 11 31	9.3	8.25	0.07	0.01	2.48	5.48	Female - immature 9.3/5.2
BT 12 32	9.0	7.38	0.06	—	2.42	4.60	Immature
BT 13 33	8.7	6.81	0.02	—	2.26	4.23	"
BT 14 34	8.8	6.60	0.07	—	2.22	4.02	"
BT 15 35	8.8	6.93	0.05	0.02	1.94	4.57	Female - immature
36							
37							
38							
39							
40							Check
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							Check

Watercourse/Site: BEAR

Personnel: EMW MJS OB

Quantitative Site Survey
Slimy Sculpin

Job #: 121810356

Date: Sept 8, 2011

	Total Length (cm)	Fresh Weight (g)	Condition Factor (W/(L^3))/100	Comments
1	5.6	1.75		
2	5.3	1.92		
3	7.5	4.84		
4	5.4	1.55		
5	8.6	5.93		
6	5.1	1.36		
7	5.0	1.23		
8				
9				
10				Check
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				Check
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				Check
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				Check
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				Check

WQ
87.3 % DO pH 5.9
9.46 mg/L
11.8°C
17.4 ms
0.0 ppt
234 mv (ORP)

sweep 1 - 1496 sec
42 BT
2 SS

Sweep 2 - 1435 sec
19 BT
1 SS

sweep 3 - 1064 sec
12 BT
4 SS

Stantec

Sep. 16, 2011 121810356
MJS BZAZ

- Returned to BZAZ to characterize L+W relationship of trout.

- Completed 1508 s of electrofishing ~50 m below previously barricaded area + w/in previously swept area.

- Obtained brook trout (54) + slimy sculpin (4) ⇒ weighed + measured all fish.

- 15 fish were previously sacrificed @ this site. ∴ the 5 largest fish captured (ranging b/w 9.6 cm & 11.4 - 13.4 cm) were sacrificed so that we'd have 20 fish for metals analyses in total.

- returned to Juniper, sequenced killed fish + returned to Fredericton.

- Now have L+W for 69 BT total

Designed by: Checked by:

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Watercourse/Site: B2A2 Quantitative Site Survey Job #: 121810356

Personnel: MJS/DB/HE/DT Brook Trout Date: Sep. 16, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
1	BT		5.2	1.34					
2	BT		4.9	1.23					
3	BT		6.7	2.95					
4	BT		8.8	7.06					
5	BT		6.2	2.41					
6	BT		5.0	1.22					
7	BT		4.8	1.01					
8	BT		5.0	1.37					
9	BT		4.3	0.69					
10	BT		6.3	2.39					Check
11	BT		7.4	3.70					
12	BT		5.6	1.60					
13	BT		5.4	1.66					
14	BT		7.3	3.99					
15	BT		8.3	5.03					
16	BT-19	M	12.8	21.51	0.22	0.67	7.35	13.51	
17	BT		8.2	5.27					
18	BT		6.3	2.87					
19	BT		7.8	4.43					
20	BT		5.9	3.21					Check
21	BT		5.7	1.76					
22	BT		6.2	2.49					
23	BT		6.4	2.53					
24	BT		5.1	1.35					
25	BT		6.6	2.47					
26	BT		4.8	1.01					
27	BT		4.9	1.03					
28	BT		5.8	1.88					
29	BT		6.4	2.62					
30	BT		4.9	1.09					Check
31	BT		5.1	1.33					
32	SS		7.8	3.31					
33	SS		6.0	2.13					
34	BT-20	F	13.4	28.66	0.37	4.95	6.94	15.41	
35	BT-16	M	12.9	21.46	0.14	0.71	6.94	14.06	
36	BT-17	M	11.4	15.09	0.15	0.41	5.34	9.05	
37	BT-18	F	9.6	9.60	0.16	0.93	2.86	5.33	
38	BT		8.0	4.71					
39	BT		6.3	2.08					
40	BT		5.9	1.79					Check
41	SS		8.6	6.07					
42	BT		8.4	5.76					
43	BT		8.8	6.51					
44	BT		5.9	1.89					
45	BT		7.6	3.92					
46	BT		5.3	1.34					
47	BT		5.0	2.21					
48	BT		4.8	1.04					
49	BT		7.4	3.41					
50	SS		6.3	2.65					Check

Watercourse/Site: B2A2 | Quantitative Site Survey | Job #: 121810356

Personnel: MOSIDB/HELDT | Brook Trout | Date: Sep. 16, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
51	BT		4.4	0.78					
52	BT		6.4	2.37					
53	BT		4.8	1.11					
54	BT		6.0	1.98					
55	BT		5.0	1.21					
56	BT		5.7	1.79					
57	BT		5.4	1.49					
58	BT		5.4	1.50					
59									
60									Check
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									Check
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									Check
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									Check

Electrofisher Settings	Time (s)	Voltage	Amps	Duty Cycle	Total BT	Total SS	Total ___	Total ___
Sweep 1	1508							
Sweep 2								
Sweep 3								
Sweep 4								
Sweep 5								

Water Quality						
Air Temp. (ºC)	10 °C	Salinity (ppt)	0.0	ORP(mv)	142	
Water Temp.	10.4	DO (mg/L)	8.79	78.7		
Sp. Conductivity (µS/sec)	19.0	pH (water)				

5.9

Mike Sweezey 121810356 Sep. 14, 2011
B3A9

- MJS/DB/HF/DT completed quantitative site assessment @ site B3A9.
- barrier nets placed in stream approximately 3m wide & 33m apart (i.e., 100 m2)
- captured Atlantic salmon (1), Brook Trout (18), American eel (2), & sliny sculpin (15) in 3 sweeps - (36 fish total)
- completed additional 1220 s e-fishing in 2100m stream length above barriers.
  → captured At. Sal. (1), Br. Tr. (13), Am. eel (2), Sliny sculpin (4), (20 fish total).

Brook Trout - 31 characterized (L/W)
→ 15 >10cm sacrificed
→ + add. 5 sacrificed to make 20
→ 7 mature (2male/5female) (<10cm)

Sliny Sculpin — 19 characterized (L/W)

Pg: 1/1

Watercourse/Site: B3A9 | Quantitative Site Survey | Job #: 121810356

Personnel: MJS/HF/DB/JDT | Brook Trout | Date: Sep. 14, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
Sweep 1	51	SAS		11.9	17.11				
	52	BT		9.4	8.62				
	53	BT		8.9	7.31				
	54	BT		9.0	7.24				
	55	BT		8.8	7.01				
	56	BT		7.1	3.65				
	57	SS		6.7	3.20				
	58	SS		3.0	0.29				
	59	SS		5.2	1.48				
	60	SS		7.4	4.54				Check
	61	SS		5.8	2.01				
	62	SS		6.1	2.99				
	63	SS		7.2	4.16				
	64	SS		3.0	0.28				
	65	SS		2.8	0.20				
	66	AF		~25					
	67	AF		~30					
	68	BT-1	F	14.7	35.08	0.52	4.86	10.31	18.97	
	69	BT-2	?	11.5	14.24	0.12	—	4.75	9.02	Immature
	70	BT-3	F	11.2	13.26	0.03	0.07	4.44	8.47	Check Immature Female
Sweep 2	71	BT		6.9	3.32					
	72	BT-17	?	9.0	7.22	0.03	—	2.55	4.37	Immature
	73	BT		6.7	3.21					
	74	SS		7.1	4.08					
	75	SS		7.7	5.96					
	76	SS		5.7	2.22					
	77	SS		6.0	2.17					
	78	BT-4	?	11.9	16.75	0.10	—	5.88	10.49	Immature
	79	BT-5	?	10.2	10.64	0.12	—	3.63	6.66	Immature
	80	BT-6	F	12.8	22.00	0.18	2.04	7.13	14.29	Check Immature Female
Swep 3	81	BT		4.9	1.36					
	82	BT-20		9.4	8.43	0.02	—	2.86	5.19	Immature
	83	BT		5.9	2.38					
	84	SS		7.7	5.56					
	85	SS		5.6	1.94					
?	86	BT-7	F	13.6	39.25	0.58	5.46	9.96	22.69	
Outside	87	AS		12.8	21.53					
	88	BT-16	?	8.5	6.28	0.05	—	2.14	3.86	Immature
	89	BT-19	?	8.9	8.19	0.06	—	2.81	4.76	Immature
	90	BT		6.3	2.38					Check

Electrofisher Settings	Time (s)	Voltage	Amps	Duty Cycle	Total BT	Total SS	Total ___	Total ___
Sweep 1	978	990	35	16				
Sweep 2	779	990	35	16				
Sweep 3	725	990	35	16				
Sweep 4	1220	990	35	16				
Sweep 5								

Water Quality					
Air Temp. (ºC)	17.0°C	Salinity (ppt)	Ø	ORP(mv)	97
Water Temp.	13.4°C	DO (mg/L)	92.6%	9.79 m/l	
Sp. Conductivity (µS/sec)	17.8	pH (water)	6.4		

Watercourse/Site: BSA9 | Quantitative Site Survey | Job #: 121810356

Personnel: MJS/DB/HF/DT | Brook Trout | Date: Sep. 14, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
1	SS		6.3	2.76					
2	SS		8.6	7.07					
3	BT-18	?	6.7	3.13	0.01	—	1.12	1.75	Immature
4	BT		6.6	2.90					
5	AE		~15						
6	SS		7.6	4.46					
7	SS		7.1	4.59					
8	AE		~60						
9	BT-8	M	16.6	61.53	0.48	1.94	22.48	37.74	
10	BT-9	M	16.9	57.79	0.53	1.58	20.89	35.60	Check
11	BT-10	?	14.6	26.14	0.20	—	8.90	16.38	Immature
12	BT-11	F	13.3	21.73	0.22	1.93	8.36	11.87	
13	BT-12	F	11.6	17.59	0.23	1.67	5.24	9.96	
14	BT-13	?	12.4	18.21	0.18	—	6.30	11.10	Immature
15	BT-14	F	12.9	22.49	0.40	3.03	6.29	12.16	
16	BT-15	?	12.3	17.03	0.12	—	5.95	10.48	Immature
17									
18									
19									
20									Check
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									Check
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									Check
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									Check

Watercourse/Site: M3C3 Quantitative Site Survey Job #: 121810356

Personnel: KMW MTS DT Brook Trout Date: Sept 13

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
1	BND		6.6	3.62					
2			5.3	1.66					
3			6.6	3.20					
4			6.6	3.60					
5			6.5	3.77					
6			6.0	2.34					
7			6.6	3.43					
8			3.0	0.29					
9			6.7	3.57					
10			6.4	2.95					Check
11			5.3	1.51					
12			3.1	0.37					
13			6.4	2.79					
14			6.5	3.01					
15			5.4	1.79					
16			5.6	2.62					
17			6.1	2.50					
18			5.0	1.42					
19			4.9	1.30					
20			5.0	1.39					Check 1.34g
21			5.7	1.91					
22			4.5	1.07					
23			6.4	2.92					
24			4.6	1.16					
25			6.6	3.35					
26			5.2	1.58					
27			3.2	0.40					
28			3.4	0.46					
29			4.6	1.02					
30			4.6	0.90					Check 1.00g
31			4.8	1.22					
32			4.3	0.83					
33	BN Shiner		8.8	8.00					
34	BN Shiner		6.1	2.36					
35	BN Shiner		7.1	4.58					
36	BN Shiner		5.4	1.71					
37			6.1	2.54					
38			5.3	1.59					
39			6.6	3.14					
40	Comm. Shiner		5.6	2.07					Check
41			5.2	1.53					
42			4.6	1.08					
43	Salamander		4.3	0.38					
44	E								
45	Lamp.		14.2	4.80					
46	lamp.		12.5	4.03					
47	lamp		11.2	2.49					
48	lamp.		6.2	0.49					
49	lamp		10.9	2.32					
50									Check

11 lamp 11 AE 111 [illegible] 111 BNS 1 WS

Watercourse/Site: M3C3

Personnel: MJS EMW DB

Quantitative Site Survey

~~Brook Trout~~

Job #: 121810356

Date: ~~Aug~~ Sept 13, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
51	A. Sal.		14.7	38.87					
52	"		13.3	21.71					
53	Am. eel	—	~40.0	>120					
54	BN Dace		3.0	0.31					
55	W.S		4.2	0.92					
56	BN. Shiner		5.8	2.40					
57	Am. eel		31.0	34.00					
58	Am. eel		17.4	7.75					
59	BNS		5.4	1.84					
60	BNS		6.4	2.70					Check
61									
62	BND		4.8	1.27					
63	BND		5.3	1.49					
64	BN Shiner		8.4	6.15					
65	BND		4.9	1.37					
66	W Sucker		5.3	1.47					
67	BND		6.6	3.35					
68	Am eel		18.5	15.00					
69	Am eel		24.0	29.10					
70	Am eel		26.0	21.34					Check
71	A. Sal.		13.4	21.54					same as before?
72	C. Shin.		5.1	1.51					
73			4.8	1.08					
74			6.8	3.73					
75			5.1	1.43					
76			5.0	1.42					
77			4.6	1.02					
78			5.2	1.42					
79	WS		12.5	22.44					
80	BND		5.2	1.52					Check 5.2, 1.59
81			4.8	1.07					
82			6.7	3.52					
83			5.3	1.70					
84			4.1	0.72					
85			4.4	0.97					
86			6.6	3.18					
87	BN Shin.		3.4	0.40					
88			5.1	1.44					
89			4.5	0.89					
90			3.0	0.30					Check

inside barriers

outside

sucker

① white

① common shiner

③ BN Shiner

Electrofisher Settings	Time (s)	Voltage	Amps	Duty Cycle	Total BT	Total SS	Total AS	Total BND	AE
Sweep 1	1482	990	40Hz	12%	6	0	2	22	3
Sweep 2	1234				0	0	0	~~BN~~ 11	1
Sweep 3	1167								
Sweep 4									
Sweep 5									

① salam. ① Lamp

② common shiner ② Lamp

2 BN Shiner 6

Water Quality					
Air Temp. (ºC)	18.0	Salinity (ppt)	0.0	ORP(mv)	204
Water Temp.	15.6	DO (mg/L)	8.78	89.4%	
Sp. Conductivity (µS/sec)	24.6	pH (water)	6.3		

~~WS~~ 1 BT 6 BND 1 Shin. BN Shin.

1+5 11 111

+7

Watercourse/Site: M3C3

Personnel: MJS/EMW/DT

Quantitative Site Survey
Slimy Sculpin

Pg. 2/3

Job #: 121810356

Date: Sep. 13, 2011

outside barriers

	Total Length (cm)	Fresh Weight (g)	Condition Factor (W/(L^3))/100	Comments
51	3.6	0.47	BN Shiner	
52	5.4	1.62		
53	5.0	1.52		
54	7.7	5.01		
55	6.4	2.76		
56	5.6	1.80		
57	6.2	2.70		
58	2.9	0.24		
59	26.0	22.73	Am. eel	no mucous - scraping
60	4.5	0.89	WS	Check
61	6.5	3.08	BND	
62	5.2	1.45		
63	6.5	2.95		
64	5.1	1.29		
65	2.7	0.19		
66	6.0	2.69		
67	6.4	2.89		
68	5.3	1.80		
69	6.6	3.14		
70	5.0	1.26		Check 1.27g
71	5.5	1.81		
72	3.5	0.46		
73	6.7	4.06		
74	2.3	0.25		
75	2.5	0.17		
76	4.7	1.08		
77	3.5	0.46		
78	3.0	0.30		
79	6.4	2.78		
80	5.1	1.45		Check 1.43g
81	7.3	4.92		
82	6.3	2.62		
83	4.8	1.00		
84	3.2	0.37		
85	4.7	1.07		
86	5.8	2.18		
87	3.1	0.30		
88	3.2	0.37	BNS	
89	2.8	0.23		
90	3.2	0.38		Check
91	3.2	0.48		
92	3.3	0.37		
93	(.Shiner	6.0	2.42	
94		5.1	1.45	
95		4.8	1.13	
96		5.2	1.64	
97		5.2	1.50	
98		5.0	1.34	
99	4.7	1.13	WS	
100	2.9	0.58	WS	Check

	Sweep #1	2	3	4
BN Dace	22	11	3	19
BN Shiner	3	2	6	17
Am. Eel	3	1	2	2
At. Sal.	2	0	0	1
Br. Trout	6	0	2	1
Lamprey	1	2	2	0
Salamander	1	0	0	0
white sucker	1	0	1	3
comm. shiner	1	2	0	10
Slimy Sculpin	0	0	0	0

Sweep #4 - swept lower 65m below barrier net to ~15m below rd crossing = 1046sf

Sweep #5 - above barriers 50m 1068sf

BND 16 +1+1+1

cshin 6+1

BN shin. 3+1+1+7+2+2+1

wsuck. 1+2

AE

Watercourse/Site: MSC3

Personnel: _____

Quantitative Site Survey
Slimy Sculpin

Job #: 121810356
Date: Sep. 13, 2014

	Total Length (cm)	Fresh Weight (g)	Condition Factor (W/(L^3))/100	Comments
1	2.7	0.31	BKS	regurgitated?
2	2.5	0.17		
3	6.2	2.56		
4	3.0	0.33		
5	27.3	29.63	Am.eel	
6	2.3	0.10	BND	
7				
8				
9				
10				Check
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				Check
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				Check
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				Check
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				Check

Watercourse/Site: M3C3

Personnel: EMW, MJS, DT

Quantitative Site Survey
Brook Trout

Pg 3/3

Job #: 121810356

Date: Sept. 13, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
1	BT-1	F	16.5	50.61	0.83	3.39	14.18	31.62	
2	" 2	I	12.9	22.37	0.17	—	7.33	14.47	Immature
3	" 3	I	10.0	9.89	0.06	—	3.38	6.29	Immature
4	" 4	M	11.6	16.02	0.11	—	4.83	10.89	Immature
5	" 5	M	11.4	16.29	0.16	0.61	5.39	10.40	
6	" 6	I	12.2	19.96	0.24	—	6.61	12.72	Immature
7	" 7	F	16.0	44.51	0.86	2.63	11.84	28.40	
8	" 8	F	12.3	21.66	0.44	1.12	6.02	9.84	
9	" 9	M	14.3	33.05	0.24	1.55	11.39	20.83	
10	" 10	I	12.5	18.22	0.17	—	6.02	11.60	Check 18.20 g
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									Check
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									Check
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									Check
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									Check

Mike Sweezey 121810356 Sep. 18, 2011
EBNB1 19

- MJS/DBI/DT completed quantitative site assessment @ site EBNB1
- barrier nets placed in river where 7 m wide & 14 m apart (~98 m²)
- completed 3 sweeps & captured very few brook trout (3 on sweep 1 only)*, & mainly Atlantic salmon (2), BND (6), & white sucker (4), & (1) American eel.
- completed additional 10 5 s upstream of the barriers (~100 m watercourse)
  → captured many salmon (14), white sucker (3), BND (6), & American eel (11)
  → did not continue fishing due to lack of brook trout & prevalence of Atlantic salmon

Watercourse/Site: EBNB1 | Quantitative Site Survey | Job #: 121810356

Personnel: MJS/DB/DT | Brook Trout | Date: Sep. 19, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
51	BT-1	F	14.0	25.94	0.192	0.03	8.54	16.57	Immature
52	BT-2	I	12.7	19.13	0.132	—	6.27	12.09	Immature
53	AS		13.7	25.94					
54	white sucker		9.6	9.31					
55	BND		4.4	0.99					
56	AS		10.3	13.28					
57	white sucker		8.6	6.64					
58	white sucker		8.3	6.31					
59	white sucker		9.0	8.16					
60	BT-3	I	7.2	3.48	0.034	—	1.16	2.12	Check Immature
61	BND		7.6	5.10					
62	"		4.3	0.401					
63	"		3.0	0.31					
64	"		2.6	0.30					
65	BND		6.9	3.98					
66	AS		13.2	28.31					
67	sucker		8.2	6.12					
68	AS		11.3	16.36					
69	"		14.2	31.37					
70	"		13.3	27.20					Check
71	"		10.8	14.70					
72	BND		4.9	1.32					
73	"		7.2	4.58					
74	AS		15.1	40.56					
75	"		15.2	34.59					
76	"		10.5	13.50					
77	"		14.4	32.49					
78	"		9.5	9.55					
79	"		12.0	21.71					
80	BND		4.8	1.72					Check
81	AS		11.1	14.68					
82	"		14.4	36.24					
83	BND		6.8	3.73					
84	AS		11.4	17.24					
85	white sucker		10.5	13.05					
86	BND		6.4	3.34					
87	AE		~15.0	—					
88	white sucker		8.0	6.07					
89	BND		4.3	1.18					
90									Check

Sweep 1 — check 7.8

Sweep 2

Sweep 3 — no fish

+ 1 AE ~25 cm length (total)

+ additional ID American eels not kept/measured ~15-25 cm

Voutsin barri

Electrofisher Settings	Time (s)	Voltage	Amps	Duty Cycle	Total BT	Total SS	Total ___	Total ___
Sweep 1	509	850	40	12				
Sweep 2	567							
Sweep 3	400							
Sweep 4								
Sweep 5								

1056 s swept ~100 m/us of barriers

Water Quality					
Air Temp. (ºC)	21	Salinity (ppt)	Ø	ORP(mv)	24
Water Temp.	10.5	DO (mg/L)	98.8	10.86	
Sp. Conductivity (µS/sec)	31.3	pH (water)	6.4		

Sweep area 7m wide x ~~13.5m~~ 14m long

M. Sweezey 1218/0356 Sep. 29, 2011
MSS/DB/MF/DT W4A17

- Completed quant. site assessment. River ~5m wide, barriers placed ~20m apart (100m2)
- Collected water/sediment samples above barriers & invert samples 3/4.
- Completed 3 sweeps of the confined area. Captured 15 Atlantic salmon (7, 6, 2), 17 brook trout (7, 7, 3), 10 slimy sculpin (6, 1, 3), 3 lamprey, 2 white sucker,
- Completed additional electrofishing outside barrier area while targeting brook trout habitat (stream banks, slow & deep areas). Avoided fast, riffle salmon habitat when possible. 1856s total efishing (1/2 ~50m upstream of barriers (not many trout) + 1/2 ~70m below barriers).

→ captured additional fish: 3 white sucker, 21 Atlantic salmon, 19 brook trout, 12 slimy sculpin, 3 American eel,

36 brook trout total captured (ranging between 5.4 & 16.8 cm. 24 trout >10cm sacrificed & sequenced @ the lab. Only 6 mature (all female)

Sheet 1/2

Watercourse/Site: W4 A17 | Quantitative Site Survey | Job #: 121810356

Personnel: MJS, OB, HE, OT | Brook Trout | Date: Sept. 29, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments	
Sweep 1	1	AS		13.8	26.70					
→	2	BT-1	—	14.5	31.38	0.221	—	10.53	20.17	14.5/31.4
→	3	BT-2	F	12.4	21.50	0.297	2.106	6.78	12.01	
	4	AS		16.4	36.04					
	5	SS		7.9	6.33					
	6	SS		9.6	8.80					
	7	lamprey		~10						
	8	AS		10.5	11.82					
→	9	BT-3	—	12.7	18.54	0.199	—	6.48	11.38	Pectoral Fin Clip 12.7/18.5
→	10	BT-4	F	13.1	20.89	0.350	2.299	6.58	11.26	Check 13.1/20.9
	11	SS		8.7	7.94					
	12	AS		14.7	15.86					
	13	AS		14.3	30.01					
	14	AS		12.8	16.36					
	15	AS		10.5	14.00					
	16	BT		7.3	3.90					
	17	SS		9.1	8.57					
	18	BT		6.6	3.10					
	19	SS		3.8	0.75					
	20	WS		8.0	6.04					Check
	21	SS		8.2	6.44					
	22	BT		6.3	2.76					
	23	AE		~20						
	24	AE		~30						
Sweep 2 →	25	BT-5	—	11.2	14.42	0.114	—	5.06	8.94	11.2/14.4
	26	BT-6	—	12.9	21.65	0.135	—	7.54	13.58	
	27	AS		14.1	33.68					
	28	WS		8.5	6.54					
→	29	BT-7	F	15.6	37.66	0.518	4.516	10.93	21.02	15.6/37.6
	30	AS		12.0	19.95					Check
→	31	BT-8	IF	10.3	10.22	0.063	0.02	3.70	6.02	Adipose Removed
	32	AS		10.3	10.74					
	33	AS		10.2	11.11					
	34	AS		12.8	21.50					
→	35	BT-9	—	11.4	12.20	0.113	—	4.44	7.35	11.4/12.2
	36	AS		10.0	10.62					
	37	BT-10		9.7	8.59					
	38	SS		7.6	5.01					
	39	BT		6.4	2.87					
Sweep 3	40	AS		14.2	28.51					Check
	41	SS		7.5	5.49					
→	42	BT-10	IF	10.7	12.74	0.087	0.12	4.17	8.21	Pectoral Fin Clip
	43	BT		9.4	8.10					
	44	SS		10.1	12.48					
	45	SS		7.5	5.33					
→	46	BT-11	—	11.1	13.45	0.095	—	4.68	8.39	11.1/13.4
	47	AS		7.1	4.21					
	48	Lamprey		~10						
	49	Lamprey		~10						
outside barrier	50	WS		10.4	12.70					Check

Watercourse/Site: _____ Quantitative Site Survey Job #: 121810356

Personnel: _____ Brook Trout Date: _____

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
51	AS		12.8	25.12					
52	AS		14.9	37.22					
53	SS		7.6	5.73					
54	BT-12	IF	11.7	12.31	0.122	0.07	6.53	10.28	
55	SS		8.1	6.06					
56	SS		6.1	2.66					
57	BT		7.0	3.33					
58	SS		8.0	6.81					
59	SS		6.5	2.84					
60	BT-13	IF	10.6	11.26	0.088	0.04	3.93	6.94	Check 10.6/11.2
61	BT		6.5	2.89					
62	BT		7.3	4.01					
63	BT		7.0	3.79					
64	AE		≈30						
65	AE		≈15						
66	SS		3.7	0.56					
67	AS		13.7	27.00					
68	AS		14.1	34.23					
69	BT-14	F	13.8	24.62	0.296	3.349	7.18	12.75	
70	AS		10.3	14.36					Check
71	BT-15	—	10.3	12.03	0.083	—	4.50	7.23	
72	AS		13.0	24.26					
73	BT-16	—	10.2	10.26	0.074	—	3.87	6.06	
74	AS		13.1	24.08					
75	AS		15.7	36.54					
76	BT-17	IF	9.8	10.47	0.132	0.04	3.97	6.12	
77	SS		9.5	9.33					
78	AS		14.2	32.79					
79	AS		13.7	24.35					
80	AS		15.2	40.07					Check
81	AS		14.2	29.15					
82	BT-18	IF	11.6	13.88	0.125	0.09	5.10	8.29	Adipose Parasite
83	WS		14.3	32.64					
84	AS		13.8	31.61					
85	BT-19	F	13.2	22.11	0.355	2.568	6.07	12.55	13.2/22.0
86	BT		9.6	9.91					
87	AS		12.5	23.50					
88	AS		10.6	14.19					
89	AS		11.1	13.99					
90	BT-20	—	13.4	24.48	0.187	—	9.04	14.79	Check Adipose Parasite

Electrofisher Settings	Time (s)	Voltage	Amps	Duty Cycle	Total BT	Total SS	Total ___	Total ___
Sweep 1	971	990	3.5	16				
Sweep 2	709	↓	↓	↓				
Sweep 3	858	↓	↓	↓				
Outside ~~Sweep 4~~	1856	↓	↓	↓				
Sweep 5								

Water Quality					
Air Temp. (ºC)	15	Salinity (ppt)	0	ORP(mv)	37
Water Temp.	10.6	DO (mg/L)	96.1	10.74 mg/L	
Sp. Conductivity (µS/sec)	27.3	pH (water)	6.64		

Sheet 2/2

Watercourse/Site: W4A17 | Quantitative Site Survey | Job #: 121810356

Personnel: MJS/DB/HF/DT | Brook Trout | Date: Sept 29/11

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
1	WS		9.7	10.60					
2	AS		10.5	13.17					
3	BT-21	–	12.9	19.83	0.140	–	6.69	12.64	
4	AS		11.4	15.59					
5	BT-22	–	10.7	11.33	0.093	–	4.07	6.86	
6	BT-23	–	11.0	12.64	0.079	–	4.51	7.77	Adipose Parasite
7	AS		11.2	14.12					
8	SS		8.2	7.08					
9	SS		6.2	2.12					
10	AS		9.5	10.62					Check
11	AS		10.7	12.16					
12	SS		3.7	0.75					
13	SS		3.9	0.64					
14	SS		3.7	0.65					
15	BT		5.4	1.83					
16	AE		≈15						
17	BT-24	F	16.8	47.35	0.748	6.797	11.98	26.62	
18									
19									
20									Check
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									Check
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									Check
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									Check

M. Sweezey W4A21 Sep. 27, 2011
MJS/DB/DT 1218/0356

- Quantitative assessment of W4A21 completed
Accessed site from the east by truck to avoid high slope to west of 4-wheeler road. ~300m walk through bush. Site located US of quantitative assessment - habitat consistent w/ US section of previously assessed area.

- placed barriers ~15m apart, river ~7m average width (105 m²). Completed 5 sweeps of delineated area. Identified American eel (3), Brook trout (3) & Atlantic salmon (12).

- Completed additional electrofishing upstream of barriers (~100m) in attempt to collect brook trout. Fished for 1660 s while trying to target trout habitat (slow, deep, cover areas close to shore).

--> Captured 1 sculpin (lost, dropped bucket) 2 white sucker, 14 Atlantic salmon, & 10 Brook trout

- 13 Brook trout sacrificed, 1 mature (male).

* All captured fish (except eels) were weighed & measured.

"Rite in the Rain" ALL-WEATHER WRITING PAPER

Watercourse/Site: W4AZ1 | Quantitative Site Survey | Job #: 121810356

Personnel: MJS/DB/DT | Brook Trout | Date: Sep. 27, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
1	AF		~30						Sweep 1
2	AF		~20						
3	BT-1	M	14.5	32.31	0.218	0.83	10.94	20.79	Pictoral fin
4	AS		12.2	24.40					
5	AS		14.3	31.64					
6	AS		9.5	9.85					
7	AS		11.3	15.60					
8	AS		13.0	21.95					
9	AS		12.9	21.46					
10	BT-2	IF	12.3	18.48	0.192	0.03	6.14	11.47	Check Immature Female
11	AS		10.3	14.04					
12	AS		10.4	11.55					10.4 / 11.57
13	AS		9.6	9.26					
14	AS		13.0	24.36					SWEEP 2
15	AS		10.0	11.88					Sweep 3
16	AF		~15						
17	AS		13.7	27.55					
18	BT-3	I	10.7	11.74	0.093	—	3.66	7.58	Immature unknown
19	BT-4	I	14.6	32.52	0.261	—	11.96	19.78	32.50g adipose parasite
20	WS		12.2	18.40					Check
21	BT-5	I	12.8	22.64	0.178	—	7.64	14.42	Immature unknown
22	AS		13.9	31.51					
23	BT-6	I	10.4	11.15	0.129	—	4.10	6.58	Adipose parisite.
24	AS		12.0	20.87					
25	BT-7	I	9.8	10.04	0.088	—	3.33	6.26	Immature unknown
26	WS		12.3	18.54					
27	AS		10.3	13.73					
28	AS		11.2	15.26					
29	BT-8	I	7.0	3.95	0.041	—	1.22	2.55	Immature unknown
30	AS		14.1	27.22					Check
31	AS		10.1	12.90					
32	AS		11.7	14.40					
33	BT-9	IF	11.0	12.52	0.141	0.06	4.20	7.82	Immature female
34	AS		13.4	27.82					
35	BT-10	IF	9.1	8.10	0.068	0.02	2.60	4.99	8.08g, pictoral fin
36	AS		10.5	13.29					
37	AS		10.9	13.46					
38	BT-11	I	8.8	7.39	0.053	—	2.78	4.29	7.39g, unknown
39	BT-12	I	7.2	3.53	0.035	—	1.23	2.12	
40	AS		10.4	14.62					Check
41	AS	I	7.2	3.69					
42	AS		10.3	13.25					
43	BT-13	I	7.3	4.09	0.057	—	1.40	2.42	
44	AS		9.2	8.81					
45	Sculpin		7	7					
46									
47									
48									
49									
50									Check

Outside

W

Note: Lost (large sculpin from bucket

Watercourse/Site: _____ Quantitative Site Survey Job #: 121810356

Personnel: _____ Brook Trout Date: _____

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									Check
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									Check
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									Check
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									Check

Electrofisher Settings	Time (s)	Voltage	Amps	Duty Cycle	Total BT	Total SS	Total AF	Total ___
Sweep 1	758	990	3.5	16	2	9 salmon	2	
Sweep 2	672	↓	↓	↓	0	1	0	
Sweep 3	592	↓	↓	↓	1	2	1	
Sweep 4	573	↓	↓	↓	0	0	0	
Sweep 5	550	↓	↓	↓	0	0	0	

Water Quality						
	Air Temp. (ºC)	15	Salinity (ppt)	0	ORP(mv)	120
	Water Temp.	11.3	DO (mg/L)	93.2	10.24 mg/l	
	Sp. Conductivity (µS/sec)	26.0	pH (water)	6.5		

Outside ~~Stream~~ 1660 sec

Mike Sweezey 12181056 Sep. 15, 2011
W4A31

- MJS/DB/HF/DT completed quantitative site assessment @ site W4A31
- barrier nets placed in stream appoximately 30 m above bridge where widens (flow too fast in narrow areas for barriers). Site approx. 15 m stream length x 20 m width ($300 m^2$)
- captured mostly Atlantic salmon (54) brook trout (3), Lamprey (3), slimy sculpin (3), white sucker (1), Blacknose dace (13)
  → 77 fish total
- did not fish outside barrier due to low BT & SS #s & high AS presence
- also, lightning occurred following 3rd sweep - left site a.s.a.p.

Watercourse/Site: W4A31 | Quantitative Site Survey | Pg 1/1 | Job #: 121810356

Personnel: MJS/DB/HF/DT | ~~Brook Trout~~ | Date: Sep. 15, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
1	AS		13.6	28.79					
→ 2	BT-1	?	13.9	25.38	0.20	—	7.58	16.99	Immature
3	Lamprey		~10						
4	AS		8.6	8.34					
5	BND		5.3	1.52					
→ 6	BT-2	?	11.9	14.98	0.10	—	5.23	9.19	Immature
7	AS		13.0	25.57					
8	AS		8.8	7.50					
9	BND		6.7	3.66					
10	AS		8.7	7.95					Check
11	AS		6.1	2.53					
12	AS		9.7	11.74					
13	AS		11.5	16.39					
14	AS		5.9	2.61					
15	AS		13.0	22.10					
16	AS		8.8	9.15					
17	AS		8.7	7.70					
18	AS		7.6	5.02					
19	AS		9.3	9.86					
20	AS		11.8	18.80					Check
21	AS		5.7	2.09					
22	BND		7.3	5.01					
23	AS		5.7	2.15					
24	AS		10.4	13.01					
25	BND		7.7	5.64					
26	BND		5.9	1.74					
27	AS		11.6	15.39					
28	WS		11.2	17.65					
29	AS		6.0	2.46					
30	AS		9.7	10.32					Check
31	AS		6.1	2.55					
32	AS		9.7	11.08					
33	AS		9.8	11.84					
34	AS		6.4	2.73					
35	BND		7.1	4.35					
36	AS		9.7	10.34					
37	AS		10.3	14.73					
38	AS		10.6	12.10					
39	AS		9.8	10.72					
40	SS		40	0.81					Check
41	Lamprey		~10						
42	Lamprey		~8						
Sweep 2 43	AS		10.2	12.51					
44	AS		8.4	7.19					
45	AS		8.8	9.06					
46	AS		10.3	12.64					
47	AS		10.5	15.55					
48	AS		9.3	8.14					
49	BND		6.4	2.94					
→ 50	BT-3	F	16.0	42.61	0.52	3.71	11.61	25.98	Check

Watercourse/Site: _____ Quantitative Site Survey Job #: 121810356

Personnel: DB, MS, HF, D Brook Trout Date: Sept 15

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
Sweep 2 Continued									
51	AS -		9.1	9.70					
52	AS -		7.5	5.27					
53	AS -		10.1	10.63					
54	BND		7.8	5.77					
55	BND		6.7	3.52					
56	AS -		6.2	2.40					
57	BND		7.0	3.66					
58	AS -		12.6	20.32					
59	AS -		10.3	12.65					
60	BND		6.8	4.05					Check
61	AS -		9.0	8.82					
62	BND		6.3	3.69					
63	AS -		8.9	8.63					
64	AS -		13.3	25.09					
65	AS -		11.7	17.13					
66	SS		8.7	7.70					
67	AS -		12.7	25.02					
68	BND		7.8	6.07					
69	SS		6.8	3.48					
Sweep 3 70	AS -		12.2	20.80					Check Mort
71	AS -		6.3	2.74					
72	AS -		12.3	24.33					
73	AS -		9.7	11.37					
74	AS -		8.0	4.41					
75	AS -		10.8	15.62					
76	AS -		8.6	7.59					
77	AS -		9.0	9.83					
78									
79									
80									Check
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									Check

Electrofisher Settings	Time (s)	Voltage	Amps	Duty Cycle	Total BT	Total SS	Total ___	Total ___
Sweep 1	722	990	35	16				
Sweep 2	692	990	35	16				
Sweep 3	651	990	35	16				
Sweep 4								
Sweep 5								

Water Quality					
Air Temp. (ºC)	12	Salinity (ppt)	0.0	ORP(mv)	-51
Water Temp.	13.0	DO (mg/L)	9.71	92.1%	
Sp. Conductivity (µS/sec)	24.4	pH (water)	7.0		

MJS/DB/DT/HF

W4A31 12/8/0356 Sep. 28, 2011

- Returned to W4A31 in afternoon to collect additional trout (7) for metals analysis.
- electrofished (1019 s) ~80 m upstream of barrier net site, targeting potential brook trout habitat (right bank slow, deep, high cover areas). Only collected brook trout but saw many salmon & blacknose dace, + a few Am. eel.
- sequenced the 7 captured trout @ the Juniper Lab.

"Rite in the Rain"
ALL-WEATHER WRITING PAPER

Watercourse/Site: W4A31
Personnel: DB/MS/HF

Quantitative Site Survey
Brook Trout

Job #: 121810356
Date: Sept 28/11

	ID	Sex (M/F)	Fork Length (mm) cm	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
1	BT-4	–	6.8	2.81	0.026	–	0.97	1.69	
2	BT-5	–	7.0	3.29	0.027	–	1.02	2.13	Adipose parasite
3	BT-6	–	11.2	15.31	0.108	–	5.14	9.61	
4	BT-7	–	14.0	25.97	0.216	–	8.06	17.22	
5	BT-8	F	11.4	15.28	0.141	0.06	4.61	9.97	Immature
6	BT-9	F	12.3	15.23	0.084	0.06	4.93	9.84	Immature
7	BT-10	F	18.6	70.64	1.320	10.277	17.16	40.48	
8									
9									
10									Check
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									Check
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									Check
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									Check
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									Check

M. Sweezey 12181035S6 Sep. 28, 2011
MJS/DB/DT/HF NRC (Naskwaak R.)

- Arrived @ site in a.m. & set up barrier nets (river ~14m wide & 8m apart) (~112 m²)

- collected invertebrate samples w/in barrier area. Collected water & sediment samples; collected periphyton samples.
  - water: NRC-1 > duplicate water samples
    NRC-2
    NRC-3 – distilled water / blank
  - sediment: NRC-1 > duplicates – note confirm to run w/ Mary / Malcolm
    NRC-2

- Completed 3 sweeps of the barrier area, → found no brook trout, 25 blacknose dace, 14 Atlantic salmon, 2 American eel, & 2 Lamprey.

- Completed additional electrofishing upstream (120 s) while trying to target brook trout & blacknose dace habitat (avoided fast-flow areas w/ high salmon occurrence). → found no brook trout, 11 Atlantic salmon, 34 blacknose dace, 2 American eel, 1 lamprey, 5 white sucker, 4 creek chub, 1 common shiner,

- All fish (Lamprey & AE excepted) were weighed & measured.

- Completed stream survey form & site sketch.

- Returned to lab to sequence periphyton samples.

"Rite in the Rain" ALL-WEATHER WRITING PAPER

Watercourse/Site: Nashwaak R. NRC

Personnel: MJS/DB/ME/DT

Quantitative Site Survey
Brook Trout

Job #: 121810356

Date: Sep. 28, 2011

	ID	Sex (M/F)	Fork Length (mm) (cm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
Sweep 1									
1	AE		~20	—					
2	BND		5.8	2.76					
3	AS		9.8	9.54					
4	BND		6.7	3.80					
5	BND		5.3	2.20					
6	BND		5.2	1.89					
7	BND		4.8	1.20					
8	BND		6.8	4.42					
9	AS		6.5	3.13					
10	BND		7.1	4.53					Check 7.1, 4.61
11	BND		6.4	3.55					
12	BND		4.6	1.17					
13	BND		6.3	2.97					
14	BND		5.3	1.63					
15	AS		6.4	3.15					
16	AS		7.2	4.20					
17	BND		4.4	1.05					
18	AS		6.8	3.53					
19	AS		6.6	3.12					
20	BND		5.3	2.10					Check 5.3, 2.18
21	BND		2.4	0.41					
22	BND		4.6	1.22					
23	AS		6.2	3.08					
24	BND		4.8	1.45					
25	BND		4.8	1.92					
Sweep 2									
26	AS		12.0	16.64					
27	BND		5.5	1.83					
28	BND		6.1	3.05					
29	BND		5.1	1.64					
30	AS		6.6	3.68					Check 6.7 3.59
31	AS		6.4	3.12					
32	AS		6.1	2.89					
33	BND		3.3	0.44					
34	AS		6.5	3.20					
35	BND		5.2	1.75					
36	AE		~15	—					
Sweep 3									
37	lamprey		~6						
38	lamprey		~10						
39	BND		6.6	3.78					
40	BND		4.5	1.16					Check 6.6, 3.71
41	BND		4.8	1.54					
42	AS		6.6	3.45					
43	AS		6.3	2.65					
Outside									
44	AS		12.9	24.08					
45	AS		11.3	17.63					
46	AS		10.9	14.84					
47	AS		7.3	4.12					
48	AS		6.9	3.55					
49	AS		7.0	4.57					
50	AS		6.0	2.60					Check 6.0 2.81

Watercourse/Site: _____ Quantitative Site Survey Job #: 121810356

Personnel: _____ Brook Trout Date: Sep. 28, 2011

	ID	Sex (M/F)	Fork Length (mm)	Fresh Weight (g)	Liver Weight (g)	Gonad Weight (g)	Viscera Weight (g)	Carcass Weight (g)	Comments
51	BND		5.5	2.32					
52	BND		2.7	0.23					
53	BND		4.6	1.05					
54	BND		5.3	1.66					
55	BND		4.6	1.14					
56	BND		5.8	2.53					
57	BND		6.4	3.52					
58	BND		6.6	3.18					
59	BND		6.5	3.56					
60	BND		7.2	11.36					Check 7.2, 4.29
61	BND		6.7	3.84					
62	BND		6.2	3.17					
63	BND		2.6	0.37					
64	BND		6.5	3.19					
65	BND		5.5	2.03					
66	BND		5.3	1.70					
67	BND		6.6	3.47					
68	BND		5.5	2.51					
69	BND		6.4	3.68					
70	BND		6.3	2.84					Check 4.7, 1.32
71	BND		4.7	1.26					
72	BND		5.1	1.57					
73	BND		5.7	2.01					
74	BND		4.5	1.05					
75	BND		5.0	1.69					
76	BND		5.1	1.60					
77	BND		4.3	1.27					
78	BND		2.3	0.82					
79	BND		4.8	1.41					
80	BND		5.0	1.65					Check 5.0, 1.63
81	AE		~15	—					
82	lamprey		~25	—					
83	WS		11.0	14.64					
84	AS		5.5	1.57					
85	AS		7.0	3.40					
86	WS		9.4	9.46					
87	WS		9.9	12.47					
88	WS		9.8	10.95					
89	CC		6.1	2.58					
90	AE		~30	—					Check

outside

BND
4.5, 1.20
2.6, 0.24
2.2, 0.14
2.3, 0.25

CC
5.6, 2.30
[Check: 2.03]
5.2, 1.64
3.3, 0.25

AS
6.4, 3.16
5.8, 1.78

CS
5.4, 1.50

WS
3.9, 0.61

Electrofisher Settings	Time (s)	Voltage	Amps	Duty Cycle	Total BT	Total SS	Total AS	Total BND
Sweep 1	660	800	30Hz	12%	0		7	17
Sweep 2	679	↓	↓	↓	0		5	5
Sweep 3	681	↓	↓	↓	0		2	3
~~Sweep 4~~ Add. sweep	1202	↓	↓	↓				
Sweep 5								

Water Quality					
Air Temp. (ºC)		Salinity (ppt)		ORP(mv)	157
Water Temp.		DO (mg/L)			
Sp. Conductivity (µS/sec)		pH (water)			

Fish Survey Data Collection Form Job No. 121810356

GENERAL DATA			
Watercourse Name:	NRC (Nashwaaksis)	Date: (mm/dd/yyyy)	09/28/2011
Coordinates: (dd.dd)		Personnel:	MJS/DTH/FDB
Weather:	*Sunny, Clear, Partial Cloud, Calm, Breezy, Windy: Wind Direction: N, NW, W, SW, S, SE, E, NE or NA*		

SAMPLING INFORMATION				
Gear Type:	BP E-Fish, Seining, Fyke Net, Minnow Traps			
BP E-Fish:	Voltage: 900	Amps: 30	Duty Cycle: 12%	Seconds
Seining:	# of hauls:		Length of Hauls (m):	
Fyke Netting:	Start Time (am/pm):		End Time (am/pm):	

WATER QUALITY INFORMATION			
Air Temp.: (°C)		**Water Temp.:** (°C)	
Sp. Conductivity: (µS/sec)		**Salinity:** (ppt)	
DO: (mg/L):		**pH:**	

NOTES

- see other fish sheet (quant. assessment sheet)

SPECIES RECORD		
Species	Fish #	Fork Length (cm)
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	
	15	
	16	
	17	
	18	
	19	
	20	
	21	
	22	
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	24	
	25	
	26	
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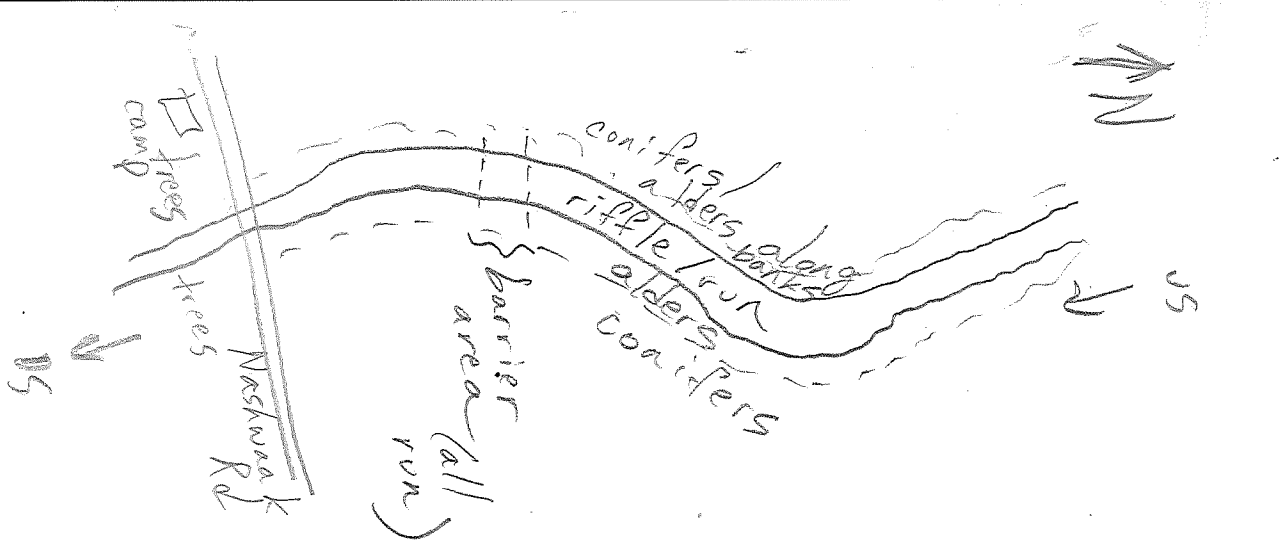
	30	
	31	
	32	
	33	
	34	
	35	

Site Sketch (Plan View)



Site Sketch (Profile View)

Ledged

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Nashwaak R. NRC **Date:** Sep-28, 2011 **Job Number:** 121810356

Personnel: MJS/DB/HS/LT **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
1	3/8	1	100	14	15	0	2	10	25	50	10	3	100	35	20	30	45	45	0	1	NO	Some Aquatic Plants
2	3/8	1	100	12	12	0	2	10	30	40	15	3	110	40	10	10	45	45	0	1	NO	

Nashwaak R.

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: NRC **Date:** Sep. 28, 2011 **Job Number:** 121810356

Personnel: MSS/DB/DT/HF **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *														
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)			No.	Letter	Embeddedness	% Turbulence
															82.0										
1	100	0	10	5	25	60	10	50	—	L	50	—	—	6.8	9.35	27.9	9.7°C	11°C	<	<	—	—	—	—
2	100	0	10	5	20	60	15	50	—	—	50	—	—						<	<	—	—	—	—

Reach #	Wet width (m)	Depth (m) 1/4	1/2	3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec) Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

Appendix E-3

Data Summary Table and RPC Water Quality Reports

Table E-3.1 General Water Chemistry Baseline EEM Stations (Quantitative Stations)

Quantitative	Lab ID	Sample ID	Date Sampled	Alkalinity (as CaCO3)	Ammonia (as N)	Calcium	Chloride	Conductivity	Copper	Hardness (as CaCO3)	Iron	Magnesium	Manganese	Nitrate + Nitrite (as N)	o-Phosphate (as P)	pH	Potassium
Units				mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	units	mg/L
Analysis Type				Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water
	125169-1	B2A2	8-Sep-11	1	0.025	1.34	1.3	18	0.002	5	0.17	0.39	0.014	0.05	0.005	6.4	0.24
	125577-1	B3A9	14-Sep-11	7	0.025	2.1	1.1	23	0.0005	7.1	0.2	0.44	0.007	0.025	0.005	7	0.34
	125664-1	EBNB1	19-Sep-11	10	0.06	3.86	1.9	33	0.0005	11.9	0.3	0.56	0.028	0.05	0.005	7.3	0.26
	125406-2	M3C3	13-Sep-11	7	0.025	2.92	1.3	25	0.002	9.1	0.14	0.44	0.007	0.025	0.005	6.5	0.18
	126278-03	NRC-1	28-Sep-11	9	0.025	3.52	1.05	29	0.00125	11.55	0.24	0.66	0.011	0.025	0.005	6.95	0.305
	125406-1	S2A2	12-Sep-11	6	0.025	1.86	1.3	22	0.001	6.8	0.22	0.53	0.011	0.025	0.005	6.4	0.24
	126278-01	S3A3	26-Sep-11	6	0.025	2.53	1.8	27	0.002	8.6	0.17	0.55	0.016	0.11	0.005	7.2	0.37
	126278-06	W4A17	29-Sep-11	9	0.025	3.09	1.1	28	0.001	9.7	0.2	0.47	0.011	0.025	0.005	6.8	0.34
	126278-02	W4A21	27-Sep-11	7	0.025	2.95	1.2	27	0.004	9.3	0.22	0.47	0.01	0.025	0.005	7	0.34
	125577-2	W4A31	15-Sep-11	7	0.025	2.6	1	24	0.002	8.3	0.2	0.44	0.009	0.025	0.005	7	0.34

Table E-3.1 General Water Chemistry Baseline EEM Stations (Quantitative Stations)

Quantitative	Lab ID	Sample ID	r-Silica (as SiO2)	Sodium	Sulfate	Total Kjeldahl Nitrogen	Total Organic Carbon	Total Phosphorus	Total Suspended Solids	Turbidity	Zinc	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Analysis Type			Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water
	125169-1	B2A2	7.8	1.43	0.5	0.125	9.1	0.014	2.5	0.3	0.009	250	0.05	2	3	0.05	0.5
	125577-1	B3A9	10.2	1.67	0.5	0.125	7.5	0.018	2.5	0.5	0.003	141	0.05	2	3	0.05	0.5
	125664-1	EBNB1	5.5	1.62	0.5	0.125	7.6	0.009	2.5	0.7	0.004	75	0.05	0.5	5	0.05	0.5
	125406-2	M3C3	7.4	1.08	0.5	0.3	12.8	0.02	2.5	0.8	0.005	139	0.05	0.5	3	0.05	0.5
	126278-03	NRC-1	6.95	1.45	0.5	0.2625	6.7	0.0195	2.5	0.6	0.0055	95.5	0.05	1	3	0.05	0.5
	125406-1	S2A2	8.1	1.27	0.5	0.125	9.5	0.049	2.5	0.7	0.004	90	0.05	0.5	2	0.05	0.5
	126278-01	S3A3	8.3	1.56	2	0.125	3.9	0.008	2.5	0.5	0.006	83	0.1	3	2	0.05	0.5
	126278-06	W4A17	10.3	1.89	0.5	0.125	6.4	0.018	2.5	0.7	0.003	116	0.05	0.5	3	0.05	0.5
	126278-02	W4A21	9.4	1.82	0.5	0.125	7.7	0.024	2.5	0.9	0.017	133	0.05	1	3	0.05	0.5
	125577-2	W4A31	9.1	1.62	0.5	0.3	7	0.064	2.5	0.4	0.006	123	0.05	1	6	0.05	0.5

Table E-3.1 General Water Chemistry Baseline EEM Stations (Quantitative Stations)

Quantitative	Lab ID	Sample ID	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Analysis Type			Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water
	125169-1	B2A2	3	0.1	1340	0.5	0.05	2	170	0.5	0.5	390	14	0.0125	0.05	0.5	240
	125577-1	B3A9	4	0.04	2100	0.5	0.05	0.5	200	3.3	0.5	440	7	0.0125	0.8	0.5	340
	125664-1	EBNB1	3	0.01	3860	0.5	0.1	0.5	300	0.2	0.3	560	28	0.0125	0.05	0.5	260
	125406-2	M3C3	3	0.06	2920	0.5	0.05	2	140	0.3	0.3	440	7	0.0125	0.1	0.5	180
	126278-03	NRC-1	3.5	0.025	3520	0.5	0.05	1.25	240	0.3	0.9	660	11	0.0125	0.2	0.5	305
	125406-1	S2A2	2	0.02	1860	0.5	0.05	1	220	0.2	0.4	530	11	0.0125	2.1	0.5	240
	126278-01	S3A3	4	0.04	2530	0.5	0.1	2	170	0.3	0.4	550	16	0.0125	2.4	0.5	370
	126278-06	W4A17	3	0.01	3090	0.5	0.05	1	200	0.3	1.8	470	11	0.0125	0.2	0.5	340
	126278-02	W4A21	4	0.03	2950	0.5	0.1	4	220	0.7	1.3	470	10	0.0125	0.2	0.5	340
	125577-2	W4A31	3	0.03	2600	0.5	0.05	2	200	0.3	1	440	9	0.0125	0.5	0.5	340

Table E-3.1 General Water Chemistry Baseline EEM Stations (Quantitative Stations)

Quantitative	Lab ID	Sample ID	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Analysis Type			Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water	Analysis of Metals in Water
	125169-1	B2A2	0.6	0.5	0.05	1430	8	0.05	0.05	0.05	2.5	0.05	0.5	9
	125577-1	B3A9	1	0.5	0.05	1670	11	0.05	0.05	0.05	2.5	0.05	0.5	3
	125664-1	EBNB1	0.8	0.5	0.05	1620	17	0.05	0.05	0.05	2.5	0.05	0.5	4
	125406-2	M3C3	0.6	0.5	0.05	1080	16	0.05	0.05	0.05	2.5	0.05	0.5	5
	126278-03	NRC-1	0.95	0.5	0.05	1450	13	0.05	0.05	0.05	2.5	0.1	0.5	5.5
	125406-1	S2A2	1.1	0.5	0.05	1270	12	0.05	0.05	0.05	2.5	0.05	0.5	4
	126278-01	S3A3	1.8	0.5	0.05	1560	15	0.05	0.05	0.05	2.5	0.05	0.5	6
	126278-06	W4A17	1.4	0.5	0.05	1890	14	0.05	0.05	0.05	2.5	0.3	0.5	3
	126278-02	W4A21	1.4	0.5	0.05	1820	14	0.05	0.05	0.05	2.5	0.2	0.5	17
	125577-2	W4A31	1.3	0.5	0.05	1620	13	0.05	0.05	0.05	2.5	0.2	0.5	6

Report ID: 125169-IAS Rev01
Report Date: 09-Mar-12
Date Received: 09-Sep-11

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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			125169-1
Client Sample ID:			B2A2
Date Sampled:			8-Sep-11
Analytes	**Units**	**RL**	
Sodium	mg/L	0.05	1.43
Potassium	mg/L	0.02	0.24
Calcium	mg/L	0.05	1.34
Magnesium	mg/L	0.01	0.39
Iron	mg/L	0.02	0.17
Manganese	mg/L	0.001	0.014
Copper	mg/L	0.001	0.002
Zinc	mg/L	0.001	0.009
Ammonia (as N)	mg/L	0.05	< 0.05
Kjeldahl Nitrogen	mg/L	0.25	< 0.25
pH	units	-	6.4
Alkalinity (as $CaCO_3$)	mg/L	2	< 2
Chloride	mg/L	0.5	1.3
Sulfate	mg/L	1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01
Phosphorus - Total	mg/L	0.002	0.014
r-Silica (as SiO_2)	mg/L	0.1	7.8
Carbon - Total Organic	mg/L	0.5	9.1
Turbidity	NTU	0.1	0.3
Colour	TCU	5	65
Solids - Total Suspended	mg/L	5	< 5
Conductivity	µS/cm	1	18
Calculated Parameters			
Bicarbonate (as $CaCO_3$)	mg/L	-	0.0
Carbonate (as $CaCO_3$)	mg/L	-	0.000
Hydroxide (as $CaCO_3$)	mg/L	-	0.001
Cation Sum	meq/L	-	0.177
Anion Sum	meq/L	-	0.040
Percent Difference	%	-	63.1
Theoretical Conductivity	µS/cm	-	12
Hardness (as $CaCO_3$)	mg/L	0.2	5.0
Ion Sum	mg/L	-	13
Saturation pH (5°C)	units	-	-
Langelier Index (5°C)		-	-

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			125169-1
Client Sample ID:			B2A2
Date Sampled:			8-Sep-11
Analytes	**Units**	**RL**	
Aluminum	µg/L	1	250
Antimony	µg/L	0.1	< 0.1
Arsenic	µg/L	1	2
Barium	µg/L	1	3
Beryllium	µg/L	0.1	< 0.1
Bismuth	µg/L	1	< 1
Boron	µg/L	1	3
Cadmium	µg/L	0.01	0.10
Calcium	µg/L	50	1340
Chromium	µg/L	1	< 1
Cobalt	µg/L	0.1	< 0.1
Copper	µg/L	1	2
Iron	µg/L	20	170
Lead	µg/L	0.1	0.5
Lithium	µg/L	0.1	0.5
Magnesium	µg/L	10	390
Manganese	µg/L	1	14
Mercury	µg/L	0.025	< 0.025
Molybdenum	µg/L	0.1	< 0.1
Nickel	µg/L	1	< 1
Potassium	µg/L	20	240
Rubidium	µg/L	0.1	0.6
Selenium	µg/L	1	< 1
Silver	µg/L	0.1	< 0.1
Sodium	µg/L	50	1430
Strontium	µg/L	1	8
Tellurium	µg/L	0.1	< 0.1
Thallium	µg/L	0.1	< 0.1
Tin	µg/L	0.1	< 0.1
Uranium	µg/L	0.1	< 0.1
Vanadium	µg/L	1	< 1
Zinc	µg/L	1	9

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Report Date: 21-Sep-11
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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
Kjeldahl Nitrogen	4.M16	APHA 4500-NORG	Digestion, phenate colorimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
Phosphorus - Total	4.M17	APHA 4500-P E	Digestion, Manual Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Colour	4.M51	APHA 2020 Color (A,C)	Single Wavelength Spectrophotometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 125406-IAS
Report Date: 26-Sep-11
Date Received: 14-Sep-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			125406-1	125406-2
Client Sample ID:			S2A2 - water	M3C3 - water
Date Sampled:			12-Sep-11	13-Sep-11
Analytes	**Units**	**RL**		
Sodium	mg/L	0.05	1.27	1.08
Potassium	mg/L	0.02	0.24	0.18
Calcium	mg/L	0.05	1.86	2.92
Magnesium	mg/L	0.01	0.53	0.44
Iron	mg/L	0.02	0.22	0.14
Manganese	mg/L	0.001	0.011	0.007
Copper	mg/L	0.001	0.001	0.002
Zinc	mg/L	0.001	0.004	0.005
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05
pH	units	-	6.4	6.5
Alkalinity (as $CaCO_3$)	mg/L	2	6	7
Chloride	mg/L	0.5	1.3	1.3
Sulfate	mg/L	1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	8.1	7.4
Carbon - Total Organic	mg/L	0.5	9.5	12.8
Turbidity	NTU	0.1	0.7	0.8
Conductivity	µS/cm	1	22	25
Calculated Parameters				
Bicarbonate (as $CaCO_3$)	mg/L	-	6.0	7.0
Carbonate (as $CaCO_3$)	mg/L	-	0.001	0.002
Hydroxide (as $CaCO_3$)	mg/L	-	0.001	0.002
Cation Sum	meq/L	-	0.210	0.241
Anion Sum	meq/L	-	0.156	0.176
Percent Difference	%	-	14.8	15.6
Theoretical Conductivity	µS/cm	-	19	21
Hardness (as $CaCO_3$)	mg/L	0.2	6.8	9.1
Ion Sum	mg/L	-	17	18
Saturation pH (5°C)	units	-	10.4	10.2
Langelier Index (5°C)		-	-4.05	-3.69

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Report Date: 26-Sep-11
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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			125406-1	125406-2
Client Sample ID:			S2A2 - water	M3C3 - water
Date Sampled:			12-Sep-11	13-Sep-11
Analytes	**Units**	**RL**		
Kjeldahl Nitrogen	mg/L	0.25	< 0.25	0.3
Phosphorus - Total	mg/L	0.002	0.049	0.020
Colour	TCU	5	44	88
Solids - Total Suspended	mg/L	5	< 5	< 5

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			125406-1	125406-2
Client Sample ID:			S2A2 - water	M3C3 - water
Date Sampled:			12-Sep-11	13-Sep-11
Analytes	**Units**	**RL**		
Aluminum	µg/L	1	90	139
Antimony	µg/L	0.1	< 0.1	< 0.1
Arsenic	µg/L	1	< 1	< 1
Barium	µg/L	1	2	3
Beryllium	µg/L	0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1
Boron	µg/L	1	2	3
Cadmium	µg/L	0.01	0.02	0.06
Calcium	µg/L	50	1860	2920
Chromium	µg/L	1	< 1	< 1
Cobalt	µg/L	0.1	< 0.1	< 0.1
Copper	µg/L	1	1	2
Iron	µg/L	20	220	140
Lead	µg/L	0.1	0.2	0.3
Lithium	µg/L	0.1	0.4	0.3
Magnesium	µg/L	10	530	440
Manganese	µg/L	1	11	7
Mercury	µg/L	0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	2.1	0.1
Nickel	µg/L	1	< 1	< 1
Potassium	µg/L	20	240	180
Rubidium	µg/L	0.1	1.1	0.6
Selenium	µg/L	1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1
Sodium	µg/L	50	1270	1080
Strontium	µg/L	1	12	16
Tellurium	µg/L	0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1
Vanadium	µg/L	1	< 1	< 1
Zinc	µg/L	1	4	5

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
Kjeldahl Nitrogen	4.M16	APHA 4500-NORG	Digestion, phenate colorimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
Phosphorus - Total	4.M17	APHA 4500-P E	Digestion, Manual Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Colour	4.M51	APHA 2020 Color (A,C)	Single Wavelength Spectrophotometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 125577-IAS
Report Date: 30-Sep-11
Date Received: 16-Sep-11

CERTIFICATE OF ANALYSIS

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Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			125577-1	125577-2
Client Sample ID:			B3A9	W4A31
Date Sampled:			14-Sep-11	15-Sep-11
Analytes	**Units**	**RL**		
Sodium	mg/L	0.05	1.67	1.62
Potassium	mg/L	0.02	0.34	0.34
Calcium	mg/L	0.05	2.10	2.60
Magnesium	mg/L	0.01	0.44	0.44
Iron	mg/L	0.02	0.20	0.20
Manganese	mg/L	0.001	0.007	0.009
Copper	mg/L	0.001	< 0.001	0.002
Zinc	mg/L	0.001	0.003	0.006
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05
pH	units	-	7.0	7.0
Alkalinity (as $CaCO_3$)	mg/L	2	7	7
Chloride	mg/L	0.5	1.1	1.0
Sulfate	mg/L	1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	10.2	9.1
Carbon - Total Organic	mg/L	0.5	7.5	7.0
Turbidity	NTU	0.1	0.5	0.4
Conductivity	µS/cm	1	23	24
Calculated Parameters				
Bicarbonate (as $CaCO_3$)	mg/L	-	7.0	7.0
Carbonate (as $CaCO_3$)	mg/L	-	0.007	0.007
Hydroxide (as $CaCO_3$)	mg/L	-	0.005	0.005
Cation Sum	meq/L	-	0.233	0.256
Anion Sum	meq/L	-	0.171	0.168
Percent Difference	%	-	15.4	20.8
Theoretical Conductivity	µS/cm	-	20	21
Hardness (as $CaCO_3$)	mg/L	0.2	7.1	8.3
Ion Sum	mg/L	-	20	20
Saturation pH (5°C)	units	-	10.3	10.2
Langelier Index (5°C)		-	-3.34	-3.24

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Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			125577-1	125577-2
Client Sample ID:			B3A9	W4A31
Date Sampled:			14-Sep-11	15-Sep-11
Analytes	**Units**	**RL**		
Kjeldahl Nitrogen	mg/L	0.25	< 0.25	0.3
Phosphorus - Total	mg/L	0.002	0.018	0.064
Colour	TCU	5	69	69
Solids - Total Suspended	mg/L	5	< 5	< 5

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Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			125577-1	125577-2
Client Sample ID:			B3A9	W4A31
Date Sampled:			14-Sep-11	15-Sep-11
Analytes	**Units**	**RL**		
Aluminum	µg/L	1	141	123
Antimony	µg/L	0.1	< 0.1	< 0.1
Arsenic	µg/L	1	2	1
Barium	µg/L	1	3	6
Beryllium	µg/L	0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1
Boron	µg/L	1	4	3
Cadmium	µg/L	0.01	0.04	0.03
Calcium	µg/L	50	2100	2600
Chromium	µg/L	1	< 1	< 1
Cobalt	µg/L	0.1	< 0.1	< 0.1
Copper	µg/L	1	< 1	2
Iron	µg/L	20	200	200
Lead	µg/L	0.1	3.3	0.3
Lithium	µg/L	0.1	0.5	1.0
Magnesium	µg/L	10	440	440
Manganese	µg/L	1	7	9
Mercury	µg/L	0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	0.8	0.5
Nickel	µg/L	1	< 1	< 1
Potassium	µg/L	20	340	340
Rubidium	µg/L	0.1	1.0	1.3
Selenium	µg/L	1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1
Sodium	µg/L	50	1670	1620
Strontium	µg/L	1	11	13
Tellurium	µg/L	0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	0.2
Vanadium	µg/L	1	< 1	< 1
Zinc	µg/L	1	3	6

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Report Date: 30-Sep-11
Date Received: 16-Sep-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
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Kjeldahl Nitrogen	4.M16	APHA 4500-NORG	Digestion, phenate colorimetry
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Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
Phosphorus - Total	4.M17	APHA 4500-P E	Digestion, Manual Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Colour	4.M51	APHA 2020 Color (A,C)	Single Wavelength Spectrophotometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 125664-IAS Rev.01
Report Date: 03-Oct-11
Date Received: 20-Sep-11

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Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			125664-1
Client Sample ID:			EBNB1
Date Sampled:			19-Sep-11
Analytes	**Units**	**RL**	
Sodium	mg/L	0.05	1.62
Potassium	mg/L	0.02	0.26
Calcium	mg/L	0.05	3.86
Magnesium	mg/L	0.01	0.56
Iron	mg/L	0.02	0.30
Manganese	mg/L	0.001	0.028
Copper	mg/L	0.001	< 0.001
Zinc	mg/L	0.001	0.004
Ammonia (as N)	mg/L	0.05	0.06
pH	units	-	7.3
Alkalinity (as $CaCO_3$)	mg/L	2	10
Chloride	mg/L	0.5	1.9
Sulfate	mg/L	1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01
r-Silica (as SiO_2)	mg/L	0.1	5.5
Carbon - Total Organic	mg/L	0.5	7.6
Turbidity	NTU	0.1	0.7
Conductivity	µS/cm	1	33
Calculated Parameters			
Bicarbonate (as $CaCO_3$)	mg/L	-	10.0
Carbonate (as $CaCO_3$)	mg/L	-	0.019
Hydroxide (as $CaCO_3$)	mg/L	-	0.010
Cation Sum	meq/L	-	0.337
Anion Sum	meq/L	-	0.257
Percent Difference	%	-	13.5
Theoretical Conductivity	µS/cm	-	30
Hardness (as $CaCO_3$)	mg/L	0.2	11.9
Ion Sum	mg/L	-	20
Saturation pH (5°C)	units	-	9.9
Langelier Index (5°C)		-	-2.62

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Report ID: 125664-IAS Rev.01
Report Date: 03-Oct-11
Date Received: 20-Sep-11

CERTIFICATE OF ANALYSIS

rpc
921 College Hill Rd
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			125664-1
Client Sample ID:			EBNB1
Date Sampled:			19-Sep-11
Analytes	**Units**	**RL**	
Kjeldahl Nitrogen	mg/L	0.25	< 0.25
Phosphorus - Total	mg/L	0.002	0.009
Colour	TCU	5	54
Solids - Total Suspended	mg/L	5	< 5

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Fax: 506.452.0594
www.rpc.ca

Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			125664-1
Client Sample ID:			EBNB1
Date Sampled:			19-Sep-11
Analytes	**Units**	**RL**	
Aluminum	µg/L	1	75
Antimony	µg/L	0.1	< 0.1
Arsenic	µg/L	1	< 1
Barium	µg/L	1	5
Beryllium	µg/L	0.1	< 0.1
Bismuth	µg/L	1	< 1
Boron	µg/L	1	3
Cadmium	µg/L	0.01	0.01
Calcium	µg/L	50	3860
Chromium	µg/L	1	< 1
Cobalt	µg/L	0.1	0.1
Copper	µg/L	1	< 1
Iron	µg/L	20	300
Lead	µg/L	0.1	0.2
Lithium	µg/L	0.1	0.3
Magnesium	µg/L	10	560
Manganese	µg/L	1	28
Mercury	µg/L	0.025	< 0.025
Molybdenum	µg/L	0.1	< 0.1
Nickel	µg/L	1	< 1
Potassium	µg/L	20	260
Rubidium	µg/L	0.1	0.8
Selenium	µg/L	1	< 1
Silver	µg/L	0.1	< 0.1
Sodium	µg/L	50	1620
Strontium	µg/L	1	17
Tellurium	µg/L	0.1	< 0.1
Thallium	µg/L	0.1	< 0.1
Tin	µg/L	0.1	< 0.1
Uranium	µg/L	0.1	< 0.1
Vanadium	µg/L	1	< 1
Zinc	µg/L	1	4

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
Kjeldahl Nitrogen	4.M16	APHA 4500-NORG	Digestion, phenate colorimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
Phosphorus - Total	4.M17	APHA 4500-P E	Digestion, Manual Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Colour	4.M51	APHA 2020 Color (A,C)	Single Wavelength Spectrophotometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 126277-IAS
Report Date: 07-Oct-11
Date Received: 30-Sep-11

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Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			126277-1	126277-2	126277-3
Client Sample ID:			NRC-1	NRC-2	NRC-3
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Chlorophyll-a	mg/m³	5	3440	2990	1880
Solids - Total Suspended	mg/L	5	1810	1540	4680
Solids - Volatile Suspended	mg/L	5	910	800	1970

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A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 126277-IAS
Report Date: 07-Oct-11
Date Received: 30-Sep-11

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General Report Comments

Chlorophyll a was determined according to Method 10200 H (trichromatic method) from Stardard Methods for the Examination of Water and Wastewater.

Report ID: 126277-IAS
Report Date: 07-Oct-11
Date Received: 30-Sep-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry

Report ID: 126278-IAS
Report Date: 12-Oct-11
Date Received: 30-Sep-11

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Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			126278-01	126278-02	126278-03	126278-04
Client Sample ID:			S3A3	W4A21	NRC-1	NRC-2
Date Sampled:			26-Sep-11	27-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**				
Sodium	mg/L	0.05	1.56	1.82	1.48	1.42
Potassium	mg/L	0.02	0.37	0.34	0.34	0.27
Calcium	mg/L	0.05	2.53	2.95	3.50	3.54
Magnesium	mg/L	0.01	0.55	0.47	0.66	0.66
Iron	mg/L	0.02	0.17	0.22	0.24	0.24
Manganese	mg/L	0.001	0.016	0.010	0.012	0.010
Copper	mg/L	0.001	0.002	0.004	0.002	< 0.001
Zinc	mg/L	0.001	0.006	0.017	0.007	0.004
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Kjeldahl Nitrogen	mg/L	0.25	< 0.25	< 0.25	0.4	< 0.25
pH	units	-	7.2	7.0	7.0	6.9
Alkalinity (as $CaCO_3$)	mg/L	2	6	7	9	9
Chloride	mg/L	0.5	1.8	1.2	1.1	1.0
Sulfate	mg/L	1	2	< 1	< 1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	0.11	< 0.05	< 0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phosphorus - Total	mg/L	0.002	0.008	0.024	0.014	0.025
r-Silica (as SiO_2)	mg/L	0.1	8.3	9.4	6.9	7.0
Carbon - Total Organic	mg/L	0.5	3.9	7.7	6.7	6.7
Turbidity	NTU	0.1	0.5	0.9	0.6	0.6
Colour	TCU	5	30	63	69	68
Solids - Total Suspended	mg/L	5	< 5	< 5	< 5	< 5
Conductivity	µS/cm	1	27	27	29	29
Calculated Parameters						
Bicarbonate (as $CaCO_3$)	mg/L	-	6.0	7.0	9.0	9.0
Carbonate (as $CaCO_3$)	mg/L	-	0.009	0.007	0.008	0.007
Hydroxide (as $CaCO_3$)	mg/L	-	0.008	0.005	0.005	0.004
Cation Sum	meq/L	-	0.259	0.287	0.316	0.313
Anion Sum	meq/L	-	0.220	0.174	0.211	0.208
Percent Difference	%	-	8.14	24.5	19.9	20.2
Theoretical Conductivity	µS/cm	-	26	23	26	26
Hardness (as $CaCO_3$)	mg/L	0.2	8.6	9.3	11.5	11.6
Ion Sum	mg/L	-	21	21	20	20
Saturation pH (5°C)	units	-	10.3	10.2	10.0	10.0
Langelier Index (5°C)		-	-3.12	-3.19	-3.01	-3.11

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Report ID: 126278-IAS
Report Date: 12-Oct-11
Date Received: 30-Sep-11

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Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Water

RPC Sample ID:			126278-05	126278-06
Client Sample ID:			NRC-3	W4A17
Date Sampled:			28-Sep-11	29-Sep-11
Analytes	**Units**	**RL**		
Sodium	mg/L	0.05	< 0.05	1.89
Potassium	mg/L	0.02	< 0.02	0.34
Calcium	mg/L	0.05	0.09	3.09
Magnesium	mg/L	0.01	0.01	0.47
Iron	mg/L	0.02	0.03	0.20
Manganese	mg/L	0.001	0.002	0.011
Copper	mg/L	0.001	0.002	0.001
Zinc	mg/L	0.001	0.010	0.003
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05
Kjeldahl Nitrogen	mg/L	0.25	< 0.25	< 0.25
pH	units	-	6.3	6.8
Alkalinity (as $CaCO_3$)	mg/L	2	< 2	9
Chloride	mg/L	0.5	0.6	1.1
Sulfate	mg/L	1	1	< 1
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01
Phosphorus - Total	mg/L	0.002	< 0.002	0.018
r-Silica (as SiO_2)	mg/L	0.1	< 0.1	10.3
Carbon - Total Organic	mg/L	0.5	< 0.5	6.4
Turbidity	NTU	0.1	< 0.1	0.7
Colour	TCU	5	< 5	72
Solids - Total Suspended	mg/L	5	< 5	< 5
Conductivity	µS/cm	1	1	28
Calculated Parameters				
Bicarbonate (as $CaCO_3$)	mg/L	-	-	9.0
Carbonate (as $CaCO_3$)	mg/L	-	-	0.005
Hydroxide (as $CaCO_3$)	mg/L	-	-	0.003
Cation Sum	meq/L	-	-	0.295
Anion Sum	meq/L	-	-	0.211
Percent Difference	%	-	-	16.6
Theoretical Conductivity	µS/cm	-	-	25
Hardness (as $CaCO_3$)	mg/L	0.2	-	9.7
Ion Sum	mg/L	-	-	23
Saturation pH (5°C)	units	-	-	10.1
Langelier Index (5°C)		-	-	-3.26

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Report Date: 12-Oct-11
Date Received: 30-Sep-11

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Fax: 506.452.0594
www.rpc.ca

Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			126278-01	126278-02	126278-03	126278-04
Client Sample ID:			S3A3	W4A21	NRC-1	NRC-2
Date Sampled:			26-Sep-11	27-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**				
Aluminum	µg/L	1	83	133	98	93
Antimony	µg/L	0.1	0.1	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	3	1	1	1
Barium	µg/L	1	2	3	3	3
Beryllium	µg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1	< 1	< 1
Boron	µg/L	1	4	4	4	3
Cadmium	µg/L	0.01	0.04	0.03	0.04	0.01
Calcium	µg/L	50	2530	2950	3500	3540
Chromium	µg/L	1	< 1	< 1	< 1	< 1
Cobalt	µg/L	0.1	0.1	0.1	< 0.1	< 0.1
Copper	µg/L	1	2	4	2	< 1
Iron	µg/L	20	170	220	240	240
Lead	µg/L	0.1	0.3	0.7	0.3	0.3
Lithium	µg/L	0.1	0.4	1.3	0.9	0.9
Magnesium	µg/L	10	550	470	660	660
Manganese	µg/L	1	16	10	12	10
Mercury	µg/L	0.025	< 0.025	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	2.4	0.2	0.2	0.2
Nickel	µg/L	1	< 1	< 1	< 1	< 1
Potassium	µg/L	20	370	340	340	270
Rubidium	µg/L	0.1	1.8	1.4	1.0	0.9
Selenium	µg/L	1	< 1	< 1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	1560	1820	1480	1420
Strontium	µg/L	1	15	14	13	13
Tellurium	µg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	0.2	0.1	0.1
Vanadium	µg/L	1	< 1	< 1	< 1	< 1
Zinc	µg/L	1	6	17	7	4

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Fax: 506.452.0594
www.rpc.ca

Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Metals in Water

RPC Sample ID:			126278-05	126278-06
Client Sample ID:			NRC-3	W4A17
Date Sampled:			28-Sep-11	29-Sep-11
Analytes	**Units**	**RL**		
Aluminum	µg/L	1	18	116
Antimony	µg/L	0.1	< 0.1	< 0.1
Arsenic	µg/L	1	< 1	< 1
Barium	µg/L	1	< 1	3
Beryllium	µg/L	0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1
Boron	µg/L	1	1	3
Cadmium	µg/L	0.01	0.02	0.01
Calcium	µg/L	50	90	3090
Chromium	µg/L	1	< 1	< 1
Cobalt	µg/L	0.1	< 0.1	< 0.1
Copper	µg/L	1	2	1
Iron	µg/L	20	30	200
Lead	µg/L	0.1	0.5	0.3
Lithium	µg/L	0.1	< 0.1	1.8
Magnesium	µg/L	10	10	470
Manganese	µg/L	1	2	11
Mercury	µg/L	0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	< 0.1	0.2
Nickel	µg/L	1	< 1	< 1
Potassium	µg/L	20	< 20	340
Rubidium	µg/L	0.1	< 0.1	1.4
Selenium	µg/L	1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1
Sodium	µg/L	50	< 50	1890
Strontium	µg/L	1	< 1	14
Tellurium	µg/L	0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	0.3
Vanadium	µg/L	1	< 1	< 1
Zinc	µg/L	1	10	3

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Ammonia	4.M47	APHA 4500-NH_3 G	"Phenate" Colourimetry
Kjeldahl Nitrogen	4.M16	APHA 4500-NORG	Digestion, phenate colorimetry
pH	4.M03	APHA 4500-H^+ B	pH Electrode - Electrometric
Alkalinity (as $CaCO_3$)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO_4 E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO_3 H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
Phosphorus - Total	4.M17	APHA 4500-P E	Digestion, Manual Colourimetry
r-Silica (as SiO_2)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Colour	4.M51	APHA 2020 Color (A,C)	Single Wavelength Spectrophotometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Mercury	4.M21	EPA 245.1	Cold Vapor AAS

Report ID: 127369-IAS
Report Date: 03-Nov-11
Date Received: 20-Oct-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356

Analysis of Metals in Water

Analytes:			Tungsten
Units:			µg/L
RL:			5
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127369-01	NRC	15-Aug-11	< 5
127369-02	B2A2	8-Sep-11	< 5
127369-03	S2A2 - water	12-Sep-11	< 5
127369-04	M3C3 - water	13-Sep-11	< 5
127369-05	B3A9	14-Sep-11	< 5
127369-06	W4A31	15-Sep-11	< 5
127369-07	EBNB1	19-Sep-11	< 5
127369-08	S3A3	26-Sep-11	< 5
127369-09	W4A21	27-Sep-11	< 5
127369-10	NRC-1	28-Sep-11	< 5
127369-11	NRC-2	28-Sep-11	< 5
127369-12	NRC-3	28-Sep-11	< 5
127369-13	W4A17	29-Sep-11	< 5

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Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Appendix E-4

Data Summary Table and RPC Sediment Quality Reports

Table E-4.1 General Sediment Chemistry (Quantitative Sites)

Quantitative	Lab ID	Sample ID	Date Sampled	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium
Units				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analysis Type				Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil
	125169-2	B2A2	8-Sep-11	4620	0.05	6	22	0.3	0.5	1	0.28	1450	4	3.2	2	3580	12.5	8.5	1000
	125577-3	B3A9	14-Sep-11	6860	0.05	13	35	0.05	0.5	0.5	0.83	2910	6	4.3	3	7550	30.9	7.2	1360
	125664-2	EBNB1	19-Sep-11	15000	0.1	19	110	0.8	0.5	2	0.55	3440	28	20.6	9	26200	17.1	22.5	4760
	125406-4	M3C3	13-Sep-11	5650	0.05	2	20	0.2	0.5	1	1.69	2550	6	3.8	4	6620	12.4	8.8	2230
	126278-09	NRC-1	28-Sep-11	10700	0.125	8.5	37	0.5	1.25	1	0.37	2415	17	6.4	5	15150	12.8	18.5	3610
	125406-3	S2A2	12-Sep-11	6810	0.125	25.5	48	0.45	2.5	1.5	1.385	1570	8	9.5	34	7805	20.5	9.25	1650
	126278-07	S3A3	26-Sep-11	7350	0.05	66.5	36	0.55	2	0.75	0.95	1230	9	11.7	29.5	10980	12.15	11.6	2135
	126278-11	W4A17	28-Sep-11	4930	0.05	7	22	0.5	0.5	0.5	0.36	1530	6	4.2	2	8060	11.8	11.7	1040
	126278-08	W4A21	27-Sep-11	4080	0.05	68	117	1.9	0.5	0.5	0.99	2820	5	9.9	5	70400	10.8	7.1	1360
	125577-4	W4A31	15-Sep-11	7860	0.05	41	36	0.8	0.5	0.5	0.27	860	11	10.6	14	20000	17.7	16.5	2500

Table E-4.1 General Sediment Chemistry (Quantitative Sites)

Manganese	Mercury	Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Total Inorganic Carbon	Total Kjeldahl Nitrogen	Total Organic Carbon	Total Phosphorus	Tungsten	Uranium	Vanadium	Zinc
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil	Analysis of Metals in Soil
192	0.03	0.1	3	410	4.9	0.5	0.1	50	7	0.05	0.05	0.5	0.3	1950	2.8	280	2.5	1.2	8	23
331	0.11	0.05	4	520	7.1	0.5	0.05	70	17	0.05	0.05	0.5	4.6	11500	13.8	650	2.5	1.1	10	51
1500	0.07	1.3	31	660	9.6	0.5	0.05	60	18	0.05	0.5	0.5	1.3	5300	9	680	2.5	1.2	39	100
210	0.05	0.4	5	380	5	0.5	0.05	80	12	0.05	0.05	0.5	1.5	6190	3.1	300	2.5	0.7	14	71
366.5	0.04	0.65	15	710	9.05	0.5	0.05	65	10.5	0.05	0.1	0.5	0.8	4355	6.85	440	2.5	2	25	54.5
723	0.06	17.45	8	580	8.8	0.5	0.3	42.5	10.5	0.05	0.4	0.5	1	4770	6.6	425	17	0.65	16.5	65
509.5	0.04	6.8	9.5	630	9.15	0.5	0.05	25	8.5	0.05	0.3	0.5	0.1	2620	4.4	360	20	0.6	13.5	69.5
295	0.05	0.3	5	420	7.9	0.5	0.05	25	10	0.05	0.1	0.5	1.4	3820	6	380	2.5	3.1	10	32
2770	0.03	4.7	19	210	4.3	0.5	0.05	25	10	0.05	0.05	0.5	0.3	1130	2.4	450	2.5	1.4	7	64
784	0.03	4.5	11	360	7.3	0.5	0.05	25	5	0.05	0.2	0.5	0.1	3050	1.4	290	2.5	2.5	24	51

Report ID: 125169-IAS Rev01
Report Date: 09-Mar-12
Date Received: 09-Sep-11

CERTIFICATE OF ANALYSIS

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Soil

RPC Sample ID:			125169-2	125169-2 Dup
Client Sample ID:			B2A2	Lab Duplicate
Date Sampled:			8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**		
Total Inorganic Carbon	%	0.2	0.5	< 0.2
Carbon - Organic	%	0.1	2.7	2.9
Kjeldahl Nitrogen	mg/kg	50	1950	-

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Peter Crowhurst, B.Sc., C.Chem.
Analytical Chemist
Inorganic Analytical Chemistry

Krista Skinner
Chemical Technician
Inorganic Analytical Chemistry

Report ID: 125169-IAS Rev01
Report Date: 09-Mar-12
Date Received: 09-Sep-11

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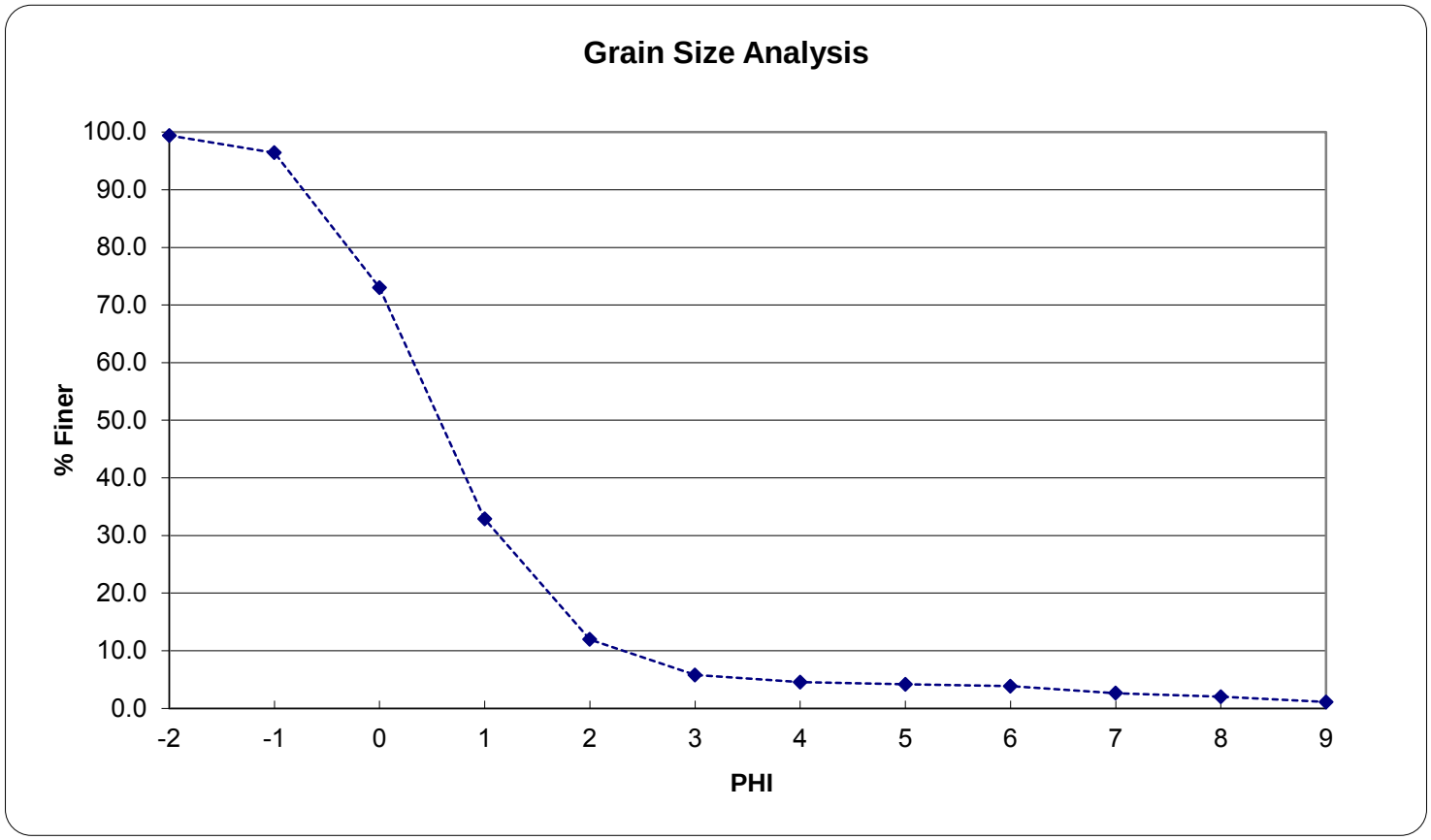
Particle Size Distribution

RPC ID	125169-2
Client ID	B2A2 8-Sept-11
PHI	
-2	99.4
-1	96.4
0	73.0
1	32.8
2	12.0
3	5.8
4	4.6
5	4.2
6	3.8
7	2.6
8	2.0
9	1.1

% Gravel	3.6
% Sand	91.9
% Silt	2.5
% Clay	2.0

RPC ID **125169-2**
Client ID **B2A2** **8-Sept-11**



% Gravel	3.6
% Sand	91.9
% Silt	2.5
% Clay	2.0

RPC
921 College Hill Road
Fredericton, NB
E3B 6Z9

Report ID: 125169-IAS Rev01
Report Date: 09-Mar-12
Date Received: 09-Sep-11

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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			125169-2
Client Sample ID:			B2A2
Date Sampled:			8-Sep-11
Analytes	**Units**	**RL**	
Aluminum	mg/kg	1	4620
Antimony	mg/kg	0.1	< 0.1
Arsenic	mg/kg	1	6
Barium	mg/kg	1	22
Beryllium	mg/kg	0.1	0.3
Bismuth	mg/kg	1	< 1
Boron	mg/kg	1	1
Cadmium	mg/kg	0.01	0.28
Calcium	mg/kg	50	1450
Chromium	mg/kg	1	4
Cobalt	mg/kg	0.1	3.2
Copper	mg/kg	1	2
Iron	mg/kg	20	3580
Lead	mg/kg	0.1	12.5
Lithium	mg/kg	0.1	8.5
Magnesium	mg/kg	10	1000
Manganese	mg/kg	1	192
Mercury	mg/kg	0.01	0.03
Molybdenum	mg/kg	0.1	0.1
Nickel	mg/kg	1	3
Phosphorus	mg/kg	20	280
Potassium	mg/kg	20	410
Rubidium	mg/kg	0.1	4.9
Selenium	mg/kg	1	< 1
Silver	mg/kg	0.1	0.1
Sodium	mg/kg	50	50
Strontium	mg/kg	1	7
Tellurium	mg/kg	0.1	< 0.1
Thallium	mg/kg	0.1	< 0.1
Tin	mg/kg	1	< 1
Uranium	mg/kg	0.1	1.2
Vanadium	mg/kg	1	8
Zinc	mg/kg	1	23

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Report ID: 125169-IAS Rev01
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Date Received: 09-Sep-11

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General Report Comments

125169-1
Ion imbalance is most likely due to species associated with the high organic carbon (relative to the total ionic strength of the sample) which are not accounted for in the anion calculations. In addition the iron and manganese in the sample are included in the cation calculations but may not be present in ionic form.

125169-02
Sample was air dried and sieved at 2 mm. A portion was digested according to EPA Method 3050B.
The resulting solution was analyzed for trace elements by ICP-MS.

Revision Comments

125169-02
Corrected the result for Kjeldahl Nitrogen.

Report ID: 125169-IAS Rev01
Report Date: 09-Mar-12
Date Received: 09-Sep-11

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Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000587	RB001931
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	24100	< 1
Antimony	mg/kg	0.1	< 0.1	0.1
Arsenic	mg/kg	1	8	< 1
Barium	mg/kg	1	401	< 1
Beryllium	mg/kg	0.1	0.7	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	35	< 1
Cadmium	mg/kg	0.01	0.33	< 0.01
Calcium	mg/kg	50	12900	< 50
Chromium	mg/kg	1	70	< 1
Cobalt	mg/kg	0.1	10.7	< 0.1
Copper	mg/kg	1	27	< 1
Iron	mg/kg	20	26200	< 20
Lead	mg/kg	0.1	10.6	< 0.1
Lithium	mg/kg	0.1	34.0	< 0.1
Magnesium	mg/kg	10	11400	< 10
Manganese	mg/kg	1	425	< 1
Mercury	mg/kg	0.01	0.87	< 0.01
Molybdenum	mg/kg	0.1	0.7	< 0.1
Nickel	mg/kg	1	69	< 1
Phosphorus	mg/kg	20	540	< 20
Potassium	mg/kg	20	3590	< 20
Rubidium	mg/kg	0.1	31.3	< 0.1
Selenium	mg/kg	1	1	< 1
Silver	mg/kg	0.1	0.1	< 0.1
Sodium	mg/kg	50	510	< 50
Strontium	mg/kg	1	99	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	3
Uranium	mg/kg	0.1	1.6	< 0.1
Vanadium	mg/kg	1	65	< 1
Zinc	mg/kg	1	84	< 1

Report ID: 125169-IAS Rev01
Report Date: 09-Mar-12
Date Received: 09-Sep-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 125406-IAS
Report Date: 26-Sep-11
Date Received: 14-Sep-11

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Tel: 506.452.1212
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Soil

RPC Sample ID:			125406-3	125406-4
Client Sample ID:			S2A2 - sediment	M3C3 - sediment
Date Sampled:			12-Sep-11	13-Sep-11
Analytes	**Units**	**RL**		
Total Inorganic Carbon	%	0.2	1.0	1.5
Carbon - Organic	%	0.1	6.6	3.1
Kjeldahl Nitrogen	mg/kg	50	4770	6190

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem.
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 125406-IAS
Report Date: 26-Sep-11
Date Received: 14-Sep-11

CERTIFICATE OF ANALYSIS

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www.rpc.ca

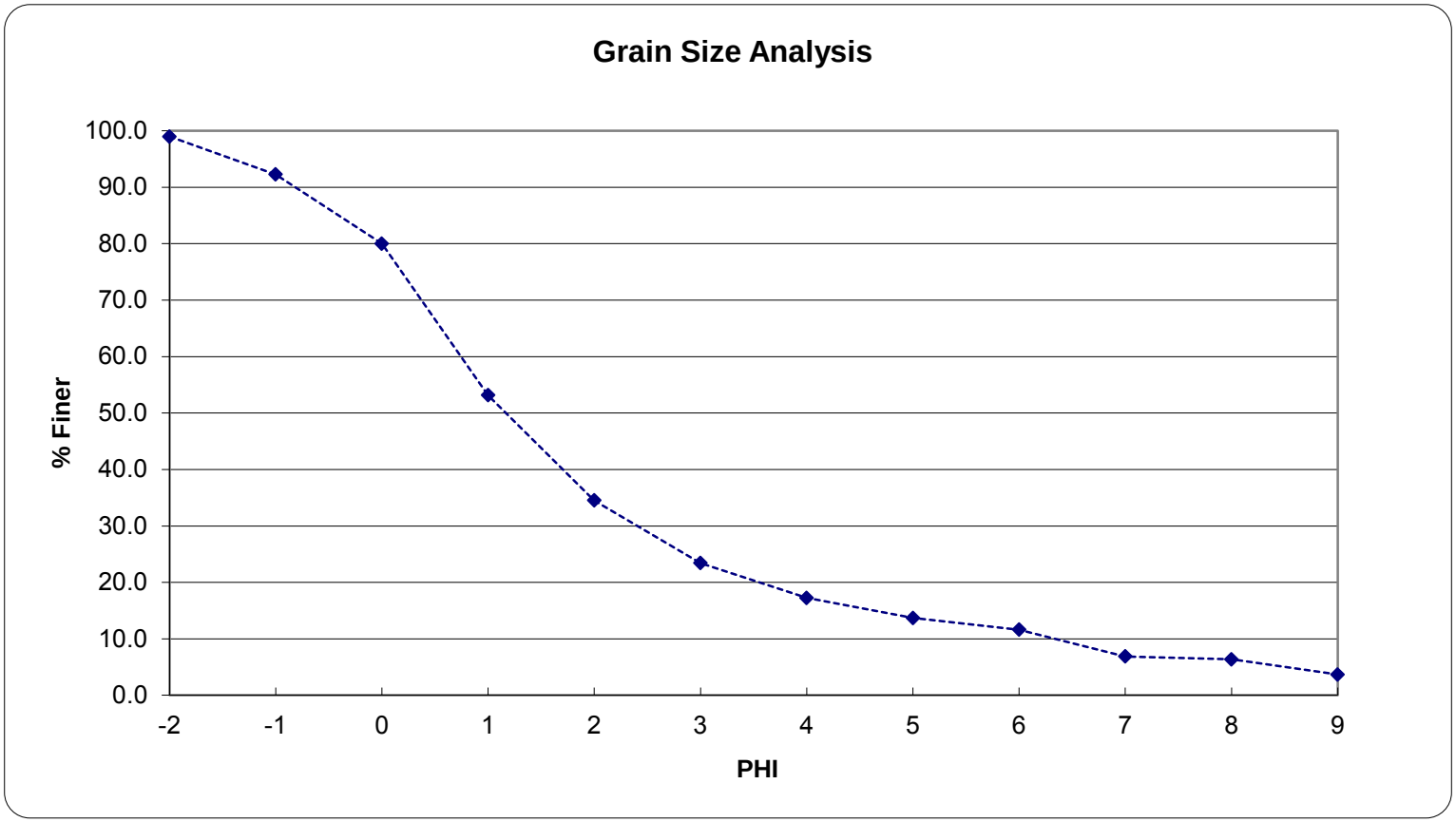
Attention: Eva Walker
Project #: 121810356
Location: Sisson

Grain Size Analysis

RPC ID	125406-3	125406-4
Client ID	S2A2 - sediment	M3C3 - sediment
Date Sampled:	12-Sep-11	13-Sep-11
	% Finer	
PHI		
-2.0	99.0	98.9
-1.0	92.3	94.9
0.0	80.0	87.8
1.0	53.2	63.7
2.0	34.5	24.5
3.0	23.4	11.0
4.0	17.3	7.6
5.0	13.7	6.7
6.0	11.6	6.1
7.0	6.9	4.3
8.0	6.4	3.1
9.0	3.7	1.9

% Gravel	7.7	5.1
% Sand	75.0	87.3
% Silt	10.9	4.5
% Clay	6.4	3.1

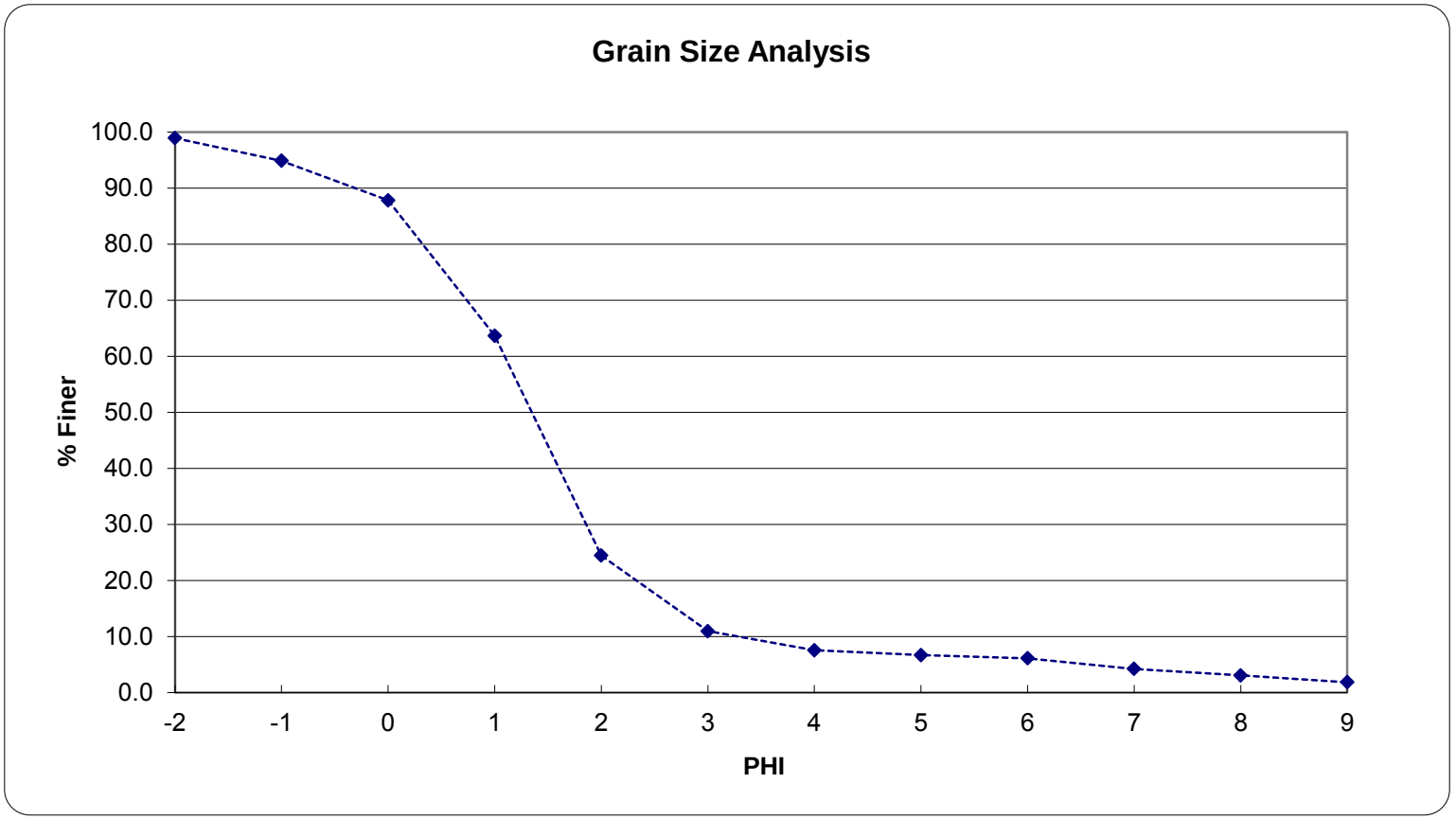
RPC ID **125406-3**
Client ID **S2A2 - sediment**
Date Sampled: 12-Sep-11



% Gravel	7.7
% Sand	75.0
% Silt	10.9
% Clay	6.4

RPC
921 College Hill Rd.
Fredericton, N.B.
E3B 6Z9

RPC ID **125406-4**
Client ID **M3C3 - sediment**
Date Sampled: 13-Sep-11



% Gravel	5.1
% Sand	87.3
% Silt	4.5
% Clay	3.1

RPC
921 College Hill Rd.
Fredericton, N.B.
E3B 6Z9

Report ID: 125406-IAS
Report Date: 26-Sep-11
Date Received: 14-Sep-11

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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			125406-3	125406-3 Dup	125406-4
Client Sample ID:			S2A2 - sediment	Lab Duplicate	M3C3 - sediment
Date Sampled:			12-Sep-11	12-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	1	6630	6990	5650
Antimony	mg/kg	0.1	0.2	< 0.1	< 0.1
Arsenic	mg/kg	1	24	27	2
Barium	mg/kg	1	45	51	20
Beryllium	mg/kg	0.1	0.4	0.5	0.2
Bismuth	mg/kg	1	3	2	< 1
Boron	mg/kg	1	2	1	1
Cadmium	mg/kg	0.01	1.21	1.56	1.69
Calcium	mg/kg	50	1320	1820	2550
Chromium	mg/kg	1	8	8	6
Cobalt	mg/kg	0.1	9.2	9.8	3.8
Copper	mg/kg	1	30	38	4
Iron	mg/kg	20	8070	7540	6620
Lead	mg/kg	0.1	18.4	22.6	12.4
Lithium	mg/kg	0.1	9.6	8.9	8.8
Magnesium	mg/kg	10	1740	1560	2230
Manganese	mg/kg	1	659	787	210
Mercury	mg/kg	0.01	0.06	0.06	0.05
Molybdenum	mg/kg	0.1	15.7	19.2	0.4
Nickel	mg/kg	1	8	8	5
Phosphorus	mg/kg	20	390	460	300
Potassium	mg/kg	20	540	620	380
Rubidium	mg/kg	0.1	8.3	9.3	5.0
Selenium	mg/kg	1	< 1	< 1	< 1
Silver	mg/kg	0.1	0.4	0.2	< 0.1
Sodium	mg/kg	50	< 50	60	80
Strontium	mg/kg	1	9	12	12
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.4	0.4	< 0.1
Tin	mg/kg	1	< 1	< 1	< 1
Uranium	mg/kg	0.1	0.6	0.7	0.7
Vanadium	mg/kg	1	15	18	14
Zinc	mg/kg	1	62	68	71

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Report ID: 125406-IAS
Report Date: 26-Sep-11
Date Received: 14-Sep-11

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General Report Comments

125406-03 & 125406-04
Samples were air dried and sieved at 2 mm. A portion of each was digested according to EPA Method 3050B.
The resulting solutions were analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

125406-01 & 125406-02
Ion imbalances are most likely due to species associated with the high organic carbon (relative to the total ionic strength of the sample) which are not accounted for in the anion calculations. In addition the iron and manganese in the samples are included in the cation calculations but may not be present in ionic form.

Report ID: 125406-IAS
Report Date: 26-Sep-11
Date Received: 14-Sep-11

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Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000589	RB001944
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	25400	< 1
Antimony	mg/kg	0.1	< 0.1	0.1
Arsenic	mg/kg	1	8	< 1
Barium	mg/kg	1	436	< 1
Beryllium	mg/kg	0.1	0.8	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	34	< 1
Cadmium	mg/kg	0.01	0.36	< 0.01
Calcium	mg/kg	50	13800	< 50
Chromium	mg/kg	1	76	< 1
Cobalt	mg/kg	0.1	11.7	< 0.1
Copper	mg/kg	1	30	< 1
Iron	mg/kg	20	28700	< 20
Lead	mg/kg	0.1	11.4	< 0.1
Lithium	mg/kg	0.1	37.4	< 0.1
Magnesium	mg/kg	10	12500	< 10
Manganese	mg/kg	1	465	< 1
Mercury	mg/kg	0.01	0.79	< 0.01
Molybdenum	mg/kg	0.1	0.6	< 0.1
Nickel	mg/kg	1	75	< 1
Phosphorus	mg/kg	20	580	20
Potassium	mg/kg	20	3800	< 20
Rubidium	mg/kg	0.1	32.6	< 0.1
Selenium	mg/kg	1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	550	< 50
Strontium	mg/kg	1	110	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	3
Uranium	mg/kg	0.1	1.7	< 0.1
Vanadium	mg/kg	1	69	< 1
Zinc	mg/kg	1	92	< 1

Report ID: 125406-IAS
Report Date: 26-Sep-11
Date Received: 14-Sep-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 125577-IAS
Report Date: 30-Sep-11
Date Received: 16-Sep-11

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Fax: 506.452.0594
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Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Soil

RPC Sample ID:			125577-3	125577-4
Client Sample ID:			B3A9	W4A31
Date Sampled:			14-Sep-11	15-Sep-11
Analytes	**Units**	**RL**		
Total Inorganic Carbon	%	0.2	4.6	< 0.2
Carbon - Organic	%	0.1	13.8	1.4
Kjeldahl Nitrogen	mg/kg	50	11500	3050

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem.
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 125577-IAS
Report Date: 30-Sep-11
Date Received: 16-Sep-11

CERTIFICATE OF ANALYSIS

921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

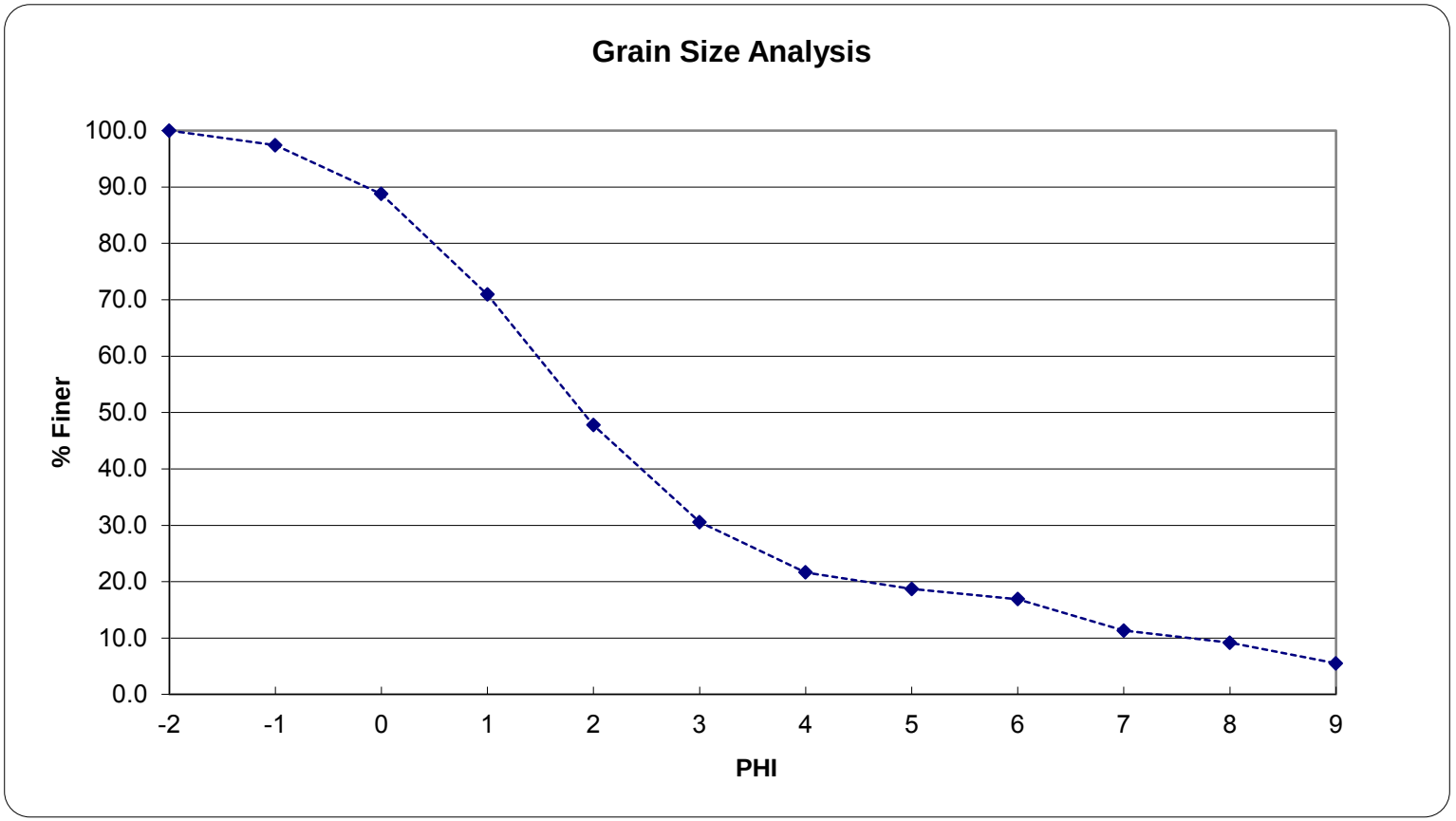
Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Grain Size Analysis

RPC ID	125577-3	125577-4
Client ID	B3A9	W4A31
Date Sampled:	14-Sep-11	15-Sep-11
	% Finer	
PHI		
-2.0	100.0	87.8
-1.0	97.4	77.6
0.0	88.8	51.1
1.0	70.9	25.7
2.0	47.8	13.5
3.0	30.5	8.9
4.0	21.6	6.9
5.0	18.7	6.0
6.0	16.9	4.6
7.0	11.3	2.7
8.0	9.2	1.8
9.0	5.5	0.8

% Gravel	2.6	22.4
% Sand	75.8	70.6
% Silt	12.5	5.1
% Clay	9.2	1.8

RPC ID **125577-3**
Client ID **B3A9**
Date Sampled: 14-Sep-11



% Gravel	2.6
% Sand	75.8
% Silt	12.5
% Clay	9.2

RPC
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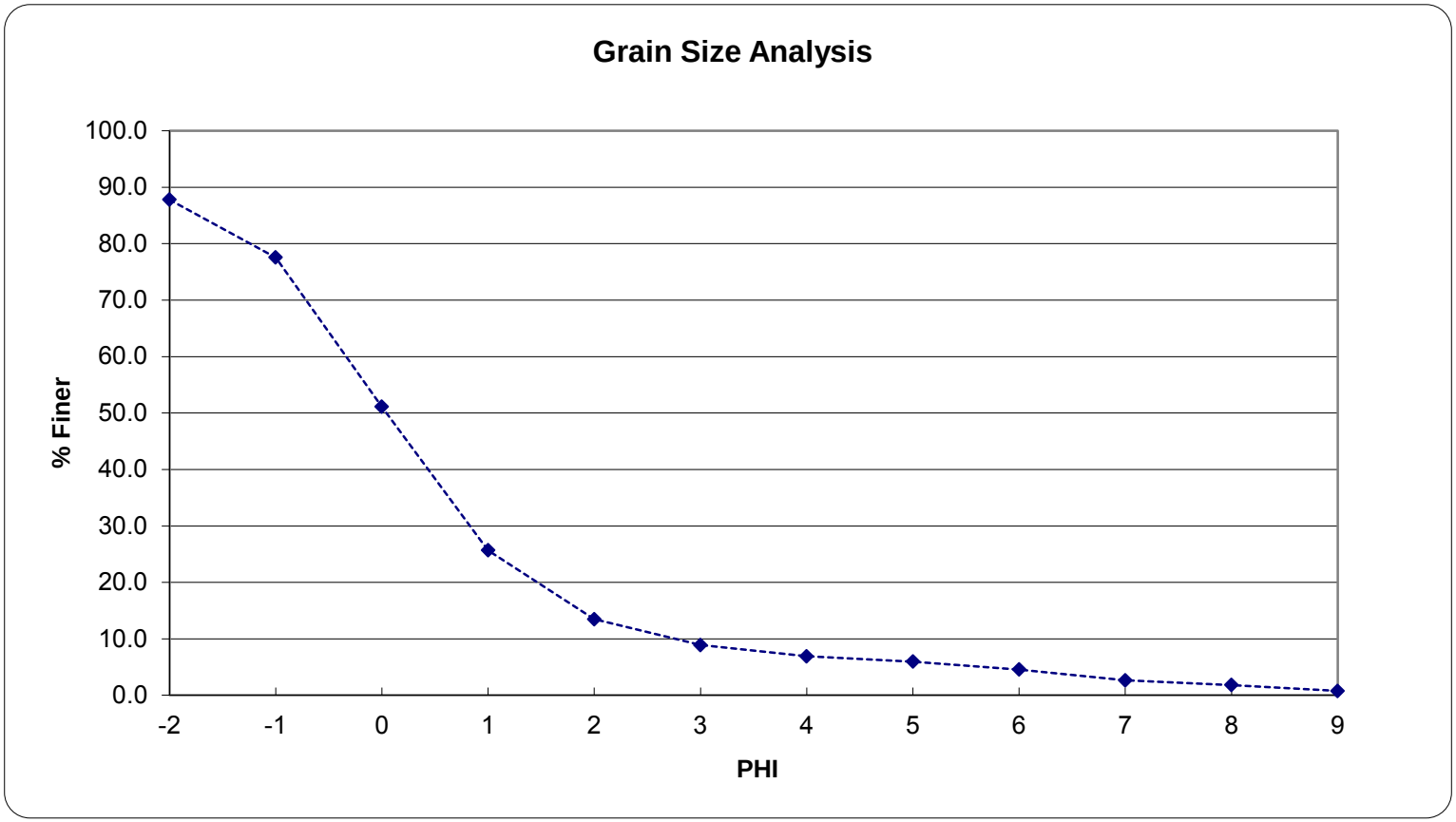
Fredericton, N.B.
E3B 6Z9

RPC ID **125577-4**
Client ID **W4A31**
Date Sampled: 15-Sep-11



% Gravel	22.4
% Sand	70.6
% Silt	5.1
% Clay	1.8

RPC
921 College Hill Rd.
Fredericton, N.B.
E3B 6Z9

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www.rpc.ca

Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			125577-3	125577-4
Client Sample ID:			B3A9	W4A31
Date Sampled:			14-Sep-11	15-Sep-11
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	6860	7860
Antimony	mg/kg	0.1	< 0.1	< 0.1
Arsenic	mg/kg	1	13	41
Barium	mg/kg	1	35	36
Beryllium	mg/kg	0.1	< 0.1	0.8
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	< 1	< 1
Cadmium	mg/kg	0.01	0.83	0.27
Calcium	mg/kg	50	2910	860
Chromium	mg/kg	1	6	11
Cobalt	mg/kg	0.1	4.3	10.6
Copper	mg/kg	1	3	14
Iron	mg/kg	20	7550	20000
Lead	mg/kg	0.1	30.9	17.7
Lithium	mg/kg	0.1	7.2	16.5
Magnesium	mg/kg	10	1360	2500
Manganese	mg/kg	1	331	784
Mercury	mg/kg	0.01	0.11	0.03
Molybdenum	mg/kg	0.1	< 0.1	4.5
Nickel	mg/kg	1	4	11
Phosphorus	mg/kg	20	650	290
Potassium	mg/kg	20	520	360
Rubidium	mg/kg	0.1	7.1	7.3
Selenium	mg/kg	1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	70	< 50
Strontium	mg/kg	1	17	5
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	< 0.1	0.2
Tin	mg/kg	1	< 1	< 1
Uranium	mg/kg	0.1	1.1	2.5
Vanadium	mg/kg	1	10	24
Zinc	mg/kg	1	51	51

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General Report Comments

125577-3 & 125577-4
Samples were air dried and sieved at 2 mm. A portion of each was digested according to EPA Method 3050B.
The resulting solutions were analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

125577-1 & 125577-2
Ion imbalances are most likely due to species associated with the high organic carbon (relative to the total ionic strength of the sample) which are not accounted for in the anion calculations. In addition the iron and manganese in the samples are included in the cation calculations but may not be present in ionic form.

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Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000589	RB001944
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	25400	< 1
Antimony	mg/kg	0.1	< 0.1	0.1
Arsenic	mg/kg	1	8	< 1
Barium	mg/kg	1	436	< 1
Beryllium	mg/kg	0.1	0.8	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	34	< 1
Cadmium	mg/kg	0.01	0.36	< 0.01
Calcium	mg/kg	50	13800	< 50
Chromium	mg/kg	1	76	< 1
Cobalt	mg/kg	0.1	11.7	< 0.1
Copper	mg/kg	1	30	< 1
Iron	mg/kg	20	28700	< 20
Lead	mg/kg	0.1	11.4	< 0.1
Lithium	mg/kg	0.1	37.4	< 0.1
Magnesium	mg/kg	10	12500	< 10
Manganese	mg/kg	1	465	< 1
Mercury	mg/kg	0.01	0.79	< 0.01
Molybdenum	mg/kg	0.1	0.6	< 0.1
Nickel	mg/kg	1	75	< 1
Phosphorus	mg/kg	20	580	20
Potassium	mg/kg	20	3800	< 20
Rubidium	mg/kg	0.1	32.6	< 0.1
Selenium	mg/kg	1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	550	< 50
Strontium	mg/kg	1	110	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	3
Uranium	mg/kg	0.1	1.7	< 0.1
Vanadium	mg/kg	1	69	< 1
Zinc	mg/kg	1	92	< 1

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 125664-IAS Rev.01
Report Date: 03-Oct-11
Date Received: 20-Sep-11

CERTIFICATE OF ANALYSIS

rpc
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Fredericton NB
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Tel: 506.452.1212
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www.rpc.ca

Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Soil

RPC Sample ID:			125664-2
Client Sample ID:			EBNB1
Date Sampled:			19-Sep-11
Analytes	**Units**	**RL**	
Total Inorganic Carbon	%	0.2	1.3
Carbon - Organic	%	0.1	9.0
Kjeldahl Nitrogen	mg/kg	50	5300

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A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem.
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 125664-IAS Rev.01
Report Date: 03-Oct-11
Date Received: 20-Sep-11

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Tel: 506.452.1212
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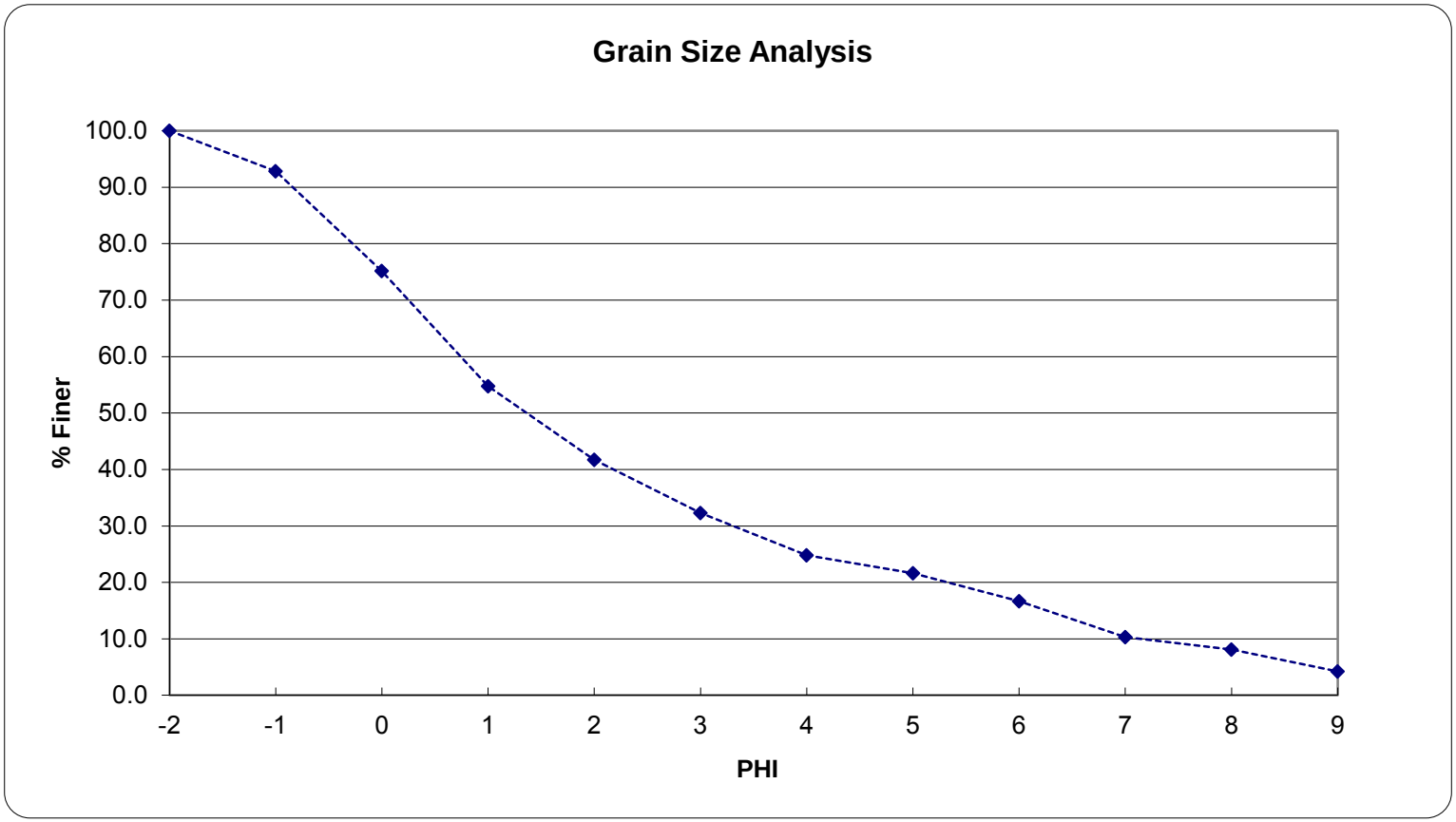
Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Grain Size Analysis

RPC ID	125664-2
Client ID	EBNB1
Date Sampled:	19-Sep-11
	% Finer
PHI	
-2.0	100.0
-1.0	92.8
0.0	75.1
1.0	54.7
2.0	41.7
3.0	32.3
4.0	24.8
5.0	21.6
6.0	16.7
7.0	10.3
8.0	8.1
9.0	4.2

% Gravel	7.2
% Sand	68.0
% Silt	16.7
% Clay	8.1

RPC ID **125664-2**
Client ID **EBNB1**
Date Sampled: 19-Sep-11



% Gravel	7.2
% Sand	68.0
% Silt	16.7
% Clay	8.1

RPC
921 College Hill Rd.
Fredericton, N.B.
E3B 6Z9

Report ID: 125664-IAS Rev.01
Report Date: 03-Oct-11
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			125664-2
Client Sample ID:			EBNB1
Date Sampled:			19-Sep-11
Analytes	**Units**	**RL**	
Aluminum	mg/kg	1	15000
Antimony	mg/kg	0.1	0.1
Arsenic	mg/kg	1	19
Barium	mg/kg	1	110
Beryllium	mg/kg	0.1	0.8
Bismuth	mg/kg	1	< 1
Boron	mg/kg	1	2
Cadmium	mg/kg	0.01	0.55
Calcium	mg/kg	50	3440
Chromium	mg/kg	1	28
Cobalt	mg/kg	0.1	20.6
Copper	mg/kg	1	9
Iron	mg/kg	20	26200
Lead	mg/kg	0.1	17.1
Lithium	mg/kg	0.1	22.5
Magnesium	mg/kg	10	4760
Manganese	mg/kg	1	1500
Mercury	mg/kg	0.01	0.07
Molybdenum	mg/kg	0.1	1.3
Nickel	mg/kg	1	31
Phosphorus	mg/kg	20	680
Potassium	mg/kg	20	660
Rubidium	mg/kg	0.1	9.6
Selenium	mg/kg	1	< 1
Silver	mg/kg	0.1	< 0.1
Sodium	mg/kg	50	60
Strontium	mg/kg	1	18
Tellurium	mg/kg	0.1	< 0.1
Thallium	mg/kg	0.1	0.5
Tin	mg/kg	1	< 1
Uranium	mg/kg	0.1	1.2
Vanadium	mg/kg	1	39
Zinc	mg/kg	1	100

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General Report Comments

125564-2
Sample was air dried and sieved at 2 mm. A portion was digested according to EPA Method 3050B.
The resulting solution was analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

125664-1
Ion imbalance is most likely due to species associated with the high organic carbon (relative to the total ionic strength of the sample) which are not accounted for in the anion calculations. In addition the iron and manganese in the sample are included in the cation calculations but may not be present in ionic form.

Report ID: 125664-IAS Rev.01
Report Date: 03-Oct-11
Date Received: 20-Sep-11

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Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000594	RB001958
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	25900	1
Antimony	mg/kg	0.1	0.1	0.1
Arsenic	mg/kg	1	8	< 1
Barium	mg/kg	1	435	< 1
Beryllium	mg/kg	0.1	0.7	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	39	< 1
Cadmium	mg/kg	0.01	0.35	< 0.01
Calcium	mg/kg	50	14000	< 50
Chromium	mg/kg	1	76	< 1
Cobalt	mg/kg	0.1	11.6	< 0.1
Copper	mg/kg	1	30	< 1
Iron	mg/kg	20	28500	< 20
Lead	mg/kg	0.1	11.1	< 0.1
Lithium	mg/kg	0.1	36.9	< 0.1
Magnesium	mg/kg	10	12500	< 10
Manganese	mg/kg	1	462	< 1
Mercury	mg/kg	0.01	0.86	< 0.01
Molybdenum	mg/kg	0.1	0.7	< 0.1
Nickel	mg/kg	1	74	< 1
Phosphorus	mg/kg	20	570	< 20
Potassium	mg/kg	20	3920	< 20
Rubidium	mg/kg	0.1	33.7	< 0.1
Selenium	mg/kg	1	1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	570	< 50
Strontium	mg/kg	1	106	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	3
Uranium	mg/kg	0.1	1.7	< 0.1
Vanadium	mg/kg	1	71	< 1
Zinc	mg/kg	1	90	< 1

Report ID: 125664-IAS Rev.01
Report Date: 03-Oct-11
Date Received: 20-Sep-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 126278-IAS
Report Date: 12-Oct-11
Date Received: 30-Sep-11

CERTIFICATE OF ANALYSIS

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Soil

RPC Sample ID:			126278-07	126278-08	126278-09	126278-10
Client Sample ID:			S3A3	W4A21	NRC-1	NRC-2
Date Sampled:			26-Sep-11	27-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**				
Total Inorganic Carbon	%	0.2	< 0.2	0.3	1.2	0.4
Carbon - Organic	%	0.1	4.4	2.4	8.6	5.1
Kjeldahl Nitrogen	mg/kg	50	2620	1130	4760	3950

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A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem.
Analytical Chemist
Inorganic Analytical Chemistry

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Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Soil

RPC Sample ID:			126278-11
Client Sample ID:			W4A17
Date Sampled:			28-Sep-11
Analytes	**Units**	**RL**	
Total Inorganic Carbon	%	0.2	1.4
Carbon - Organic	%	0.1	6.0
Kjeldahl Nitrogen	mg/kg	50	3820

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A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem.
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 125963-IAS
Report Date: 06-Oct-11
Date Received: 23-Sep-11

CERTIFICATE OF ANALYSIS

921 College Hill Rd
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

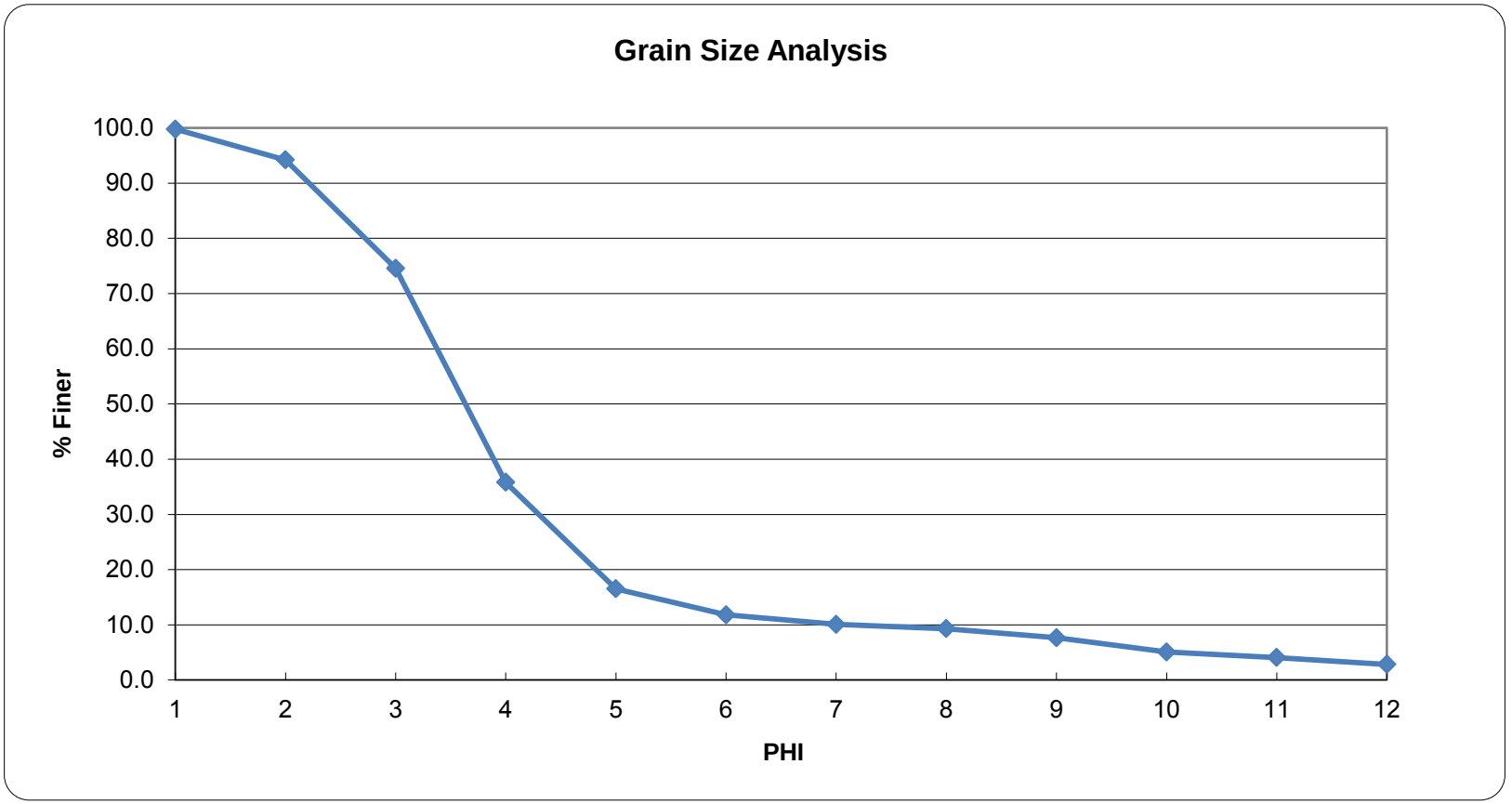
Attention: Mike Sweezey
Project #: 121810182
Location: Nadeau Poultry

Grain Size Analysis

RPC Sample ID:	126278-07	126278-08	126278-09	126278-10	126278-11
Client Sample ID:	S3A3	W4A21	NRC-1	NRC-2	W4A17
Date Sampled:	26-Sep-11	27-Sep-11	28-Sep-11	28-Sep-11	28-Sep-11
	% Finer				
PHI					
-2.0	99.8	95.8	99.6	99.8	94.1
-1.0	94.2	85.2	97.9	97.5	89.1
0.0	74.6	63.8	93.5	91.2	80.1
1.0	35.8	39.8	75.6	72.2	67.8
2.0	16.5	19.5	42.6	39.0	39.4
3.0	11.8	9.1	27.2	23.4	19.1
4.0	10.1	5.7	18.5	15.7	12.1
5.0	9.3	5.2	15.6	13.5	11.9
6.0	7.7	3.9	12.7	11.1	8.6
7.0	5.1	2.0	8.9	7.9	6.1
8.0	4.1	1.5	7.4	6.7	4.8
9.0	2.8	0.7	4.5	4.3	3.2

% Gravel	5.8	14.8	2.1	2.5	10.9
% Sand	84.1	79.5	79.4	81.7	77.0
% Silt	6.0	4.2	11.1	9.0	7.4
% Clay	4.1	1.5	7.4	6.7	4.8

RPC Sample ID: **126278-07**
Client Sample ID: **S3A3**
Date Sampled: 26-Sep-11



% Gravel	5.8
% Sand	84.1
% Silt	6.0
% Clay	4.1

RPC
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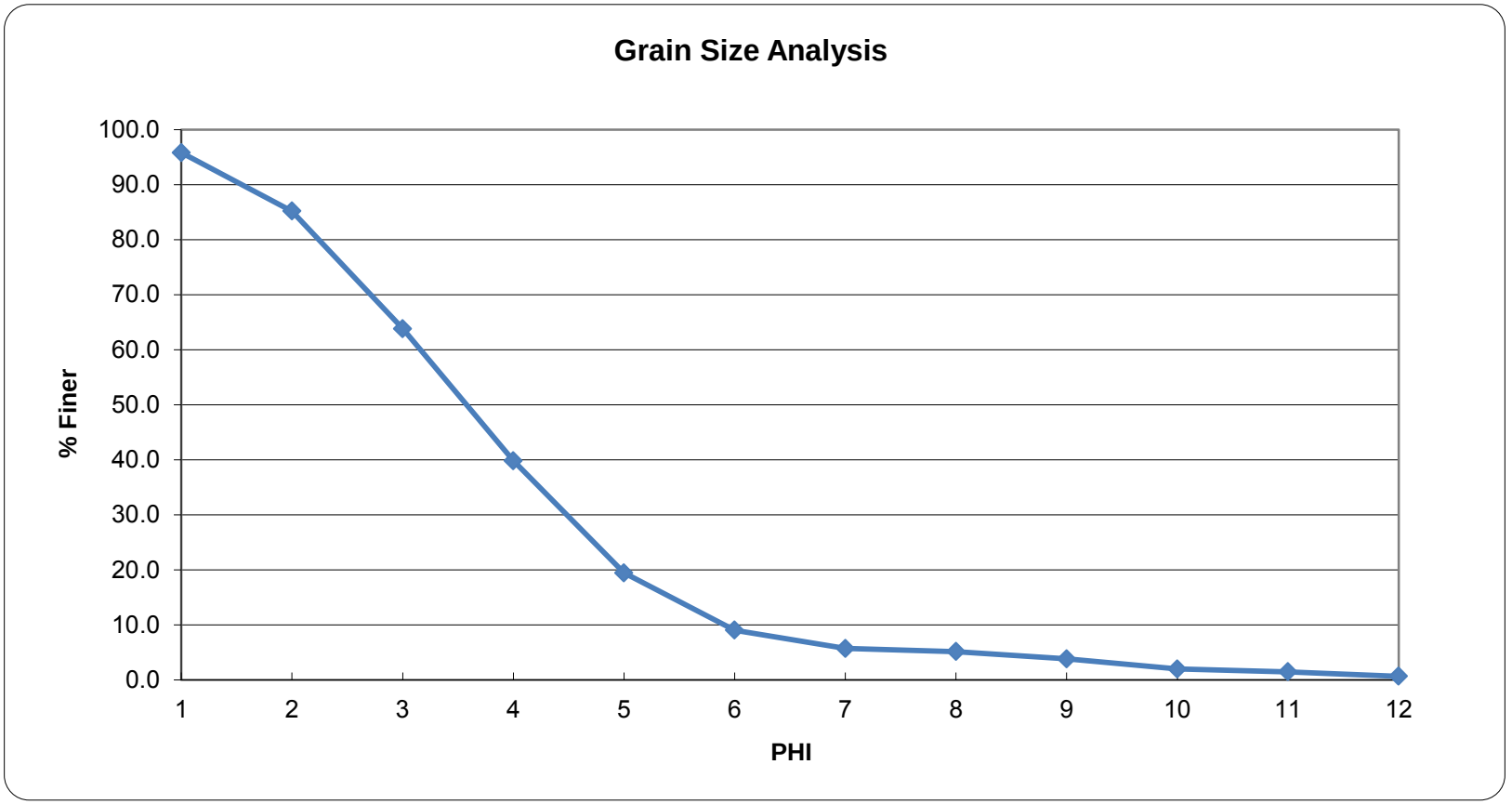
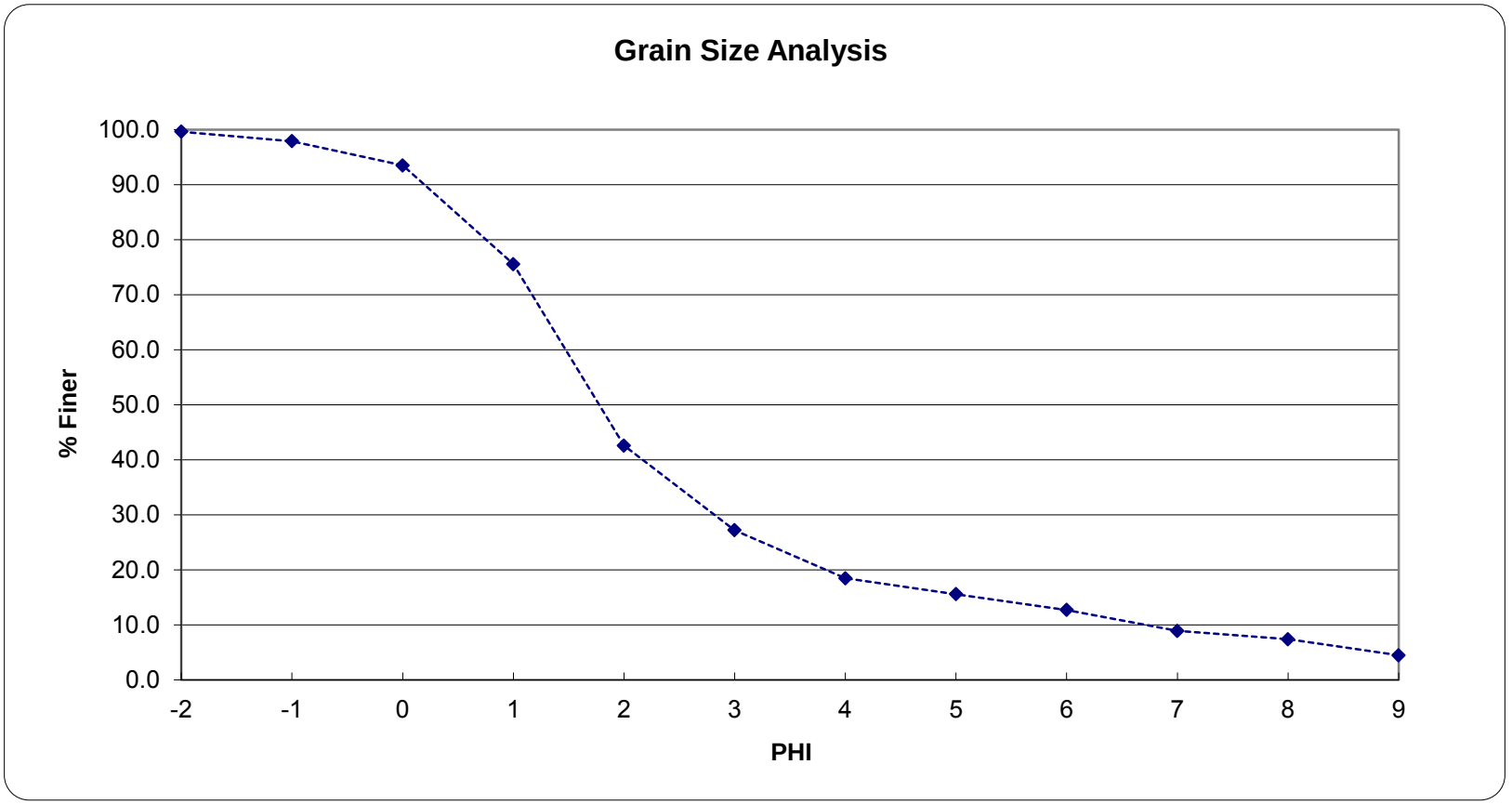
RPC Sample ID: **126278-08**
Client Sample ID: **W4A21**
Date Sampled: 26-Sep-11



% Gravel	14.8
% Sand	84.1
% Silt	6.0
% Clay	4.1

RPC
921 College Hill Rd.
Fredericton, N.B.
E3B 6Z9

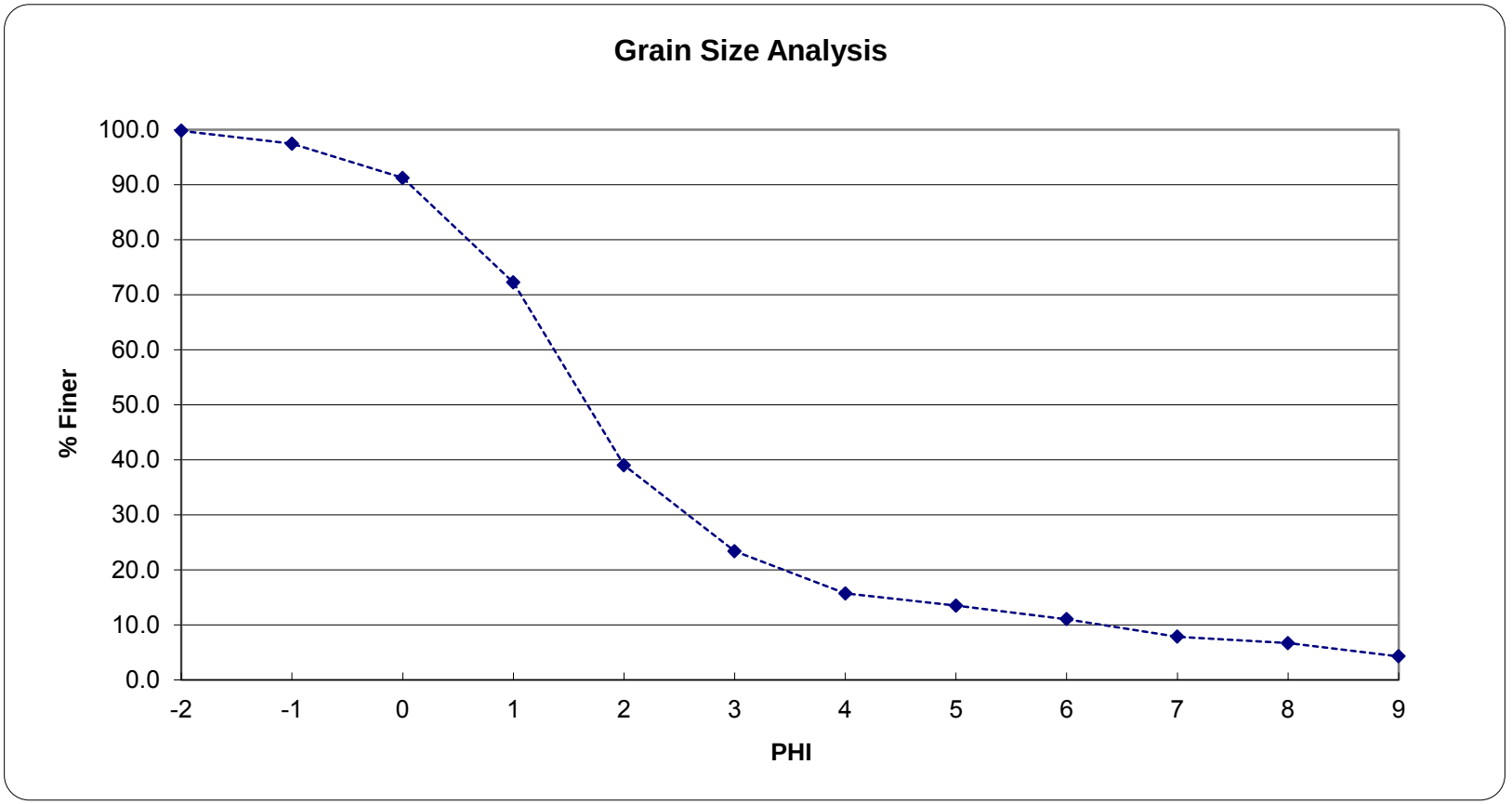
RPC Sample ID: **126278-09**
Client Sample ID: **NRC-1**
Date Sampled: 26-Sep-11



% Gravel	2.1
% Sand	79.4
% Silt	11.1
% Clay	7.4

RPC
921 College Hill Rd.
Fredericton, N.B.
E3B 6Z9

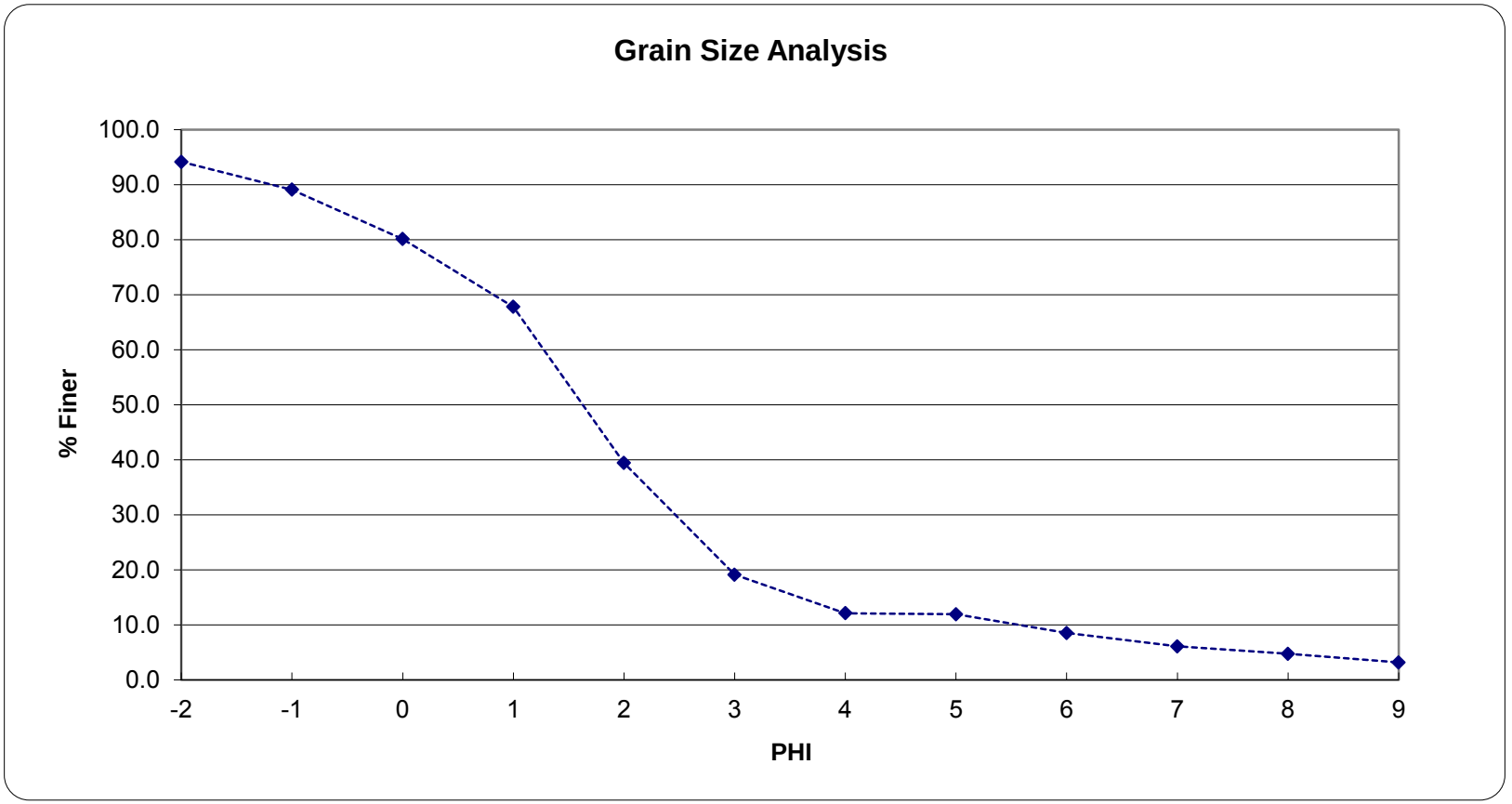
RPC Sample ID: **126278-10**
Client Sample ID: **NRC-2**
Date Sampled: 26-Sep-11



% Gravel	2.5
% Sand	81.7
% Silt	9.0
% Clay	6.7

RPC
921 College Hill Rd.
Fredericton, N.B.
E3B 6Z9

RPC Sample ID: **126278-11**
Client Sample ID: **W4A17**
Date Sampled: 26-Sep-11



% Gravel	10.9
% Sand	77.0
% Silt	7.4
% Clay	4.8

RPC
921 College Hill Rd.
Fredericton, N.B.
E3B 6Z9

Report ID: 126278-IAS
Report Date: 12-Oct-11
Date Received: 30-Sep-11

CERTIFICATE OF ANALYSIS

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
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www.rpc.ca

Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			126278-07	126278-07 Dup	126278-08	126278-09
Client Sample ID:			S3A3	Lab Duplicate	W4A21	NRC-1
Date Sampled:			26-Sep-11	26-Sep-11	27-Sep-11	28-Sep-11
Analytes	**Units**	**RL**				
Aluminum	mg/kg	1	8020	6680	4080	11300
Antimony	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Arsenic	mg/kg	1	72	61	68	10
Barium	mg/kg	1	38	34	117	40
Beryllium	mg/kg	0.1	0.6	0.5	1.9	0.5
Bismuth	mg/kg	1	2	2	< 1	< 1
Boron	mg/kg	1	1	< 1	< 1	1
Cadmium	mg/kg	0.01	0.98	0.92	0.99	0.39
Calcium	mg/kg	50	1190	1270	2820	2710
Chromium	mg/kg	1	10	8	5	18
Cobalt	mg/kg	0.1	12.5	10.9	9.9	6.7
Copper	mg/kg	1	30	29	5	5
Iron	mg/kg	20	12300	9660	70400	16300
Lead	mg/kg	0.1	13.4	10.9	10.8	14.0
Lithium	mg/kg	0.1	12.7	10.5	7.1	19.3
Magnesium	mg/kg	10	2490	1780	1360	3820
Manganese	mg/kg	1	549	470	2770	382
Mercury	mg/kg	0.01	0.04	0.04	0.03	0.04
Molybdenum	mg/kg	0.1	7.3	6.3	4.7	0.7
Nickel	mg/kg	1	10	9	19	15
Phosphorus	mg/kg	20	330	390	450	460
Potassium	mg/kg	20	700	560	210	740
Rubidium	mg/kg	0.1	9.9	8.4	4.3	9.5
Selenium	mg/kg	1	< 1	< 1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sodium	mg/kg	50	< 50	< 50	< 50	70
Strontium	mg/kg	1	9	8	10	11
Tellurium	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.3	0.3	< 0.1	0.1
Tin	mg/kg	1	< 1	< 1	< 1	< 1
Uranium	mg/kg	0.1	0.6	0.6	1.4	2.2
Vanadium	mg/kg	1	15	12	7	27
Zinc	mg/kg	1	75	64	64	57

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

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Attention: Mike Sweezey
Project #: 121810356
Location: Sisson

Analysis of Metals in Soil

RPC Sample ID:			126278-10	126278-11
Client Sample ID:			NRC-2	W4A17
Date Sampled:			28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	10100	4930
Antimony	mg/kg	0.1	0.2	< 0.1
Arsenic	mg/kg	1	7	7
Barium	mg/kg	1	34	22
Beryllium	mg/kg	0.1	0.5	0.5
Bismuth	mg/kg	1	2	< 1
Boron	mg/kg	1	1	< 1
Cadmium	mg/kg	0.01	0.35	0.36
Calcium	mg/kg	50	2120	1530
Chromium	mg/kg	1	16	6
Cobalt	mg/kg	0.1	6.1	4.2
Copper	mg/kg	1	5	2
Iron	mg/kg	20	14000	8060
Lead	mg/kg	0.1	11.6	11.8
Lithium	mg/kg	0.1	17.7	11.7
Magnesium	mg/kg	10	3400	1040
Manganese	mg/kg	1	351	295
Mercury	mg/kg	0.01	0.04	0.05
Molybdenum	mg/kg	0.1	0.6	0.3
Nickel	mg/kg	1	15	5
Phosphorus	mg/kg	20	420	380
Potassium	mg/kg	20	680	420
Rubidium	mg/kg	0.1	8.6	7.9
Selenium	mg/kg	1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	60	< 50
Strontium	mg/kg	1	10	10
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.1	0.1
Tin	mg/kg	1	< 1	< 1
Uranium	mg/kg	0.1	1.8	3.1
Vanadium	mg/kg	1	23	10
Zinc	mg/kg	1	52	32

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General Report Comments

Samples were air dried and sieved at 2 mm. A portion of each was digested according to EPA Method 3050B.
The resulting solutions were analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

126278-1 to 126278-3
Ion imbalances are most likely due to species associated with the high organic carbon (relative to the total ionic strength of the sample) which are not accounted for in the anion calculations. In addition the iron and manganese in the samples are included in the cation calculations but may not be present in ionic form.

Report ID: 126278-IAS
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Project #: 121810356
Location: Sisson

QA/QC Report

RPC Sample ID:			CRM000603	RB001990
Type:			CRM NIST 2709a	Blank
Analytes	**Units**	**RL**		
Aluminum	mg/kg	1	24600	< 1
Antimony	mg/kg	0.1	0.1	0.2
Arsenic	mg/kg	1	8	< 1
Barium	mg/kg	1	425	< 1
Beryllium	mg/kg	0.1	0.7	< 0.1
Bismuth	mg/kg	1	< 1	< 1
Boron	mg/kg	1	38	1
Cadmium	mg/kg	0.01	0.36	< 0.01
Calcium	mg/kg	50	13600	< 50
Chromium	mg/kg	1	74	< 1
Cobalt	mg/kg	0.1	11.5	< 0.1
Copper	mg/kg	1	30	< 1
Iron	mg/kg	20	28000	< 20
Lead	mg/kg	0.1	11.1	< 0.1
Lithium	mg/kg	0.1	36.1	< 0.1
Magnesium	mg/kg	10	12200	< 10
Manganese	mg/kg	1	458	< 1
Mercury	mg/kg	0.01	0.84	< 0.01
Molybdenum	mg/kg	0.1	0.7	< 0.1
Nickel	mg/kg	1	76	< 1
Phosphorus	mg/kg	20	570	< 20
Potassium	mg/kg	20	3740	< 20
Rubidium	mg/kg	0.1	33.5	< 0.1
Selenium	mg/kg	1	< 1	< 1
Silver	mg/kg	0.1	< 0.1	< 0.1
Sodium	mg/kg	50	540	< 50
Strontium	mg/kg	1	105	< 1
Tellurium	mg/kg	0.1	< 0.1	< 0.1
Thallium	mg/kg	0.1	0.2	< 0.1
Tin	mg/kg	1	< 1	3
Uranium	mg/kg	0.1	1.7	< 0.1
Vanadium	mg/kg	1	68	< 1
Zinc	mg/kg	1	90	< 1

Report ID: 126278-IAS
Report Date: 12-Oct-11
Date Received: 30-Sep-11

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion
Trace Metals	4.M01 & 4.M29	EPA 200.8 or EPA 200.7	ICP-MS or ICP-ES
Mercury	4.M20	EPA 245.5	Cold Vapor AAS

Report ID: 127369-IAS
Report Date: 03-Nov-11
Date Received: 20-Oct-11

CERTIFICATE OF ANALYSIS

rpc
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Attention: Eva Walker
Project #: 121810356

Analysis of Metals in Soil

Analytes:			Tungsten
Units:			mg/kg
RL:			5
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127369-14	NRC	15-Aug-11	< 5
127369-15	B2A2	8-Sep-11	< 5
127369-16	S2A2 - sediment	12-Sep-11	14
127369-16 Dup	Lab Duplicate	12-Sep-11	20
127369-17	M3C3 - sediment	13-Sep-11	< 5
127369-18	B3A9	14-Sep-11	< 5
127369-19	W4A31	15-Sep-11	< 5
127369-20	EBNB1	19-Sep-11	< 5
127369-21	S3A3	26-Sep-11	25
127369-21 Dup	Lab Duplicate	26-Sep-11	15
127369-22	W4A21	27-Sep-11	< 5
127369-23	NRC-1	28-Sep-11	< 5
127369-24	NRC-2	28-Sep-11	< 5
127369-25	W4A17	28-Sep-11	< 5

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RL = Reporting Limit

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 127369-IAS
Report Date: 03-Nov-11
Date Received: 20-Oct-11

CERTIFICATE OF ANALYSIS

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General Report Comments

127369-14 to 127369-25
Samples were air dried and sieved at 2 mm. A portion of each was digested according to EPA Method 3050B.
The resulting solutions were analyzed for Tungsten by ICP-MS.

Report ID: 127369-IAS
Report Date: 03-Nov-11
Date Received: 20-Oct-11

CERTIFICATE OF ANALYSIS

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Project #: 121810356

QA/QC Report - Soil

Analytes:			Tungsten
Units:			mg/kg
RL:			5
RPC Sample ID	**Type**	**Name**	
RB002082	Blank		< 5

Report ID: 127369-IAS
Report Date: 03-Nov-11
Date Received: 20-Oct-11

CERTIFICATE OF ANALYSIS

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
EPA 3050B Digestion	4.M19	EPA 3050B	Nitric acid/Hydrogen Peroxide Digestion

Appendix E-5

Data Summary Table and RPC Fish Tissue

Table E-5.1 Liver Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
B2A2-BT1	B2A2	BT1	11	0.03	0.1	0.1	0.01	0.1	0.1	0.59	60	0.1	0.09	52.4	345	0.03	0.01	184	2.8	0.33
B2A2-BT16	B2A2	BT16	0.5	0.01	0.1	0.1	0.01	0.1	0.1	0.082	40	0.1	0.07	19.2	157	0.01	0.01	201	1.5	0.69
B2A2-BT18	B2A2	BT18	2.1	0.01	0.1	0.1	0.01	0.1	0.1	0.157	70	0.1	0.07	27.5	82	0.01	0.01	242	3.8	0.17
B2A2-BT3	B2A2	BT3	2.15	0.015	0.05	0.05	0.005	0.05	0.05	0.0645	54.5	0.05	0.105	11.8	261	0.04	0.005	160.5	2	0.355
B2A2-BT4	B2A2	BT4	4.3	0.01	0.1	0.1	0.01	0.1	0.1	0.282	60	0.1	0.17	49.7	328	0.02	0.01	214	3	0.3
B2A2-BT5	B2A2	BT5	4.3	0.01	0.1	0.1	0.01	0.1	0.1	0.266	80	0.1	0.29	18.1	161	0.03	0.01	217	4.7	0.2
B2A2-BT6	B2A2	BT6	4.4	0.01	0.1	0.1	0.01	0.1	0.1	0.206	80	0.1	0.25	17	207	0.02	0.01	180	2.1	0.21
B2A2-BT8	B2A2	BT8	1.9	0.01	0.1	0.1	0.01	0.1	0.1	0.211	50	0.1	0.16	32.9	163	0.01	0.01	182	4.8	0.54
B2A2-Comp.1	B2A2	Comp.1	2.5	0.01	0.1	0.1	0.01	0.1	0.1	0.212	70	0.1	0.18	23.7	127	0.01	0.01	203	2.5	0.22
B2A2-Comp.2	B2A2	Comp.2	2.3	0.01	0.1	0.1	0.01	0.1	0.1	0.171	70	0.1	0.24	41.3	184	0.01	0.01	196	1.7	0.23
B3A9-BT1	B3A9	BT1	7.3	0.01	0.1	0.1	0.01	0.1	0.1	0.898	50	0.1	0.08	26.4	276	0.02	0.01	216	2.1	0.42
B3A9-BT13	B3A9	BT13	8.8	0.01	0.1	0.1	0.01	0.1	0.1	0.568	50	0.1	0.12	22.9	284	0.01	0.01	181	1.2	0.22
B3A9-BT14	B3A9	BT14	7	0.01	0.1	0.1	0.01	0.1	0.1	0.89	70	0.1	0.17	22.9	171	0.03	0.01	220	2.7	0.25
B3A9-BT2	B3A9	BT2	6.2	0.01	0.1	0.1	0.01	0.1	0.1	0.747	60	0.1	0.12	33.8	253	0.01	0.01	215	2	0.26
B3A9-BT4	B3A9	BT4	4.9	0.01	0.1	0.1	0.01	0.1	0.1	0.646	100	0.1	0.14	35.6	215	0.01	0.01	190	1.5	0.29
B3A9-BT5	B3A9	BT5	1.9	0.01	0.1	0.1	0.01	0.1	0.1	0.416	60	0.1	0.07	7.7	130	0.01	0.01	178	1.6	0.18
B3A9-BT7	B3A9	BT7	1.8	0.01	0.1	0.1	0.01	0.1	0.1	0.3155	60	0.1	0.135	14.8	99	0.01	0.01	228.5	2.7	0.08
B3A9-BT9	B3A9	BT9	6.8	0.01	0.1	0.1	0.01	0.1	0.1	0.473	40	0.1	0.12	14.3	200	0.06	0.01	171	1.6	0.23
B3A9-Comp1	B3A9	Comp1	5.5	0.01	0.1	0.1	0.01	0.1	0.1	0.457	70	0.1	0.07	14.1	108	0.01	0.01	194	1.4	0.21
B3A9-Comp2	B3A9	Comp2	14	0.05	0.5	0.5	0.05	0.5	0.5	0.83	120	0.5	0.2	62	220	0.05	0.05	280	3	0.2
EBNB1-BT1	EBNB1	BT1	2	0.05	0.2	0.05	0.005	0.2	0.05	0.267	47	0.05	0.16	28.6	183	0.01	0.005	204	1.9	0.04
EBNB1-BT2	EBNB1	BT2	2.1	0.01	0.1	0.1	0.01	0.1	0.1	0.196	50	0.1	0.12	27.1	160	0.01	0.01	185	1.8	0.03
EBNB1-BT3	EBNB1	BT3	6	0.1	1	1	0.1	1	1	0.29	100	1	0.3	40	160	0.1	0.1	460	7	0.1
M3C3-BT1	M3C3	BT1	1.45	0.01	0.1	0.1	0.01	0.1	0.1	0.1695	60	0.1	0.09	8.15	93.5	0.01	0.01	220.5	2.9	0.165
M3C3-BT10	M3C3	BT10	4.2	0.01	0.1	0.1	0.01	0.1	0.1	0.407	80	0.1	0.24	14.4	210	0.01	0.01	171	2.2	0.08
M3C3-BT2	M3C3	BT2	2.2	0.01	0.1	0.1	0.01	0.1	0.1	0.569	80	0.1	0.19	39.9	241	0.01	0.01	173	1.5	0.2
M3C3-BT3	M3C3	BT3	14.6	0.025	0.25	0.25	0.025	0.25	0.25	0.982	80	0.25	0.16	53.9	220	0.025	0.025	258	1.9	0.15
M3C3-BT4	M3C3	BT4	3.4	0.01	0.1	0.1	0.01	0.1	0.1	0.551	140	0.1	0.15	24.9	146	0.01	0.01	209	2.5	0.1
M3C3-BT5	M3C3	BT5	1.5	0.01	0.1	0.1	0.01	0.1	0.1	0.347	60	0.1	0.13	25.2	95	0.01	0.01	174	1.7	0.13
M3C3-BT6	M3C3	BT6	3.2	0.01	0.1	0.1	0.01	0.1	0.1	0.294	50	0.1	0.09	26.4	250	0.01	0.01	173	1.8	0.11
M3C3-BT7	M3C3	BT7	0.7	0.01	0.1	0.1	0.01	0.1	0.1	0.182	85	0.1	0.075	12.8	83.5	0.01	0.01	221.5	3.3	0.195
M3C3-BT8	M3C3	BT8	1.4	0.01	0.1	0.1	0.01	0.1	0.1	0.317	70	0.1	0.05	10.8	86	0.01	0.01	222	5	0.12
M3C3-BT9	M3C3	BT9	2.6	0.01	0.1	0.1	0.01	0.1	0.1	0.484	60	0.1	0.14	33.8	132	0.03	0.01	176	1.5	0.18
S2A2-BT11	S2A2	BT11	7.7	0.01	0.1	0.1	0.01	0.1	0.1	0.395	70	0.1	0.07	38.3	358	0.01	0.01	173	1.9	0.25
S2A2-BT13	S2A2	BT13	1.4	0.01	0.1	0.1	0.01	0.1	0.1	0.278	80	0.1	0.05	52.8	149	0.01	0.01	195	1.6	0.16
S2A2-BT15	S2A2	BT15	2	0.005	0.05	0.05	0.005	0.05	0.05	0.241	67	0.05	0.11	20.1	248	0.005	0.005	181	2.1	0.41
S2A2-BT22	S2A2	BT22	6	0.01	0.1	0.1	0.01	0.1	0.1	0.363	60	0.1	0.06	19.2	129	0.01	0.01	179	1.4	0.17
S2A2-BT23	S2A2	BT23	2.6	0.01	0.1	0.1	0.01	0.1	0.1	0.1915	55	0.1	0.075	14.9	255	0.01	0.01	131.5	1.55	0.18
S2A2-BT24	S2A2	BT24	11.7	0.025	0.25	0.25	0.025	0.25	0.25	0.43	70	0.25	0.1	43.4	210	0.025	0.025	192	1.8	0.11
S2A2-BT3	S2A2	BT3	0.8	0.01	0.1	0.1	0.01	0.1	0.1	0.27	60	0.1	0.03	69.2	159	0.05	0.01	169	1.8	0.17
S2A2-BT4	S2A2	BT4	1.6	0.07	0.1	0.1	0.01	0.6	0.1	0.306	50	0.1	0.07	22.9	101	0.01	0.01	220	3.5	0.18
S2A2-Comp1	S2A2	Comp1	10	0.01	0.1	0.1	0.01	0.1	0.1	0.533	80	0.1	0.11	28.3	218	0.01	0.01	253	2.4	0.18
S2A2-Comp2	S2A2	Comp2	5.3	0.01	0.1	0.1	0.01	0.1	0.1	0.667	70	0.1	0.09	36.3	229	0.01	0.01	235	1.8	0.15
S3A3-BT1	S3A3	BT1	11.1	0.01	0.1	0.1	0.01	0.1	0.1	1.26	80	0.1	0.26	8.6	379	0.01	0.01	217	2.1	0.29
S3A3-BT10	S3A3	BT10	3.3	0.01	0.1	0.1	0.01	0.1	0.1	0.747	90	0.1	0.27	18	143	0.01	0.01	239	2.9	0.16
S3A3-BT12	S3A3	BT12	20.9	0.08	0.1	0.1	0.01	0.1	0.1	1.44	90	0.1	0.35	58.4	243	0.06	0.01	206	2.8	0.16
S3A3-BT23	S3A3	BT23	7.3	0.01	0.1	0.1	0.01	0.1	0.1	0.828	50	0.1	0.26	31.5	180	0.01	0.01	196	1.5	0.12
S3A3-BT4	S3A3	BT4	10.8	0.005	0.05	0.05	0.005	0.05	0.05	1.56	64	0.05	0.31	46.9	494	0.005	0.005	179	1.9	0.29
S3A3-BT5	S3A3	BT5	10.6	0.01	0.1	0.1	0.01	0.1	0.1	1.18	70	0.1	0.15	38.7	245	0.01	0.01	189	1.8	0.15
S3A3-BT8	S3A3	BT8	16.7	0.01	0.1	0.1	0.01	0.1	0.1	3.03	80	0.1	0.2	80.5	311	0.03	0.01	171	2	0.24

Table E-5.1 Liver Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
B2A2-BT1	B2A2	BT1	0.31	0.1	2550	7.32	0.7	2.37	2180	0.1	0.01	0.02	0.02	0.01	0.01	0.1	35.3
B2A2-BT16	B2A2	BT16	0.35	0.1	3710	5.39	0.4	0.66	1700	0.1	0.01	0.12	0.05	0.01	0.01	0.1	21.2
B2A2-BT18	B2A2	BT18	0.21	0.1	4570	15.7	0.5	1.39	1010	0.1	0.01	0.1	0.01	0.01	0.01	0.1	21.5
B2A2-BT3	B2A2	BT3	0.28	0.05	2750	5.255	0.35	0.41	1885	0.1	0.005	0.03	0.0225	0.0125	0.005	0.05	23.1
B2A2-BT4	B2A2	BT4	0.3	0.1	3630	12.8	0.8	1.98	2140	0.1	0.01	0.05	0.04	0.01	0.01	0.1	31
B2A2-BT5	B2A2	BT5	0.17	0.1	3630	21.1	0.5	0.86	1490	0.1	0.01	0.06	0.28	0.01	0.01	0.1	19
B2A2-BT6	B2A2	BT6	0.27	0.1	3080	8.6	0.8	0.95	2390	0.2	0.01	0.07	0.01	0.01	0.01	0.1	20.7
B2A2-BT8	B2A2	BT8	0.29	0.1	3520	7.94	0.5	1.26	1610	0.1	0.01	0.04	0.04	0.01	0.01	0.1	25.2
B2A2-Comp.1	B2A2	Comp.1	0.31	0.1	4070	10.4	1	1.11	1960	0.2	0.01	0.06	0.01	0.01	0.01	0.1	27.4
B2A2-Comp.2	B2A2	Comp.2	0.31	0.1	3740	10.8	0.9	1.52	1780	0.2	0.01	0.09	0.01	0.01	0.01	0.1	29.3
B3A9-BT1	B3A9	BT1	0.21	0.1	3780	19.3	0.5	1.09	1210	0.1	0.01	0.1	0.05	0.01	0.01	0.1	27.9
B3A9-BT13	B3A9	BT13	0.29	0.1	2870	11.8	0.7	1.35	1690	0.1	0.01	0.07	0.01	0.01	0.01	0.1	26.2
B3A9-BT14	B3A9	BT14	0.2	0.1	3490	23.2	0.5	1.24	1320	0.1	0.01	0.06	0.01	0.01	0.01	0.1	23.7
B3A9-BT2	B3A9	BT2	0.4	0.1	3570	14.7	0.7	1.53	1710	0.1	0.01	0.1	0.05	0.01	0.01	0.1	33.2
B3A9-BT4	B3A9	BT4	0.33	0.1	3510	12.9	0.8	1.19	1860	0.1	0.01	0.11	0.01	0.01	0.01	0.1	29.1
B3A9-BT5	B3A9	BT5	0.29	0.1	3830	13	0.5	0.34	1590	0.1	0.01	0.09	0.01	0.01	0.01	0.1	17.6
B3A9-BT7	B3A9	BT7	0.18	0.1	4290	26.25	0.7	0.465	1110	0.1	0.01	0.095	0.01	0.01	0.01	0.1	19.4
B3A9-BT9	B3A9	BT9	0.31	0.1	2930	10.2	0.7	0.7	1500	0.1	0.01	0.09	0.01	0.01	0.01	0.1	21.6
B3A9-Comp1	B3A9	Comp1	0.37	0.1	3340	11.8	0.7	0.72	1860	0.1	0.01	0.08	0.02	0.01	0.01	0.1	23.2
B3A9-Comp2	B3A9	Comp2	0.5	0.5	5000	19.7	1	2.8	2380	0.5	0.05	0.1	0.05	0.05	0.05	0.5	39
EBNB1-BT1	EBNB1	BT1	0.33	0.05	3890	15.9	2.9	0.98	1350	0.05	0.005	0.29	0.04	0.005	0.005	0.05	32.2
EBNB1-BT2	EBNB1	BT2	0.31	0.1	3470	11.9	2	1.31	1390	0.1	0.01	0.15	0.07	0.01	0.01	0.1	24.7
EBNB1-BT3	EBNB1	BT3	0.6	1	8960	24.6	3	1.4	3500	1	0.1	0.6	2.9	0.1	0.1	1	48
M3C3-BT1	M3C3	BT1	0.22	0.1	3880	21.2	0.45	0.24	1210	0.1	0.01	0.05	0.01	0.01	0.01	0.1	21.15
M3C3-BT10	M3C3	BT10	0.25	0.1	3390	10.5	0.7	0.38	1840	0.1	0.01	0.15	0.01	0.01	0.01	0.1	22.6
M3C3-BT2	M3C3	BT2	0.27	0.1	3410	11.9	0.7	0.93	1560	0.1	0.01	0.05	0.01	0.01	0.01	0.1	32.7
M3C3-BT3	M3C3	BT3	0.41	0.25	4420	12.8	0.8	0.67	1510	0.25	0.025	0.08	0.025	0.025	0.025	0.25	66
M3C3-BT4	M3C3	BT4	0.31	0.1	3800	14.1	0.7	0.58	1280	0.1	0.01	0.08	0.01	0.01	0.01	0.1	35.2
M3C3-BT5	M3C3	BT5	0.25	0.1	3430	6.68	0.7	1.06	1910	0.1	0.01	0.05	0.01	0.01	0.01	0.1	26.4
M3C3-BT6	M3C3	BT6	0.23	0.1	3460	8.94	0.6	0.63	1320	0.1	0.01	0.04	0.01	0.01	0.01	0.1	29.6
M3C3-BT7	M3C3	BT7	0.175	0.1	3865	20	0.4	0.22	1195	0.1	0.01	0.05	0.01	0.01	0.01	0.1	23.45
M3C3-BT8	M3C3	BT8	0.22	0.1	3760	18.2	0.4	0.36	1290	0.1	0.01	0.05	0.01	0.01	0.01	0.1	19.8
M3C3-BT9	M3C3	BT9	0.29	0.1	3360	9.92	0.6	0.82	1580	0.1	0.01	0.09	0.01	0.01	0.01	0.1	29.9
S2A2-BT11	S2A2	BT11	0.39	0.1	3030	11.3	0.7	0.93	1980	0.1	0.01	0.09	0.01	0.03	0.01	0.1	26.9
S2A2-BT13	S2A2	BT13	0.33	0.1	3560	12.7	0.5	1.1	1840	0.2	0.01	0.12	0.01	0.03	0.01	0.1	41.7
S2A2-BT15	S2A2	BT15	0.48	0.05	2770	8.91	0.4	0.37	2100	0.2	0.005	0.08	0.005	0.02	0.005	0.05	20.7
S2A2-BT22	S2A2	BT22	0.36	0.1	3230	13.9	0.8	0.71	1520	0.1	0.01	0.07	0.01	0.01	0.01	0.1	28.6
S2A2-BT23	S2A2	BT23	0.285	0.1	2475	6.365	0.4	0.355	1865	0.1	0.01	0.08	0.01	0.01	0.01	0.1	21.4
S2A2-BT24	S2A2	BT24	0.42	0.25	3240	11.3	0.8	1.33	1900	0.25	0.025	0.13	0.025	0.025	0.025	0.25	32.8
S2A2-BT3	S2A2	BT3	0.27	0.1	3010	13.9	0.6	0.72	1900	0.1	0.01	0.05	0.01	0.01	0.01	0.1	44.5
S2A2-BT4	S2A2	BT4	0.26	0.1	3730	18.3	0.5	0.42	1160	0.1	0.01	0.11	0.04	0.03	0.01	0.1	22.4
S2A2-Comp1	S2A2	Comp1	0.59	0.1	4280	11.4	1.1	0.92	2030	0.2	0.01	0.17	0.01	0.05	0.07	0.1	35.7
S2A2-Comp2	S2A2	Comp2	0.44	0.1	4330	17	1	1.2	1500	0.1	0.01	0.25	0.01	0.02	0.01	0.1	33.4
S3A3-BT1	S3A3	BT1	0.58	0.1	2860	12.8	1.1	0.26	2530	0.2	0.01	0.29	0.05	0.06	0.01	0.1	18.3
S3A3-BT10	S3A3	BT10	0.21	0.1	3600	28.6	0.7	0.31	1510	0.1	0.01	0.13	0.01	0.02	0.01	0.1	23.1
S3A3-BT12	S3A3	BT12	0.38	0.1	3150	15.2	1	1.35	1880	0.1	0.01	0.22	0.01	0.03	0.01	0.1	36.4
S3A3-BT23	S3A3	BT23	0.39	0.1	3570	14.6	0.9	0.58	1450	0.1	0.01	0.21	0.01	0.01	0.01	0.1	26.6
S3A3-BT4	S3A3	BT4	0.51	0.05	2690	11.7	1.2	1.06	2160	0.1	0.005	0.34	0.005	0.05	0.005	0.05	31.3
S3A3-BT5	S3A3	BT5	0.41	0.1	2860	10.4	1	1.17	2030	0.1	0.01	0.19	0.01	0.03	0.01	0.1	32.3
S3A3-BT8	S3A3	BT8	0.37	0.1	2700	14	1.1	1.64	2260	0.1	0.01	0.16	0.01	0.11	0.01	0.1	37.1

Table E-5.1 Liver Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
S3A3-BT9	S3A3	BT9	12.7	0.01	0.1	0.1	0.01	0.1	0.1	1.5	60	0.1	0.63	43.3	295	0.01	0.01	175	1.9	0.15
S3A3-Comp1	S3A3	Comp1	6.9	0.01	0.1	0.1	0.01	0.1	0.1	0.782	90	0.1	0.28	38	225	0.01	0.01	218	2	0.14
S3A3-Comp2	S3A3	Comp2	3.6	0.01	0.1	0.1	0.01	0.1	0.1	0.847	60	0.1	0.21	28.8	223	0.01	0.01	192	1.8	0.15
W4A17-BT1	W4A17	BT1	3.8	0.005	0.05	0.05	0.005	0.05	0.05	0.121	73	0.05	0.08	46.5	223	0.005	0.02	183	2	0.22
W4A17-BT12	W4A17	BT12	10.1	0.01	0.1	0.1	0.01	0.1	0.1	0.276	50	0.1	0.12	80.7	375	0.01	0.01	191	2.9	0.2
W4A17-BT13	W4A17	BT13	7	0.01	0.1	0.1	0.01	0.1	0.1	0.204	50	0.1	0.1	11.8	165	0.01	0.01	191	3.4	0.07
W4A17-BT2	W4A17	BT2	4.5	0.01	0.1	0.1	0.01	0.1	0.1	0.138	70	0.1	0.07	21.8	133	0.01	0.01	263	3.3	0.25
W4A17-BT20	W4A17	BT20	4.7	0.01	0.1	0.1	0.01	0.1	0.1	0.125	60	0.1	0.16	13.2	240	0.01	0.01	187	1.5	0.22
W4A17-BT23	W4A17	BT23	4.3	0.025	0.25	0.25	0.025	0.25	0.25	0.154	260	0.25	0.1	29.3	180	0.025	0.025	190	1.7	0.17
W4A17-BT24	W4A17	BT24	2	0.01	0.1	0.1	0.01	0.1	0.1	0.119	70	0.1	0.055	5.9	95	0.01	0.01	210.5	2.05	0.14
W4A17-BT6	W4A17	BT6	8.9	0.01	0.1	0.1	0.01	0.1	0.1	0.163	60	0.1	0.07	17	240	0.01	0.01	182	1.3	0.17
W4A17-BT9	W4A17	BT9	6.8	0.01	0.1	0.1	0.01	0.1	0.1	0.137	70	0.5	0.32	15.4	226	0.01	0.01	176	2	0.11
W4A17-Comp1	W4A17	Comp1	3.4	0.005	0.05	0.05	0.005	0.05	0.05	0.12	58	0.05	0.06	27.9	177	0.005	0.01	201	1.4	0.27
W4A21-BT1	W4A21	BT1	1.9	0.04	0.1	0.05	0.005	0.1	0.05	0.203	62	0.05	0.23	23.1	130	0.005	0.005	197	1.5	0.1
W4A21-BT2	W4A21	BT2	2.2	0.005	0.05	0.05	0.005	0.05	0.05	0.327	54	0.05	0.09	15.4	168	0.02	0.005	191	1.5	0.11
W4A21-BT3	W4A21	BT3	3.6	0.01	0.1	0.1	0.01	0.1	0.1	0.289	60	0.1	0.1	29.7	147	0.01	0.01	186	1.4	0.18
W4A21-BT4	W4A21	BT4	2.9	0.01	0.1	0.1	0.01	0.1	0.1	0.248	40	0.1	0.08	50.7	94	0.01	0.01	196	1.2	0.18
W4A21-BT5	W4A21	BT5	5.1	0.01	0.1	0.1	0.01	0.1	0.1	0.364	50	0.1	0.09	66.2	304	0.01	0.01	179	1.4	0.18
W4A21-BT6	W4A21	BT6	2.8	0.01	0.1	0.1	0.01	0.1	0.1	0.4	60	0.1	0.1	35.5	154	0.01	0.01	186	1.5	0.17
W4A21-BT9	W4A21	BT9	2.1	0.01	0.1	0.1	0.01	0.1	0.1	0.372	60	0.1	0.11	17.1	194	0.01	0.01	177	1.7	0.12
W4A21-Comp1	W4A21	Comp1	3.6	0.025	0.25	0.25	0.025	0.25	0.25	0.188	60	0.25	0.12	18.3	120	0.025	0.025	222	1.9	0.12
W4A21-Comp2	W4A21	Comp2	3.1	0.01	0.1	0.1	0.01	0.1	0.1	0.189	80	0.1	0.14	15.6	111	0.01	0.01	230	1.7	0.16
W4A21-Comp3	W4A21	Comp3	3.6	0.01	0.1	0.1	0.01	0.1	0.1	0.517	60	0.1	0.14	17.3	192	0.01	0.01	197	1.6	0.11
W4A31-BT1	W4A31	BT1	1.8	0.005	0.2	0.05	0.005	0.05	0.05	0.512	62	0.05	0.13	13.8	183	0.005	0.005	194	1.5	0.05
W4A31-BT10	W4A31	BT10	4.2	0.01	0.15	0.1	0.01	0.1	0.1	0.5295	100	0.1	0.315	7.8	129	0.01	0.01	232.5	3	0.09
W4A31-BT2	W4A31	BT2	3.6	0.01	0.3	0.1	0.01	0.1	0.1	0.758	60	0.1	0.15	33.1	213	0.01	0.01	196	2.2	0.06
W4A31-BT3	W4A31	BT3	1.85	0.01	0.2	0.1	0.01	0.1	0.1	0.62	65	0.1	0.215	14.85	115	0.01	0.01	227.5	2.7	0.055
W4A31-BT6	W4A31	BT6	1.7	0.01	0.1	0.1	0.01	0.1	0.1	0.591	50	0.1	0.12	17.4	206	0.01	0.01	200	1.3	0.06
W4A31-BT7	W4A31	BT7	2.5	0.005	0.2	0.05	0.005	0.05	0.05	0.718	43	0.05	0.14	17.4	175	0.005	0.005	180	1.2	0.05
W4A31-BT8	W4A31	BT8	5.7	0.01	0.1	0.1	0.01	0.1	0.1	0.746	60	0.1	0.18	25.1	211	0.01	0.01	199	1.6	0.06
W4A31-BT9	W4A31	BT9	15.2	0.025	0.25	0.25	0.025	0.25	0.25	0.836	80	0.25	0.18	33.9	280	0.025	0.025	219	1.5	0.07
W4A31-Comp1	W4A31	Comp1	39	0.05	0.5	0.5	0.05	0.5	0.5	0.43	100	0.5	0.2	16	100	0.05	0.05	230	2	0.05

Table E-5.1 Liver Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
S3A3-BT9	S3A3	BT9	0.42	0.1	2870	14.8	0.8	0.66	1540	0.1	0.01	0.46	0.01	0.1	0.01	0.1	29.7
S3A3-Comp1	S3A3	Comp1	0.46	0.1	3780	16.3	1	0.68	1710	0.2	0.01	0.24	0.01	0.03	0.01	0.1	25.6
S3A3-Comp2	S3A3	Comp2	0.47	0.1	3440	15.7	1	0.74	1690	0.1	0.01	0.29	0.01	0.03	0.01	0.1	21.9
W4A17-BT1	W4A17	BT1	0.31	0.05	3150	17.3	0.5	1.37	1730	0.1	0.005	0.07	0.005	0.005	0.005	0.05	34.1
W4A17-BT12	W4A17	BT12	0.35	0.1	3630	21.6	0.6	2.23	1450	0.1	0.01	0.04	0.01	0.01	0.01	0.1	42.7
W4A17-BT13	W4A17	BT13	0.3	0.1	3800	14.1	0.7	0.42	1600	0.1	0.01	0.04	0.01	0.01	0.01	0.1	25.8
W4A17-BT2	W4A17	BT2	0.21	0.1	4580	37.8	0.5	0.62	820	0.1	0.01	0.13	0.01	0.01	0.01	0.1	28.9
W4A17-BT20	W4A17	BT20	0.32	0.1	3320	16.6	0.5	0.44	1820	0.1	0.01	0.05	0.01	0.01	0.01	0.1	23.2
W4A17-BT23	W4A17	BT23	0.34	0.25	3160	16	0.25	0.81	1770	0.6	0.025	0.025	0.025	0.025	0.025	0.25	23.9
W4A17-BT24	W4A17	BT24	0.18	0.1	3365	22.6	0.4	0.1	1545	0.1	0.01	0.045	0.01	0.01	0.01	0.1	23.75
W4A17-BT6	W4A17	BT6	0.37	0.1	3110	14.8	0.5	0.5	1590	0.1	0.01	0.03	0.01	0.01	0.01	0.1	27.9
W4A17-BT9	W4A17	BT9	0.93	0.1	3310	14.2	0.5	0.43	1840	0.1	0.01	0.07	0.01	0.9	0.01	0.2	25.3
W4A17-Comp1	W4A17	Comp1	0.32	0.05	3940	16.1	0.5	0.62	1360	0.05	0.005	0.09	0.005	0.005	0.005	0.05	26.3
W4A21-BT1	W4A21	BT1	0.33	0.05	3670	14.7	1.6	0.6	1300	0.05	0.005	0.43	0.02	0.005	0.005	0.05	30.1
W4A21-BT2	W4A21	BT2	0.23	0.05	3440	11.3	0.6	0.42	1470	0.1	0.005	0.04	0.005	0.005	0.005	0.05	24.4
W4A21-BT3	W4A21	BT3	0.3	0.1	3720	17.3	0.4	1.56	1590	0.1	0.01	0.04	0.01	0.01	0.01	0.1	32.8
W4A21-BT4	W4A21	BT4	0.24	0.1	3510	12	0.7	1.24	1180	0.1	0.01	0.05	0.01	0.01	0.01	0.1	40.5
W4A21-BT5	W4A21	BT5	0.28	0.1	3370	16	0.8	1.94	1510	0.1	0.01	0.06	0.01	0.01	0.01	0.1	31
W4A21-BT6	W4A21	BT6	0.28	0.1	3460	11.5	0.5	1.69	1570	0.1	0.01	0.08	0.01	0.01	0.01	0.1	28.1
W4A21-BT9	W4A21	BT9	0.22	0.1	3850	18.4	0.9	0.8	1510	0.1	0.01	0.05	0.01	0.01	0.01	0.1	19.2
W4A21-Comp1	W4A21	Comp1	0.3	0.25	4000	16.5	0.7	0.56	1820	0.25	0.025	0.07	0.025	0.025	0.025	0.25	26.1
W4A21-Comp2	W4A21	Comp2	0.28	0.1	3910	18.9	0.6	0.49	2000	0.1	0.01	0.07	0.02	0.01	0.01	0.1	26.2
W4A21-Comp3	W4A21	Comp3	0.29	0.1	3650	15.4	0.8	0.59	1620	0.1	0.01	0.07	0.06	0.01	0.01	0.1	25.3
W4A31-BT1	W4A31	BT1	0.29	0.05	3240	16.2	2.6	0.37	1520	0.2	0.005	0.11	0.005	0.005	0.005	0.05	26.6
W4A31-BT10	W4A31	BT10	0.145	0.1	4020	24.75	1.3	0.2	1290	0.1	0.01	0.165	0.01	0.01	0.01	0.1	20.55
W4A31-BT2	W4A31	BT2	0.33	0.1	3410	18.9	2.2	1.23	1570	0.1	0.01	0.13	0.01	0.01	0.01	0.1	33.1
W4A31-BT3	W4A31	BT3	0.16	0.1	4055	32.6	1.3	0.525	1380	0.1	0.01	0.105	0.035	0.01	0.01	0.1	20.8
W4A31-BT6	W4A31	BT6	0.35	0.1	3860	16.5	1.7	0.69	1530	0.1	0.01	0.09	0.04	0.01	0.01	0.1	24.3
W4A31-BT7	W4A31	BT7	0.3	0.05	3490	15.3	2.7	0.79	1300	0.1	0.005	0.16	0.005	0.005	0.005	0.05	24.2
W4A31-BT8	W4A31	BT8	0.33	0.1	3500	15.7	2.2	0.62	1580	0.1	0.01	0.1	0.01	0.01	0.01	0.1	31.4
W4A31-BT9	W4A31	BT9	0.4	0.25	3730	16.3	3.3	1.12	1820	0.25	0.025	0.08	0.025	0.025	0.025	0.25	40.4
W4A31-Comp1	W4A31	Comp1	0.3	0.5	4000	16.7	2	0.6	1720	0.5	0.05	0.2	0.05	0.05	0.05	0.5	37

Table E-5.2 Carcass Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
B2A2-BT1	B2A2	BT1	1.39	0.0025	0.06	0.25	0.0025	0.025	0.025	0.0114	4140	0.1	0.022	0.38	6	0.023	0.011	310	3.31	0.15	0.008
B2A2-BT16	B2A2	BT16	0.39	0.0025	0.025	0.41	0.0025	0.025	0.025	0.0026	5120	0.025	0.017	0.39	5	0.012	0.006	349	1.39	0.21	0.008
B2A2-BT18	B2A2	BT18	0.56	0.0025	0.2	0.33	0.0025	0.025	0.025	0.0076	2950	0.025	0.04	0.37	4	0.02	0.0025	313	2.22	0.15	0.005
B2A2-BT3	B2A2	BT3	1.03	0.0025	0.025	0.29	0.0025	0.025	0.025	0.002	3070	0.15	0.026	0.43	8	0.018	0.006	295	1.32	0.15	0.006
B2A2-BT4	B2A2	BT4	7.82	0.0025	0.19	0.7	0.0025	0.025	0.025	0.0102	7230	0.025	0.056	0.39	10	0.035	0.02	356	9.81	0.13	0.007
B2A2-BT5	B2A2	BT5	1.13	0.0025	0.3	0.52	0.0025	0.025	0.025	0.0047	4840	0.025	0.061	0.36	5	0.028	0.008	337	5.55	0.16	0.007
B2A2-BT6	B2A2	BT6	2.4	0.0025	0.2	0.54	0.0025	0.025	0.025	0.0067	5450	0.1	0.074	0.46	7	0.028	0.009	360	8.34	0.12	0.008
B2A2-BT8	B2A2	BT8	1.39	0.007	0.13	0.48	0.0025	0.025	0.025	0.0065	3380	0.025	0.04	0.35	5	0.014	0.008	313	3.54	0.27	0.007
B2A2-Comp.1	B2A2	Comp.1	0.78	0.0025	0.2	0.41	0.0025	0.025	0.025	0.00765	3765	0.025	0.036	0.4	5	0.0165	0.0065	335.5	2.885	0.13	0.006
B2A2-Comp.2	B2A2	Comp.2	0.91	0.0025	0.24	0.46	0.0025	0.025	0.025	0.0067	3870	0.025	0.052	0.42	5	0.019	0.007	338	3.31	0.12	0.006
B3A9-BT1	B3A9	BT1	0.88	0.0025	0.08	0.26	0.0025	0.025	0.025	0.0194	4680	0.025	0.032	0.4	6	0.026	0.008	318	2.87	0.22	0.007
B3A9-BT13	B3A9	BT13	0.41	0.017	0.11	0.32	0.0025	0.28	0.025	0.0161	4740	0.025	0.028	0.32	4	0.017	0.007	360	2.62	0.15	0.013
B3A9-BT14	B3A9	BT14	0.52	0.0025	0.11	0.28	0.0025	0.025	0.025	0.0132	5580	0.025	0.038	0.3	3	0.03	0.006	348	2.55	0.2	0.007
B3A9-BT2	B3A9	BT2	0.56	0.0025	0.11	0.25	0.0025	0.025	0.025	0.0124	3500	0.025	0.035	0.32	5	0.015	0.006	329	2.42	0.13	0.005
B3A9-BT4	B3A9	BT4	0.65	0.0025	0.1	0.29	0.0025	0.025	0.025	0.0129	4590	0.025	0.027	0.31	5	0.014	0.007	323	2.31	0.16	0.005
B3A9-BT5	B3A9	BT5	0.61	0.0025	0.09	0.21	0.0025	0.025	0.025	0.0114	3290	0.025	0.018	0.3	6	0.006	0.005	332	1.37	0.12	0.0025
B3A9-BT7	B3A9	BT7	0.46	0.0025	0.4	0.41	0.0025	0.025	0.025	0.0085	4540	0.025	0.046	0.39	6	0.006	0.007	347	4.92	0.09	0.005
B3A9-BT9	B3A9	BT9	0.43	0.0025	0.1	0.13	0.0025	0.025	0.025	0.015	1810	0.025	0.049	0.38	4	0.021	0.0025	284	1.44	0.15	0.0025
B3A9-Comp1	B3A9	Comp1	0.745	0.0025	0.12	0.255	0.0025	0.025	0.025	0.02045	4105	0.025	0.019	0.315	4	0.013	0.005	339	1.85	0.14	0.0055
B3A9-Comp2	B3A9	Comp2	0.57	0.0025	0.09	0.43	0.0025	0.025	0.025	0.0139	4410	0.025	0.027	0.29	4	0.011	0.007	318	1.51	0.15	0.006
EBNB1-BT1	EBNB1	BT1	0.76	0.0025	0.51	0.51	0.0025	0.025	0.025	0.0085	4070	0.025	0.044	0.29	5	0.008	0.0025	345	6.11	0.05	0.0025
EBNB1-BT2	EBNB1	BT2	1.09	0.0025	0.41	0.31	0.0025	0.025	0.025	0.0071	2890	0.025	0.043	0.32	5	0.0025	0.0025	308	4.59	0.05	0.0025
EBNB1-BT3	EBNB1	BT3	0.25	0.0025	0.24	0.29	0.0025	0.025	0.025	0.0054	2900	0.025	0.038	0.3	4	0.0025	0.0025	318	4.31	0.04	0.0025
M3C3-BT1	M3C3	BT1	0.54	0.0025	0.09	0.3	0.0025	0.025	0.025	0.0034	4370	0.025	0.028	0.33	5	0.018	0.0025	345	4.22	0.13	0.02
M3C3-BT10	M3C3	BT10	0.51	0.0025	0.07	0.24	0.0025	0.025	0.025	0.015	2500	0.025	0.05	0.33	4	0.027	0.006	268	2.22	0.09	0.0025
M3C3-BT2	M3C3	BT2	0.69	0.0025	0.07	0.21	0.0025	0.025	0.025	0.0188	3300	0.025	0.04	0.27	5	0.012	0.0025	290	1.83	0.12	0.007
M3C3-BT3	M3C3	BT3	0.79	0.0025	0.09	0.32	0.0025	0.025	0.025	0.0214	3910	0.025	0.041	0.29	4	0.011	0.006	331	1.89	0.07	0.006
M3C3-BT4	M3C3	BT4	0.65	0.0025	0.06	0.41	0.0025	0.025	0.025	0.0135	5480	0.025	0.041	0.29	4	0.022	0.007	354	2.7	0.06	0.005
M3C3-BT5	M3C3	BT5	0.48	0.0025	0.025	0.16	0.0025	0.025	0.025	0.0085	2800	0.025	0.024	0.46	3	0.046	0.0025	296	4.74	0.1	0.0025
M3C3-BT6	M3C3	BT6	0.515	0.0025	0.025	0.21	0.0025	0.025	0.025	0.00645	3765	0.025	0.014	0.33	4.5	0.0285	0.006	304.5	1.93	0.08	0.0025
M3C3-BT7	M3C3	BT7	0.29	0.017	0.025	0.32	0.0025	0.2	0.025	0.0053	5980	0.025	0.022	0.37	5	0.026	0.006	355	4.39	0.16	0.02
M3C3-BT8	M3C3	BT8	0.37	0.006	0.05	0.19	0.0025	0.025	0.025	0.0135	3860	0.025	0.018	0.38	3	0.013	0.006	332	5.07	0.11	0.0025
M3C3-BT9	M3C3	BT9	0.21	0.0025	0.05	0.12	0.0025	0.025	0.025	0.0126	1920	0.025	0.033	0.35	4	0.01	0.0025	284	2.44	0.13	0.0025
S2A2-BT11	S2A2	BT11	0.48	0.0025	0.06	0.28	0.0025	0.025	0.025	0.0075	4290	0.025	0.015	0.48	5	0.019	0.0025	316	2.6	0.16	0.006
S2A2-BT13	S2A2	BT13	0.33	0.0025	0.06	0.55	0.0025	0.025	0.025	0.0045	3940	0.025	0.009	0.31	3	0.006	0.0025	340	1.81	0.1	0.007
S2A2-BT15	S2A2	BT15	0.42	0.0025	0.05	0.33	0.0025	0.025	0.025	0.008	5040	0.05	0.024	0.48	6	0.009	0.0025	341	3.76	0.19	0.012
S2A2-BT22	S2A2	BT22	0.245	0.0025	0.085	0.24	0.0025	0.025	0.025	0.00525	4040	0.025	0.0125	0.32	3	0.00475	0.0025	353.5	2.495	0.125	0.0095
S2A2-BT23	S2A2	BT23	0.24	0.0025	0.025	0.25	0.0025	0.025	0.025	0.0072	3050	0.025	0.014	0.51	5	0.009	0.0025	290	1.99	0.14	0.007
S2A2-BT24	S2A2	BT24	0.3	0.006	0.11	0.3	0.0025	0.025	0.025	0.0094	4080	0.025	0.025	0.31	4	0.009	0.005	299	3.81	0.09	0.02
S2A2-BT3	S2A2	BT3	0.47	0.0025	0.025	0.43	0.0025	0.025	0.025	0.0077	4930	0.025	0.007	0.45	6	0.01	0.006	347	2.12	0.09	0.007
S2A2-BT4	S2A2	BT4	0.39	0.0025	0.06	0.31	0.0025	0.025	0.025	0.0095	4540	0.025	0.015	0.34	5	0.01	0.006	312	2.64	0.17	0.013
S2A2-Comp1	S2A2	Comp1	0.76	0.0025	0.08	0.29	0.0025	0.025	0.025	0.0114	5160	0.025	0.025	0.4	5	0.008	0.006	347	2.52	0.11	0.026
S2A2-Comp2	S2A2	Comp2	0.4	0.0025	0.12	0.34	0.0025	0.025	0.025	0.0101	5040	0.025	0.022	0.35	4	0.032	0.006	338	2.97	0.1	0.01
S3A3-BT1	S3A3	BT1	0.84	0.0025	0.11	0.29	0.0025	0.025	0.025	0.0224	3440	0.025	0.063	0.52	5	0.014	0.0025	280	4.03	0.13	0.006

Table E-5.2 Carcass Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
B2A2-BT1	B2A2	BT1	0.025	4210	10.6	0.28	0.0025	609	7.3	0.0025	0.008	0.019	0.0025	0.0025	0.025	11.6
B2A2-BT16	B2A2	BT16	0.025	4210	5.5	0.15	0.0025	606	9.93	0.0025	0.006	0.007	0.0025	0.0025	0.025	18.1
B2A2-BT18	B2A2	BT18	0.025	4060	8.31	0.39	0.0025	565	6.66	0.0025	0.008	0.01	0.012	0.0025	0.025	13.5
B2A2-BT3	B2A2	BT3	0.025	4080	6.89	0.21	0.0025	661	5.17	0.0025	0.0025	0.016	0.0025	0.0025	0.025	14.8
B2A2-BT4	B2A2	BT4	0.025	4010	11.4	0.38	0.0025	746	14	0.0025	0.01	0.007	0.01	0.0025	0.025	13.2
B2A2-BT5	B2A2	BT5	0.025	4240	11.2	0.42	0.0025	730	9.68	0.0025	0.01	0.007	0.012	0.0025	0.025	13.1
B2A2-BT6	B2A2	BT6	0.025	3900	8.87	0.38	0.0025	727	10.1	0.0025	0.01	0.007	0.007	0.0025	0.025	22
B2A2-BT8	B2A2	BT8	0.025	3890	7.37	0.26	0.0025	673	9.1	0.0025	0.011	0.017	0.006	0.0025	0.025	14.3
B2A2-Comp.1	B2A2	Comp.1	0.025	3965	7.57	0.445	0.0025	676	8.335	0.0025	0.0095	0.0105	0.0075	0.0025	0.025	16.55
B2A2-Comp.2	B2A2	Comp.2	0.025	4050	9.48	0.38	0.0025	687	8.85	0.0025	0.009	0.017	0.008	0.0025	0.025	15.9
B3A9-BT1	B3A9	BT1	0.025	4020	13.6	0.33	0.0025	734	7.87	0.0025	0.006	0.008	0.0025	0.0025	0.025	15.1
B3A9-BT13	B3A9	BT13	0.025	4160	12.1	0.3	0.0025	623	9.17	0.0025	0.01	0.012	0.0025	0.0025	0.025	14.3
B3A9-BT14	B3A9	BT14	0.025	4060	12.5	0.3	0.0025	627	9.15	0.0025	0.01	0.005	0.0025	0.0025	0.025	14.6
B3A9-BT2	B3A9	BT2	0.025	4100	13	0.31	0.0025	635	6.19	0.0025	0.009	0.0025	0.0025	0.0025	0.025	14.1
B3A9-BT4	B3A9	BT4	0.025	4090	12	0.32	0.0025	657	8.14	0.0025	0.01	0.006	0.0025	0.0025	0.025	18.1
B3A9-BT5	B3A9	BT5	0.025	4090	11.8	0.26	0.0025	636	5.92	0.0025	0.008	0.006	0.0025	0.0025	0.025	17.1
B3A9-BT7	B3A9	BT7	0.025	4080	12.2	0.55	0.0025	645	6.24	0.0025	0.011	0.007	0.0025	0.0025	0.025	13.7
B3A9-BT9	B3A9	BT9	0.025	4070	12.5	0.29	0.0025	583	3.13	0.0025	0.01	0.008	0.0025	0.0025	0.025	11.3
B3A9-Comp1	B3A9	Comp1	0.025	3865	9.615	0.31	0.0025	646	7.535	0.0025	0.009	0.0085	0.0025	0.0025	0.025	19.1
B3A9-Comp2	B3A9	Comp2	0.025	3810	11.1	0.28	0.0025	638	8.03	0.0025	0.01	0.01	0.0025	0.0025	0.025	19.7
EBNB1-BT1	EBNB1	BT1	0.025	4130	10.5	0.99	0.0025	551	5.63	0.0025	0.031	0.009	0.0025	0.0025	0.025	11.6
EBNB1-BT2	EBNB1	BT2	0.025	4100	10.8	0.84	0.0025	573	3.72	0.0025	0.026	0.0025	0.0025	0.0025	0.025	14
EBNB1-BT3	EBNB1	BT3	0.025	4200	9.35	0.55	0.0025	529	3.97	0.0025	0.021	0.0025	0.0025	0.0025	0.025	16.5
M3C3-BT1	M3C3	BT1	0.025	4200	13.1	0.29	0.0025	562	10.5	0.0025	0.008	0.0025	0.033	0.0025	0.025	13.6
M3C3-BT10	M3C3	BT10	0.025	3930	8.79	0.26	0.0025	728	4.32	0.0025	0.012	0.006	0.0025	0.0025	0.025	12
M3C3-BT2	M3C3	BT2	0.025	3870	10.8	0.22	0.0025	650	5.37	0.0025	0.011	0.0025	0.0025	0.0025	0.025	14.4
M3C3-BT3	M3C3	BT3	0.025	3970	9.04	0.23	0.0025	541	6.72	0.0025	0.01	0.0025	0.0025	0.0025	0.025	18.1
M3C3-BT4	M3C3	BT4	0.025	3930	10.3	0.21	0.0025	655	10.4	0.0025	0.013	0.007	0.0025	0.0025	0.025	17.9
M3C3-BT5	M3C3	BT5	0.025	4070	7.14	0.31	0.0025	590	3.55	0.0025	0.005	0.018	0.0025	0.0025	0.025	11.9
M3C3-BT6	M3C3	BT6	0.025	3955	8.765	0.175	0.0025	694	5.17	0.0025	0.0065	0.00375	0.0025	0.0025	0.025	12.55
M3C3-BT7	M3C3	BT7	0.025	3800	9.67	0.18	0.0025	614	14.1	0.0025	0.008	0.019	0.052	0.0025	0.025	15.6
M3C3-BT8	M3C3	BT8	0.025	4000	9.72	0.28	0.0025	535	5.7	0.0025	0.007	0.009	0.006	0.0025	0.025	14.6
M3C3-BT9	M3C3	BT9	0.025	3970	9.33	0.26	0.0025	554	3.14	0.0025	0.008	0.0025	0.0025	0.0025	0.025	10.1
S2A2-BT11	S2A2	BT11	0.025	3930	12.9	0.29	0.0025	675	9.82	0.0025	0.009	0.0025	0.033	0.0025	0.025	10.4
S2A2-BT13	S2A2	BT13	0.025	3880	11.2	0.24	0.0025	550	12.2	0.0025	0.009	0.0025	0.035	0.0025	0.025	13
S2A2-BT15	S2A2	BT15	0.025	4050	12	0.2	0.0025	644	12.3	0.0025	0.009	0.0025	0.066	0.0025	0.025	11.6
S2A2-BT22	S2A2	BT22	0.025	3995	13.35	0.31	0.0025	592	10.46	0.0025	0.009	0.00475	0.046	0.0025	0.025	13.3
S2A2-BT23	S2A2	BT23	0.025	4000	9.77	0.17	0.0025	665	6.83	0.0025	0.008	0.0025	0.029	0.0025	0.025	10.9
S2A2-BT24	S2A2	BT24	0.025	3740	12.2	0.31	0.0025	602	10.4	0.0025	0.013	0.008	0.066	0.0025	0.025	12.8
S2A2-BT3	S2A2	BT3	0.025	4030	14.7	0.22	0.0025	678	15.5	0.0025	0.008	0.0025	0.024	0.0025	0.025	14.2
S2A2-BT4	S2A2	BT4	0.025	4030	11.2	0.25	0.0025	677	11.7	0.0025	0.013	0.005	0.048	0.0025	0.025	12.2
S2A2-Comp1	S2A2	Comp1	0.025	3900	9.13	0.34	0.0025	634	11	0.0025	0.012	0.009	0.071	0.0025	0.025	14.9
S2A2-Comp2	S2A2	Comp2	0.025	3850	11.9	0.35	0.0025	606	11.9	0.0025	0.011	0.005	0.056	0.0025	0.025	14.7
S3A3-BT1	S3A3	BT1	0.06	4000	16.2	0.34	0.0025	665	7.77	0.0025	0.022	0.006	0.048	0.0025	0.025	10.3

Table E-5.2 Carcass Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
S3A3-BT10	S3A3	BT10	0.89	0.0025	0.235	0.19	0.0025	0.025	0.025	0.0145	3550	0.025	0.0595	0.385	4.5	0.0125	0.0025	307.5	2.27	0.145	0.0115
S3A3-BT12	S3A3	BT12	0.97	0.019	0.22	0.22	0.0025	0.2	0.025	0.0188	3400	0.025	0.085	0.35	4	0.011	0.0025	305	4.02	0.13	0.018
S3A3-BT23	S3A3	BT23	0.38	0.005	0.16	0.2	0.0025	0.025	0.025	0.0247	3700	0.025	0.06	0.39	5	0.013	0.0025	320	2.75	0.11	0.009
S3A3-BT4	S3A3	BT4	1.04	0.007	0.16	0.28	0.0025	0.025	0.025	0.0291	5100	0.025	0.08	0.46	6	0.011	0.005	340	3.1	0.17	0.01
S3A3-BT5	S3A3	BT5	1.38	0.006	0.13	0.5	0.0025	0.025	0.025	0.0238	5390	0.025	0.043	0.55	7	0.016	0.005	348	5.18	0.11	0.007
S3A3-BT8	S3A3	BT8	0.74	0.0025	0.2	0.29	0.0025	0.025	0.025	0.0248	5190	0.025	0.04	0.46	6	0.019	0.007	306	4.1	0.19	0.01
S3A3-BT9	S3A3	BT9	1.35	0.0025	0.22	0.2	0.0025	0.025	0.025	0.0244	3540	0.025	0.157	0.35	5	0.024	0.007	328	2.97	0.12	0.02
S3A3-Comp1	S3A3	Comp1	0.77	0.0025	0.19	0.2	0.0025	0.025	0.025	0.0233	2880	0.025	0.068	0.36	5	0.012	0.0025	312	1.74	0.12	0.009
S3A3-Comp2	S3A3	Comp2	1.35	0.0025	0.23	0.29	0.0025	0.025	0.025	0.0193	4500	0.025	0.054	0.32	5	0.02	0.006	366	3.19	0.1	0.017
W4A17-BT1	W4A17	BT1	0.39	0.0025	0.025	0.21	0.0025	0.025	0.025	0.0025	3920	0.025	0.016	0.31	4	0.021	0.015	332	1.65	0.15	0.0025
W4A17-BT12	W4A17	BT12	4.17	0.0025	0.025	0.29	0.0025	0.025	0.025	0.0024	3620	0.025	0.031	0.27	6	0.064	0.021	338	4.58	0.14	0.005
W4A17-BT13	W4A17	BT13	2.95	0.00475	0.095	0.365	0.0025	0.025	0.025	0.00215	3860	0.065	0.032	0.32	6.5	0.0895	0.017	340.5	2.36	0.1	0.0025
W4A17-BT2	W4A17	BT2	0.7	0.0025	0.025	0.26	0.0025	0.025	0.025	0.0026	4780	0.025	0.033	0.32	4	0.049	0.014	337	2.97	0.22	0.0025
W4A17-BT20	W4A17	BT20	0.43	0.0025	0.025	0.17	0.0025	0.025	0.025	0.0024	3330	0.025	0.029	0.28	4	0.0025	0.012	320	1.32	0.18	0.0025
W4A17-BT23	W4A17	BT23	0.47	0.0025	0.025	0.32	0.0025	0.025	0.025	0.0045	5240	0.025	0.03	0.38	4	0.0025	0.015	357	2.14	0.14	0.0025
W4A17-BT24	W4A17	BT24	0.42	0.0025	0.09	0.24	0.0025	0.025	0.025	0.0023	4960	0.025	0.01	0.4	5	0.0025	0.011	322	1.69	0.15	0.0025
W4A17-BT6	W4A17	BT6	0.33	0.0025	0.025	0.21	0.0025	0.025	0.025	0.0018	3160	0.025	0.016	0.26	3	0.013	0.012	317	1.82	0.14	0.0025
W4A17-BT9	W4A17	BT9	0.45	0.0025	0.025	0.28	0.0025	0.025	0.025	0.0026	4290	0.025	0.043	0.26	5	0.032	0.013	328	3.16	0.12	0.0025
W4A17-Comp1	W4A17	Comp1	0.41	0.0025	0.025	0.27	0.0025	0.025	0.025	0.0022	4160	0.025	0.016	0.37	4	0.008	0.017	334	1.97	0.17	0.005
W4A21-BT1	W4A21	BT1	13.2	0.0025	0.34	0.59	0.0025	0.025	0.025	0.0162	5140	0.08	0.076	0.51	63	0.04	0.022	342	5.57	0.11	0.01
W4A21-BT2	W4A21	BT2	0.67	0.0025	0.45	0.63	0.0025	0.025	0.025	0.0071	5500	0.025	0.026	0.44	6	0.016	0.013	356	3.13	0.08	0.0025
W4A21-BT3	W4A21	BT3	0.65	0.0025	0.06	0.21	0.0025	0.025	0.025	0.0053	3260	0.025	0.017	0.39	4	0.0025	0.012	322	1.58	0.13	0.0025
W4A21-BT4	W4A21	BT4	0.28	0.0025	0.14	0.36	0.0025	0.025	0.025	0.004	3160	0.025	0.017	0.43	4	0.0025	0.01	306	1.64	0.13	0.0025
W4A21-BT5	W4A21	BT5	0.62	0.0025	0.11	0.19	0.0025	0.025	0.025	0.005	3480	0.025	0.02	0.44	8	0.01	0.01	338	1.25	0.13	0.0025
W4A21-BT6	W4A21	BT6	0.64	0.0155	0.125	0.345	0.0025	0.2075	0.025	0.0123	4995	0.025	0.033	0.39	5	0.00375	0.0095	360.5	2.77	0.155	0.014
W4A21-BT9	W4A21	BT9	0.54	0.0025	0.34	0.28	0.0025	0.025	0.025	0.0087	3970	0.025	0.031	0.37	4	0.01	0.01	332	2.63	0.16	0.006
W4A21-Comp1	W4A21	Comp1	0.4	0.0025	0.06	0.34	0.0025	0.025	0.025	0.0064	4450	0.025	0.032	0.41	5	0.0025	0.015	354	1.82	0.08	0.006
W4A21-Comp2	W4A21	Comp2	0.55	0.0025	0.09	0.42	0.0025	0.025	0.025	0.0089	5270	0.025	0.037	0.39	5	0.0025	0.013	357	2.19	0.11	0.0025
W4A21-Comp3	W4A21	Comp3	0.75	0.0025	0.22	0.52	0.0025	0.025	0.025	0.0115	4700	0.025	0.031	0.48	5	0.008	0.012	351	2.64	0.09	0.0025
W4A31-BT1	W4A31	BT1	0.35	0.0025	1.32	0.43	0.0025	0.025	0.025	0.012	2530	0.025	0.028	0.4	5	0.019	0.006	309	2.1	0.07	0.0025
W4A31-BT10	W4A31	BT10	0.53	0.0025	0.95	0.3	0.0025	0.025	0.025	0.0082	3020	0.025	0.076	0.48	6	0.012	0.005	311	2.46	0.09	0.006
W4A31-BT2	W4A31	BT2	0.35	0.0025	1.32	0.55	0.0025	0.025	0.025	0.0102	4150	0.025	0.03	0.31	4	0.009	0.01	341	2.54	0.08	0.0025
W4A31-BT3	W4A31	BT3	0.42	0.0025	1.45	0.44	0.0025	0.025	0.025	0.0138	5050	0.025	0.062	0.39	5	0.016	0.009	340	3.43	0.07	0.007
W4A31-BT6	W4A31	BT6	0.49	0.0025	0.98	0.58	0.0025	0.025	0.025	0.0101	3900	0.025	0.032	0.35	4	0.007	0.009	332	3.17	0.07	0.0025
W4A31-BT7	W4A31	BT7	0.27	0.0025	1.77	0.47	0.0025	0.025	0.025	0.0102	4500	0.025	0.036	0.35	4	0.017	0.007	344	3.57	0.07	0.0025
W4A31-BT8	W4A31	BT8	0.98	0.0025	0.91	0.415	0.0025	0.025	0.025	0.01975	3155	0.0725	0.05	0.405	5.5	0.013	0.0075	339	2.16	0.06	0.00425
W4A31-BT9	W4A31	BT9	0.75	0.009	1.29	0.46	0.0025	0.025	0.025	0.0092	3390	0.025	0.041	0.56	5	0.01	0.009	331	2.12	0.07	0.005
W4A31-Comp1	W4A31	Comp1	0.95	0.006	0.72	0.5	0.0025	0.025	0.025	0.0093	4300	0.025	0.063	0.43	4	0.014	0.009	356	2.46	0.07	0.007

Table E-5.2 Carcass Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
S3A3-BT10	S3A3	BT10	0.025	3950	14.85	0.36	0.0025	634.5	6.52	0.0025	0.0155	0.0155	0.0365	0.0025	0.025	13.2
S3A3-BT12	S3A3	BT12	0.025	3870	16.3	0.32	0.0025	560	6.99	0.0025	0.027	0.018	0.045	0.0025	0.025	13
S3A3-BT23	S3A3	BT23	0.025	3900	13.5	0.32	0.0025	604	7.56	0.0025	0.019	0.0025	0.031	0.0025	0.025	12.6
S3A3-BT4	S3A3	BT4	0.025	4030	16.3	0.38	0.0025	659	10.2	0.0025	0.025	0.0025	0.079	0.0025	0.025	12.3
S3A3-BT5	S3A3	BT5	0.025	3780	13	0.36	0.0025	689	12.6	0.0025	0.015	0.031	0.061	0.0025	0.025	13.6
S3A3-BT8	S3A3	BT8	0.025	3710	15.4	0.4	0.0025	846	9.49	0.0025	0.022	0.01	0.124	0.0025	0.025	10.9
S3A3-BT9	S3A3	BT9	0.025	3810	17.3	0.35	0.0025	600	6.66	0.0025	0.048	0.016	0.064	0.0025	0.025	12.3
S3A3-Comp1	S3A3	Comp1	0.025	3820	14.3	0.32	0.0025	644	5.65	0.0025	0.019	0.008	0.028	0.0025	0.025	14.5
S3A3-Comp2	S3A3	Comp2	0.025	3830	14.6	0.37	0.0025	665	9.07	0.0025	0.023	0.457	0.042	0.0025	0.025	13.6
W4A17-BT1	W4A17	BT1	0.025	4040	15.3	0.21	0.0025	597	5.88	0.0025	0.008	0.008	0.0025	0.0025	0.025	11.9
W4A17-BT12	W4A17	BT12	0.025	4120	16.1	0.21	0.0025	588	6.78	0.0025	0.01	0.006	0.0025	0.0025	0.025	16.1
W4A17-BT13	W4A17	BT13	0.025	4150	10.7	0.33	0.0025	648.5	9.745	0.0025	0.0095	0.0125	0.0025	0.0025	0.025	18.5
W4A17-BT2	W4A17	BT2	0.025	3970	14.9	0.21	0.0025	634	8.18	0.0025	0.007	0.008	0.0025	0.0025	0.025	15.6
W4A17-BT20	W4A17	BT20	0.025	4110	15.7	0.2	0.0025	547	5.37	0.0025	0.01	0.0025	0.0025	0.0025	0.025	14.5
W4A17-BT23	W4A17	BT23	0.025	4180	17.4	0.17	0.0025	589	10.4	0.0025	0.011	0.0025	0.0025	0.0025	0.025	15.6
W4A17-BT24	W4A17	BT24	0.025	4110	17.7	0.2	0.0025	616	7.61	0.0025	0.006	0.005	0.0025	0.0025	0.025	14.4
W4A17-BT6	W4A17	BT6	0.025	4080	17.3	0.18	0.0025	552	6.23	0.0025	0.007	0.007	0.0025	0.0025	0.025	10.4
W4A17-BT9	W4A17	BT9	0.025	4000	13.4	0.16	0.0025	573	7.97	0.0025	0.014	0.006	0.0025	0.0025	0.025	14.2
W4A17-Comp1	W4A17	Comp1	0.025	4150	13.5	0.21	0.0025	627	6.83	0.0025	0.009	0.006	0.0025	0.0025	0.025	17.1
W4A21-BT1	W4A21	BT1	0.06	3770	11.1	0.49	0.0025	549	7.4	0.0025	0.025	0.013	0.012	0.007	0.025	19.1
W4A21-BT2	W4A21	BT2	0.025	4100	10.7	0.37	0.0025	514	9.92	0.0025	0.009	0.011	0.0025	0.0025	0.025	15.5
W4A21-BT3	W4A21	BT3	0.025	4040	15.8	0.21	0.0025	563	6.29	0.0025	0.008	0.006	0.0025	0.0025	0.025	11.9
W4A21-BT4	W4A21	BT4	0.025	4200	11.9	0.27	0.0025	483	6.12	0.0025	0.005	0.0025	0.0025	0.0025	0.025	12
W4A21-BT5	W4A21	BT5	0.025	4140	15.4	0.27	0.0025	589	5.56	0.0025	0.007	0.0025	0.0025	0.0025	0.025	16.6
W4A21-BT6	W4A21	BT6	0.025	4240	13.05	0.27	0.0025	615	9.34	0.0025	0.012	0.01	0.0025	0.0025	0.025	21.5
W4A21-BT9	W4A21	BT9	0.025	4180	14.8	0.35	0.0025	601	6.66	0.0025	0.009	0.009	0.0025	0.0025	0.025	16
W4A21-Comp1	W4A21	Comp1	0.025	4020	16	0.23	0.0025	637	8.53	0.0025	0.009	0.0025	0.0025	0.0025	0.025	20.4
W4A21-Comp2	W4A21	Comp2	0.025	4120	15.2	0.25	0.0025	633	9.77	0.0025	0.007	0.0025	0.0025	0.0025	0.025	18.7
W4A21-Comp3	W4A21	Comp3	0.025	4070	13.1	0.35	0.0025	616	8.06	0.0025	0.012	0.006	0.0025	0.0025	0.025	15.4
W4A31-BT1	W4A31	BT1	0.025	4260	15.5	0.92	0.0025	548	4.95	0.0025	0.016	0.01	0.0025	0.0025	0.025	13
W4A31-BT10	W4A31	BT10	0.025	4290	14.3	0.67	0.0025	570	4.99	0.0025	0.014	0.0025	0.0025	0.0025	0.025	12.3
W4A31-BT2	W4A31	BT2	0.025	4310	16.2	0.54	0.0025	600	7.09	0.0025	0.017	0.0025	0.0025	0.0025	0.025	15.8
W4A31-BT3	W4A31	BT3	0.025	4130	15.2	0.76	0.0025	566	9.05	0.0025	0.016	0.0025	0.005	0.0025	0.025	13.8
W4A31-BT6	W4A31	BT6	0.025	4150	13.4	0.58	0.0025	604	7.59	0.0025	0.015	0.0025	0.0025	0.0025	0.025	12.7
W4A31-BT7	W4A31	BT7	0.025	4280	12.9	0.98	0.0025	548	7.8	0.0025	0.022	0.0025	0.0025	0.0025	0.025	12.5
W4A31-BT8	W4A31	BT8	0.025	4200	14.6	0.64	0.0025	528.5	5.8	0.0025	0.016	0.0025	0.0025	0.0025	0.025	15.6
W4A31-BT9	W4A31	BT9	0.025	4230	15.2	0.68	0.0025	588	5.71	0.0025	0.018	0.0025	0.0025	0.0025	0.025	18.2
W4A31-Comp1	W4A31	Comp1	0.025	4200	14.9	0.49	0.0025	606	7.86	0.0025	0.026	0.009	0.0025	0.0025	0.025	20.4

Table E-5.3 Viscera Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
B2A2-BT1	B2A2	BT1	4.03	0.0025	0.09	0.97	0.0025	0.025	0.025	0.095	13000	0.28	0.071	0.68	24	0.079	0.018	342	13.8	0.1	0.015
B2A2-BT16	B2A2	BT16	9.81	0.0025	0.06	0.815	0.0025	0.025	0.025	0.0326	10390	0.36	0.0655	0.99	39.5	0.0945	0.0155	306.5	4.685	0.145	0.024
B2A2-BT18	B2A2	BT18	39	0.0025	0.18	1.25	0.0025	0.025	0.025	0.0732	10800	0.19	0.177	1.23	56	0.134	0.046	313	19.8	0.11	0.023
B2A2-BT3	B2A2	BT3	1.56	0.0025	0.06	0.74	0.0025	0.025	0.025	0.0657	8780	0.19	0.073	0.88	34	0.21	0.01	273	4.81	0.12	0.017
B2A2-BT4	B2A2	BT4	165	0.0025	0.33	1.44	0.011	0.025	0.06	0.0888	9890	1.92	0.216	0.74	98	0.214	0.231	308	29.9	0.09	0.021
B2A2-BT5	B2A2	BT5	16.5	0.0025	0.22	1.4	0.0025	0.025	0.025	0.0576	13000	0.15	0.197	0.81	26	0.134	0.029	328	18.9	0.1	0.019
B2A2-BT6	B2A2	BT6	251	0.008	0.3	1.5	0.014	0.21	0.13	0.0575	8230	3.83	0.269	0.77	146	0.324	0.302	309	26.2	0.08	0.037
B2A2-BT8	B2A2	BT8	159	0.006	0.54	1.88	0.008	0.07	0.06	0.078	12300	0.85	0.324	0.94	114	0.307	0.219	338	41.9	0.15	0.038
B2A2-Comp.1	B2A2	Comp.1	50.2	0.0025	0.33	1.38	0.0025	0.025	0.025	0.0758	11700	0.37	0.141	1.03	57	0.127	0.063	331	14.3	0.09	0.027
B2A2-Comp.2	B2A2	Comp.2	42.3	0.0025	0.22	1.2	0.0025	0.025	0.025	0.0704	10700	0.12	0.17	0.93	49	0.1	0.063	325	11.5	0.08	0.021
B3A9-BT1	B3A9	BT1	2.06	0.0025	0.11	0.56	0.0025	0.025	0.025	0.279	11600	0.15	0.093	0.74	28	0.068	0.017	306	6.73	0.18	0.025
B3A9-BT13	B3A9	BT13	3.15	0.0025	0.2	0.64	0.0025	0.025	0.025	0.132	10400	0.025	0.096	0.57	21	0.054	0.019	314	6.82	0.11	0.018
B3A9-BT14	B3A9	BT14	19.9	0.0025	0.21	0.75	0.0025	0.025	0.025	0.236	12400	0.21	0.13	0.63	36	0.086	0.03	324	7.01	0.14	0.028
B3A9-BT2	B3A9	BT2	353	0.0025	5.93	2.12	0.027	0.025	0.025	0.156	9840	0.9	0.539	0.78	1190	0.613	0.354	400	41.8	0.08	0.092
B3A9-BT4	B3A9	BT4	12.6	0.0025	0.15	0.74	0.0025	0.025	0.025	0.169	12300	0.23	0.092	0.66	36	0.063	0.032	345	8.72	0.11	0.025
B3A9-BT5	B3A9	BT5	9.68	0.0025	0.11	0.67	0.0025	0.025	0.025	0.2	10500	0.08	0.067	0.81	28	0.051	0.02	311	8.75	0.07	0.036
B3A9-BT7	B3A9	BT7	3.36	0.0025	0.26	0.67	0.0025	0.025	0.025	0.135	8550	0.21	0.118	1.01	34	0.03	0.016	285	9.1	0.07	0.028
B3A9-BT9	B3A9	BT9	19.95	0.0025	0.16	0.465	0.0025	0.025	0.025	0.175	7300	0.215	0.133	0.65	46.5	0.0735	0.0405	272	8.02	0.11	0.0215
B3A9-Comp1	B3A9	Comp1	10	0.0025	0.12	0.61	0.0025	0.025	0.025	0.178	10200	0.06	0.064	0.79	27	0.069	0.019	298	7.2	0.1	0.041
B3A9-Comp2	B3A9	Comp2	8.8	0.0025	0.14	0.92	0.0025	0.025	0.025	0.177	11000	0.06	0.105	0.86	28	0.084	0.023	309	6.69	0.1	0.026
EBNB1-BT1	EBNB1	BT1	252	0.006	0.41	2.62	0.012	0.025	0.09	0.164	8970	0.42	0.218	0.97	280	0.116	0.214	303	18	0.04	0.037
EBNB1-BT2	EBNB1	BT2	33.9	0.0025	0.28	1.19	0.0025	0.025	0.025	0.157	10400	0.22	0.197	0.58	72	0.043	0.058	312	22.3	0.04	0.04
EBNB1-BT3	EBNB1	BT3	1.72	0.0025	0.13	0.88	0.0025	0.025	0.025	0.0974	8160	0.09	0.153	0.72	24	0.019	0.007	246	17.3	0.03	0.024
M3C3-BT1	M3C3	BT1	8.68	0.011	0.09	0.65	0.0025	0.21	0.025	0.0908	9920	1.56	0.088	0.77	31	0.056	0.018	297	12.9	0.09	0.414
M3C3-BT10	M3C3	BT10	2.04	0.0025	0.06	1.03	0.0025	0.025	0.025	0.122	15200	0.08	0.157	0.5	21	0.065	0.021	359	11.7	0.06	0.025
M3C3-BT2	M3C3	BT2	174	0.006	0.13	1.37	0.006	0.025	0.06	0.271	13900	0.7	0.216	0.82	149	0.178	0.245	373	16.3	0.08	0.067
M3C3-BT3	M3C3	BT3	49.1	0.0025	0.1	0.69	0.0025	0.025	0.025	0.2	9060	0.23	0.147	1.42	59	0.104	0.065	329	8.93	0.05	0.054
M3C3-BT4	M3C3	BT4	12.2	0.0025	0.1	0.99	0.0025	0.025	0.025	0.187	14600	0.12	0.136	0.75	49	0.085	0.026	353	19.3	0.04	0.036
M3C3-BT5	M3C3	BT5	6.91	0.0025	0.06	0.56	0.0025	0.025	0.025	0.105	13400	0.08	0.077	0.51	26	0.049	0.017	335	20.4	0.05	0.031
M3C3-BT6	M3C3	BT6	2.63	0.0025	0.05	0.61	0.0025	0.025	0.025	0.102	12500	0.08	0.056	0.75	23	0.046	0.016	337	9.04	0.05	0.053
M3C3-BT7	M3C3	BT7	5.23	0.0025	0.105	0.895	0.0025	0.025	0.025	0.193	13000	0.09	0.074	1.06	30	0.063	0.0195	332.5	74.9	0.095	0.062
M3C3-BT8	M3C3	BT8	7.67	0.0025	0.09	0.69	0.0025	0.025	0.025	0.159	13600	0.06	0.065	0.61	28	0.067	0.024	346	25.5	0.07	0.039
M3C3-BT9	M3C3	BT9	8.435	0.0025	0.085	0.6	0.0025	0.025	0.025	0.2385	11650	0.025	0.107	0.75	25	0.0575	0.017	320.5	15.5	0.07	0.0305
S2A2-BT11	S2A2	BT11	331	0.015	1.755	1.475	0.0085	0.025	0.09	0.1128	11850	0.655	0.1855	1.885	458.5	0.2	0.464	383.5	20.65	0.1	0.528
S2A2-BT13	S2A2	BT13	5	0.008	0.08	0.98	0.0025	0.025	0.025	0.0815	10900	0.1	0.034	0.76	27	0.033	0.017	303	8.56	0.06	0.095
S2A2-BT15	S2A2	BT15	1.36	0.005	0.07	0.66	0.0025	0.025	0.025	0.132	11100	0.025	0.064	0.84	21	0.043	0.01	297	9.83	0.12	0.051
S2A2-BT22	S2A2	BT22	1.64	0.0025	0.06	0.58	0.0025	0.025	0.025	0.0959	11100	0.025	0.042	0.71	26	0.016	0.012	291	9.31	0.07	0.051
S2A2-BT23	S2A2	BT23	1.03	0.0025	0.025	0.68	0.0025	0.025	0.025	0.0626	10400	0.05	0.042	0.59	28	0.028	0.008	284	7.39	0.09	0.039
S2A2-BT24	S2A2	BT24	3	0.0025	0.09	0.82	0.0025	0.025	0.025	0.0814	12400	0.025	0.081	0.88	29	0.042	0.015	317	13.2	0.06	0.182
S2A2-BT3	S2A2	BT3	2.13	0.0025	0.05	0.91	0.0025	0.025	0.025	0.0807	11600	0.025	0.024	0.8	24	0.03	0.014	306	26.1	0.07	0.057
S2A2-BT4	S2A2	BT4	15.4	0.017	0.07	0.82	0.0025	0.22	0.025	0.0979	12000	0.09	0.043	0.8	23	0.04	0.018	311	10.6	0.11	0.144
S2A2-Comp1	S2A2	Comp1	8.43	0.0025	0.1	0.56	0.0025	0.025	0.025	0.116	10100	0.025	0.077	0.85	32	0.03	0.015	296	7.61	0.08	0.235
S2A2-Comp2	S2A2	Comp2	4.47	0.005	0.09	0.81	0.0025	0.025	0.025	0.115	11700	0.025	0.077	0.71	26	0.026	0.016	322	11.6	0.06	0.071
S3A3-BT1	S3A3	BT1	3.42	0.006	0.14	0.99	0.0025	0.025	0.025	0.267	14000	0.025	0.188	0.65	25	0.033	0.013	331	13.3	0.09	0.039

Table E-5.3 Viscera Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
B2A2-BT1	B2A2	BT1	0.025	2320	6.61	0.38	0.006	1650	24.4	0.0025	0.01	0.033	0.022	0.0025	0.05	31.4
B2A2-BT16	B2A2	BT16	0.025	2550	4.13	0.245	0.0065	1790	19.95	0.0025	0.01	0.0145	0.008	0.00425	0.025	48
B2A2-BT18	B2A2	BT18	0.07	2370	6.08	0.51	0.044	1720	24.6	0.0025	0.014	0.013	0.021	0.016	0.11	41.2
B2A2-BT3	B2A2	BT3	0.025	2420	4.93	0.31	0.013	1590	14.4	0.0025	0.01	0.013	0.016	0.0025	0.025	50.1
B2A2-BT4	B2A2	BT4	0.1	2660	9.25	0.48	0.012	1680	19.2	0.0025	0.015	0.018	0.041	0.015	0.12	34.6
B2A2-BT5	B2A2	BT5	0.025	2410	7.79	0.48	0.015	1790	26.7	0.0025	0.016	0.019	0.044	0.0025	0.025	45.4
B2A2-BT6	B2A2	BT6	0.22	2640	7.92	0.49	0.012	1610	15.6	0.0025	0.02	0.0025	0.039	0.043	0.3	41.9
B2A2-BT8	B2A2	BT8	0.1	2620	6.07	0.48	0.018	1710	32.6	0.0025	0.021	0.01	0.071	0.025	0.23	52
B2A2-Comp.1	B2A2	Comp.1	0.025	2650	5.88	0.58	0.026	1660	26.2	0.0025	0.015	0.021	0.048	0.01	0.1	47.3
B2A2-Comp.2	B2A2	Comp.2	0.025	2670	7.31	0.53	0.017	1600	23.7	0.0025	0.014	0.012	0.036	0.016	0.07	48.8
B3A9-BT1	B3A9	BT1	0.025	2240	8.58	0.41	0.016	1920	19	0.0025	0.011	0.036	0.016	0.0025	0.025	52.3
B3A9-BT13	B3A9	BT13	0.025	2510	8.48	0.38	0.008	1680	19.3	0.0025	0.011	0.014	0.009	0.0025	0.025	43.1
B3A9-BT14	B3A9	BT14	0.025	2310	8.46	0.37	0.01	1720	19.8	0.0025	0.013	0.015	0.015	0.006	0.06	49.5
B3A9-BT2	B3A9	BT2	0.44	2310	9.67	0.4	0.014	1620	17.1	0.0025	0.02	0.028	0.068	0.031	0.9	48.2
B3A9-BT4	B3A9	BT4	0.025	2540	9.29	0.42	0.014	1800	21.5	0.0025	0.015	0.02	0.01	0.0025	0.025	48.2
B3A9-BT5	B3A9	BT5	0.025	2430	8.35	0.37	0.012	1670	17.9	0.0025	0.012	0.02	0.048	0.0025	0.025	43.7
B3A9-BT7	B3A9	BT7	0.025	2660	9.67	0.7	0.084	1600	11.6	0.0025	0.021	0.019	0.0025	0.0025	0.025	44.4
B3A9-BT9	B3A9	BT9	0.025	2715	10.5	0.395	0.014	1415	12.15	0.0025	0.018	0.0075	0.009	0.0025	0.06	41.3
B3A9-Comp1	B3A9	Comp1	0.025	2510	7.39	0.39	0.017	1560	18.4	0.0025	0.013	0.013	0.012	0.006	0.025	51.9
B3A9-Comp2	B3A9	Comp2	0.025	2460	8.58	0.41	0.026	1750	19.4	0.0025	0.013	0.008	0.009	0.0025	0.025	52.2
EBNB1-BT1	EBNB1	BT1	0.3	2470	7.72	1.57	0.106	1550	11.9	0.0025	0.045	0.055	0.006	0.01	0.46	46.5
EBNB1-BT2	EBNB1	BT2	0.1	2610	8.03	1.37	0.067	1590	12.9	0.0025	0.038	0.01	0.007	0.0025	0.1	45.5
EBNB1-BT3	EBNB1	BT3	0.06	2370	6.23	0.79	0.02	1540	11.2	0.0025	0.027	0.0025	0.008	0.0025	0.025	41.8
M3C3-BT1	M3C3	BT1	0.025	2300	8.62	0.35	0.01	1630	23.4	0.0025	0.012	0.011	0.116	0.0025	0.025	43.8
M3C3-BT10	M3C3	BT10	0.05	2380	6	0.32	0.0025	1840	24.7	0.0025	0.018	0.018	0.029	0.014	0.025	41.2
M3C3-BT2	M3C3	BT2	0.21	2500	8.27	0.32	0.01	1700	21.5	0.0025	0.016	0.016	0.057	0.024	0.25	42.1
M3C3-BT3	M3C3	BT3	0.07	2390	6.15	0.33	0.008	1590	15.2	0.0025	0.012	0.01	0.027	0.019	0.13	47
M3C3-BT4	M3C3	BT4	0.05	2450	7.25	0.34	0.008	1700	25.8	0.0025	0.016	0.008	0.02	0.01	0.06	49.7
M3C3-BT5	M3C3	BT5	0.025	2470	4.86	0.38	0.005	1690	16.1	0.0025	0.008	0.007	0.027	0.0025	0.025	42.2
M3C3-BT6	M3C3	BT6	0.025	2490	5.89	0.29	0.006	1590	16.5	0.0025	0.009	0.005	0.012	0.006	0.025	47.2
M3C3-BT7	M3C3	BT7	0.025	2250	6.84	0.285	0.0125	1710	29.4	0.0025	0.01	0.012	0.1065	0.0025	0.025	44.8
M3C3-BT8	M3C3	BT8	0.025	2330	6.67	0.38	0.014	1650	20.2	0.0025	0.01	0.03	0.035	0.0025	0.025	44.2
M3C3-BT9	M3C3	BT9	0.025	2735	7.43	0.37	0.008	1625	19.2	0.0025	0.017	0.021	0.0225	0.0025	0.025	36.4
S2A2-BT11	S2A2	BT11	0.235	2505	9.685	0.385	0.011	1755	27.75	0.0025	0.0165	0.019	1.104	0.0285	0.775	35.95
S2A2-BT13	S2A2	BT13	0.025	2250	7.21	0.32	0.005	1680	34.6	0.0025	0.014	0.028	0.166	0.0025	0.025	40.8
S2A2-BT15	S2A2	BT15	0.025	2380	8.07	0.27	0.009	1700	26.6	0.0025	0.015	0.028	0.167	0.0025	0.025	36.5
S2A2-BT22	S2A2	BT22	0.025	2260	8.32	0.45	0.01	1660	28.5	0.0025	0.012	0.165	0.149	0.0025	0.025	47.8
S2A2-BT23	S2A2	BT23	0.025	2320	6.26	0.23	0.0025	1840	22.9	0.0025	0.011	0.041	0.12	0.0025	0.025	41.3
S2A2-BT24	S2A2	BT24	0.07	2320	8.54	0.47	0.015	1830	32.1	0.0025	0.017	0.0025	0.223	0.0025	0.025	47.5
S2A2-BT3	S2A2	BT3	0.025	2430	10.3	0.3	0.0025	1920	36	0.0025	0.011	0.022	0.08	0.0025	0.025	38.9
S2A2-BT4	S2A2	BT4	0.025	2180	6.04	0.34	0.005	1500	30.7	0.0025	0.02	0.032	0.163	0.0025	0.025	47.7
S2A2-Comp1	S2A2	Comp1	0.025	2430	6.41	0.54	0.009	1590	22.5	0.0025	0.015	0.012	0.201	0.0025	0.025	46.8
S2A2-Comp2	S2A2	Comp2	0.025	2260	8.07	0.47	0.008	1610	28.6	0.0025	0.015	0.018	0.156	0.0025	0.025	46.8
S3A3-BT1	S3A3	BT1	0.025	2300	10.9	0.42	0.006	1830	31.7	0.0025	0.028	0.031	0.209	0.0025	0.025	41.1

Table E-5.3 Viscera Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
S3A3-BT10	S3A3	BT10	9.15	0.005	0.39	0.92	0.0025	0.025	0.025	0.379	8850	0.025	0.173	1.15	28	0.043	0.014	286	12.2	0.07	0.117
S3A3-BT12	S3A3	BT12	9.94	0.006	0.44	0.82	0.0025	0.025	0.025	0.247	14400	0.06	0.302	0.79	25	0.029	0.023	351	16.9	0.07	0.095
S3A3-BT23	S3A3	BT23	3.05	0.023	0.27	0.69	0.0025	0.29	0.025	0.432	12800	0.025	0.192	0.86	18	0.016	0.013	348	9.64	0.06	0.041
S3A3-BT4	S3A3	BT4	7.33	0.005	0.25	0.71	0.0025	0.025	0.025	0.375	12800	0.08	0.252	0.89	32	0.029	0.019	321	8.63	0.11	0.09
S3A3-BT5	S3A3	BT5	50.72	0.0025	0.195	0.88	0.0025	0.025	0.025	0.238	11250	0.115	0.121	0.83	98.5	0.03	0.042	337.5	11	0.075	0.056
S3A3-BT8	S3A3	BT8	3.07	0.0025	0.25	0.67	0.0025	0.025	0.025	0.247	12500	0.025	0.102	1.07	18	0.031	0.015	321	9.97	0.12	0.051
S3A3-BT9	S3A3	BT9	808	0.005	4.56	2.07	0.044	0.1	0.025	0.503	6900	0.98	1.16	3.53	1680	0.681	0.785	604	44.6	0.08	0.696
S3A3-Comp1	S3A3	Comp1	6.94	0.01	0.3	0.66	0.0025	0.025	0.025	0.234	12500	0.025	0.199	0.71	22	0.015	0.016	345	7.4	0.07	0.044
S3A3-Comp2	S3A3	Comp2	119	0.008	0.68	1.25	0.007	0.025	0.025	0.348	9720	0.37	0.266	1.05	116	0.089	0.142	324	17.8	0.05	0.149
W4A17-BT1	W4A17	BT1	95.4	0.005	0.09	0.69	0.005	0.025	0.025	0.0327	7490	0.56	0.101	0.62	98	0.105	0.185	276	13.5	0.1	0.028
W4A17-BT12	W4A17	BT12	132	0.0025	0.38	1.16	0.007	0.025	0.025	0.0312	11000	0.31	0.125	0.83	93	0.119	0.241	342	49.8	0.09	0.022
W4A17-BT13	W4A17	BT13	68.5	0.027	0.09	1.23	0.0025	0.37	0.025	0.0349	12000	0.18	0.133	0.65	48	0.094	0.102	342	15.2	0.06	0.029
W4A17-BT2	W4A17	BT2	29.1	0.0025	0.07	0.53	0.0025	0.025	0.025	0.0352	8380	0.63	0.112	0.65	38	0.058	0.096	269	8.35	0.15	0.021
W4A17-BT20	W4A17	BT20	7.89	0.006	0.025	0.48	0.0025	0.025	0.025	0.0347	11100	0.13	0.101	0.48	22	0.035	0.045	329	5.47	0.12	0.022
W4A17-BT23	W4A17	BT23	127	0.0025	0.07	1.34	0.006	0.025	0.05	0.0417	7940	0.19	0.119	0.85	128	0.093	0.224	301	8.3	0.11	0.032
W4A17-BT24	W4A17	BT24	6.72	0.0025	0.025	0.48	0.0025	0.025	0.025	0.0334	10500	0.025	0.027	0.55	19	0.02	0.033	323	4.44	0.1	0.018
W4A17-BT6	W4A17	BT6	77.3	0.005	0.08	1.04	0.0025	0.025	0.025	0.038	12400	0.23	0.07	0.61	43	0.044	0.068	341	8.68	0.09	0.019
W4A17-BT9	W4A17	BT9	52.6	0.0025	0.1	1.14	0.007	0.025	0.025	0.0629	9350	0.21	0.229	0.53	73	0.188	0.111	305	31.6	0.09	0.021
W4A17-Comp1	W4A17	Comp1	60.8	0.0025	0.06	0.79	0.0025	0.025	0.025	0.0376	9700	0.1	0.076	0.81	41	0.076	0.208	324	9.6	0.11	0.026
W4A21-BT1	W4A21	BT1	63.9	0.0025	0.46	1.34	0.024	0.025	0.025	0.094	10900	0.11	0.231	0.84	279	0.193	0.101	311	14.5	0.07	0.038
W4A21-BT2	W4A21	BT2	4.92	0.0025	0.13	1.03	0.0025	0.025	0.025	0.119	9740	0.06	0.068	0.77	18	0.045	0.029	312	7.96	0.05	0.014
W4A21-BT3	W4A21	BT3	0.21	0.0025	0.06	0.49	0.0025	0.025	0.025	0.0329	10500	0.025	0.046	0.66	18	0.014	0.031	334	4.5	0.09	0.006
W4A21-BT4	W4A21	BT4	7.62	0.0025	0.075	1.19	0.0025	0.025	0.025	0.08655	9485	0.0425	0.0725	1.445	39.5	0.053	0.0355	303.5	9.455	0.07	0.031
W4A21-BT5	W4A21	BT5	7.17	0.0025	0.07	0.51	0.0025	0.025	0.025	0.0474	10600	0.025	0.066	1.37	29	0.033	0.032	353	6.93	0.1	0.018
W4A21-BT6	W4A21	BT6	3.78	0.0025	0.07	0.49	0.0025	0.025	0.025	0.176	6830	0.025	0.094	1.12	22	0.036	0.018	285	10	0.1	0.03
W4A21-BT9	W4A21	BT9	4.65	0.0025	0.14	0.7	0.0025	0.025	0.025	0.105	10200	0.025	0.122	0.67	21	0.051	0.029	300	7.7	0.09	0.014
W4A21-Comp1	W4A21	Comp1	10.6	0.0025	0.06	0.74	0.0025	0.025	0.025	0.158	8980	0.025	0.085	1.23	24	0.026	0.037	303	10	0.06	0.024
W4A21-Comp2	W4A21	Comp2	51.1	0.0025	0.14	0.94	0.0025	0.025	0.025	0.106	9780	0.06	0.161	0.86	55	0.118	0.09	305	13.7	0.08	0.032
W4A21-Comp3	W4A21	Comp3	46.8	0.0025	0.16	1.29	0.0025	0.025	0.025	0.116	11700	0.07	0.119	0.81	52	0.088	0.091	308	9.9	0.05	0.021
W4A31-BT1	W4A31	BT1	14.7	0.0025	0.42	1.61	0.0025	0.025	0.025	0.204	9760	0.06	0.117	1.54	52	0.091	0.039	285	15	0.04	0.03
W4A31-BT10	W4A31	BT10	5.67	0.0025	0.43	1.15	0.0025	0.025	0.025	0.115	13900	0.05	0.245	1.03	29	0.084	0.025	359	11.6	0.06	0.035
W4A31-BT2	W4A31	BT2	2.57	0.0025	0.42	1.53	0.0025	0.025	0.025	0.123	13400	0.025	0.103	1.11	19	0.043	0.029	373	9.62	0.05	0.027
W4A31-BT3	W4A31	BT3	114	0.063	1.05	2.14	0.011	0.025	0.025	0.449	13400	0.27	0.32	1.29	224	0.377	0.192	349	16.1	0.05	0.064
W4A31-BT6	W4A31	BT6	6.545	0.014	0.275	1.335	0.0025	0.1725	0.025	0.37	11110	0.025	0.112	0.895	20.5	0.0385	0.028	326.5	9.29	0.04	0.0295
W4A31-BT7	W4A31	BT7	6.39	0.0025	0.46	1.18	0.0025	0.025	0.025	0.293	12000	0.05	0.138	0.79	24	0.05	0.022	317	9.9	0.04	0.021
W4A31-BT8	W4A31	BT8	33.5	0.0025	0.36	1.31	0.0025	0.025	0.025	0.109	11300	0.07	0.169	0.55	45	0.061	0.074	334	8.13	0.03	0.017
W4A31-BT9	W4A31	BT9	3.95	0.0025	0.36	1.46	0.0025	0.025	0.025	0.0945	14700	0.06	0.119	0.87	25	0.052	0.031	375	9.17	0.04	0.016
W4A31-Comp1	W4A31	Comp1	33.7	0.0025	0.28	1.33	0.0025	0.025	0.025	0.365	8420	0.07	0.241	0.95	69	0.08	0.063	286	12.2	0.05	0.048

Table E-5.3 Viscera Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
S3A3-BT10	S3A3	BT10	0.025	2250	9.6	0.48	0.015	1500	16.2	0.0025	0.022	0.016	0.154	0.0025	0.025	48.7
S3A3-BT12	S3A3	BT12	0.06	2360	11.6	0.47	0.012	1600	29.4	0.0025	0.034	0.012	0.244	0.0025	0.025	46
S3A3-BT23	S3A3	BT23	0.05	2480	9.62	0.46	0.012	1530	25.8	0.0025	0.025	0.013	0.123	0.0025	0.025	40.2
S3A3-BT4	S3A3	BT4	0.025	2170	10.1	0.49	0.009	1880	26.5	0.0025	0.034	0.044	0.243	0.0025	0.025	49.9
S3A3-BT5	S3A3	BT5	0.0975	2335	9.085	0.43	0.0125	1735	26.95	0.0025	0.0175	0.045	0.171	0.0025	0.0775	48
S3A3-BT8	S3A3	BT8	0.05	2070	9.57	0.42	0.007	1770	23.5	0.0025	0.023	0.058	0.377	0.0025	0.05	44.2
S3A3-BT9	S3A3	BT9	0.96	2340	13.1	0.56	0.009	1340	14.1	0.0025	0.074	0.086	1.32	0.046	1.18	50.3
S3A3-Comp1	S3A3	Comp1	0.05	2540	11.1	0.54	0.0025	1570	24.4	0.0025	0.027	0.011	0.148	0.0025	0.025	49.7
S3A3-Comp2	S3A3	Comp2	0.11	2460	10.9	0.54	0.012	1500	20.1	0.0025	0.033	0.026	0.42	0.009	0.21	48
W4A17-BT1	W4A17	BT1	0.09	2190	10.2	0.32	0.007	1520	11.5	0.0025	0.014	0.021	0.018	0.023	0.11	50.7
W4A17-BT12	W4A17	BT12	0.07	2210	11.7	0.27	0.011	1640	20.2	0.0025	0.016	0.099	0.009	0.031	0.15	45.1
W4A17-BT13	W4A17	BT13	0.09	2520	7.35	0.33	0.007	1730	30.3	0.0025	0.014	0.022	0.007	0.019	0.07	42.2
W4A17-BT2	W4A17	BT2	0.025	2150	9.9	0.31	0.009	1630	14.5	0.0025	0.011	0.019	0.01	0.017	0.025	44.1
W4A17-BT20	W4A17	BT20	0.05	2480	10.2	0.23	0.0025	1640	17.9	0.0025	0.012	0.008	0.0025	0.013	0.025	29.9
W4A17-BT23	W4A17	BT23	0.13	2450	11.8	0.26	0.008	1550	15.6	0.0025	0.015	0.012	0.006	0.04	0.18	34.8
W4A17-BT24	W4A17	BT24	0.025	2730	13.2	0.23	0.008	1670	15.7	0.0025	0.01	0.0025	0.005	0.009	0.025	46.6
W4A17-BT6	W4A17	BT6	0.025	2380	11.9	0.3	0.006	1870	24.2	0.0025	0.013	0.024	0.011	0.012	0.1	43.3
W4A17-BT9	W4A17	BT9	0.06	2300	9.11	0.31	0.0025	1580	18.1	0.0025	0.026	0.018	0.009	0.047	0.08	43.7
W4A17-Comp1	W4A17	Comp1	0.09	2730	9.69	0.27	0.0025	1520	15.8	0.0025	0.012	0.005	0.006	0.024	0.06	38.5
W4A21-BT1	W4A21	BT1	0.11	2570	8.8	0.57	0.01	1590	15.2	0.0025	0.031	0.013	0.041	0.035	0.13	40.2
W4A21-BT2	W4A21	BT2	0.025	2660	7.47	0.38	0.0025	1320	16.7	0.0025	0.011	0.0025	0.0025	0.005	0.025	43.8
W4A21-BT3	W4A21	BT3	0.025	2690	10.7	0.23	0.005	1560	18.6	0.0025	0.009	0.0025	0.0025	0.0025	0.025	32.2
W4A21-BT4	W4A21	BT4	0.025	2460	8.44	0.34	0.015	1590	17.35	0.0025	0.012	0.0025	0.0025	0.008	0.025	42.15
W4A21-BT5	W4A21	BT5	0.025	2700	10.9	0.3	0.016	1520	16.5	0.0025	0.01	0.0025	0.006	0.008	0.025	36.7
W4A21-BT6	W4A21	BT6	0.025	2650	8.77	0.3	0.014	1610	12.6	0.0025	0.014	0.006	0.006	0.0025	0.025	49.1
W4A21-BT9	W4A21	BT9	0.025	2420	9.63	0.46	0.012	1820	16.3	0.0025	0.01	0.0025	0.0025	0.007	0.025	44.6
W4A21-Comp1	W4A21	Comp1	0.025	2740	12.5	0.37	0.013	1410	17.1	0.0025	0.012	0.0025	0.0025	0.0025	0.025	43.3
W4A21-Comp2	W4A21	Comp2	0.07	2700	11.1	0.31	0.011	1620	17.9	0.0025	0.011	0.008	0.005	0.024	0.07	43.6
W4A21-Comp3	W4A21	Comp3	0.07	2520	9.12	0.41	0.007	1840	19.5	0.0025	0.015	0.0025	0.013	0.015	0.07	51.3
W4A31-BT1	W4A31	BT1	0.05	2330	10.1	1.35	0.028	1680	19.1	0.0025	0.027	0.009	0.014	0.007	0.08	46.2
W4A31-BT10	W4A31	BT10	0.07	2540	9.32	0.64	0.013	1580	22.5	0.0025	0.026	0.012	0.021	0.012	0.07	41.1
W4A31-BT2	W4A31	BT2	0.17	2610	10.7	0.67	0.044	1710	22.4	0.0025	0.023	0.015	0.013	0.006	0.025	48.3
W4A31-BT3	W4A31	BT3	0.25	2360	9.88	1.21	0.032	1780	24.3	0.0025	0.032	0.012	0.039	0.046	0.3	50.2
W4A31-BT6	W4A31	BT6	0.06	2460	9.025	0.75	0.0345	1715	21.85	0.0025	0.02	0.016	0.0105	0.00425	0.025	38.7
W4A31-BT7	W4A31	BT7	0.06	2580	9.1	1.36	0.072	1760	21.1	0.0025	0.031	0.008	0.013	0.0025	0.025	37.9
W4A31-BT8	W4A31	BT8	0.08	2550	10.1	0.77	0.007	1590	20	0.0025	0.021	0.009	0.017	0.008	0.08	35.7
W4A31-BT9	W4A31	BT9	0.06	2510	9.77	0.72	0.015	1680	24.3	0.0025	0.022	0.0025	0.013	0.006	0.025	36.5
W4A31-Comp1	W4A31	Comp1	0.08	2650	11.4	0.75	0.021	1610	15.8	0.0025	0.031	0.0025	0.015	0.018	0.12	47.1

Table E-5.4 Whole Fish Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
B2A2-BT1	B2A2	BT1	2.119	0.002739	0.06768	0.4247	0.002565	0.02565	0.02565	0.03687	6270	0.144	0.03457	0.9061	13.35	0.03675	0.0127	316.7	5.87	0.1393	0.01234
B2A2-BT16	B2A2	BT16	3.2	0.002544	0.03587	0.529	0.002544	0.02544	0.02544	0.01201	6662	0.1254	0.03177	0.6782	16.17	0.03659	0.008857	335.5	2.373	0.1934	0.01476
B2A2-BT18	B2A2	BT18	12.35	0.002633	0.1921	0.6075	0.002633	0.02633	0.02633	0.03033	5301	0.07684	0.08247	1.116	21.3	0.05471	0.01595	311.7	7.629	0.1381	0.01415
B2A2-BT3	B2A2	BT3	1.14	0.002635	0.03175	0.3708	0.002527	0.02527	0.02527	0.01447	4095	0.1563	0.03556	0.6362	15.55	0.0538	0.00673	289.5	1.974	0.1467	0.011
B2A2-BT4	B2A2	BT4	57.79	0.002568	0.2337	0.93	0.005272	0.02568	0.03681	0.03767	8011	0.6285	0.1079	0.9491	40.88	0.09181	0.08703	339.4	16.14	0.1188	0.01411
B2A2-BT5	B2A2	BT5	5.679	0.002679	0.2719	0.7661	0.002679	0.02679	0.02679	0.02634	7102	0.06317	0.1061	0.9145	14.84	0.0589	0.01416	331.5	9.416	0.1435	0.01438
B2A2-BT6	B2A2	BT6	63.16	0.003915	0.2235	0.7704	0.005381	0.07092	0.05137	0.02101	6078	1.011	0.1233	0.6934	42.87	0.1002	0.0806	345.8	12.64	0.1111	0.01758
B2A2-BT8	B2A2	BT8	40.99	0.006772	0.2328	0.8288	0.00394	0.03688	0.03437	0.02604	5595	0.2328	0.1123	0.7493	33.6	0.08757	0.06102	318.3	13.19	0.2419	0.01697
B2A2-Comp.1	B2A2	Comp.1	17.12	0.002547	0.2423	0.7286	0.002547	0.02547	0.02547	0.03146	6364	0.1395	0.0716	0.7553	22.95	0.05297	0.02519	333.2	6.654	0.1174	0.01486
B2A2-Comp.2	B2A2	Comp.2	13.83	0.002555	0.2327	0.6882	0.002555	0.02555	0.02555	0.02778	5973	0.05519	0.09019	0.8799	20.04	0.0442	0.02449	332.9	5.853	0.1083	0.01292
B3A9-BT1	B3A9	BT1	1.293	0.002645	0.08772	0.3302	0.002645	0.02645	0.02645	0.09983	6281	0.05699	0.04783	0.9865	16.6	0.03614	0.01024	313.1	3.798	0.2141	0.01533
B3A9-BT13	B3A9	BT13	1.472	0.01172	0.1423	0.4332	0.002568	0.1866	0.02568	0.06282	6734	0.02568	0.05331	0.6151	12.66	0.03025	0.01135	341.8	4.119	0.1362	0.01732
B3A9-BT14	B3A9	BT14	7.26	0.00266	0.1438	0.4362	0.00266	0.0266	0.0266	0.1079	7785	0.08962	0.07216	0.896	17.84	0.04908	0.01426	337.1	4.072	0.1806	0.01828
B3A9-BT2	B3A9	BT2	92.07	0.002554	1.62	0.7343	0.008913	0.02554	0.02554	0.05496	5121	0.2526	0.1664	0.6806	314.3	0.1702	0.09635	346.6	12.64	0.118	0.03043
B3A9-BT4	B3A9	BT4	4.443	0.002541	0.1158	0.4309	0.002541	0.02541	0.02541	0.06561	6998	0.09008	0.04812	0.6136	15.93	0.02944	0.0149	329.2	4.328	0.1449	0.01309
B3A9-BT5	B3A9	BT5	3.735	0.002577	0.09696	0.3667	0.002577	0.02577	0.02577	0.08024	5731	0.04464	0.03534	0.5505	14.81	0.02148	0.0102	323.2	3.905	0.1035	0.01693
B3A9-BT7	B3A9	BT7	1.144	0.002632	0.3629	0.4637	0.002632	0.02632	0.02632	0.04269	5374	0.06842	0.06395	0.7849	14.01	0.01153	0.009101	330.8	5.832	0.08527	0.01332
B3A9-BT9	B3A9	BT9	5.279	0.002565	0.1147	0.212	0.002565	0.02565	0.02565	0.05828	3143	0.07232	0.07025	0.5676	16.15	0.03423	0.0119	280.1	3.057	0.1409	0.009845
B3A9-Comp1	B3A9	Comp1	4.211	0.00254	0.1199	0.3862	0.00254	0.0254	0.0254	0.08133	6350	0.03841	0.036	0.5644	13.1	0.0338	0.01023	323	3.837	0.1255	0.02062
B3A9-Comp2	B3A9	Comp2	3.507	0.002592	0.1085	0.6035	0.002592	0.02592	0.02592	0.07318	6733	0.0383	0.05493	0.6116	12.91	0.0369	0.01274	314.7	3.345	0.1324	0.01404
EBNB1-BT1	EBNB1	BT1	76.33	0.003885	0.4778	1.141	0.005375	0.02622	0.04472	0.05707	5515	0.144	0.09714	0.6926	88.95	0.04049	0.06612	331.4	9.656	0.04692	0.01517
EBNB1-BT2	EBNB1	BT2	11.56	0.002549	0.3665	0.5892	0.002549	0.02549	0.02549	0.05614	5266	0.08767	0.09261	0.5788	27.38	0.01546	0.02025	308.5	10.22	0.04668	0.01648
EBNB1-BT3	EBNB1	BT3	0.7893	0.002866	0.2041	0.5005	0.002866	0.02866	0.02866	0.03887	4742	0.05156	0.07949	0.5971	11.63	0.008678	0.004451	293.2	8.895	0.0367	0.01232
M3C3-BT1	M3C3	BT1	2.292	0.004455	0.09019	0.3707	0.002644	0.06585	0.02644	0.02521	5470	0.3535	0.04197	0.5738	12.24	0.02594	0.005946	332.4	6.044	0.1221	0.1078
M3C3-BT10	M3C3	BT10	1.05	0.002554	0.06687	0.5038	0.002554	0.02554	0.02554	0.05371	6739	0.04398	0.08724	0.4892	11.19	0.03961	0.01106	297.8	5.397	0.07987	0.01184
M3C3-BT2	M3C3	BT2	55.94	0.003669	0.08934	0.5789	0.003669	0.02554	0.03669	0.1031	6655	0.2407	0.09717	0.7284	52.58	0.06489	0.07984	315.6	6.44	0.1078	0.028
M3C3-BT3	M3C3	BT3	16.64	0.002607	0.09403	0.4406	0.002607	0.02607	0.02607	0.08435	5575	0.09307	0.07621	0.9151	23.01	0.04146	0.02537	330	4.191	0.06385	0.02361
M3C3-BT4	M3C3	BT4	4.137	0.002545	0.07226	0.5824	0.002545	0.02545	0.02545	0.06888	8188	0.054	0.0702	0.5773	18.38	0.04086	0.01273	352.8	7.686	0.05423	0.01616
M3C3-BT5	M3C3	BT5	2.631	0.002563	0.03729	0.2928	0.002563	0.02563	0.02563	0.04351	6308	0.04396	0.04255	0.6856	11.44	0.0467	0.007394	308	9.931	0.0836	0.01408
M3C3-BT6	M3C3	BT6	1.252	0.002588	0.03422	0.3421	0.002588	0.02588	0.02588	0.0417	6635	0.04423	0.0289	0.7766	13.56	0.03412	0.009383	313.8	4.3	0.07034	0.02202
M3C3-BT7	M3C3	BT7	1.632	0.01294	0.04814	0.4708	0.002653	0.1507	0.02653	0.0596	7755	0.04409	0.03713	0.8105	13.36	0.03566	0.009727	346.2	23.41	0.1432	0.03451
M3C3-BT8	M3C3	BT8	2.491	0.005079	0.06256	0.3319	0.002659	0.02659	0.02659	0.06178	6580	0.03666	0.03219	0.6674	11.95	0.02846	0.01126	333.7	10.94	0.09871	0.01761
M3C3-BT9	M3C3	BT9	2.977	0.002555	0.06207	0.2803	0.002555	0.02555	0.02555	0.09157	5160	0.02555	0.05852	0.7276	11.95	0.02603	0.007403	295.4	6.8	0.1103	0.01396
S2A2-BT11	S2A2	BT11	99.66	0.006304	0.5686	0.6371	0.004354	0.02555	0.04504	0.0419	6526	0.2145	0.06654	1.178	143.6	0.07322	0.141	335.2	8.008	0.1427	0.1654
S2A2-BT13	S2A2	BT13	1.763	0.004236	0.06641	0.6778	0.002557	0.02557	0.02557	0.03008	6034	0.04846	0.01694	0.8476	11.44	0.01427	0.006982	327.6	3.868	0.08825	0.03632
S2A2-BT15	S2A2	BT15	0.7143	0.003275	0.05611	0.4296	0.002511	0.02511	0.02511	0.04693	6870	0.04236	0.03661	0.6774	11.66	0.01937	0.004803	326.8	5.607	0.1696	0.026
S2A2-BT22	S2A2	BT22	0.6944	0.002558	0.07786	0.3376	0.002558	0.02558	0.02558	0.03433	6059	0.02558	0.02143	0.5788	10.65	0.008057	0.005316	334	4.465	0.1094	0.02425
S2A2-BT23	S2A2	BT23	0.4758	0.002575	0.02575	0.3641	0.002575	0.02575	0.02575	0.02393	4995	0.03247	0.02213	0.675	13.67	0.01412	0.004053	286.8	3.437	0.127	0.01837
S2A2-BT24	S2A2	BT24	1.159	0.005038	0.1046	0.4554	0.002602	0.02602	0.02602	0.03285	6552	0.02602	0.0421	0.6751	12.41	0.01895	0.008083	303.9	6.611	0.08111	0.07029
S2A2-BT3	S2A2	BT3	0.9176	0.002594	0.03262	0.5541	0.002594	0.02594	0.02594	0.0305	6651	0.02594	0.01183	1.408	12.73	0.01585	0.008187	333.8	8.522	0.08566	0.02366
S2A2-BT4	S2A2	BT4	4.762	0.007577	0.06342	0.4553	0.002597	0.08899	0.02597	0.03897	6647	0.04483	0.02383	0.7639	11.46	0.01871	0.009534	310.5	4.961	0.1527	0.0542
S2A2-Comp1	S2A2	Comp1	3.296	0.002547	0.08659	0.3761	0.002547	0.02547	0.02547	0.04845	6725	0.02547	0.04233	0.7194	15.05	0.01512	0.008933	329.9	4.164	0.1007	0.09705
S2A2-Comp2	S2A2	Comp2	1.726	0.003348	0.1103	0.4871	0.002556	0.02556	0.02556	0.04825	7113	0.02556	0.03994	0.7326	12.65	0.02993	0.009199	332.2	5.696	0.0877	0.03254
S3A3-BT1	S3A3	BT1	1.847	0.003821	0.1208	0.5426	0.002552	0.02552	0.02552	0.1197	7247	0.02552	0.1097	0.6229	14.83	0.02086	0.00636	298.1	7.379	0.1166	0.02193

Table E-5.4 Whole Fish Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
B2A2-BT1	B2A2	BT1	0.02565	3734	9.596	0.3081	0.02396	877.2	11.42	0.002565	0.008593	0.02243	0.007332	0.002565	0.03176	16.65
B2A2-BT16	B2A2	BT16	0.02544	3712	5.091	0.1798	0.007513	965.5	12.86	0.002544	0.007855	0.009487	0.004184	0.003066	0.02544	27.04
B2A2-BT18	B2A2	BT18	0.04011	3552	7.759	0.4287	0.03987	926.4	12.03	0.002633	0.01147	0.01092	0.01472	0.006765	0.05235	22.12
B2A2-BT3	B2A2	BT3	0.02527	3758	6.509	0.23	0.008848	846.3	6.825	0.002527	0.004186	0.01551	0.005109	0.002527	0.02527	21.43
B2A2-BT4	B2A2	BT4	0.04954	3577	10.73	0.4156	0.02348	1056	15.53	0.002568	0.01195	0.0108	0.01986	0.006545	0.0559	20.17
B2A2-BT5	B2A2	BT5	0.02679	3693	10.44	0.4394	0.02661	1057	14.41	0.002679	0.01294	0.01701	0.02127	0.002679	0.02679	22.64
B2A2-BT6	B2A2	BT6	0.07336	3584	8.635	0.4109	0.01385	958.6	11.35	0.002571	0.01302	0.005929	0.01485	0.01247	0.09291	26.85
B2A2-BT8	B2A2	BT8	0.04442	3568	7.048	0.3171	0.01609	940.7	14.93	0.002558	0.01374	0.01542	0.02236	0.00821	0.07708	23.85
B2A2-Comp.1	B2A2	Comp.1	0.02547	3531	7.029	0.4931	0.01726	1009	14.19	0.002547	0.01164	0.01397	0.0209	0.005026	0.05026	26.78
B2A2-Comp.2	B2A2	Comp.2	0.02555	3617	8.813	0.4306	0.01819	979.9	13.42	0.002555	0.01116	0.01539	0.01675	0.006767	0.03959	26.26
B3A9-BT1	B3A9	BT1	0.02645	3581	12.48	0.3528	0.02685	1033	10.44	0.002645	0.009041	0.01565	0.005943	0.002645	0.02645	24.43
B3A9-BT13	B3A9	BT13	0.02568	3554	10.79	0.3324	0.01672	1013	12.73	0.002568	0.0109	0.0127	0.004907	0.002568	0.02568	24.77
B3A9-BT14	B3A9	BT14	0.0266	3452	11.35	0.3281	0.03153	1014	12.58	0.00266	0.01209	0.008513	0.006918	0.003853	0.03853	26.68
B3A9-BT2	B3A9	BT2	0.1333	3632	12.15	0.3362	0.01649	898.4	8.978	0.002554	0.01251	0.009461	0.01955	0.009951	0.2526	23.09
B3A9-BT4	B3A9	BT4	0.02541	3598	11.15	0.3542	0.01263	1024	12.31	0.002541	0.01212	0.01044	0.004907	0.002541	0.02541	27.66
B3A9-BT5	B3A9	BT5	0.02577	3518	10.63	0.3002	0.009204	1001	9.971	0.002577	0.01021	0.01084	0.01819	0.002577	0.02577	26.23
B3A9-BT7	B3A9	BT7	0.02632	3761	11.87	0.5868	0.02919	870.5	7.352	0.002632	0.01475	0.009784	0.002632	0.002632	0.02632	20.79
B3A9-BT9	B3A9	BT9	0.02565	3727	11.99	0.3194	0.0114	795.3	5.319	0.002565	0.01266	0.007895	0.004162	0.002565	0.03425	18.76
B3A9-Comp1	B3A9	Comp1	0.0254	3358	8.799	0.3418	0.01168	992.2	11.54	0.00254	0.01086	0.01023	0.006072	0.003841	0.0254	31.32
B3A9-Comp2	B3A9	Comp2	0.02592	3335	10.23	0.3274	0.01625	1035	12.04	0.002592	0.01124	0.00937	0.004892	0.002592	0.02592	31.23
EBNB1-BT1	EBNB1	BT1	0.1079	3629	9.702	1.178	0.04047	857	7.477	0.002517	0.03702	0.02305	0.00357	0.004773	0.156	22.24
EBNB1-BT2	EBNB1	BT2	0.04941	3621	9.924	1.017	0.03165	902.7	6.624	0.002549	0.03064	0.005335	0.003984	0.002549	0.04941	24.11
EBNB1-BT3	EBNB1	BT3	0.04099	3573	8.308	0.6437	0.01391	896.2	6.505	0.002866	0.02529	0.01339	0.004803	0.002866	0.02866	25.53
M3C3-BT1	M3C3	BT1	0.02644	3789	12.3	0.3059	0.008655	802	13.05	0.002644	0.009658	0.004455	0.05024	0.002644	0.02644	20.18
M3C3-BT10	M3C3	BT10	0.03392	3407	7.867	0.2833	0.005243	1109	11.12	0.002554	0.01501	0.01005	0.01144	0.006409	0.02554	21.86
M3C3-BT2	M3C3	BT2	0.0845	3430	10	0.2553	0.01152	991.2	10.47	0.002554	0.01287	0.006856	0.01992	0.009406	0.09725	23.36
M3C3-BT3	M3C3	BT3	0.04078	3456	8.113	0.2654	0.007482	888.4	9.46	0.002607	0.01099	0.005058	0.01061	0.008	0.06039	27.77
M3C3-BT4	M3C3	BT4	0.03297	3485	9.407	0.252	0.007651	972.8	14.96	0.002545	0.01431	0.007319	0.007803	0.004799	0.03597	27.56
M3C3-BT5	M3C3	BT5	0.02563	3532	6.377	0.3366	0.01226	967.6	7.702	0.002563	0.006379	0.01427	0.01073	0.002563	0.02563	22.12
M3C3-BT6	M3C3	BT6	0.02588	3460	7.808	0.2184	0.01104	1000	8.89	0.002588	0.007728	0.00424	0.005757	0.003756	0.02588	24.31
M3C3-BT7	M3C3	BT7	0.02653	3383	9.117	0.2129	0.009647	921.8	17.95	0.002653	0.009399	0.01693	0.06586	0.002653	0.02653	23.65
M3C3-BT8	M3C3	BT8	0.02659	3515	9.023	0.3113	0.0134	871.6	9.751	0.002659	0.008776	0.01506	0.01442	0.002659	0.02659	23.22
M3C3-BT9	M3C3	BT9	0.02555	3553	8.699	0.2993	0.0103	919.6	8.488	0.002555	0.01161	0.00874	0.009242	0.002555	0.02555	19.04
S2A2-BT11	S2A2	BT11	0.08853	3496	11.92	0.3215	0.01184	1008	15.13	0.002555	0.01184	0.007503	0.354	0.01035	0.2505	18.18
S2A2-BT13	S2A2	BT13	0.02557	3380	9.994	0.2664	0.01163	904.7	18.94	0.002557	0.01137	0.01034	0.07494	0.002557	0.02557	21.7
S2A2-BT15	S2A2	BT15	0.02511	3534	10.79	0.2223	0.006123	973.2	16.62	0.002511	0.01115	0.0103	0.09666	0.002511	0.02511	19.25
S2A2-BT22	S2A2	BT22	0.02558	3485	11.89	0.3544	0.01013	909.3	15.62	0.002558	0.01034	0.05132	0.07563	0.002558	0.02558	23.44
S2A2-BT23	S2A2	BT23	0.02575	3533	8.793	0.1884	0.006016	992.7	11.08	0.002575	0.009524	0.01292	0.05327	0.002575	0.02575	19.17
S2A2-BT24	S2A2	BT24	0.03948	3313	11.1	0.3601	0.01223	975.4	16.85	0.002602	0.01473	0.006431	0.1128	0.002602	0.02602	23.27
S2A2-BT3	S2A2	BT3	0.02594	3590	13.51	0.2461	0.01152	1025	20.78	0.002594	0.00933	0.007803	0.03878	0.002594	0.02594	21.18
S2A2-BT4	S2A2	BT4	0.02597	3489	9.794	0.2793	0.008599	922.1	17.06	0.002597	0.01628	0.01329	0.08114	0.002597	0.02597	22.63
S2A2-Comp1	S2A2	Comp1	0.02547	3427	8.265	0.4094	0.01032	951.6	14.65	0.002547	0.01395	0.009976	0.1129	0.002921	0.02547	25.34
S2A2-Comp2	S2A2	Comp2	0.02556	3350	10.72	0.3929	0.01319	930.8	17.1	0.002556	0.01405	0.009157	0.08742	0.002556	0.02556	25.01
S3A3-BT1	S3A3	BT1	0.04758	3376	14.25	0.3743	0.005545	1100	16.4	0.002552	0.02602	0.01537	0.1065	0.002552	0.02552	21.53

Table E-5.4 Whole Fish Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
S3A3-BT10	S3A3	BT10	3.702	0.003518	0.2833	0.431	0.002685	0.02685	0.02685	0.154	5230	0.02685	0.1025	1.075	15.75	0.0226	0.006517	298.6	5.594	0.1204	0.05156
S3A3-BT12	S3A3	BT12	4.209	0.01497	0.2949	0.4259	0.002556	0.1389	0.02556	0.108	7167	0.03762	0.1618	0.9322	13.01	0.01757	0.009621	320.1	8.45	0.1095	0.04722
S3A3-BT23	S3A3	BT23	1.375	0.01138	0.1982	0.3717	0.00256	0.1189	0.0256	0.1745	6875	0.0256	0.1081	0.8038	10.97	0.01403	0.006257	328.9	5.166	0.09248	0.02331
S3A3-BT4	S3A3	BT4	3.044	0.006371	0.1868	0.4104	0.002518	0.02518	0.02518	0.1466	7428	0.04208	0.1345	0.9328	17.57	0.01649	0.0093	333	4.79	0.1525	0.03824
S3A3-BT5	S3A3	BT5	18.36	0.004818	0.1522	0.6285	0.002537	0.02537	0.02537	0.103	7376	0.05626	0.0703	0.832	39.57	0.02078	0.01773	343.6	7.161	0.09818	0.02578
S3A3-BT8	S3A3	BT8	1.686	0.002554	0.2171	0.4242	0.002554	0.02554	0.02554	0.1257	7762	0.02554	0.06327	1.252	12.47	0.02336	0.009877	310.4	6.18	0.1654	0.02721
S3A3-BT9	S3A3	BT9	287	0.00345	1.755	0.8611	0.01726	0.0522	0.02565	0.2066	4699	0.3637	0.5161	1.847	600.4	0.2565	0.2824	424.4	17.7	0.1061	0.2628
S3A3-Comp1	S3A3	Comp1	2.909	0.0051	0.2268	0.3556	0.002551	0.02551	0.02551	0.1001	6130	0.02551	0.114	0.7373	12.29	0.01301	0.00714	322.6	3.665	0.1031	0.02399
S3A3-Comp2	S3A3	Comp2	44.27	0.004563	0.3931	0.6386	0.004198	0.02557	0.02557	0.1455	6370	0.1514	0.1325	0.8034	47.14	0.04509	0.05563	349.4	8.507	0.08215	0.06859
W4A17-BT1	W4A17	BT1	32.64	0.003364	0.0472	0.3718	0.003364	0.02515	0.02515	0.01348	5107	0.2066	0.04523	0.7003	37.24	0.0494	0.0727	312.1	5.672	0.1335	0.01305
W4A17-BT12	W4A17	BT12	53.16	0.002545	0.1614	0.6221	0.004268	0.02545	0.02545	0.01505	6425	0.1346	0.06753	0.9618	41.51	0.08474	0.1052	338.7	21.89	0.1212	0.01356
W4A17-BT13	W4A17	BT13	24.64	0.01214	0.09339	0.6487	0.002559	0.1396	0.02559	0.01455	6519	0.1033	0.0659	0.5191	21.45	0.09036	0.04503	339.8	6.61	0.08655	0.01359
W4A17-BT2	W4A17	BT2	11.02	0.002607	0.04235	0.3553	0.002607	0.02607	0.02607	0.01633	6014	0.2448	0.0621	0.747	18.14	0.0517	0.04359	311.4	4.92	0.1951	0.01216
W4A17-BT20	W4A17	BT20	2.86	0.003679	0.02553	0.2692	0.002553	0.02553	0.02553	0.01365	5807	0.05931	0.05309	0.4354	11.45	0.01301	0.0226	322	2.656	0.161	0.01101
W4A17-BT23	W4A17	BT23	46.22	0.00261	0.04236	0.6884	0.003875	0.0261	0.03514	0.01868	6192	0.08574	0.06251	0.6911	49.68	0.03532	0.09059	335.9	4.364	0.1293	0.01481
W4A17-BT24	W4A17	BT24	2.126	0.002639	0.07288	0.3013	0.002639	0.02639	0.02639	0.01274	6344	0.02639	0.01536	0.5419	10.4	0.007297	0.01684	320.2	2.429	0.1365	0.009917
W4A17-BT6	W4A17	BT6	28.66	0.003465	0.04567	0.5142	0.002546	0.02546	0.02546	0.01609	6536	0.1008	0.03617	0.4917	19.15	0.02437	0.03256	325	4.337	0.1218	0.01083
W4A17-BT9	W4A17	BT9	19.89	0.002564	0.05352	0.5981	0.004237	0.02564	0.02564	0.02616	6135	0.09781	0.1145	0.4895	32.16	0.0898	0.0494	318.2	13.72	0.1088	0.01729
W4A17-Comp1	W4A17	Comp1	23.74	0.002522	0.03873	0.4688	0.002522	0.02522	0.02522	0.01689	6262	0.05416	0.03954	0.7798	19.79	0.03422	0.09065	329	4.91	0.1477	0.01585
W4A21-BT1	W4A21	BT1	30.6	0.002741	0.3798	0.8451	0.009927	0.02548	0.02516	0.04422	7093	0.09015	0.1304	0.7692	137.9	0.09251	0.04912	330.4	8.622	0.09615	0.02171
W4A21-BT2	W4A21	BT2	2.182	0.002523	0.3335	0.7655	0.002523	0.02523	0.02523	0.0495	6943	0.03756	0.04139	0.6954	11.73	0.02625	0.01856	339	4.817	0.06971	0.008667
W4A21-BT3	W4A21	BT3	0.5208	0.002552	0.06028	0.3046	0.002552	0.02552	0.02552	0.01668	5702	0.02552	0.02745	0.6869	9.766	0.006467	0.01845	325.1	2.573	0.1167	0.005772
W4A21-BT4	W4A21	BT4	3.109	0.002557	0.1148	0.6757	0.002557	0.02557	0.02557	0.03744	5557	0.03226	0.03872	1.198	18.27	0.02189	0.01976	304.2	4.628	0.1074	0.0152
W4A21-BT5	W4A21	BT5	2.932	0.002553	0.096	0.3008	0.002553	0.02553	0.02553	0.02228	5935	0.02553	0.0365	1.224	17.38	0.01801	0.01766	342.1	3.228	0.1199	0.00984
W4A21-BT6	W4A21	BT6	1.9	0.01032	0.1031	0.3999	0.002571	0.1344	0.02571	0.08061	5672	0.02571	0.05772	1.012	13.13	0.01654	0.01286	329	5.612	0.1334	0.02285
W4A21-BT9	W4A21	BT9	1.971	0.002562	0.269	0.4234	0.002562	0.02562	0.02562	0.04492	6087	0.02562	0.06305	0.6115	11.43	0.02414	0.01655	319.7	4.371	0.1355	0.01053
W4A21-Comp1	W4A21	Comp1	4.005	0.002629	0.06109	0.4801	0.002629	0.02629	0.02629	0.06075	6018	0.02629	0.05114	0.8008	12.34	0.01089	0.02279	335.3	4.697	0.0732	0.01401
W4A21-Comp2	W4A21	Comp2	21.28	0.002559	0.1106	0.6305	0.002559	0.02559	0.02559	0.05009	7076	0.03993	0.0886	0.7026	26.32	0.04987	0.04452	334.7	6.901	0.09811	0.01677
W4A21-Comp3	W4A21	Comp3	16.82	0.002549	0.1983	0.7856	0.002549	0.02549	0.02549	0.05122	7109	0.04117	0.06238	0.7048	22.6	0.03589	0.03952	335	5.163	0.07619	0.01083
W4A31-BT1	W4A31	BT1	4.372	0.002518	1.06	0.7571	0.002518	0.02518	0.02518	0.06927	4533	0.03496	0.05361	0.8152	19.42	0.03902	0.01522	301.5	5.701	0.06147	0.01226
W4A31-BT10	W4A31	BT10	2.089	0.002661	0.7831	0.5405	0.002661	0.02661	0.02661	0.05015	6091	0.03381	0.1298	0.7955	15.26	0.03269	0.01087	323.1	5.104	0.08136	0.01734
W4A31-BT2	W4A31	BT2	1.175	0.002545	0.9873	0.9029	0.002545	0.02545	0.02545	0.05564	7482	0.02545	0.05721	0.7979	10.7	0.02134	0.01689	351.7	5.107	0.06899	0.01336
W4A31-BT3	W4A31	BT3	34.4	0.02069	1.315	0.944	0.005137	0.02595	0.02595	0.1516	7483	0.09921	0.1411	0.8428	71.88	0.1239	0.06373	341.3	7.209	0.06383	0.02599
W4A31-BT6	W4A31	BT6	2.623	0.006586	0.7267	0.8418	0.00255	0.07727	0.0255	0.1403	6403	0.0255	0.06066	0.6546	11.13	0.01808	0.01568	329.2	5.306	0.0594	0.01429
W4A31-BT7	W4A31	BT7	2.236	0.00252	1.341	0.6927	0.00252	0.0252	0.0252	0.1058	6852	0.03315	0.06929	0.6241	11.71	0.02741	0.01176	334.1	5.566	0.06029	0.01073
W4A31-BT8	W4A31	BT8	11.44	0.002556	0.7276	0.6996	0.002556	0.02556	0.02556	0.05378	5743	0.0719	0.08912	0.6358	19.7	0.02837	0.02884	336.4	4.07	0.05038	0.01077
W4A31-BT9	W4A31	BT9	1.523	0.007669	1.082	0.6766	0.002618	0.02618	0.02618	0.03211	5835	0.0338	0.05871	0.8025	10.8	0.01922	0.01387	340	3.652	0.06347	0.009468
W4A31-Comp1	W4A31	Comp1	12.99	0.004972	0.5598	0.7999	0.002756	0.02756	0.02756	0.1401	5766	0.04382	0.1281	0.7017	28	0.03804	0.02873	330	5.977	0.06267	0.02339

Table E-5.4 Whole Fish Trace Metal Concentrations

Sample ID	Site ID	Fish ID	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Tungsten	Uranium	Vanadium	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
S3A3-BT10	S3A3	BT10	0.02685	3375	13.44	0.4084	0.01426	944.5	9.587	0.002685	0.02049	0.01553	0.07524	0.002685	0.02685	25.27
S3A3-BT12	S3A3	BT12	0.03762	3344	14.67	0.3767	0.01577	928.2	14.66	0.002556	0.03084	0.01587	0.1135	0.002556	0.02556	24.55
S3A3-BT23	S3A3	BT23	0.0344	3397	12.14	0.3739	0.01046	936.8	13.92	0.00256	0.02264	0.006257	0.06322	0.00256	0.0256	22.43
S3A3-BT4	S3A3	BT4	0.02518	3449	14.36	0.4198	0.01225	1045	15.13	0.002518	0.03008	0.01527	0.1292	0.002518	0.02518	23.99
S3A3-BT5	S3A3	BT5	0.05025	3279	11.64	0.3871	0.01162	1055	17.47	0.002537	0.01671	0.0357	0.09861	0.002537	0.04339	25.5
S3A3-BT8	S3A3	BT8	0.03446	3117	13.31	0.4122	0.01585	1186	14.42	0.002554	0.02335	0.02713	0.2142	0.002554	0.03446	22.97
S3A3-BT9	S3A3	BT9	0.3566	3282	15.79	0.4282	0.01048	870.1	9.237	0.002565	0.06076	0.04073	0.5089	0.01796	0.4345	25.9
S3A3-Comp1	S3A3	Comp1	0.03401	3385	13.23	0.3994	0.00715	966	11.98	0.002551	0.02324	0.009033	0.0688	0.002551	0.02551	26.54
S3A3-Comp2	S3A3	Comp2	0.05657	3327	13.26	0.4368	0.01159	977.3	13.02	0.002557	0.02868	0.2964	0.1798	0.004928	0.09304	26.21
W4A17-BT1	W4A17	BT1	0.0472	3407	13.58	0.2491	0.01247	917.1	7.751	0.002515	0.01042	0.01239	0.007774	0.00947	0.05399	25.2
W4A17-BT12	W4A17	BT12	0.04268	3386	14.45	0.2353	0.01897	996	11.88	0.002545	0.01248	0.04164	0.005034	0.01346	0.07332	27.36
W4A17-BT13	W4A17	BT13	0.04706	3609	9.62	0.3329	0.007264	1013	16.46	0.002559	0.01123	0.01562	0.004046	0.00801	0.04046	26.39
W4A17-BT2	W4A17	BT2	0.02607	3321	13.42	0.2503	0.0137	996.8	10.35	0.002607	0.01021	0.01201	0.005319	0.007851	0.02607	26.1
W4A17-BT20	W4A17	BT20	0.03357	3580	13.94	0.2118	0.005582	907.6	9.364	0.002553	0.01093	0.004322	0.002553	0.005931	0.02553	19.52
W4A17-BT23	W4A17	BT23	0.06405	3550	15.37	0.2029	0.008432	942.1	12.23	0.00261	0.01251	0.006044	0.003875	0.01616	0.08213	22.58
W4A17-BT24	W4A17	BT24	0.02639	3729	16.59	0.2117	0.005772	913.8	9.624	0.002639	0.007788	0.004427	0.003304	0.004369	0.02639	23.14
W4A17-BT6	W4A17	BT6	0.02546	3449	15.3	0.2261	0.00685	1043	12.79	0.002546	0.009346	0.01326	0.005669	0.006036	0.05302	22.59
W4A17-BT9	W4A17	BT9	0.03865	3362	11.81	0.2187	0.006146	958.1	11.67	0.002564	0.01894	0.01049	0.01257	0.0191	0.04694	25.26
W4A17-Comp1	W4A17	Comp1	0.0503	3600	12.05	0.2357	0.007884	978	10.23	0.002522	0.01086	0.005605	0.003873	0.01082	0.03873	25.44
W4A21-BT1	W4A21	BT1	0.07717	3356	10.33	0.5247	0.008932	912.7	10.04	0.002516	0.02968	0.01305	0.02195	0.01664	0.06135	26.44
W4A21-BT2	W4A21	BT2	0.02523	3587	9.568	0.3757	0.006382	806.9	12.22	0.002523	0.009993	0.00795	0.002523	0.003404	0.02523	25.55
W4A21-BT3	W4A21	BT3	0.02552	3578	14.07	0.2181	0.01424	909.6	10.44	0.002552	0.008564	0.004836	0.002552	0.002552	0.02552	18.96
W4A21-BT4	W4A21	BT4	0.02557	3529	10.58	0.3	0.01664	912	10.37	0.002557	0.008019	0.002557	0.002557	0.004662	0.02557	23.76
W4A21-BT5	W4A21	BT5	0.02553	3633	13.84	0.2842	0.02077	919.6	9.33	0.002553	0.008416	0.002553	0.003771	0.004467	0.02553	23.7
W4A21-BT6	W4A21	BT6	0.02571	3605	11.35	0.284	0.02308	1017	10.54	0.002571	0.01344	0.008421	0.003953	0.002571	0.02571	32.46
W4A21-BT9	W4A21	BT9	0.02562	3570	13.05	0.3925	0.01236	1029	9.932	0.002562	0.009683	0.006766	0.002562	0.004114	0.02562	25.89
W4A21-Comp1	W4A21	Comp1	0.02629	3570	14.77	0.2819	0.009385	915.6	11.5	0.002629	0.0104	0.002629	0.002629	0.002629	0.02629	28.49
W4A21-Comp2	W4A21	Comp2	0.04402	3537	13.55	0.2773	0.00983	1048	13.02	0.002559	0.009136	0.004891	0.003583	0.01137	0.04402	28.96
W4A21-Comp3	W4A21	Comp3	0.04117	3527	11.73	0.3738	0.007905	1049	12	0.002549	0.01342	0.005133	0.006208	0.006905	0.04117	27.98
W4A31-BT1	W4A31	BT1	0.03217	3713	14	1.052	0.01228	871.4	8.871	0.002518	0.01975	0.009684	0.005732	0.003776	0.04055	22.38
W4A31-BT10	W4A31	BT10	0.03957	3780	13.09	0.6749	0.009764	876.4	9.928	0.002661	0.0207	0.005397	0.007989	0.005397	0.03957	20.77
W4A31-BT2	W4A31	BT2	0.07806	3688	14.22	0.5972	0.02496	1009	12.6	0.002545	0.01986	0.007081	0.006355	0.003815	0.02545	27.7
W4A31-BT3	W4A31	BT3	0.09323	3600	13.83	0.9014	0.01796	939.3	13.5	0.002595	0.02191	0.005754	0.01523	0.0156	0.1082	24.77
W4A31-BT6	W4A31	BT6	0.03778	3555	11.89	0.6471	0.0183	1000	12.55	0.00255	0.01725	0.007487	0.005358	0.003164	0.0255	21.9
W4A31-BT7	W4A31	BT7	0.03634	3733	11.71	1.114	0.03081	939.7	11.97	0.00252	0.02595	0.00427	0.005862	0.00252	0.0252	20.68
W4A31-BT8	W4A31	BT8	0.04319	3666	13.17	0.6933	0.008551	876.7	10.31	0.002556	0.01823	0.00464	0.007205	0.004319	0.04319	22.16
W4A31-BT9	W4A31	BT9	0.0338	3853	14.02	0.7025	0.01109	832.2	9.729	0.002618	0.0192	0.002618	0.004904	0.00338	0.02618	22.3
W4A31-Comp1	W4A31	Comp1	0.04743	3639	13.65	0.5921	0.0124	974.8	10.69	0.002756	0.02874	0.006872	0.007272	0.008356	0.06188	30.14

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
845 Prospect Street
Fredericton, NB E3B 2T7

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-083	127275-084	127275-085
Client Sample ID:			B2A2-BT1 Carcass	B2A2-BT3 Carcass	B2A2-BT4 Carcass
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.39	1.03	7.82
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.06	< 0.05	0.19
Barium	mg/kg	0.05	0.25	0.29	0.70
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0114	0.0020	0.0102
Calcium	mg/kg	2	4140	3070	7230
Chromium	mg/kg	0.05	0.10	0.15	< 0.05
Cobalt	mg/kg	0.005	0.022	0.026	0.056
Copper	mg/kg	0.05	0.38	0.43	0.39
Iron	mg/kg	1	6	8	10
Lead	mg/kg	0.005	0.023	0.018	0.035
Lithium	mg/kg	0.005	0.011	0.006	0.020
Magnesium	mg/kg	0.5	310.	295.	356.
Manganese	mg/kg	0.05	3.31	1.32	9.81
Mercury	mg/kg	0.01	0.15	0.15	0.13
Molybdenum	mg/kg	0.005	0.008	0.006	0.007
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4210	4080	4010
Rubidium	mg/kg	0.005	10.6	6.89	11.4
Selenium	mg/kg	0.05	0.28	0.21	0.38
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	609	661	746
Strontium	mg/kg	0.05	7.30	5.17	14.0
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.008	< 0.005	0.010
Tin	mg/kg	0.005	0.019	0.016	0.007
Tungsten	mg/kg	0.005	< 0.005	< 0.005	0.010
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	11.6	14.8	13.2

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
845 Prospect Street
Fredericton, NB E3B 2T7

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-086	127275-087	127275-088
Client Sample ID:			B2A2-BT5 Carcass	BEA2-BT6 Carcass	B2A2-BT8 Carcass
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.13	2.40	1.39
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.007
Arsenic	mg/kg	0.05	0.30	0.20	0.13
Barium	mg/kg	0.05	0.52	0.54	0.48
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0047	0.0067	0.0065
Calcium	mg/kg	2	4840	5450	3380
Chromium	mg/kg	0.05	< 0.05	0.10	< 0.05
Cobalt	mg/kg	0.005	0.061	0.074	0.040
Copper	mg/kg	0.05	0.36	0.46	0.35
Iron	mg/kg	1	5	7	5
Lead	mg/kg	0.005	0.028	0.028	0.014
Lithium	mg/kg	0.005	0.008	0.009	0.008
Magnesium	mg/kg	0.5	337.	360.	313.
Manganese	mg/kg	0.05	5.55	8.34	3.54
Mercury	mg/kg	0.01	0.16	0.12	0.27
Molybdenum	mg/kg	0.005	0.007	0.008	0.007
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4240	3900	3890
Rubidium	mg/kg	0.005	11.2	8.87	7.37
Selenium	mg/kg	0.05	0.42	0.38	0.26
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	730	727	673
Strontium	mg/kg	0.05	9.68	10.1	9.10
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.010	0.011
Tin	mg/kg	0.005	0.007	0.007	0.017
Tungsten	mg/kg	0.005	0.012	0.007	0.006
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.1	22.0	14.3

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
845 Prospect Street
Fredericton, NB E3B 2T7

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-089	127275-090	127275-091
Client Sample ID:			B2A2-BT16 Carcass	B2A2-BT18 Carcass	B2A2-Comp.1 Carcass
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.39	0.56	0.76
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	0.20	0.20
Barium	mg/kg	0.05	0.41	0.33	0.47
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0026	0.0076	0.0075
Calcium	mg/kg	2	5120	2950	4400
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.017	0.040	0.035
Copper	mg/kg	0.05	0.39	0.37	0.39
Iron	mg/kg	1	5	4	5
Lead	mg/kg	0.005	0.012	0.020	0.019
Lithium	mg/kg	0.005	0.006	< 0.005	0.007
Magnesium	mg/kg	0.5	349.	313.	352.
Manganese	mg/kg	0.05	1.39	2.22	3.52
Mercury	mg/kg	0.01	0.21	0.15	0.13
Molybdenum	mg/kg	0.005	0.008	0.005	0.006
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4210	4060	3910
Rubidium	mg/kg	0.005	5.50	8.31	7.50
Selenium	mg/kg	0.05	0.15	0.39	0.46
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	606	565	681
Strontium	mg/kg	0.05	9.93	6.66	9.78
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.006	0.008	0.010
Tin	mg/kg	0.005	0.007	0.010	0.013
Tungsten	mg/kg	0.005	< 0.005	0.012	0.008
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	18.1	13.5	17.4

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
845 Prospect Street
Fredericton, NB E3B 2T7

rpc
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-091 Dup	127275-092	127275-093
Client Sample ID:			Lab Duplicate	B2A2-Comp.2 Carcass	B3A9-BT1 Carcass
Date Sampled:			8-Sep-11	8-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.80	0.91	0.88
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.20	0.24	0.08
Barium	mg/kg	0.05	0.35	0.46	0.26
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0078	0.0067	0.0194
Calcium	mg/kg	2	3130	3870	4680
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.037	0.052	0.032
Copper	mg/kg	0.05	0.41	0.42	0.40
Iron	mg/kg	1	5	5	6
Lead	mg/kg	0.005	0.014	0.019	0.026
Lithium	mg/kg	0.005	0.006	0.007	0.008
Magnesium	mg/kg	0.5	319.	338.	318.
Manganese	mg/kg	0.05	2.25	3.31	2.87
Mercury	mg/kg	0.01	0.13	0.12	0.22
Molybdenum	mg/kg	0.005	0.006	0.006	0.007
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4020	4050	4020
Rubidium	mg/kg	0.005	7.64	9.48	13.6
Selenium	mg/kg	0.05	0.43	0.38	0.33
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	671	687	734
Strontium	mg/kg	0.05	6.89	8.85	7.87
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.009	0.006
Tin	mg/kg	0.005	0.008	0.017	0.008
Tungsten	mg/kg	0.005	0.007	0.008	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	15.7	15.9	15.1

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-094	127275-095	127275-096
Client Sample ID:			B3A9-BT2 Carcass	B3A9-BT4 Carcass	B3A9-BT5 Carcass
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.56	0.65	0.61
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.11	0.10	0.09
Barium	mg/kg	0.05	0.25	0.29	0.21
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0124	0.0129	0.0114
Calcium	mg/kg	2	3500	4590	3290
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.035	0.027	0.018
Copper	mg/kg	0.05	0.32	0.31	0.30
Iron	mg/kg	1	5	5	6
Lead	mg/kg	0.005	0.015	0.014	0.006
Lithium	mg/kg	0.005	0.006	0.007	0.005
Magnesium	mg/kg	0.5	329.	323.	332.
Manganese	mg/kg	0.05	2.42	2.31	1.37
Mercury	mg/kg	0.01	0.13	0.16	0.12
Molybdenum	mg/kg	0.005	0.005	0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4100	4090	4090
Rubidium	mg/kg	0.005	13.0	12.0	11.8
Selenium	mg/kg	0.05	0.31	0.32	0.26
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	635	657	636
Strontium	mg/kg	0.05	6.19	8.14	5.92
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.010	0.008
Tin	mg/kg	0.005	< 0.005	0.006	0.006
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	14.1	18.1	17.1

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-097	127275-098	127275-099
Client Sample ID:			B3A9-BT7 Carcass	B3A9-BT9 Carcass	B3A9-BT13 Carcass
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.46	0.43	0.41
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.017
Arsenic	mg/kg	0.05	0.40	0.10	0.11
Barium	mg/kg	0.05	0.41	0.13	0.32
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.28
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0085	0.0150	0.0161
Calcium	mg/kg	2	4540	1810	4740
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.046	0.049	0.028
Copper	mg/kg	0.05	0.39	0.38	0.32
Iron	mg/kg	1	6	4	4
Lead	mg/kg	0.005	0.006	0.021	0.017
Lithium	mg/kg	0.005	0.007	< 0.005	0.007
Magnesium	mg/kg	0.5	347.	284.	360.
Manganese	mg/kg	0.05	4.92	1.44	2.62
Mercury	mg/kg	0.01	0.09	0.15	0.15
Molybdenum	mg/kg	0.005	0.005	< 0.005	0.013
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4080	4070	4160
Rubidium	mg/kg	0.005	12.2	12.5	12.1
Selenium	mg/kg	0.05	0.55	0.29	0.30
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	645	583	623
Strontium	mg/kg	0.05	6.24	3.13	9.17
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.010	0.010
Tin	mg/kg	0.005	0.007	0.008	0.012
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.7	11.3	14.3

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-100	127275-101	127275-101 Dup
Client Sample ID:			B3A9-BT14 Carcass	B3A9-Comp1 Carcass	Lab Duplicate
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.52	0.68	0.81
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.11	0.12	0.12
Barium	mg/kg	0.05	0.28	0.27	0.24
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0132	0.0199	0.0210
Calcium	mg/kg	2	5580	4260	3950
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.038	0.018	0.020
Copper	mg/kg	0.05	0.30	0.30	0.33
Iron	mg/kg	1	3	4	4
Lead	mg/kg	0.005	0.030	0.015	0.011
Lithium	mg/kg	0.005	0.006	0.005	0.005
Magnesium	mg/kg	0.5	348.	337.	341.
Manganese	mg/kg	0.05	2.55	1.90	1.80
Mercury	mg/kg	0.01	0.20	0.15	0.13
Molybdenum	mg/kg	0.005	0.007	0.006	0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4060	3840	3890
Rubidium	mg/kg	0.005	12.5	9.54	9.69
Selenium	mg/kg	0.05	0.30	0.30	0.32
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	627	641	651
Strontium	mg/kg	0.05	9.15	7.79	7.28
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.009	0.009
Tin	mg/kg	0.005	0.005	0.006	0.011
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	14.6	18.8	19.4

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-102	127275-103	127275-104
Client Sample ID:			B3A9-Comp2 Carcass	EBNB1-BT1 Carcass	EBNB1-BT2 Carcass
Date Sampled:			14-Sep-11	19-Sep-11	19-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.57	0.76	1.09
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.09	0.51	0.41
Barium	mg/kg	0.05	0.43	0.51	0.31
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0139	0.0085	0.0071
Calcium	mg/kg	2	4410	4070	2890
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.027	0.044	0.043
Copper	mg/kg	0.05	0.29	0.29	0.32
Iron	mg/kg	1	4	5	5
Lead	mg/kg	0.005	0.011	0.008	< 0.005
Lithium	mg/kg	0.005	0.007	< 0.005	< 0.005
Magnesium	mg/kg	0.5	318.	345.	308.
Manganese	mg/kg	0.05	1.51	6.11	4.59
Mercury	mg/kg	0.01	0.15	0.05	0.05
Molybdenum	mg/kg	0.005	0.006	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3810	4130	4100
Rubidium	mg/kg	0.005	11.1	10.5	10.8
Selenium	mg/kg	0.05	0.28	0.99	0.84
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	638	551	573
Strontium	mg/kg	0.05	8.03	5.63	3.72
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.031	0.026
Tin	mg/kg	0.005	0.010	0.009	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	19.7	11.6	14.0

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-105	127275-106	127275-107
Client Sample ID:			EBNB1-BT3 Carcass	M3C3-BT1 Carcass	M3C3-BT2 Carcass
Date Sampled:			19-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.25	0.54	0.69
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.24	0.09	0.07
Barium	mg/kg	0.05	0.29	0.30	0.21
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0054	0.0034	0.0188
Calcium	mg/kg	2	2900	4370	3300
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.038	0.028	0.040
Copper	mg/kg	0.05	0.30	0.33	0.27
Iron	mg/kg	1	4	5	5
Lead	mg/kg	0.005	< 0.005	0.018	0.012
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	318.	345.	290.
Manganese	mg/kg	0.05	4.31	4.22	1.83
Mercury	mg/kg	0.01	0.04	0.13	0.12
Molybdenum	mg/kg	0.005	< 0.005	0.020	0.007
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4200	4200	3870
Rubidium	mg/kg	0.005	9.35	13.1	10.8
Selenium	mg/kg	0.05	0.55	0.29	0.22
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	529	562	650
Strontium	mg/kg	0.05	3.97	10.5	5.37
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.021	0.008	0.011
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	0.033	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	16.5	13.6	14.4

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-108	127275-109	127275-110
Client Sample ID:			M3C3-BT3 Carcass	M3C3-BT4 Carcass	M3C3-BT5 Carcass
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.79	0.65	0.48
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.09	0.06	< 0.05
Barium	mg/kg	0.05	0.32	0.41	0.16
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0214	0.0135	0.0085
Calcium	mg/kg	2	3910	5480	2800
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.041	0.041	0.024
Copper	mg/kg	0.05	0.29	0.29	0.46
Iron	mg/kg	1	4	4	3
Lead	mg/kg	0.005	0.011	0.022	0.046
Lithium	mg/kg	0.005	0.006	0.007	< 0.005
Magnesium	mg/kg	0.5	331.	354.	296.
Manganese	mg/kg	0.05	1.89	2.70	4.74
Mercury	mg/kg	0.01	0.07	0.06	0.10
Molybdenum	mg/kg	0.005	0.006	0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3970	3930	4070
Rubidium	mg/kg	0.005	9.04	10.3	7.14
Selenium	mg/kg	0.05	0.23	0.21	0.31
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	541	655	590
Strontium	mg/kg	0.05	6.72	10.4	3.55
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.013	0.005
Tin	mg/kg	0.005	< 0.005	0.007	0.018
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	18.1	17.9	11.9

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-111	127275-111 Dup	127275-112
Client Sample ID:			M3C3-BT6 Carcass	Lab Duplicate	M3C3-BT7 Carcass
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.50	0.53	0.29
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.017
Arsenic	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Barium	mg/kg	0.05	0.23	0.19	0.32
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.20
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0062	0.0067	0.0053
Calcium	mg/kg	2	4520	3010	5980
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.014	0.014	0.022
Copper	mg/kg	0.05	0.34	0.32	0.37
Iron	mg/kg	1	5	4	5
Lead	mg/kg	0.005	0.036	0.021	0.026
Lithium	mg/kg	0.005	0.007	0.005	0.006
Magnesium	mg/kg	0.5	315.	294.	355.
Manganese	mg/kg	0.05	2.25	1.61	4.39
Mercury	mg/kg	0.01	0.08	0.08	0.16
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	0.020
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4030	3880	3800
Rubidium	mg/kg	0.005	8.83	8.70	9.67
Selenium	mg/kg	0.05	0.17	0.18	0.18
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	717	671	614
Strontium	mg/kg	0.05	6.17	4.17	14.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.007	0.006	0.008
Tin	mg/kg	0.005	< 0.005	0.005	0.019
Tungsten	mg/kg	0.005	< 0.005	< 0.005	0.052
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	12.8	12.3	15.6

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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rpc
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-113	127275-114	127275-115
Client Sample ID:			M3C3-BT8 Carcass	M3C3-BT9 Carcass	M3C3-BT10 Carcass
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.37	0.21	0.51
Antimony	mg/kg	0.005	0.006	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.05	0.05	0.07
Barium	mg/kg	0.05	0.19	0.12	0.24
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0135	0.0126	0.0150
Calcium	mg/kg	2	3860	1920	2500
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.018	0.033	0.050
Copper	mg/kg	0.05	0.38	0.35	0.33
Iron	mg/kg	1	3	4	4
Lead	mg/kg	0.005	0.013	0.010	0.027
Lithium	mg/kg	0.005	0.006	< 0.005	0.006
Magnesium	mg/kg	0.5	332.	284.	268.
Manganese	mg/kg	0.05	5.07	2.44	2.22
Mercury	mg/kg	0.01	0.11	0.13	0.09
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4000	3970	3930
Rubidium	mg/kg	0.005	9.72	9.33	8.79
Selenium	mg/kg	0.05	0.28	0.26	0.26
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	535	554	728
Strontium	mg/kg	0.05	5.70	3.14	4.32
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.007	0.008	0.012
Tin	mg/kg	0.005	0.009	< 0.005	0.006
Tungsten	mg/kg	0.005	0.006	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	14.6	10.1	12.0

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
Fax: 506.452.0594
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-116	127275-117	127275-118
Client Sample ID:			S2A2-BT3 Carcass	S2A2-BT4 Carcass	S2A2-BT11 Carcass
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.47	0.39	0.48
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	0.06	0.06
Barium	mg/kg	0.05	0.43	0.31	0.28
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0077	0.0095	0.0075
Calcium	mg/kg	2	4930	4540	4290
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.007	0.015	0.015
Copper	mg/kg	0.05	0.45	0.34	0.48
Iron	mg/kg	1	6	5	5
Lead	mg/kg	0.005	0.010	0.010	0.019
Lithium	mg/kg	0.005	0.006	0.006	< 0.005
Magnesium	mg/kg	0.5	347.	312.	316.
Manganese	mg/kg	0.05	2.12	2.64	2.60
Mercury	mg/kg	0.01	0.09	0.17	0.16
Molybdenum	mg/kg	0.005	0.007	0.013	0.006
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4030	4030	3930
Rubidium	mg/kg	0.005	14.7	11.2	12.9
Selenium	mg/kg	0.05	0.22	0.25	0.29
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	678	677	675
Strontium	mg/kg	0.05	15.5	11.7	9.82
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.008	0.013	0.009
Tin	mg/kg	0.005	< 0.005	0.005	< 0.005
Tungsten	mg/kg	0.005	0.024	0.048	0.033
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	14.2	12.2	10.4

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-119	127275-120	127275-121
Client Sample ID:			S2A2-BT13 Carcass	S2A2-BT15 Carcass	S2A2-BT22 Carcass
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.33	0.42	0.24
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.06	0.05	0.08
Barium	mg/kg	0.05	0.55	0.33	0.19
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0045	0.0080	0.0052
Calcium	mg/kg	2	3940	5040	2910
Chromium	mg/kg	0.05	< 0.05	0.05	< 0.05
Cobalt	mg/kg	0.005	0.009	0.024	0.013
Copper	mg/kg	0.05	0.31	0.48	0.32
Iron	mg/kg	1	3	6	3
Lead	mg/kg	0.005	0.006	0.009	< 0.005
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	340.	341.	349.
Manganese	mg/kg	0.05	1.81	3.76	1.93
Mercury	mg/kg	0.01	0.10	0.19	0.12
Molybdenum	mg/kg	0.005	0.007	0.012	0.008
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3880	4050	4000
Rubidium	mg/kg	0.005	11.2	12.0	13.4
Selenium	mg/kg	0.05	0.24	0.20	0.30
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	550	644	573
Strontium	mg/kg	0.05	12.2	12.3	7.62
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.009	0.009
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	0.035	0.066	0.031
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.0	11.6	13.1

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-121 Dup	127275-122	127275-123
Client Sample ID:			Lab Duplicate	S2A2-BT23 Carcass	S2A2-BT24 Carcass
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.25	0.24	0.30
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.006
Arsenic	mg/kg	0.05	0.09	< 0.05	0.11
Barium	mg/kg	0.05	0.29	0.25	0.30
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0053	0.0072	0.0094
Calcium	mg/kg	2	5170	3050	4080
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.012	0.014	0.025
Copper	mg/kg	0.05	0.32	0.51	0.31
Iron	mg/kg	1	3	5	4
Lead	mg/kg	0.005	0.007	0.009	0.009
Lithium	mg/kg	0.005	< 0.005	< 0.005	0.005
Magnesium	mg/kg	0.5	358.	290.	299.
Manganese	mg/kg	0.05	3.06	1.99	3.81
Mercury	mg/kg	0.01	0.13	0.14	0.09
Molybdenum	mg/kg	0.005	0.011	0.007	0.020
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3990	4000	3740
Rubidium	mg/kg	0.005	13.3	9.77	12.2
Selenium	mg/kg	0.05	0.32	0.17	0.31
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	611	665	602
Strontium	mg/kg	0.05	13.3	6.83	10.4
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.008	0.013
Tin	mg/kg	0.005	0.007	< 0.005	0.008
Tungsten	mg/kg	0.005	0.061	0.029	0.066
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.5	10.9	12.8

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-124	127275-125	127275-126
Client Sample ID:			S2A2-Comp1 Carcass	S2A2-Comp2 Carcass	S3A3-BT1 Carcass
Date Sampled:			12-Sep-11	12-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.76	0.40	0.84
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.08	0.12	0.11
Barium	mg/kg	0.05	0.29	0.34	0.29
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0114	0.0101	0.0224
Calcium	mg/kg	2	5160	5040	3440
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.025	0.022	0.063
Copper	mg/kg	0.05	0.40	0.35	0.52
Iron	mg/kg	1	5	4	5
Lead	mg/kg	0.005	0.008	0.032	0.014
Lithium	mg/kg	0.005	0.006	0.006	< 0.005
Magnesium	mg/kg	0.5	347.	338.	280.
Manganese	mg/kg	0.05	2.52	2.97	4.03
Mercury	mg/kg	0.01	0.11	0.10	0.13
Molybdenum	mg/kg	0.005	0.026	0.010	0.006
Nickel	mg/kg	0.05	< 0.05	< 0.05	0.06
Potassium	mg/kg	1	3900	3850	4000
Rubidium	mg/kg	0.005	9.13	11.9	16.2
Selenium	mg/kg	0.05	0.34	0.35	0.34
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	634	606	665
Strontium	mg/kg	0.05	11.0	11.9	7.77
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.012	0.011	0.022
Tin	mg/kg	0.005	0.009	0.005	0.006
Tungsten	mg/kg	0.005	0.071	0.056	0.048
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	14.9	14.7	10.3

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-127	127275-128	127275-129
Client Sample ID:			S3A3-BT4 Carcass	S3A3-BT5 Carcass	S3A3-BT8 Carcass
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.04	1.38	0.74
Antimony	mg/kg	0.005	0.007	0.006	< 0.005
Arsenic	mg/kg	0.05	0.16	0.13	0.20
Barium	mg/kg	0.05	0.28	0.50	0.29
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0291	0.0238	0.0248
Calcium	mg/kg	2	5100	5390	5190
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.080	0.043	0.040
Copper	mg/kg	0.05	0.46	0.55	0.46
Iron	mg/kg	1	6	7	6
Lead	mg/kg	0.005	0.011	0.016	0.019
Lithium	mg/kg	0.005	0.005	0.005	0.007
Magnesium	mg/kg	0.5	340.	348.	306.
Manganese	mg/kg	0.05	3.10	5.18	4.10
Mercury	mg/kg	0.01	0.17	0.11	0.19
Molybdenum	mg/kg	0.005	0.010	0.007	0.010
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4030	3780	3710
Rubidium	mg/kg	0.005	16.3	13.0	15.4
Selenium	mg/kg	0.05	0.38	0.36	0.40
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	659	689	846
Strontium	mg/kg	0.05	10.2	12.6	9.49
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.025	0.015	0.022
Tin	mg/kg	0.005	< 0.005	0.031	0.010
Tungsten	mg/kg	0.005	0.079	0.061	0.124
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	12.3	13.6	10.9

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-130	127275-131	127275-131 Dup
Client Sample ID:			S3A3-BT9 Carcass	S3A3-BT10 Carcass	Lab Duplicate
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.35	0.82	0.96
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.22	0.24	0.23
Barium	mg/kg	0.05	0.20	0.17	0.21
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0244	0.0134	0.0156
Calcium	mg/kg	2	3540	2950	4150
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.157	0.057	0.062
Copper	mg/kg	0.05	0.35	0.36	0.41
Iron	mg/kg	1	5	4	5
Lead	mg/kg	0.005	0.024	0.014	0.011
Lithium	mg/kg	0.005	0.007	< 0.005	< 0.005
Magnesium	mg/kg	0.5	328.	306.	309.
Manganese	mg/kg	0.05	2.97	1.90	2.64
Mercury	mg/kg	0.01	0.12	0.15	0.14
Molybdenum	mg/kg	0.005	0.020	0.010	0.013
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3810	4020	3880
Rubidium	mg/kg	0.005	17.3	15.1	14.6
Selenium	mg/kg	0.05	0.35	0.37	0.35
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	600	628	641
Strontium	mg/kg	0.05	6.66	5.46	7.58
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.048	0.015	0.016
Tin	mg/kg	0.005	0.016	0.014	0.017
Tungsten	mg/kg	0.005	0.064	0.031	0.042
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	12.3	13.4	13.0

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-132	127275-133	127275-134
Client Sample ID:			S3A3-BT12 Carcass	S3A3-BT23 Carcass	S3A3-Comp1 Carcass
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.97	0.38	0.77
Antimony	mg/kg	0.005	0.019	0.005	< 0.005
Arsenic	mg/kg	0.05	0.22	0.16	0.19
Barium	mg/kg	0.05	0.22	0.20	0.20
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	0.20	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0188	0.0247	0.0233
Calcium	mg/kg	2	3400	3700	2880
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.085	0.060	0.068
Copper	mg/kg	0.05	0.35	0.39	0.36
Iron	mg/kg	1	4	5	5
Lead	mg/kg	0.005	0.011	0.013	0.012
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	305.	320.	312.
Manganese	mg/kg	0.05	4.02	2.75	1.74
Mercury	mg/kg	0.01	0.13	0.11	0.12
Molybdenum	mg/kg	0.005	0.018	0.009	0.009
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3870	3900	3820
Rubidium	mg/kg	0.005	16.3	13.5	14.3
Selenium	mg/kg	0.05	0.32	0.32	0.32
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	560	604	644
Strontium	mg/kg	0.05	6.99	7.56	5.65
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.027	0.019	0.019
Tin	mg/kg	0.005	0.018	< 0.005	0.008
Tungsten	mg/kg	0.005	0.045	0.031	0.028
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.0	12.6	14.5

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-135	127275-136	127275-137
Client Sample ID:			S3A3-Comp2 Carcass	W4A17-BT1 Carcass	W4A17-BT2 Carcass
Date Sampled:			26-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.35	0.39	0.70
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.23	< 0.05	< 0.05
Barium	mg/kg	0.05	0.29	0.21	0.26
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0193	0.0025	0.0026
Calcium	mg/kg	2	4500	3920	4780
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.054	0.016	0.033
Copper	mg/kg	0.05	0.32	0.31	0.32
Iron	mg/kg	1	5	4	4
Lead	mg/kg	0.005	0.020	0.021	0.049
Lithium	mg/kg	0.005	0.006	0.015	0.014
Magnesium	mg/kg	0.5	366.	332.	337.
Manganese	mg/kg	0.05	3.19	1.65	2.97
Mercury	mg/kg	0.01	0.10	0.15	0.22
Molybdenum	mg/kg	0.005	0.017	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3830	4040	3970
Rubidium	mg/kg	0.005	14.6	15.3	14.9
Selenium	mg/kg	0.05	0.37	0.21	0.21
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	665	597	634
Strontium	mg/kg	0.05	9.07	5.88	8.18
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.023	0.008	0.007
Tin	mg/kg	0.005	0.457	0.008	0.008
Tungsten	mg/kg	0.005	0.042	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.6	11.9	15.6

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-138	127275-139	127275-140
Client Sample ID:			W4A17-BT6 Carcass	W4A17-BT9 Carcass	W4A17-BT12 Carcass
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.33	0.45	4.17
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Barium	mg/kg	0.05	0.21	0.28	0.29
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0018	0.0026	0.0024
Calcium	mg/kg	2	3160	4290	3620
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.016	0.043	0.031
Copper	mg/kg	0.05	0.26	0.26	0.27
Iron	mg/kg	1	3	5	6
Lead	mg/kg	0.005	0.013	0.032	0.064
Lithium	mg/kg	0.005	0.012	0.013	0.021
Magnesium	mg/kg	0.5	317.	328.	338.
Manganese	mg/kg	0.05	1.82	3.16	4.58
Mercury	mg/kg	0.01	0.14	0.12	0.14
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4080	4000	4120
Rubidium	mg/kg	0.005	17.3	13.4	16.1
Selenium	mg/kg	0.05	0.18	0.16	0.21
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	552	573	588
Strontium	mg/kg	0.05	6.23	7.97	6.78
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.007	0.014	0.010
Tin	mg/kg	0.005	0.007	0.006	0.006
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	10.4	14.2	16.1

Report ID: 127275-IAS
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-141	127275-141 Dup	127275-142
Client Sample ID:			W4A17-BT13 Carcass	Lab Duplicate	W4A17-BT20 Carcass
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	5.19	0.71	0.43
Antimony	mg/kg	0.005	< 0.005	0.007	< 0.005
Arsenic	mg/kg	0.05	0.08	0.11	< 0.05
Barium	mg/kg	0.05	0.32	0.41	0.17
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0021	0.0022	0.0024
Calcium	mg/kg	2	3380	4340	3330
Chromium	mg/kg	0.05	0.08	0.05	< 0.05
Cobalt	mg/kg	0.005	0.032	0.032	0.029
Copper	mg/kg	0.05	0.35	0.29	0.28
Iron	mg/kg	1	8	5	4
Lead	mg/kg	0.005	0.096	0.083	< 0.005
Lithium	mg/kg	0.005	0.025	0.009	0.012
Magnesium	mg/kg	0.5	331.	350.	320.
Manganese	mg/kg	0.05	2.07	2.65	1.32
Mercury	mg/kg	0.01	0.10	0.10	0.18
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4150	4150	4110
Rubidium	mg/kg	0.005	10.6	10.8	15.7
Selenium	mg/kg	0.05	0.30	0.36	0.20
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	640	657	547
Strontium	mg/kg	0.05	8.49	11.0	5.37
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.010	0.010
Tin	mg/kg	0.005	0.011	0.014	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	17.9	19.1	14.5

Report ID: 127275-IAS
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-143	127275-144	127275-145
Client Sample ID:			W4A17-BT23 Carcass	W4A17-BT24 Carcass	W4A17-Comp1 Carcass
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.47	0.42	0.41
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	0.09	< 0.05
Barium	mg/kg	0.05	0.32	0.24	0.27
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0045	0.0023	0.0022
Calcium	mg/kg	2	5240	4960	4160
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.030	0.010	0.016
Copper	mg/kg	0.05	0.38	0.40	0.37
Iron	mg/kg	1	4	5	4
Lead	mg/kg	0.005	< 0.005	< 0.005	0.008
Lithium	mg/kg	0.005	0.015	0.011	0.017
Magnesium	mg/kg	0.5	357.	322.	334.
Manganese	mg/kg	0.05	2.14	1.69	1.97
Mercury	mg/kg	0.01	0.14	0.15	0.17
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4180	4110	4150
Rubidium	mg/kg	0.005	17.4	17.7	13.5
Selenium	mg/kg	0.05	0.17	0.20	0.21
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	589	616	627
Strontium	mg/kg	0.05	10.4	7.61	6.83
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.006	0.009
Tin	mg/kg	0.005	< 0.005	0.005	0.006
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	15.6	14.4	17.1

Report ID: 127275-IAS
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-146	127275-147	127275-148
Client Sample ID:			W4A21-BT1 Carcass	W4A21-BT2 Carcass	W4A21-BT3 Carcass
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	13.2	0.67	0.65
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.34	0.45	0.06
Barium	mg/kg	0.05	0.59	0.63	0.21
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0162	0.0071	0.0053
Calcium	mg/kg	2	5140	5500	3260
Chromium	mg/kg	0.05	0.08	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.076	0.026	0.017
Copper	mg/kg	0.05	0.51	0.44	0.39
Iron	mg/kg	1	63	6	4
Lead	mg/kg	0.005	0.040	0.016	< 0.005
Lithium	mg/kg	0.005	0.022	0.013	0.012
Magnesium	mg/kg	0.5	342.	356.	322.
Manganese	mg/kg	0.05	5.57	3.13	1.58
Mercury	mg/kg	0.01	0.11	0.08	0.13
Molybdenum	mg/kg	0.005	0.010	< 0.005	< 0.005
Nickel	mg/kg	0.05	0.06	< 0.05	< 0.05
Potassium	mg/kg	1	3770	4100	4040
Rubidium	mg/kg	0.005	11.1	10.7	15.8
Selenium	mg/kg	0.05	0.49	0.37	0.21
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	549	514	563
Strontium	mg/kg	0.05	7.40	9.92	6.29
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.025	0.009	0.008
Tin	mg/kg	0.005	0.013	0.011	0.006
Tungsten	mg/kg	0.005	0.012	< 0.005	< 0.005
Uranium	mg/kg	0.005	0.007	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	19.1	15.5	11.9

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-149	127275-150	127275-151
Client Sample ID:			W4A21-BT4 Carcass	W4A21-BT5 Carcass	W4A21-BT6 Carcass
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.28	0.62	0.67
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.024
Arsenic	mg/kg	0.05	0.14	0.11	0.13
Barium	mg/kg	0.05	0.36	0.19	0.40
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.39
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0040	0.0050	0.0133
Calcium	mg/kg	2	3160	3480	5600
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.017	0.020	0.035
Copper	mg/kg	0.05	0.43	0.44	0.36
Iron	mg/kg	1	4	8	5
Lead	mg/kg	0.005	< 0.005	0.010	0.005
Lithium	mg/kg	0.005	0.010	0.010	0.010
Magnesium	mg/kg	0.5	306.	338.	384.
Manganese	mg/kg	0.05	1.64	1.25	3.30
Mercury	mg/kg	0.01	0.13	0.13	0.16
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	0.020
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4200	4140	4320
Rubidium	mg/kg	0.005	11.9	15.4	13.5
Selenium	mg/kg	0.05	0.27	0.27	0.27
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	483	589	636
Strontium	mg/kg	0.05	6.12	5.56	10.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.005	0.007	0.013
Tin	mg/kg	0.005	< 0.005	< 0.005	0.015
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	12.0	16.6	23.5

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-151 Dup	127275-152	127275-153
Client Sample ID:			Lab Duplicate	W4A21-BT9 Carcass	W4A21-Comp1 Carcass
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.61	0.54	0.40
Antimony	mg/kg	0.005	0.007	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.12	0.34	0.06
Barium	mg/kg	0.05	0.29	0.28	0.34
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0113	0.0087	0.0064
Calcium	mg/kg	2	4390	3970	4450
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.031	0.031	0.032
Copper	mg/kg	0.05	0.42	0.37	0.41
Iron	mg/kg	1	5	4	5
Lead	mg/kg	0.005	< 0.005	0.010	< 0.005
Lithium	mg/kg	0.005	0.009	0.010	0.015
Magnesium	mg/kg	0.5	337.	332.	354.
Manganese	mg/kg	0.05	2.24	2.63	1.82
Mercury	mg/kg	0.01	0.15	0.16	0.08
Molybdenum	mg/kg	0.005	0.008	0.006	0.006
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4160	4180	4020
Rubidium	mg/kg	0.005	12.6	14.8	16.0
Selenium	mg/kg	0.05	0.27	0.35	0.23
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	594	601	637
Strontium	mg/kg	0.05	8.08	6.66	8.53
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.009	0.009
Tin	mg/kg	0.005	0.005	0.009	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	19.5	16.0	20.4

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
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rpc
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-154	127275-155	127275-156
Client Sample ID:			W4A21-Comp2 Carcass	W4A21-Comp3 Carcass	W4A31-BT1 Carcass
Date Sampled:			27-Sep-11	27-Sep-11	15-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.55	0.75	0.35
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.09	0.22	1.32
Barium	mg/kg	0.05	0.42	0.52	0.43
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0089	0.0115	0.0120
Calcium	mg/kg	2	5270	4700	2530
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.037	0.031	0.028
Copper	mg/kg	0.05	0.39	0.48	0.40
Iron	mg/kg	1	5	5	5
Lead	mg/kg	0.005	< 0.005	0.008	0.019
Lithium	mg/kg	0.005	0.013	0.012	0.006
Magnesium	mg/kg	0.5	357.	351.	309.
Manganese	mg/kg	0.05	2.19	2.64	2.10
Mercury	mg/kg	0.01	0.11	0.09	0.07
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4120	4070	4260
Rubidium	mg/kg	0.005	15.2	13.1	15.5
Selenium	mg/kg	0.05	0.25	0.35	0.92
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	633	616	548
Strontium	mg/kg	0.05	9.77	8.06	4.95
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.007	0.012	0.016
Tin	mg/kg	0.005	< 0.005	0.006	0.010
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	18.7	15.4	13.0

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-157	127275-158	127275-159
Client Sample ID:			W4A31-BT2 Carcass	W4A31-BT3 Carcass	W4A31-BT6 Carcass
Date Sampled:			15-Sep-11	15-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.35	0.42	0.49
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	1.32	1.45	0.98
Barium	mg/kg	0.05	0.55	0.44	0.58
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0102	0.0138	0.0101
Calcium	mg/kg	2	4150	5050	3900
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.030	0.062	0.032
Copper	mg/kg	0.05	0.31	0.39	0.35
Iron	mg/kg	1	4	5	4
Lead	mg/kg	0.005	0.009	0.016	0.007
Lithium	mg/kg	0.005	0.010	0.009	0.009
Magnesium	mg/kg	0.5	341.	340.	332.
Manganese	mg/kg	0.05	2.54	3.43	3.17
Mercury	mg/kg	0.01	0.08	0.07	0.07
Molybdenum	mg/kg	0.005	< 0.005	0.007	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4310	4130	4150
Rubidium	mg/kg	0.005	16.2	15.2	13.4
Selenium	mg/kg	0.05	0.54	0.76	0.58
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	600	566	604
Strontium	mg/kg	0.05	7.09	9.05	7.59
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.017	0.016	0.015
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	15.8	13.8	12.7

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-160	127275-161	127275-161 Dup
Client Sample ID:			W4A31-BT7 Carcass	W4A31-BT8 Carcass	Lab Duplicate
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.27	1.02	0.94
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	1.77	0.91	0.91
Barium	mg/kg	0.05	0.47	0.39	0.44
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0102	0.0213	0.0182
Calcium	mg/kg	2	4500	2830	3480
Chromium	mg/kg	0.05	< 0.05	< 0.05	0.12
Cobalt	mg/kg	0.005	0.036	0.050	0.050
Copper	mg/kg	0.05	0.35	0.41	0.40
Iron	mg/kg	1	4	5	6
Lead	mg/kg	0.005	0.017	0.016	0.010
Lithium	mg/kg	0.005	0.007	0.007	0.008
Magnesium	mg/kg	0.5	344.	331.	347.
Manganese	mg/kg	0.05	3.57	2.04	2.28
Mercury	mg/kg	0.01	0.07	0.06	0.06
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	0.006
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4280	4140	4260
Rubidium	mg/kg	0.005	12.9	14.4	14.8
Selenium	mg/kg	0.05	0.98	0.66	0.62
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	548	529	528
Strontium	mg/kg	0.05	7.80	5.27	6.33
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.022	0.015	0.017
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	12.5	15.6	15.6

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-162	127275-163	127275-164
Client Sample ID:			W4A31-BT9 Carcass	W4A31-BT10 Carcass	W4A31-Comp1 Carcass
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.75	0.53	0.95
Antimony	mg/kg	0.005	0.009	< 0.005	0.006
Arsenic	mg/kg	0.05	1.29	0.95	0.72
Barium	mg/kg	0.05	0.46	0.30	0.50
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0092	0.0082	0.0093
Calcium	mg/kg	2	3390	3020	4300
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.041	0.076	0.063
Copper	mg/kg	0.05	0.56	0.48	0.43
Iron	mg/kg	1	5	6	4
Lead	mg/kg	0.005	0.010	0.012	0.014
Lithium	mg/kg	0.005	0.009	0.005	0.009
Magnesium	mg/kg	0.5	331.	311.	356.
Manganese	mg/kg	0.05	2.12	2.46	2.46
Mercury	mg/kg	0.01	0.07	0.09	0.07
Molybdenum	mg/kg	0.005	0.005	0.006	0.007
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4230	4290	4200
Rubidium	mg/kg	0.005	15.2	14.3	14.9
Selenium	mg/kg	0.05	0.68	0.67	0.49
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	588	570	606
Strontium	mg/kg	0.05	5.71	4.99	7.86
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.018	0.014	0.026
Tin	mg/kg	0.005	< 0.005	< 0.005	0.009
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	18.2	12.3	20.4

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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rpc
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-165	127275-166	127275-167
Client Sample ID:			B2A2-BT1 Viscera	B2A2-BT3 Viscera	B2A2-BT4 Viscera
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	4.03	1.56	165.
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.09	0.06	0.33
Barium	mg/kg	0.05	0.97	0.74	1.44
Beryllium	mg/kg	0.005	< 0.005	< 0.005	0.011
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	0.06
Cadmium	mg/kg	0.0005	0.0950	0.0657	0.0888
Calcium	mg/kg	2	13000	8780	9890
Chromium	mg/kg	0.05	0.28	0.19	1.92
Cobalt	mg/kg	0.005	0.071	0.073	0.216
Copper	mg/kg	0.05	0.68	0.88	0.74
Iron	mg/kg	1	24	34	98
Lead	mg/kg	0.005	0.079	0.210	0.214
Lithium	mg/kg	0.005	0.018	0.010	0.231
Magnesium	mg/kg	0.5	342.	273.	308.
Manganese	mg/kg	0.05	13.8	4.81	29.9
Mercury	mg/kg	0.01	0.10	0.12	0.09
Molybdenum	mg/kg	0.005	0.015	0.017	0.021
Nickel	mg/kg	0.05	< 0.05	< 0.05	0.10
Potassium	mg/kg	1	2320	2420	2660
Rubidium	mg/kg	0.005	6.61	4.93	9.25
Selenium	mg/kg	0.05	0.38	0.31	0.48
Silver	mg/kg	0.005	0.006	0.013	0.012
Sodium	mg/kg	2	1650	1590	1680
Strontium	mg/kg	0.05	24.4	14.4	19.2
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.010	0.015
Tin	mg/kg	0.005	0.033	0.013	0.018
Tungsten	mg/kg	0.005	0.022	0.016	0.041
Uranium	mg/kg	0.005	< 0.005	< 0.005	0.015
Vanadium	mg/kg	0.05	0.05	< 0.05	0.12
Zinc	mg/kg	0.05	31.4	50.1	34.6

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-168	127275-169	127275-170
Client Sample ID:			B2A2-BT5 Viscera	BEA2-BT6 Viscera	B2A2-BT8 Viscera
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	16.5	251.	159.
Antimony	mg/kg	0.005	< 0.005	0.008	0.006
Arsenic	mg/kg	0.05	0.22	0.30	0.54
Barium	mg/kg	0.05	1.40	1.50	1.88
Beryllium	mg/kg	0.005	< 0.005	0.014	0.008
Bismuth	mg/kg	0.05	< 0.05	0.21	0.07
Boron	mg/kg	0.05	< 0.05	0.13	0.06
Cadmium	mg/kg	0.0005	0.0576	0.0575	0.0780
Calcium	mg/kg	2	13000	8230	12300
Chromium	mg/kg	0.05	0.15	3.83	0.85
Cobalt	mg/kg	0.005	0.197	0.269	0.324
Copper	mg/kg	0.05	0.81	0.77	0.94
Iron	mg/kg	1	26	146	114
Lead	mg/kg	0.005	0.134	0.324	0.307
Lithium	mg/kg	0.005	0.029	0.302	0.219
Magnesium	mg/kg	0.5	328.	309.	338.
Manganese	mg/kg	0.05	18.9	26.2	41.9
Mercury	mg/kg	0.01	0.10	0.08	0.15
Molybdenum	mg/kg	0.005	0.019	0.037	0.038
Nickel	mg/kg	0.05	< 0.05	0.22	0.10
Potassium	mg/kg	1	2410	2640	2620
Rubidium	mg/kg	0.005	7.79	7.92	6.07
Selenium	mg/kg	0.05	0.48	0.49	0.48
Silver	mg/kg	0.005	0.015	0.012	0.018
Sodium	mg/kg	2	1790	1610	1710
Strontium	mg/kg	0.05	26.7	15.6	32.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.016	0.020	0.021
Tin	mg/kg	0.005	0.019	< 0.005	0.010
Tungsten	mg/kg	0.005	0.044	0.039	0.071
Uranium	mg/kg	0.005	< 0.005	0.043	0.025
Vanadium	mg/kg	0.05	< 0.05	0.30	0.23
Zinc	mg/kg	0.05	45.4	41.9	52.0

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-171	127275-171 Dup	127275-172
Client Sample ID:			B2A2-BT16 Viscera	Lab Duplicate	B2A2-BT18 Viscera
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	10.5	9.12	39.0
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.06	0.06	0.18
Barium	mg/kg	0.05	0.79	0.84	1.25
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0311	0.0341	0.0732
Calcium	mg/kg	2	9780	11000	10800
Chromium	mg/kg	0.05	0.28	0.44	0.19
Cobalt	mg/kg	0.005	0.063	0.068	0.177
Copper	mg/kg	0.05	0.76	1.22	1.23
Iron	mg/kg	1	38	41	56
Lead	mg/kg	0.005	0.094	0.095	0.134
Lithium	mg/kg	0.005	0.016	0.015	0.046
Magnesium	mg/kg	0.5	297.	316.	313.
Manganese	mg/kg	0.05	4.43	4.94	19.8
Mercury	mg/kg	0.01	0.14	0.15	0.11
Molybdenum	mg/kg	0.005	0.024	0.024	0.023
Nickel	mg/kg	0.05	< 0.05	< 0.05	0.07
Potassium	mg/kg	1	2510	2590	2370
Rubidium	mg/kg	0.005	4.07	4.19	6.08
Selenium	mg/kg	0.05	0.25	0.24	0.51
Silver	mg/kg	0.005	0.006	0.007	0.044
Sodium	mg/kg	2	1750	1830	1720
Strontium	mg/kg	0.05	18.9	21.0	24.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.010	0.014
Tin	mg/kg	0.005	0.013	0.016	0.013
Tungsten	mg/kg	0.005	0.008	0.008	0.021
Uranium	mg/kg	0.005	0.006	< 0.005	0.016
Vanadium	mg/kg	0.05	< 0.05	< 0.05	0.11
Zinc	mg/kg	0.05	46.6	49.4	41.2

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-173	127275-174	127275-175
Client Sample ID:			B2A2-Comp.1 Viscera	B2A2-Comp.2 Viscera	B3A9-BT1 Viscera
Date Sampled:			8-Sep-11	8-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	50.2	42.3	2.06
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.33	0.22	0.11
Barium	mg/kg	0.05	1.38	1.20	0.56
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0758	0.0704	0.279
Calcium	mg/kg	2	11700	10700	11600
Chromium	mg/kg	0.05	0.37	0.12	0.15
Cobalt	mg/kg	0.005	0.141	0.170	0.093
Copper	mg/kg	0.05	1.03	0.93	0.74
Iron	mg/kg	1	57	49	28
Lead	mg/kg	0.005	0.127	0.100	0.068
Lithium	mg/kg	0.005	0.063	0.063	0.017
Magnesium	mg/kg	0.5	331.	325.	306.
Manganese	mg/kg	0.05	14.3	11.5	6.73
Mercury	mg/kg	0.01	0.09	0.08	0.18
Molybdenum	mg/kg	0.005	0.027	0.021	0.025
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2650	2670	2240
Rubidium	mg/kg	0.005	5.88	7.31	8.58
Selenium	mg/kg	0.05	0.58	0.53	0.41
Silver	mg/kg	0.005	0.026	0.017	0.016
Sodium	mg/kg	2	1660	1600	1920
Strontium	mg/kg	0.05	26.2	23.7	19.0
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.015	0.014	0.011
Tin	mg/kg	0.005	0.021	0.012	0.036
Tungsten	mg/kg	0.005	0.048	0.036	0.016
Uranium	mg/kg	0.005	0.010	0.016	< 0.005
Vanadium	mg/kg	0.05	0.10	0.07	< 0.05
Zinc	mg/kg	0.05	47.3	48.8	52.3

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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rpc
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-176	127275-177	127275-178
Client Sample ID:			B3A9-BT2 Viscera	B3A9-BT4 Viscera	B3A9-BT5 Viscera
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	353.	12.6	9.68
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	5.93	0.15	0.11
Barium	mg/kg	0.05	2.12	0.74	0.67
Beryllium	mg/kg	0.005	0.027	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.156	0.169	0.200
Calcium	mg/kg	2	9840	12300	10500
Chromium	mg/kg	0.05	0.90	0.23	0.08
Cobalt	mg/kg	0.005	0.539	0.092	0.067
Copper	mg/kg	0.05	0.78	0.66	0.81
Iron	mg/kg	1	1190	36	28
Lead	mg/kg	0.005	0.613	0.063	0.051
Lithium	mg/kg	0.005	0.354	0.032	0.020
Magnesium	mg/kg	0.5	400.	345.	311.
Manganese	mg/kg	0.05	41.8	8.72	8.75
Mercury	mg/kg	0.01	0.08	0.11	0.07
Molybdenum	mg/kg	0.005	0.092	0.025	0.036
Nickel	mg/kg	0.05	0.44	< 0.05	< 0.05
Potassium	mg/kg	1	2310	2540	2430
Rubidium	mg/kg	0.005	9.67	9.29	8.35
Selenium	mg/kg	0.05	0.40	0.42	0.37
Silver	mg/kg	0.005	0.014	0.014	0.012
Sodium	mg/kg	2	1620	1800	1670
Strontium	mg/kg	0.05	17.1	21.5	17.9
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.020	0.015	0.012
Tin	mg/kg	0.005	0.028	0.020	0.020
Tungsten	mg/kg	0.005	0.068	0.010	0.048
Uranium	mg/kg	0.005	0.031	< 0.005	< 0.005
Vanadium	mg/kg	0.05	0.90	< 0.05	< 0.05
Zinc	mg/kg	0.05	48.2	48.2	43.7

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-179	127275-180	127275-180 Dup
Client Sample ID:			B3A9-BT7 Viscera	B3A9-BT9 Viscera	Lab Duplicate
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.36	16.6	23.3
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.26	0.14	0.18
Barium	mg/kg	0.05	0.67	0.46	0.47
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.135	0.204	0.146
Calcium	mg/kg	2	8550	7200	7400
Chromium	mg/kg	0.05	0.21	0.13	0.30
Cobalt	mg/kg	0.005	0.118	0.134	0.132
Copper	mg/kg	0.05	1.01	0.66	0.64
Iron	mg/kg	1	34	39	54
Lead	mg/kg	0.005	0.030	0.065	0.082
Lithium	mg/kg	0.005	0.016	0.036	0.045
Magnesium	mg/kg	0.5	285.	272.	272.
Manganese	mg/kg	0.05	9.10	7.78	8.26
Mercury	mg/kg	0.01	0.07	0.11	0.11
Molybdenum	mg/kg	0.005	0.028	0.022	0.021
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2660	2720	2710
Rubidium	mg/kg	0.005	9.67	10.5	10.5
Selenium	mg/kg	0.05	0.70	0.41	0.38
Silver	mg/kg	0.005	0.084	0.017	0.011
Sodium	mg/kg	2	1600	1410	1420
Strontium	mg/kg	0.05	11.6	12.0	12.3
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.021	0.018	0.018
Tin	mg/kg	0.005	0.019	0.006	0.009
Tungsten	mg/kg	0.005	< 0.005	0.008	0.010
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	0.05	0.07
Zinc	mg/kg	0.05	44.4	42.5	40.1

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-181	127275-182	127275-183
Client Sample ID:			B3A9-BT13 Viscera	B3A9-BT14 Viscera	B3A9-Comp1 Viscera
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.15	19.9	10.0
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.20	0.21	0.12
Barium	mg/kg	0.05	0.64	0.75	0.61
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.132	0.236	0.178
Calcium	mg/kg	2	10400	12400	10200
Chromium	mg/kg	0.05	< 0.05	0.21	0.06
Cobalt	mg/kg	0.005	0.096	0.130	0.064
Copper	mg/kg	0.05	0.57	0.63	0.79
Iron	mg/kg	1	21	36	27
Lead	mg/kg	0.005	0.054	0.086	0.069
Lithium	mg/kg	0.005	0.019	0.030	0.019
Magnesium	mg/kg	0.5	314.	324.	298.
Manganese	mg/kg	0.05	6.82	7.01	7.20
Mercury	mg/kg	0.01	0.11	0.14	0.10
Molybdenum	mg/kg	0.005	0.018	0.028	0.041
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2510	2310	2510
Rubidium	mg/kg	0.005	8.48	8.46	7.39
Selenium	mg/kg	0.05	0.38	0.37	0.39
Silver	mg/kg	0.005	0.008	0.010	0.017
Sodium	mg/kg	2	1680	1720	1560
Strontium	mg/kg	0.05	19.3	19.8	18.4
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.013	0.013
Tin	mg/kg	0.005	0.014	0.015	0.013
Tungsten	mg/kg	0.005	0.009	0.015	0.012
Uranium	mg/kg	0.005	< 0.005	0.006	0.006
Vanadium	mg/kg	0.05	< 0.05	0.06	< 0.05
Zinc	mg/kg	0.05	43.1	49.5	51.9

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-184	127275-185	127275-186
Client Sample ID:			B3A9-Comp2 Viscera	EBNB1-BT1 Viscera	EBNB1-BT2 Viscera
Date Sampled:			14-Sep-11	19-Sep-11	19-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	8.80	252.	33.9
Antimony	mg/kg	0.005	< 0.005	0.006	< 0.005
Arsenic	mg/kg	0.05	0.14	0.41	0.28
Barium	mg/kg	0.05	0.92	2.62	1.19
Beryllium	mg/kg	0.005	< 0.005	0.012	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	0.09	< 0.05
Cadmium	mg/kg	0.0005	0.177	0.164	0.157
Calcium	mg/kg	2	11000	8970	10400
Chromium	mg/kg	0.05	0.06	0.42	0.22
Cobalt	mg/kg	0.005	0.105	0.218	0.197
Copper	mg/kg	0.05	0.86	0.97	0.58
Iron	mg/kg	1	28	280	72
Lead	mg/kg	0.005	0.084	0.116	0.043
Lithium	mg/kg	0.005	0.023	0.214	0.058
Magnesium	mg/kg	0.5	309.	303.	312.
Manganese	mg/kg	0.05	6.69	18.0	22.3
Mercury	mg/kg	0.01	0.10	0.04	0.04
Molybdenum	mg/kg	0.005	0.026	0.037	0.040
Nickel	mg/kg	0.05	< 0.05	0.30	0.10
Potassium	mg/kg	1	2460	2470	2610
Rubidium	mg/kg	0.005	8.58	7.72	8.03
Selenium	mg/kg	0.05	0.41	1.57	1.37
Silver	mg/kg	0.005	0.026	0.106	0.067
Sodium	mg/kg	2	1750	1550	1590
Strontium	mg/kg	0.05	19.4	11.9	12.9
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.013	0.045	0.038
Tin	mg/kg	0.005	0.008	0.055	0.010
Tungsten	mg/kg	0.005	0.009	0.006	0.007
Uranium	mg/kg	0.005	< 0.005	0.010	< 0.005
Vanadium	mg/kg	0.05	< 0.05	0.46	0.10
Zinc	mg/kg	0.05	52.2	46.5	45.5

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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rpc
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-187	127275-188	127275-189
Client Sample ID:			EBNB1-BT3 Viscera	M3C3-BT1 Viscera	M3C3-BT2 Viscera
Date Sampled:			19-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.72	8.68	174.
Antimony	mg/kg	0.005	< 0.005	0.011	0.006
Arsenic	mg/kg	0.05	0.13	0.09	0.13
Barium	mg/kg	0.05	0.88	0.65	1.37
Beryllium	mg/kg	0.005	< 0.005	< 0.005	0.006
Bismuth	mg/kg	0.05	< 0.05	0.21	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	0.06
Cadmium	mg/kg	0.0005	0.0974	0.0908	0.271
Calcium	mg/kg	2	8160	9920	13900
Chromium	mg/kg	0.05	0.09	1.56	0.70
Cobalt	mg/kg	0.005	0.153	0.088	0.216
Copper	mg/kg	0.05	0.72	0.77	0.82
Iron	mg/kg	1	24	31	149
Lead	mg/kg	0.005	0.019	0.056	0.178
Lithium	mg/kg	0.005	0.007	0.018	0.245
Magnesium	mg/kg	0.5	246.	297.	373.
Manganese	mg/kg	0.05	17.3	12.9	16.3
Mercury	mg/kg	0.01	0.03	0.09	0.08
Molybdenum	mg/kg	0.005	0.024	0.414	0.067
Nickel	mg/kg	0.05	0.06	< 0.05	0.21
Potassium	mg/kg	1	2370	2300	2500
Rubidium	mg/kg	0.005	6.23	8.62	8.27
Selenium	mg/kg	0.05	0.79	0.35	0.32
Silver	mg/kg	0.005	0.020	0.010	0.010
Sodium	mg/kg	2	1540	1630	1700
Strontium	mg/kg	0.05	11.2	23.4	21.5
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.027	0.012	0.016
Tin	mg/kg	0.005	< 0.005	0.011	0.016
Tungsten	mg/kg	0.005	0.008	0.116	0.057
Uranium	mg/kg	0.005	< 0.005	< 0.005	0.024
Vanadium	mg/kg	0.05	< 0.05	< 0.05	0.25
Zinc	mg/kg	0.05	41.8	43.8	42.1

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-190	127275-191	127275-192
Client Sample ID:			M3C3-BT3 Viscera	M3C3-BT4 Viscera	M3C3-BT5 Viscera
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	49.1	12.2	6.91
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.10	0.10	0.06
Barium	mg/kg	0.05	0.69	0.99	0.56
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.200	0.187	0.105
Calcium	mg/kg	2	9060	14600	13400
Chromium	mg/kg	0.05	0.23	0.12	0.08
Cobalt	mg/kg	0.005	0.147	0.136	0.077
Copper	mg/kg	0.05	1.42	0.75	0.51
Iron	mg/kg	1	59	49	26
Lead	mg/kg	0.005	0.104	0.085	0.049
Lithium	mg/kg	0.005	0.065	0.026	0.017
Magnesium	mg/kg	0.5	329.	353.	335.
Manganese	mg/kg	0.05	8.93	19.3	20.4
Mercury	mg/kg	0.01	0.05	0.04	0.05
Molybdenum	mg/kg	0.005	0.054	0.036	0.031
Nickel	mg/kg	0.05	0.07	0.05	< 0.05
Potassium	mg/kg	1	2390	2450	2470
Rubidium	mg/kg	0.005	6.15	7.25	4.86
Selenium	mg/kg	0.05	0.33	0.34	0.38
Silver	mg/kg	0.005	0.008	0.008	0.005
Sodium	mg/kg	2	1590	1700	1690
Strontium	mg/kg	0.05	15.2	25.8	16.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.012	0.016	0.008
Tin	mg/kg	0.005	0.010	0.008	0.007
Tungsten	mg/kg	0.005	0.027	0.020	0.027
Uranium	mg/kg	0.005	0.019	0.010	< 0.005
Vanadium	mg/kg	0.05	0.13	0.06	< 0.05
Zinc	mg/kg	0.05	47.0	49.7	42.2

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-193	127275-194	127275-194 Dup
Client Sample ID:			M3C3-BT6 Viscera	M3C3-BT7 Viscera	Lab Duplicate
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	2.63	5.50	4.96
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.05	0.11	0.10
Barium	mg/kg	0.05	0.61	0.93	0.86
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.102	0.203	0.183
Calcium	mg/kg	2	12500	14400	11600
Chromium	mg/kg	0.05	0.08	0.11	0.07
Cobalt	mg/kg	0.005	0.056	0.075	0.073
Copper	mg/kg	0.05	0.75	1.04	1.08
Iron	mg/kg	1	23	31	29
Lead	mg/kg	0.005	0.046	0.064	0.062
Lithium	mg/kg	0.005	0.016	0.021	0.018
Magnesium	mg/kg	0.5	337.	347.	318.
Manganese	mg/kg	0.05	9.04	61.1	88.7
Mercury	mg/kg	0.01	0.05	0.09	0.10
Molybdenum	mg/kg	0.005	0.053	0.064	0.060
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2490	2270	2230
Rubidium	mg/kg	0.005	5.89	6.92	6.76
Selenium	mg/kg	0.05	0.29	0.28	0.29
Silver	mg/kg	0.005	0.006	0.013	0.012
Sodium	mg/kg	2	1590	1730	1690
Strontium	mg/kg	0.05	16.5	31.6	27.2
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.010	0.010
Tin	mg/kg	0.005	0.005	0.011	0.013
Tungsten	mg/kg	0.005	0.012	0.112	0.101
Uranium	mg/kg	0.005	0.006	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	47.2	43.5	46.1

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
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rpc
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-195	127275-196	127275-196 Dup
Client Sample ID:			M3C3-BT8 Viscera	M3C3-BT9 Viscera	Lab Duplicate
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	7.67	10.4	6.47
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.09	0.08	0.09
Barium	mg/kg	0.05	0.69	0.63	0.57
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.159	0.196	0.281
Calcium	mg/kg	2	13600	12200	11100
Chromium	mg/kg	0.05	0.06	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.065	0.107	0.107
Copper	mg/kg	0.05	0.61	0.71	0.79
Iron	mg/kg	1	28	26	24
Lead	mg/kg	0.005	0.067	0.059	0.056
Lithium	mg/kg	0.005	0.024	0.019	0.015
Magnesium	mg/kg	0.5	346.	330.	311.
Manganese	mg/kg	0.05	25.5	16.0	15.0
Mercury	mg/kg	0.01	0.07	0.07	0.07
Molybdenum	mg/kg	0.005	0.039	0.029	0.032
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2330	2760	2710
Rubidium	mg/kg	0.005	6.67	7.50	7.36
Selenium	mg/kg	0.05	0.38	0.35	0.39
Silver	mg/kg	0.005	0.014	0.007	0.009
Sodium	mg/kg	2	1650	1640	1610
Strontium	mg/kg	0.05	20.2	20.1	18.3
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.017	0.017
Tin	mg/kg	0.005	0.030	0.027	0.015
Tungsten	mg/kg	0.005	0.035	0.023	0.022
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	44.2	36.3	36.5

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-197	127275-198	127275-199
Client Sample ID:			M3C3-BT10 Viscera	S2A2-BT3 Viscera	S2A2-BT4 Viscera
Date Sampled:			13-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	2.04	2.13	15.4
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.017
Arsenic	mg/kg	0.05	0.06	0.05	0.07
Barium	mg/kg	0.05	1.03	0.91	0.82
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.22
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.122	0.0807	0.0979
Calcium	mg/kg	2	15200	11600	12000
Chromium	mg/kg	0.05	0.08	< 0.05	0.09
Cobalt	mg/kg	0.005	0.157	0.024	0.043
Copper	mg/kg	0.05	0.50	0.80	0.80
Iron	mg/kg	1	21	24	23
Lead	mg/kg	0.005	0.065	0.030	0.040
Lithium	mg/kg	0.005	0.021	0.014	0.018
Magnesium	mg/kg	0.5	359.	306.	311.
Manganese	mg/kg	0.05	11.7	26.1	10.6
Mercury	mg/kg	0.01	0.06	0.07	0.11
Molybdenum	mg/kg	0.005	0.025	0.057	0.144
Nickel	mg/kg	0.05	0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2380	2430	2180
Rubidium	mg/kg	0.005	6.00	10.3	6.04
Selenium	mg/kg	0.05	0.32	0.30	0.34
Silver	mg/kg	0.005	< 0.005	< 0.005	0.005
Sodium	mg/kg	2	1840	1920	1500
Strontium	mg/kg	0.05	24.7	36.0	30.7
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.018	0.011	0.020
Tin	mg/kg	0.005	0.018	0.022	0.032
Tungsten	mg/kg	0.005	0.029	0.080	0.163
Uranium	mg/kg	0.005	0.014	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	41.2	38.9	47.7

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-200	127275-200 Dup	127275-201
Client Sample ID:			S2A2-BT11 Viscera	Lab Duplicate	S2A2-BT13 Viscera
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	451.	211.	5.00
Antimony	mg/kg	0.005	0.018	0.012	0.008
Arsenic	mg/kg	0.05	2.30	1.21	0.08
Barium	mg/kg	0.05	1.71	1.24	0.98
Beryllium	mg/kg	0.005	0.012	0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	0.12	0.06	< 0.05
Cadmium	mg/kg	0.0005	0.0995	0.126	0.0815
Calcium	mg/kg	2	11300	12400	10900
Chromium	mg/kg	0.05	0.74	0.57	0.10
Cobalt	mg/kg	0.005	0.237	0.134	0.034
Copper	mg/kg	0.05	2.29	1.48	0.76
Iron	mg/kg	1	620	297	27
Lead	mg/kg	0.005	0.253	0.147	0.033
Lithium	mg/kg	0.005	0.638	0.290	0.017
Magnesium	mg/kg	0.5	396.	371.	303.
Manganese	mg/kg	0.05	24.2	17.1	8.56
Mercury	mg/kg	0.01	0.10	0.10	0.06
Molybdenum	mg/kg	0.005	0.682	0.374	0.095
Nickel	mg/kg	0.05	0.32	0.15	< 0.05
Potassium	mg/kg	1	2490	2520	2250
Rubidium	mg/kg	0.005	9.67	9.70	7.21
Selenium	mg/kg	0.05	0.38	0.39	0.32
Silver	mg/kg	0.005	0.012	0.010	0.005
Sodium	mg/kg	2	1730	1780	1680
Strontium	mg/kg	0.05	26.5	29.0	34.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.017	0.016	0.014
Tin	mg/kg	0.005	0.020	0.018	0.028
Tungsten	mg/kg	0.005	1.39	0.817	0.166
Uranium	mg/kg	0.005	0.039	0.018	< 0.005
Vanadium	mg/kg	0.05	1.05	0.50	< 0.05
Zinc	mg/kg	0.05	35.8	36.1	40.8

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-202	127275-203	127275-204
Client Sample ID:			S2A2-BT15 Viscera	S2A2-BT22 Viscera	S2A2-BT23 Viscera
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.36	1.64	1.03
Antimony	mg/kg	0.005	0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.07	0.06	< 0.05
Barium	mg/kg	0.05	0.66	0.58	0.68
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.132	0.0959	0.0626
Calcium	mg/kg	2	11100	11100	10400
Chromium	mg/kg	0.05	< 0.05	< 0.05	0.05
Cobalt	mg/kg	0.005	0.064	0.042	0.042
Copper	mg/kg	0.05	0.84	0.71	0.59
Iron	mg/kg	1	21	26	28
Lead	mg/kg	0.005	0.043	0.016	0.028
Lithium	mg/kg	0.005	0.010	0.012	0.008
Magnesium	mg/kg	0.5	297.	291.	284.
Manganese	mg/kg	0.05	9.83	9.31	7.39
Mercury	mg/kg	0.01	0.12	0.07	0.09
Molybdenum	mg/kg	0.005	0.051	0.051	0.039
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2380	2260	2320
Rubidium	mg/kg	0.005	8.07	8.32	6.26
Selenium	mg/kg	0.05	0.27	0.45	0.23
Silver	mg/kg	0.005	0.009	0.010	< 0.005
Sodium	mg/kg	2	1700	1660	1840
Strontium	mg/kg	0.05	26.6	28.5	22.9
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.015	0.012	0.011
Tin	mg/kg	0.005	0.028	0.165	0.041
Tungsten	mg/kg	0.005	0.167	0.149	0.120
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	36.5	47.8	41.3

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-205	127275-206	127275-207
Client Sample ID:			S2A2-BT24 Viscera	S2A2-Comp1 Viscera	S2A2-Comp2 Viscera
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.00	8.43	4.47
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.005
Arsenic	mg/kg	0.05	0.09	0.10	0.09
Barium	mg/kg	0.05	0.82	0.56	0.81
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0814	0.116	0.115
Calcium	mg/kg	2	12400	10100	11700
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.081	0.077	0.077
Copper	mg/kg	0.05	0.88	0.85	0.71
Iron	mg/kg	1	29	32	26
Lead	mg/kg	0.005	0.042	0.030	0.026
Lithium	mg/kg	0.005	0.015	0.015	0.016
Magnesium	mg/kg	0.5	317.	296.	322.
Manganese	mg/kg	0.05	13.2	7.61	11.6
Mercury	mg/kg	0.01	0.06	0.08	0.06
Molybdenum	mg/kg	0.005	0.182	0.235	0.071
Nickel	mg/kg	0.05	0.07	< 0.05	< 0.05
Potassium	mg/kg	1	2320	2430	2260
Rubidium	mg/kg	0.005	8.54	6.41	8.07
Selenium	mg/kg	0.05	0.47	0.54	0.47
Silver	mg/kg	0.005	0.015	0.009	0.008
Sodium	mg/kg	2	1830	1590	1610
Strontium	mg/kg	0.05	32.1	22.5	28.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.017	0.015	0.015
Tin	mg/kg	0.005	< 0.005	0.012	0.018
Tungsten	mg/kg	0.005	0.223	0.201	0.156
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	47.5	46.8	46.8

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-208	127275-209	127275-210
Client Sample ID:			S3A3-BT1 Viscera	S3A3-BT4 Viscera	S3A3-BT5 Viscera
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.42	7.33	92.0
Antimony	mg/kg	0.005	0.006	0.005	< 0.005
Arsenic	mg/kg	0.05	0.14	0.25	0.21
Barium	mg/kg	0.05	0.99	0.71	0.87
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.267	0.375	0.247
Calcium	mg/kg	2	14000	12800	10500
Chromium	mg/kg	0.05	< 0.05	0.08	0.14
Cobalt	mg/kg	0.005	0.188	0.252	0.136
Copper	mg/kg	0.05	0.65	0.89	0.82
Iron	mg/kg	1	25	32	169
Lead	mg/kg	0.005	0.033	0.029	0.032
Lithium	mg/kg	0.005	0.013	0.019	0.065
Magnesium	mg/kg	0.5	331.	321.	350.
Manganese	mg/kg	0.05	13.3	8.63	11.8
Mercury	mg/kg	0.01	0.09	0.11	0.07
Molybdenum	mg/kg	0.005	0.039	0.090	0.064
Nickel	mg/kg	0.05	< 0.05	< 0.05	0.17
Potassium	mg/kg	1	2300	2170	2300
Rubidium	mg/kg	0.005	10.9	10.1	8.92
Selenium	mg/kg	0.05	0.42	0.49	0.44
Silver	mg/kg	0.005	0.006	0.009	0.012
Sodium	mg/kg	2	1830	1880	1710
Strontium	mg/kg	0.05	31.7	26.5	24.8
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.028	0.034	0.017
Tin	mg/kg	0.005	0.031	0.044	0.044
Tungsten	mg/kg	0.005	0.209	0.243	0.171
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	0.13
Zinc	mg/kg	0.05	41.1	49.9	54.1

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-210 Dup	127275-211	127275-212
Client Sample ID:			Lab Duplicate	S3A3-BT8 Viscera	S3A3-BT9 Viscera
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	9.44	3.07	808.
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.005
Arsenic	mg/kg	0.05	0.18	0.25	4.56
Barium	mg/kg	0.05	0.89	0.67	2.07
Beryllium	mg/kg	0.005	< 0.005	< 0.005	0.044
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.10
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.229	0.247	0.503
Calcium	mg/kg	2	12000	12500	6900
Chromium	mg/kg	0.05	0.09	< 0.05	0.98
Cobalt	mg/kg	0.005	0.106	0.102	1.16
Copper	mg/kg	0.05	0.84	1.07	3.53
Iron	mg/kg	1	28	18	1680
Lead	mg/kg	0.005	0.028	0.031	0.681
Lithium	mg/kg	0.005	0.019	0.015	0.785
Magnesium	mg/kg	0.5	325.	321.	604.
Manganese	mg/kg	0.05	10.2	9.97	44.6
Mercury	mg/kg	0.01	0.08	0.12	0.08
Molybdenum	mg/kg	0.005	0.048	0.051	0.696
Nickel	mg/kg	0.05	< 0.05	0.05	0.96
Potassium	mg/kg	1	2370	2070	2340
Rubidium	mg/kg	0.005	9.25	9.57	13.1
Selenium	mg/kg	0.05	0.42	0.42	0.56
Silver	mg/kg	0.005	0.013	0.007	0.009
Sodium	mg/kg	2	1760	1770	1340
Strontium	mg/kg	0.05	29.1	23.5	14.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.018	0.023	0.074
Tin	mg/kg	0.005	0.046	0.058	0.086
Tungsten	mg/kg	0.005	0.171	0.377	1.32
Uranium	mg/kg	0.005	< 0.005	< 0.005	0.046
Vanadium	mg/kg	0.05	< 0.05	0.05	1.18
Zinc	mg/kg	0.05	41.9	44.2	50.3

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-213	127275-214	127275-215
Client Sample ID:			S3A3-BT10 Viscera	S3A3-BT12 Viscera	S3A3-BT23 Viscera
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	9.15	9.94	3.05
Antimony	mg/kg	0.005	0.005	0.006	0.023
Arsenic	mg/kg	0.05	0.39	0.44	0.27
Barium	mg/kg	0.05	0.92	0.82	0.69
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.29
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.379	0.247	0.432
Calcium	mg/kg	2	8850	14400	12800
Chromium	mg/kg	0.05	< 0.05	0.06	< 0.05
Cobalt	mg/kg	0.005	0.173	0.302	0.192
Copper	mg/kg	0.05	1.15	0.79	0.86
Iron	mg/kg	1	28	25	18
Lead	mg/kg	0.005	0.043	0.029	0.016
Lithium	mg/kg	0.005	0.014	0.023	0.013
Magnesium	mg/kg	0.5	286.	351.	348.
Manganese	mg/kg	0.05	12.2	16.9	9.64
Mercury	mg/kg	0.01	0.07	0.07	0.06
Molybdenum	mg/kg	0.005	0.117	0.095	0.041
Nickel	mg/kg	0.05	< 0.05	0.06	0.05
Potassium	mg/kg	1	2250	2360	2480
Rubidium	mg/kg	0.005	9.60	11.6	9.62
Selenium	mg/kg	0.05	0.48	0.47	0.46
Silver	mg/kg	0.005	0.015	0.012	0.012
Sodium	mg/kg	2	1500	1600	1530
Strontium	mg/kg	0.05	16.2	29.4	25.8
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.022	0.034	0.025
Tin	mg/kg	0.005	0.016	0.012	0.013
Tungsten	mg/kg	0.005	0.154	0.244	0.123
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	48.7	46.0	40.2

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-216	127275-217	127275-218
Client Sample ID:			S3A3-Comp1 Viscera	S3A3-Comp2 Viscera	W4A17-BT1 Viscera
Date Sampled:			26-Sep-11	26-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	6.94	119.	95.4
Antimony	mg/kg	0.005	0.010	0.008	0.005
Arsenic	mg/kg	0.05	0.30	0.68	0.09
Barium	mg/kg	0.05	0.66	1.25	0.69
Beryllium	mg/kg	0.005	< 0.005	0.007	0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.234	0.348	0.0327
Calcium	mg/kg	2	12500	9720	7490
Chromium	mg/kg	0.05	< 0.05	0.37	0.56
Cobalt	mg/kg	0.005	0.199	0.266	0.101
Copper	mg/kg	0.05	0.71	1.05	0.62
Iron	mg/kg	1	22	116	98
Lead	mg/kg	0.005	0.015	0.089	0.105
Lithium	mg/kg	0.005	0.016	0.142	0.185
Magnesium	mg/kg	0.5	345.	324.	276.
Manganese	mg/kg	0.05	7.40	17.8	13.5
Mercury	mg/kg	0.01	0.07	0.05	0.10
Molybdenum	mg/kg	0.005	0.044	0.149	0.028
Nickel	mg/kg	0.05	0.05	0.11	0.09
Potassium	mg/kg	1	2540	2460	2190
Rubidium	mg/kg	0.005	11.1	10.9	10.2
Selenium	mg/kg	0.05	0.54	0.54	0.32
Silver	mg/kg	0.005	< 0.005	0.012	0.007
Sodium	mg/kg	2	1570	1500	1520
Strontium	mg/kg	0.05	24.4	20.1	11.5
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.027	0.033	0.014
Tin	mg/kg	0.005	0.011	0.026	0.021
Tungsten	mg/kg	0.005	0.148	0.420	0.018
Uranium	mg/kg	0.005	< 0.005	0.009	0.023
Vanadium	mg/kg	0.05	< 0.05	0.21	0.11
Zinc	mg/kg	0.05	49.7	48.0	50.7

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-219	127275-220	127275-221
Client Sample ID:			W4A17-BT2 Viscera	W4A17-BT6 Viscera	W4A17-BT9 Viscera
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	29.1	77.3	52.6
Antimony	mg/kg	0.005	< 0.005	0.005	< 0.005
Arsenic	mg/kg	0.05	0.07	0.08	0.10
Barium	mg/kg	0.05	0.53	1.04	1.14
Beryllium	mg/kg	0.005	< 0.005	< 0.005	0.007
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0352	0.0380	0.0629
Calcium	mg/kg	2	8380	12400	9350
Chromium	mg/kg	0.05	0.63	0.23	0.21
Cobalt	mg/kg	0.005	0.112	0.070	0.229
Copper	mg/kg	0.05	0.65	0.61	0.53
Iron	mg/kg	1	38	43	73
Lead	mg/kg	0.005	0.058	0.044	0.188
Lithium	mg/kg	0.005	0.096	0.068	0.111
Magnesium	mg/kg	0.5	269.	341.	305.
Manganese	mg/kg	0.05	8.35	8.68	31.6
Mercury	mg/kg	0.01	0.15	0.09	0.09
Molybdenum	mg/kg	0.005	0.021	0.019	0.021
Nickel	mg/kg	0.05	< 0.05	< 0.05	0.06
Potassium	mg/kg	1	2150	2380	2300
Rubidium	mg/kg	0.005	9.90	11.9	9.11
Selenium	mg/kg	0.05	0.31	0.30	0.31
Silver	mg/kg	0.005	0.009	0.006	< 0.005
Sodium	mg/kg	2	1630	1870	1580
Strontium	mg/kg	0.05	14.5	24.2	18.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.013	0.026
Tin	mg/kg	0.005	0.019	0.024	0.018
Tungsten	mg/kg	0.005	0.010	0.011	0.009
Uranium	mg/kg	0.005	0.017	0.012	0.047
Vanadium	mg/kg	0.05	< 0.05	0.10	0.08
Zinc	mg/kg	0.05	44.1	43.3	43.7

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-222	127275-223	127275-224
Client Sample ID:			W4A17-BT12 Viscera	W4A17-BT13 Viscera	W4A17-BT20 Viscera
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	132.	68.5	7.89
Antimony	mg/kg	0.005	< 0.005	0.027	0.006
Arsenic	mg/kg	0.05	0.38	0.09	< 0.05
Barium	mg/kg	0.05	1.16	1.23	0.48
Beryllium	mg/kg	0.005	0.007	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	0.37	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0312	0.0349	0.0347
Calcium	mg/kg	2	11000	12000	11100
Chromium	mg/kg	0.05	0.31	0.18	0.13
Cobalt	mg/kg	0.005	0.125	0.133	0.101
Copper	mg/kg	0.05	0.83	0.65	0.48
Iron	mg/kg	1	93	48	22
Lead	mg/kg	0.005	0.119	0.094	0.035
Lithium	mg/kg	0.005	0.241	0.102	0.045
Magnesium	mg/kg	0.5	342.	342.	329.
Manganese	mg/kg	0.05	49.8	15.2	5.47
Mercury	mg/kg	0.01	0.09	0.06	0.12
Molybdenum	mg/kg	0.005	0.022	0.029	0.022
Nickel	mg/kg	0.05	0.07	0.09	0.05
Potassium	mg/kg	1	2210	2520	2480
Rubidium	mg/kg	0.005	11.7	7.35	10.2
Selenium	mg/kg	0.05	0.27	0.33	0.23
Silver	mg/kg	0.005	0.011	0.007	< 0.005
Sodium	mg/kg	2	1640	1730	1640
Strontium	mg/kg	0.05	20.2	30.3	17.9
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.016	0.014	0.012
Tin	mg/kg	0.005	0.099	0.022	0.008
Tungsten	mg/kg	0.005	0.009	0.007	< 0.005
Uranium	mg/kg	0.005	0.031	0.019	0.013
Vanadium	mg/kg	0.05	0.15	0.07	< 0.05
Zinc	mg/kg	0.05	45.1	42.2	29.9

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-225	127275-226	127275-227
Client Sample ID:			W4A17-BT23 Viscera	W4A17-BT24 Viscera	W4A17-Comp1 Viscera
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	127.	6.72	60.8
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.07	< 0.05	0.06
Barium	mg/kg	0.05	1.34	0.48	0.79
Beryllium	mg/kg	0.005	0.006	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0417	0.0334	0.0376
Calcium	mg/kg	2	7940	10500	9700
Chromium	mg/kg	0.05	0.19	< 0.05	0.10
Cobalt	mg/kg	0.005	0.119	0.027	0.076
Copper	mg/kg	0.05	0.85	0.55	0.81
Iron	mg/kg	1	128	19	41
Lead	mg/kg	0.005	0.093	0.020	0.076
Lithium	mg/kg	0.005	0.224	0.033	0.208
Magnesium	mg/kg	0.5	301.	323.	324.
Manganese	mg/kg	0.05	8.30	4.44	9.60
Mercury	mg/kg	0.01	0.11	0.10	0.11
Molybdenum	mg/kg	0.005	0.032	0.018	0.026
Nickel	mg/kg	0.05	0.13	< 0.05	0.09
Potassium	mg/kg	1	2450	2730	2730
Rubidium	mg/kg	0.005	11.8	13.2	9.69
Selenium	mg/kg	0.05	0.26	0.23	0.27
Silver	mg/kg	0.005	0.008	0.008	< 0.005
Sodium	mg/kg	2	1550	1670	1520
Strontium	mg/kg	0.05	15.6	15.7	15.8
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.015	0.010	0.012
Tin	mg/kg	0.005	0.012	< 0.005	0.005
Tungsten	mg/kg	0.005	0.006	0.005	0.006
Uranium	mg/kg	0.005	0.040	0.009	0.024
Vanadium	mg/kg	0.05	0.18	< 0.05	0.06
Zinc	mg/kg	0.05	34.8	46.6	38.5

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-228	127275-229	127275-230
Client Sample ID:			W4A21-BT1 Viscera	W4A21-BT2 Viscera	W4A21-BT3 Viscera
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	63.9	4.92	0.21
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.46	0.13	0.06
Barium	mg/kg	0.05	1.34	1.03	0.49
Beryllium	mg/kg	0.005	0.024	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0940	0.119	0.0329
Calcium	mg/kg	2	10900	9740	10500
Chromium	mg/kg	0.05	0.11	0.06	< 0.05
Cobalt	mg/kg	0.005	0.231	0.068	0.046
Copper	mg/kg	0.05	0.84	0.77	0.66
Iron	mg/kg	1	279	18	18
Lead	mg/kg	0.005	0.193	0.045	0.014
Lithium	mg/kg	0.005	0.101	0.029	0.031
Magnesium	mg/kg	0.5	311.	312.	334.
Manganese	mg/kg	0.05	14.5	7.96	4.50
Mercury	mg/kg	0.01	0.07	0.05	0.09
Molybdenum	mg/kg	0.005	0.038	0.014	0.006
Nickel	mg/kg	0.05	0.11	< 0.05	< 0.05
Potassium	mg/kg	1	2570	2660	2690
Rubidium	mg/kg	0.005	8.80	7.47	10.7
Selenium	mg/kg	0.05	0.57	0.38	0.23
Silver	mg/kg	0.005	0.010	< 0.005	0.005
Sodium	mg/kg	2	1590	1320	1560
Strontium	mg/kg	0.05	15.2	16.7	18.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.031	0.011	0.009
Tin	mg/kg	0.005	0.013	< 0.005	< 0.005
Tungsten	mg/kg	0.005	0.041	< 0.005	< 0.005
Uranium	mg/kg	0.005	0.035	0.005	< 0.005
Vanadium	mg/kg	0.05	0.13	< 0.05	< 0.05
Zinc	mg/kg	0.05	40.2	43.8	32.2

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-231	127275-231 Dup	127275-232
Client Sample ID:			W4A21-BT4 Viscera	Lab Duplicate	W4A21-BT5 Viscera
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	4.44	10.8	7.17
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.08	0.07	0.07
Barium	mg/kg	0.05	1.24	1.14	0.51
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.104	0.0691	0.0474
Calcium	mg/kg	2	8370	10600	10600
Chromium	mg/kg	0.05	< 0.05	0.06	< 0.05
Cobalt	mg/kg	0.005	0.076	0.069	0.066
Copper	mg/kg	0.05	1.29	1.60	1.37
Iron	mg/kg	1	37	42	29
Lead	mg/kg	0.005	0.043	0.063	0.033
Lithium	mg/kg	0.005	0.031	0.040	0.032
Magnesium	mg/kg	0.5	287.	320.	353.
Manganese	mg/kg	0.05	11.4	7.51	6.93
Mercury	mg/kg	0.01	0.07	0.07	0.10
Molybdenum	mg/kg	0.005	0.030	0.032	0.018
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2410	2510	2700
Rubidium	mg/kg	0.005	8.15	8.73	10.9
Selenium	mg/kg	0.05	0.34	0.34	0.30
Silver	mg/kg	0.005	0.010	0.020	0.016
Sodium	mg/kg	2	1540	1640	1520
Strontium	mg/kg	0.05	15.0	19.7	16.5
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.012	0.012	0.010
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	0.006
Uranium	mg/kg	0.005	0.007	0.009	0.008
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	46.7	37.6	36.7

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-233	127275-234	127275-235
Client Sample ID:			W4A21-BT6 Viscera	W4A21-BT9 Viscera	W4A21-Comp1 Viscera
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.78	4.65	10.6
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.07	0.14	0.06
Barium	mg/kg	0.05	0.49	0.70	0.74
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.176	0.105	0.158
Calcium	mg/kg	2	6830	10200	8980
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.094	0.122	0.085
Copper	mg/kg	0.05	1.12	0.67	1.23
Iron	mg/kg	1	22	21	24
Lead	mg/kg	0.005	0.036	0.051	0.026
Lithium	mg/kg	0.005	0.018	0.029	0.037
Magnesium	mg/kg	0.5	285.	300.	303.
Manganese	mg/kg	0.05	10.0	7.70	10.0
Mercury	mg/kg	0.01	0.10	0.09	0.06
Molybdenum	mg/kg	0.005	0.030	0.014	0.024
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2650	2420	2740
Rubidium	mg/kg	0.005	8.77	9.63	12.5
Selenium	mg/kg	0.05	0.30	0.46	0.37
Silver	mg/kg	0.005	0.014	0.012	0.013
Sodium	mg/kg	2	1610	1820	1410
Strontium	mg/kg	0.05	12.6	16.3	17.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.014	0.010	0.012
Tin	mg/kg	0.005	0.006	< 0.005	< 0.005
Tungsten	mg/kg	0.005	0.006	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	0.007	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	49.1	44.6	43.3

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-236	127275-237	127275-238
Client Sample ID:			W4A21-Comp2 Viscera	W4A21-Comp3 Viscera	W4A31-BT1 Viscera
Date Sampled:			27-Sep-11	27-Sep-11	15-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	51.1	46.8	14.7
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.14	0.16	0.42
Barium	mg/kg	0.05	0.94	1.29	1.61
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.106	0.116	0.204
Calcium	mg/kg	2	9780	11700	9760
Chromium	mg/kg	0.05	0.06	0.07	0.06
Cobalt	mg/kg	0.005	0.161	0.119	0.117
Copper	mg/kg	0.05	0.86	0.81	1.54
Iron	mg/kg	1	55	52	52
Lead	mg/kg	0.005	0.118	0.088	0.091
Lithium	mg/kg	0.005	0.090	0.091	0.039
Magnesium	mg/kg	0.5	305.	308.	285.
Manganese	mg/kg	0.05	13.7	9.90	15.0
Mercury	mg/kg	0.01	0.08	0.05	0.04
Molybdenum	mg/kg	0.005	0.032	0.021	0.030
Nickel	mg/kg	0.05	0.07	0.07	0.05
Potassium	mg/kg	1	2700	2520	2330
Rubidium	mg/kg	0.005	11.1	9.12	10.1
Selenium	mg/kg	0.05	0.31	0.41	1.35
Silver	mg/kg	0.005	0.011	0.007	0.028
Sodium	mg/kg	2	1620	1840	1680
Strontium	mg/kg	0.05	17.9	19.5	19.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.015	0.027
Tin	mg/kg	0.005	0.008	< 0.005	0.009
Tungsten	mg/kg	0.005	0.005	0.013	0.014
Uranium	mg/kg	0.005	0.024	0.015	0.007
Vanadium	mg/kg	0.05	0.07	0.07	0.08
Zinc	mg/kg	0.05	43.6	51.3	46.2

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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rpc
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-239	127275-240	127275-241
Client Sample ID:			W4A31-BT2 Viscera	W4A31-BT3 Viscera	W4A31-BT6 Viscera
Date Sampled:			15-Sep-11	15-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	2.57	114.	10.7
Antimony	mg/kg	0.005	< 0.005	0.063	0.022
Arsenic	mg/kg	0.05	0.42	1.05	0.27
Barium	mg/kg	0.05	1.53	2.14	1.26
Beryllium	mg/kg	0.005	< 0.005	0.011	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.32
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.123	0.449	0.360
Calcium	mg/kg	2	13400	13400	9910
Chromium	mg/kg	0.05	< 0.05	0.27	< 0.05
Cobalt	mg/kg	0.005	0.103	0.320	0.111
Copper	mg/kg	0.05	1.11	1.29	0.91
Iron	mg/kg	1	19	224	22
Lead	mg/kg	0.005	0.043	0.377	0.039
Lithium	mg/kg	0.005	0.029	0.192	0.029
Magnesium	mg/kg	0.5	373.	349.	312.
Manganese	mg/kg	0.05	9.62	16.1	8.87
Mercury	mg/kg	0.01	0.05	0.05	0.05
Molybdenum	mg/kg	0.005	0.027	0.064	0.035
Nickel	mg/kg	0.05	0.17	0.25	0.06
Potassium	mg/kg	1	2610	2360	2460
Rubidium	mg/kg	0.005	10.7	9.88	8.96
Selenium	mg/kg	0.05	0.67	1.21	0.73
Silver	mg/kg	0.005	0.044	0.032	0.024
Sodium	mg/kg	2	1710	1780	1690
Strontium	mg/kg	0.05	22.4	24.3	19.5
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.023	0.032	0.020
Tin	mg/kg	0.005	0.015	0.012	0.020
Tungsten	mg/kg	0.005	0.013	0.039	0.011
Uranium	mg/kg	0.005	0.006	0.046	0.006
Vanadium	mg/kg	0.05	< 0.05	0.30	< 0.05
Zinc	mg/kg	0.05	48.3	50.2	37.9

Report ID: 127275-IAS
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CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-241 Dup	127275-242	127275-243
Client Sample ID:			Lab Duplicate	W4A31-BT7 Viscera	W4A31-BT8 Viscera
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	2.39	6.39	33.5
Antimony	mg/kg	0.005	0.006	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.28	0.46	0.36
Barium	mg/kg	0.05	1.41	1.18	1.31
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.380	0.293	0.109
Calcium	mg/kg	2	12300	12000	11300
Chromium	mg/kg	0.05	< 0.05	0.05	0.07
Cobalt	mg/kg	0.005	0.113	0.138	0.169
Copper	mg/kg	0.05	0.88	0.79	0.55
Iron	mg/kg	1	19	24	45
Lead	mg/kg	0.005	0.038	0.050	0.061
Lithium	mg/kg	0.005	0.027	0.022	0.074
Magnesium	mg/kg	0.5	341.	317.	334.
Manganese	mg/kg	0.05	9.71	9.90	8.13
Mercury	mg/kg	0.01	0.03	0.04	0.03
Molybdenum	mg/kg	0.005	0.024	0.021	0.017
Nickel	mg/kg	0.05	0.06	0.06	0.08
Potassium	mg/kg	1	2460	2580	2550
Rubidium	mg/kg	0.005	9.09	9.10	10.1
Selenium	mg/kg	0.05	0.77	1.36	0.77
Silver	mg/kg	0.005	0.045	0.072	0.007
Sodium	mg/kg	2	1740	1760	1590
Strontium	mg/kg	0.05	24.2	21.1	20.0
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.020	0.031	0.021
Tin	mg/kg	0.005	0.012	0.008	0.009
Tungsten	mg/kg	0.005	0.010	0.013	0.017
Uranium	mg/kg	0.005	< 0.005	< 0.005	0.008
Vanadium	mg/kg	0.05	< 0.05	< 0.05	0.08
Zinc	mg/kg	0.05	39.5	37.9	35.7

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-244	127275-245	127275-246
Client Sample ID:			W4A31-BT9 Viscera	W4A31-BT10 Viscera	W4A31-Comp1 Viscera
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.95	5.67	33.7
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.36	0.43	0.28
Barium	mg/kg	0.05	1.46	1.15	1.33
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0945	0.115	0.365
Calcium	mg/kg	2	14700	13900	8420
Chromium	mg/kg	0.05	0.06	0.05	0.07
Cobalt	mg/kg	0.005	0.119	0.245	0.241
Copper	mg/kg	0.05	0.87	1.03	0.95
Iron	mg/kg	1	25	29	69
Lead	mg/kg	0.005	0.052	0.084	0.080
Lithium	mg/kg	0.005	0.031	0.025	0.063
Magnesium	mg/kg	0.5	375.	359.	286.
Manganese	mg/kg	0.05	9.17	11.6	12.2
Mercury	mg/kg	0.01	0.04	0.06	0.05
Molybdenum	mg/kg	0.005	0.016	0.035	0.048
Nickel	mg/kg	0.05	0.06	0.07	0.08
Potassium	mg/kg	1	2510	2540	2650
Rubidium	mg/kg	0.005	9.77	9.32	11.4
Selenium	mg/kg	0.05	0.72	0.64	0.75
Silver	mg/kg	0.005	0.015	0.013	0.021
Sodium	mg/kg	2	1680	1580	1610
Strontium	mg/kg	0.05	24.3	22.5	15.8
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.022	0.026	0.031
Tin	mg/kg	0.005	< 0.005	0.012	< 0.005
Tungsten	mg/kg	0.005	0.013	0.021	0.015
Uranium	mg/kg	0.005	0.006	0.012	0.018
Vanadium	mg/kg	0.05	< 0.05	0.07	0.12
Zinc	mg/kg	0.05	36.5	41.1	47.1

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-001	127275-002	127275-002 Dup
Client Sample ID:			B2A2-BT1 Liver	B2A2-BT3 Liver	Lab Duplicate
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	11.0	2.3	2.0
Antimony	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Arsenic	mg/kg	0.1	1.6	0.9	0.5
Barium	mg/kg	0.1	0.2	0.5	0.2
Beryllium	mg/kg	0.01	0.04	< 0.01	0.02
Bismuth	mg/kg	0.1	194.	251.	6.9
Boron	mg/kg	0.1	0.5	0.8	0.5
Cadmium	mg/kg	0.001	15.9	1.87	1.63
Calcium	mg/kg	5	109	88	97
Chromium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Cobalt	mg/kg	0.01	1.15	1.27	1.39
Copper	mg/kg	0.1	567.	146.	109.
Iron	mg/kg	2	7	5	5
Lead	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Lithium	mg/kg	0.01	0.21	0.09	0.10
Magnesium	mg/kg	1	31700	27600	27700
Manganese	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Mercury	mg/kg	0.01	0.33	0.35	0.36
Molybdenum	mg/kg	0.01	0.11	0.11	0.09
Nickel	mg/kg	0.1	0.1	0.1	< 0.1
Potassium	mg/kg	2	66800	72400	71700
Rubidium	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Selenium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Silver	mg/kg	0.01	3.61	0.74	0.51
Sodium	mg/kg	5	920	798	793
Strontium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Tellurium	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Thallium	mg/kg	0.01	22.2	29.9	28.7
Tin	mg/kg	0.01	0.88	1.56	0.34
Tungsten	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Uranium	mg/kg	0.01	0.12	0.18	0.02
Vanadium	mg/kg	0.1	35.9	6.2	5.7
Zinc	mg/kg	0.1	357.	213.	255.

METALS CONT'D

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-003	127275-004	127275-005
Client Sample ID:			B2A2-BT4 Liver	B2A2-BT5 Liver	BEA2-BT6 Liver
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	8.6	8.6	8.7
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	4.2	5.8	3.9
Barium	mg/kg	0.1	0.9	0.5	2.3
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	28.1	< 0.2
Boron	mg/kg	0.1	1.2	0.7	1.5
Cadmium	mg/kg	0.001	15.2	14.3	11.1
Calcium	mg/kg	5	220	260	270
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	4.18	7.20	6.21
Copper	mg/kg	0.1	1080	392.	369.
Iron	mg/kg	2	13	6	8
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	0.46	0.34	0.46
Magnesium	mg/kg	1	73900	74800	61900
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Mercury	mg/kg	0.01	0.30	0.20	0.21
Molybdenum	mg/kg	0.01	0.21	0.12	0.19
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	190000	191000	161000
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Selenium	mg/kg	0.1	0.2	< 0.2	0.2
Silver	mg/kg	0.01	6.01	2.60	2.90
Sodium	mg/kg	5	1800	1260	2020
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	83.0	99.2	119.
Tin	mg/kg	0.01	3.20	22.3	1.07
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	18.7	14.1	12.0
Zinc	mg/kg	0.1	627.	384.	418.

Report ID: 127275-IAS
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CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-006	127275-007	127275-008
Client Sample ID:			B2A2-BT8 Liver	B2A2-BT16 Liver	B2A2-BT18 Liver
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	3.8	0.9	4.2
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	4.6	0.3	3.0
Barium	mg/kg	0.1	0.3	0.3	< 0.2
Beryllium	mg/kg	0.01	< 0.02	0.03	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	2.7	1.0	1.3
Cadmium	mg/kg	0.001	11.3	4.44	8.48
Calcium	mg/kg	5	180	150	220
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	4.04	1.64	1.84
Copper	mg/kg	0.1	713.	416.	595.
Iron	mg/kg	2	6	6	< 4
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	0.36	0.25	0.20
Magnesium	mg/kg	1	62600	69300	83400
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Mercury	mg/kg	0.01	0.54	0.69	0.17
Molybdenum	mg/kg	0.01	0.21	0.25	0.15
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	185000	195000	239000
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Selenium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Silver	mg/kg	0.01	3.83	2.01	4.24
Sodium	mg/kg	5	1360	1430	850
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	73.7	215.	179.
Tin	mg/kg	0.01	3.14	3.85	0.48
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	12.7	6.2	6.6
Zinc	mg/kg	0.1	510.	429.	434.

METALS CONT'D

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-009	127275-010	127275-011
Client Sample ID:			B2A2-Comp.1 Liver	B2A2-Comp.2 Liver	B3A9-BT1 Liver
Date Sampled:			8-Sep-11	8-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	5.0	4.6	7.3
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Arsenic	mg/kg	0.1	3.3	7.1	1.1
Barium	mg/kg	0.1	0.7	0.4	0.2
Beryllium	mg/kg	0.01	0.03	< 0.02	< 0.01
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Boron	mg/kg	0.1	1.7	1.4	0.3
Cadmium	mg/kg	0.001	11.4	9.24	24.2
Calcium	mg/kg	5	240	220	88
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Cobalt	mg/kg	0.01	4.41	6.06	1.05
Copper	mg/kg	0.1	513.	893.	285.
Iron	mg/kg	2	5	7	5
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Lithium	mg/kg	0.01	0.44	0.39	0.09
Magnesium	mg/kg	1	70000	67500	37200
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Mercury	mg/kg	0.01	0.22	0.23	0.42
Molybdenum	mg/kg	0.01	0.22	0.22	0.08
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Potassium	mg/kg	2	213000	196000	99100
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Selenium	mg/kg	0.1	0.3	0.2	< 0.1
Silver	mg/kg	0.01	3.38	4.64	1.67
Sodium	mg/kg	5	1650	1500	510
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Thallium	mg/kg	0.01	113.	159.	91.7
Tin	mg/kg	0.01	1.19	0.23	1.82
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Uranium	mg/kg	0.01	< 0.02	< 0.02	0.02
Vanadium	mg/kg	0.1	11.1	12.9	23.8
Zinc	mg/kg	0.1	555.	593.	282.

METALS CONT'D

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
845 Prospect Street
Fredericton, NB E3B 2T7

rpc
921 College Hill Rd
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-012	127275-013	127275-014
Client Sample ID:			B3A9-BT2 Liver	B3A9-BT4 Liver	B3A9-BT5 Liver
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	12.3	9.8	3.8
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	3.5	5.0	1.7
Barium	mg/kg	0.1	0.3	0.3	0.6
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	1.6	0.9	1.3
Cadmium	mg/kg	0.001	40.3	34.8	22.4
Calcium	mg/kg	5	200	330	210
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	2.88	3.51	1.65
Copper	mg/kg	0.1	731.	770.	167.
Iron	mg/kg	2	10	8	5
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	0.35	0.33	0.27
Magnesium	mg/kg	1	74100	65400	61200
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Mercury	mg/kg	0.01	0.26	0.29	0.18
Molybdenum	mg/kg	0.01	0.28	0.23	0.21
Nickel	mg/kg	0.1	0.3	< 0.2	< 0.2
Potassium	mg/kg	2	187000	184000	201000
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Selenium	mg/kg	0.1	< 0.2	0.2	< 0.2
Silver	mg/kg	0.01	4.66	3.63	1.03
Sodium	mg/kg	5	1440	1570	1340
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	184.	198.	151.
Tin	mg/kg	0.01	3.84	0.41	0.30
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	39.9	15.8	7.7
Zinc	mg/kg	0.1	671.	588.	357.

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for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-015	127275-015 Dup	127275-016
Client Sample ID:			B3A9-BT7 Liver	Lab Duplicate	B3A9-BT9 Liver
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	3.7	3.6	13.5
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	5.3	7.2	3.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	0.6	0.5	0.4
Cadmium	mg/kg	0.001	14.4	19.6	25.5
Calcium	mg/kg	5	200	220	130
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	3.19	3.44	2.95
Copper	mg/kg	0.1	302.	340.	309.
Iron	mg/kg	2	< 4	4	8
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	0.39	0.29	0.29
Magnesium	mg/kg	1	76900	80600	58900
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Mercury	mg/kg	0.01	0.08	0.08	0.23
Molybdenum	mg/kg	0.01	0.13	0.13	0.22
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	217000	233000	154000
Rubidium	mg/kg	0.01	< 0.02	0.02	< 0.02
Selenium	mg/kg	0.1	< 0.2	0.2	< 0.2
Silver	mg/kg	0.01	1.37	1.47	2.14
Sodium	mg/kg	5	910	960	1260
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	159.	172.	168.
Tin	mg/kg	0.01	0.14	0.08	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	14.7	13.7	36.9
Zinc	mg/kg	0.1	355.	432.	436.

METALS CONT'D

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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-017	127275-018	127275-019
Client Sample ID:			B3A9-BT13 Liver	B3A9-BT14 Liver	B3A9-Comp1 Liver
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	17.6	7.0	11.0
Antimony	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Arsenic	mg/kg	0.1	5.4	1.3	4.5
Barium	mg/kg	0.1	0.2	0.1	0.3
Beryllium	mg/kg	0.01	0.02	0.02	0.04
Bismuth	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Boron	mg/kg	0.1	0.3	0.3	0.5
Cadmium	mg/kg	0.001	30.6	24.0	24.6
Calcium	mg/kg	5	180	114	250
Chromium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cobalt	mg/kg	0.01	3.01	2.10	1.77
Copper	mg/kg	0.1	496.	247.	304.
Iron	mg/kg	2	11	3	4
Lead	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Lithium	mg/kg	0.01	0.40	0.09	0.31
Magnesium	mg/kg	1	62500	37900	66700
Manganese	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Mercury	mg/kg	0.01	0.22	0.25	0.21
Molybdenum	mg/kg	0.01	0.20	0.07	0.26
Nickel	mg/kg	0.1	< 0.2	< 0.1	0.2
Potassium	mg/kg	2	151000	91500	176000
Rubidium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Selenium	mg/kg	0.1	< 0.2	< 0.1	0.2
Silver	mg/kg	0.01	4.12	1.89	2.20
Sodium	mg/kg	5	1420	558	1560
Strontium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Thallium	mg/kg	0.01	122.	54.8	136.
Tin	mg/kg	0.01	0.07	0.16	1.63
Tungsten	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Uranium	mg/kg	0.01	< 0.02	0.01	< 0.02
Vanadium	mg/kg	0.1	49.1	16.8	20.3
Zinc	mg/kg	0.1	531.	240.	470.

Report ID: 127275-IAS
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-020	127275-021	127275-022
Client Sample ID:			B3A9-Comp2 Liver	EBNB1-BT1 Liver	EBNB1-BT2 Liver
Date Sampled:			14-Sep-11	19-Sep-11	19-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	135	2.0	4.3
Antimony	mg/kg	0.01	< 0.1	< 0.01	< 0.02
Arsenic	mg/kg	0.1	12	6.4	6.6
Barium	mg/kg	0.1	6	0.2	0.9
Beryllium	mg/kg	0.01	< 0.1	< 0.01	< 0.02
Bismuth	mg/kg	0.1	< 1	578.	< 0.2
Boron	mg/kg	0.1	20	0.8	1.5
Cadmium	mg/kg	0.001	224.	7.18	10.6
Calcium	mg/kg	5	2060	79	160
Chromium	mg/kg	0.1	< 1	< 0.1	< 0.2
Cobalt	mg/kg	0.01	24.0	1.95	3.10
Copper	mg/kg	0.1	6670	309.	587.
Iron	mg/kg	2	40	3	6
Lead	mg/kg	0.01	< 0.1	< 0.01	< 0.02
Lithium	mg/kg	0.01	4.0	0.10	0.22
Magnesium	mg/kg	1	492000	35100	63900
Manganese	mg/kg	0.1	< 1	< 0.1	< 0.2
Mercury	mg/kg	0.01	0.2	0.04	0.03
Molybdenum	mg/kg	0.01	1.7	0.12	0.22
Nickel	mg/kg	0.1	1	< 0.1	0.2
Potassium	mg/kg	2	1310000	102000	182000
Rubidium	mg/kg	0.01	< 0.1	< 0.01	< 0.02
Selenium	mg/kg	0.1	1	0.4	0.5
Silver	mg/kg	0.01	43.1	1.49	3.98
Sodium	mg/kg	5	10000	569	1170
Strontium	mg/kg	0.1	< 1	< 0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.1	0.02	< 0.02
Thallium	mg/kg	0.01	1040	254.	271.
Tin	mg/kg	0.01	16.1	1.44	5.96
Tungsten	mg/kg	0.01	< 0.1	< 0.01	< 0.02
Uranium	mg/kg	0.01	< 0.1	0.35	0.05
Vanadium	mg/kg	0.1	101	11.7	10.6
Zinc	mg/kg	0.1	3970	326.	500.

METALS CONT'D

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-023	127275-024	127275-024 Dup
Client Sample ID:			EBNB1-BT3 Liver	M3C3-BT1 Liver	Lab Duplicate
Date Sampled:			19-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	128	1.3	1.6
Antimony	mg/kg	0.01	< 0.2	< 0.01	< 0.01
Arsenic	mg/kg	0.1	107	1.3	1.9
Barium	mg/kg	0.1	11	< 0.1	0.1
Beryllium	mg/kg	0.01	< 0.2	0.01	< 0.01
Bismuth	mg/kg	0.1	< 2	< 0.1	< 0.1
Boron	mg/kg	0.1	10	< 0.1	< 0.1
Cadmium	mg/kg	0.001	154.	4.51	4.61
Calcium	mg/kg	5	3700	95	103
Chromium	mg/kg	0.1	< 2	< 0.1	< 0.1
Cobalt	mg/kg	0.01	75.6	1.07	1.14
Copper	mg/kg	0.1	8610	74.8	102.
Iron	mg/kg	2	60	< 2	< 2
Lead	mg/kg	0.01	< 0.2	< 0.01	< 0.01
Lithium	mg/kg	0.01	10.9	0.09	0.07
Magnesium	mg/kg	1	1590000	38500	37400
Manganese	mg/kg	0.1	< 2	< 0.1	< 0.1
Mercury	mg/kg	0.01	< 0.2	0.16	0.17
Molybdenum	mg/kg	0.01	4.5	0.08	0.08
Nickel	mg/kg	0.1	14	0.1	< 0.1
Potassium	mg/kg	2	4700000	102000	102000
Rubidium	mg/kg	0.01	< 0.2	< 0.01	< 0.01
Selenium	mg/kg	0.1	8	< 0.1	< 0.1
Silver	mg/kg	0.01	42.3	0.29	0.44
Sodium	mg/kg	5	29500	507	514
Strontium	mg/kg	0.1	< 2	< 0.1	< 0.1
Tellurium	mg/kg	0.01	< 0.2	< 0.01	< 0.01
Thallium	mg/kg	0.01	10700	47.0	48.4
Tin	mg/kg	0.01	2360	0.09	0.09
Tungsten	mg/kg	0.01	< 0.2	< 0.01	< 0.01
Uranium	mg/kg	0.01	< 0.2	< 0.01	< 0.01
Vanadium	mg/kg	0.1	163	5.0	5.1
Zinc	mg/kg	0.1	9700	209.	219.

METALS CONT'D

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-025	127275-026	127275-027
Client Sample ID:			M3C3-BT2 Liver	M3C3-BT3 Liver	M3C3-BT4 Liver
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	4.4	72.8	6.8
Antimony	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Arsenic	mg/kg	0.1	4.6	12.4	4.7
Barium	mg/kg	0.1	< 0.2	2.4	0.3
Beryllium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Boron	mg/kg	0.1	< 0.2	1.8	< 0.2
Cadmium	mg/kg	0.001	30.7	132.	29.7
Calcium	mg/kg	5	260	640	470
Chromium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Cobalt	mg/kg	0.01	4.73	9.78	3.62
Copper	mg/kg	0.1	862.	2910	538.
Iron	mg/kg	2	9	20	6
Lead	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Lithium	mg/kg	0.01	0.32	0.99	0.23
Magnesium	mg/kg	1	59400	222000	72000
Manganese	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Mercury	mg/kg	0.01	0.20	0.15	0.10
Molybdenum	mg/kg	0.01	0.19	0.73	0.22
Nickel	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Potassium	mg/kg	2	179000	579000	200000
Rubidium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Selenium	mg/kg	0.1	< 0.2	0.6	< 0.2
Silver	mg/kg	0.01	2.82	5.08	1.78
Sodium	mg/kg	5	1320	3180	1080
Strontium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Thallium	mg/kg	0.01	96.0	338.	137.
Tin	mg/kg	0.01	1.38	< 0.05	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Vanadium	mg/kg	0.1	25.4	43.3	16.4
Zinc	mg/kg	0.1	661.	3340	713.

METALS CONT'D

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-028	127275-029	127275-030
Client Sample ID:			M3C3-BT5 Liver	M3C3-BT6 Liver	M3C3-BT7 Liver
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	2.9	6.4	0.8
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Arsenic	mg/kg	0.1	2.8	3.2	1.7
Barium	mg/kg	0.1	< 0.2	0.2	0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Boron	mg/kg	0.1	< 0.2	0.3	< 0.1
Cadmium	mg/kg	0.001	18.7	15.9	4.89
Calcium	mg/kg	5	210	180	146
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Cobalt	mg/kg	0.01	3.20	2.30	0.95
Copper	mg/kg	0.1	544.	572.	98.2
Iron	mg/kg	2	< 4	10	< 2
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Lithium	mg/kg	0.01	0.39	0.40	0.15
Magnesium	mg/kg	1	60000	59600	38100
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Mercury	mg/kg	0.01	0.13	0.11	0.19
Molybdenum	mg/kg	0.01	0.17	0.16	0.06
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Potassium	mg/kg	2	180000	181000	102000
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Selenium	mg/kg	0.1	0.2	< 0.2	< 0.1
Silver	mg/kg	0.01	3.23	1.93	0.22
Sodium	mg/kg	5	1610	1120	504
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Thallium	mg/kg	0.01	82.1	63.3	47.9
Tin	mg/kg	0.01	0.20	0.10	0.39
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Vanadium	mg/kg	0.1	16.4	15.3	7.3
Zinc	mg/kg	0.1	535.	599.	248.

METALS CONT'D

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-030 Dup	127275-031	127275-032
Client Sample ID:			Lab Duplicate	M3C3-BT8 Liver	M3C3-BT9 Liver
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	0.6	1.4	5.2
Antimony	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Arsenic	mg/kg	0.1	1.4	1.3	5.7
Barium	mg/kg	0.1	< 0.1	0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Bismuth	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Boron	mg/kg	0.1	< 0.1	0.1	0.3
Cadmium	mg/kg	0.001	4.90	8.54	26.1
Calcium	mg/kg	5	137	118	190
Chromium	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Cobalt	mg/kg	0.01	0.84	0.66	3.47
Copper	mg/kg	0.1	178.	117.	732.
Iron	mg/kg	2	< 2	< 2	5
Lead	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Lithium	mg/kg	0.01	0.13	0.14	0.28
Magnesium	mg/kg	1	38200	38200	60600
Manganese	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Mercury	mg/kg	0.01	0.20	0.12	0.18
Molybdenum	mg/kg	0.01	0.07	0.08	0.21
Nickel	mg/kg	0.1	< 0.1	< 0.1	0.2
Potassium	mg/kg	2	100000	98600	176000
Rubidium	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Selenium	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Silver	mg/kg	0.01	0.46	0.54	2.49
Sodium	mg/kg	5	502	543	1330
Strontium	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Thallium	mg/kg	0.01	48.1	41.4	161.
Tin	mg/kg	0.01	0.07	0.10	< 0.02
Tungsten	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Uranium	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Vanadium	mg/kg	0.1	5.0	6.0	17.3
Zinc	mg/kg	0.1	226.	200.	605.

METALS CONT'D

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-033	127275-034	127275-035
Client Sample ID:			M3C3-BT10 Liver	S2A2-BT3 Liver	S2A2-BT4 Liver
Date Sampled:			13-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	8.4	1.7	3.2
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	3.2	2.9	2.7
Barium	mg/kg	0.1	0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	0.04
Bismuth	mg/kg	0.1	< 0.2	< 0.2	3230
Boron	mg/kg	0.1	< 0.2	0.3	1.0
Cadmium	mg/kg	0.001	22.0	14.5	16.5
Calcium	mg/kg	5	260	210	170
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	5.88	0.80	1.64
Copper	mg/kg	0.1	312.	1500	496.
Iron	mg/kg	2	8	6	< 4
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	0.34	0.34	0.28
Magnesium	mg/kg	1	58800	58300	75800
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Mercury	mg/kg	0.01	0.08	0.17	0.18
Molybdenum	mg/kg	0.01	0.18	0.19	0.19
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	178000	158000	196000
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Selenium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Silver	mg/kg	0.01	1.15	2.18	1.28
Sodium	mg/kg	5	1550	1600	980
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	0.04
Thallium	mg/kg	0.01	268.	96.0	202.
Tin	mg/kg	0.01	0.34	< 0.02	3.24
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	0.13	< 0.02	1.03
Vanadium	mg/kg	0.1	22.4	9.2	15.8
Zinc	mg/kg	0.1	457.	900.	453.

METALS CONT'D

Report ID: 127275-IAS
Report Date: 12-Dec-11
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CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-036	127275-037	127275-038
Client Sample ID:			S2A2-BT11 Liver	S2A2-BT13 Liver	S2A2-BT15 Liver
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	15.5	2.7	2.0
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Arsenic	mg/kg	0.1	2.5	3.5	1.7
Barium	mg/kg	0.1	0.9	0.3	0.1
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Bismuth	mg/kg	0.1	< 0.2	< 0.2	41.0
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Cadmium	mg/kg	0.001	21.3	15.0	6.50
Calcium	mg/kg	5	230	260	114
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Cobalt	mg/kg	0.01	1.82	1.28	1.31
Copper	mg/kg	0.1	828.	1140	217.
Iron	mg/kg	2	14	6	5
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Lithium	mg/kg	0.01	0.36	0.40	0.13
Magnesium	mg/kg	1	59700	67300	31200
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Mercury	mg/kg	0.01	0.25	0.16	0.41
Molybdenum	mg/kg	0.01	0.28	0.24	0.17
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Potassium	mg/kg	2	159000	187000	72700
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Selenium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Silver	mg/kg	0.01	2.84	3.36	0.57
Sodium	mg/kg	5	1670	1550	884
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Thallium	mg/kg	0.01	160.	212.	66.9
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Uranium	mg/kg	0.01	< 0.02	< 0.02	0.02
Vanadium	mg/kg	0.1	21.1	12.4	9.6
Zinc	mg/kg	0.1	544.	845.	209.

METALS CONT'D

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-039	127275-040	127275-040 Dup
Client Sample ID:			S2A2-BT22 Liver	S2A2-BT23 Liver	Lab Duplicate
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	11.9	2.7	5.0
Antimony	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Arsenic	mg/kg	0.1	4.0	1.3	3.0
Barium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Bismuth	mg/kg	0.1	< 0.2	78.4	54.1
Boron	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cadmium	mg/kg	0.001	19.6	5.36	9.93
Calcium	mg/kg	5	190	100	170
Chromium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cobalt	mg/kg	0.01	1.42	0.84	1.96
Copper	mg/kg	0.1	416.	182.	281.
Iron	mg/kg	2	5	5	10
Lead	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Lithium	mg/kg	0.01	0.33	0.12	0.31
Magnesium	mg/kg	1	61800	25700	39100
Manganese	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Mercury	mg/kg	0.01	0.17	0.21	0.15
Molybdenum	mg/kg	0.01	0.25	0.12	0.16
Nickel	mg/kg	0.1	0.3	< 0.1	< 0.2
Potassium	mg/kg	2	170000	64000	132000
Rubidium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Selenium	mg/kg	0.1	0.2	< 0.1	< 0.2
Silver	mg/kg	0.01	2.17	0.59	0.96
Sodium	mg/kg	5	1280	772	1600
Strontium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Thallium	mg/kg	0.01	132.	80.4	125.
Tin	mg/kg	0.01	< 0.02	0.20	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Uranium	mg/kg	0.01	< 0.02	0.02	< 0.02
Vanadium	mg/kg	0.1	14.2	17.4	24.8
Zinc	mg/kg	0.1	579.	238.	391.

METALS CONT'D

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-041	127275-042	127275-043
Client Sample ID:			S2A2-BT24 Liver	S2A2-Comp1 Liver	S2A2-Comp2 Liver
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	58.3	20.1	10.7
Antimony	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Arsenic	mg/kg	0.1	13.0	6.5	5.2
Barium	mg/kg	0.1	< 0.5	0.8	0.3
Beryllium	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Cadmium	mg/kg	0.001	58.0	28.7	36.0
Calcium	mg/kg	5	610	280	240
Chromium	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Cobalt	mg/kg	0.01	6.35	2.81	2.30
Copper	mg/kg	0.1	2350	611.	786.
Iron	mg/kg	2	20	8	9
Lead	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Lithium	mg/kg	0.01	1.27	0.46	0.29
Magnesium	mg/kg	1	165000	87100	81100
Manganese	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Mercury	mg/kg	0.01	0.11	0.18	0.15
Molybdenum	mg/kg	0.01	0.75	0.42	0.32
Nickel	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Potassium	mg/kg	2	425000	225000	227000
Rubidium	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Selenium	mg/kg	0.1	0.5	0.3	0.3
Silver	mg/kg	0.01	10.1	2.81	3.64
Sodium	mg/kg	5	3990	1710	1260
Strontium	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.05	0.03	< 0.02
Thallium	mg/kg	0.01	584.	297.	446.
Tin	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.05	6.77	< 0.02
Vanadium	mg/kg	0.1	55.9	21.7	16.5
Zinc	mg/kg	0.1	1660	723.	677.

METALS CONT'D

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
Fax: 506.452.0594
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-044	127275-045	127275-046
Client Sample ID:			S3A3-BT1 Liver	S3A3-BT4 Liver	S3A3-BT5 Liver
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	22.3	10.8	21.3
Antimony	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Arsenic	mg/kg	0.1	2.9	3.0	5.4
Barium	mg/kg	0.1	0.4	0.2	0.2
Beryllium	mg/kg	0.01	0.03	< 0.01	< 0.02
Bismuth	mg/kg	0.1	348.	< 0.1	< 0.2
Boron	mg/kg	0.1	2.1	0.1	0.3
Cadmium	mg/kg	0.001	67.9	42.1	63.8
Calcium	mg/kg	5	270	108	240
Chromium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cobalt	mg/kg	0.01	6.43	3.89	3.86
Copper	mg/kg	0.1	186.	507.	838.
Iron	mg/kg	2	14	9	9
Lead	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Lithium	mg/kg	0.01	0.29	0.09	0.26
Magnesium	mg/kg	1	74800	30800	65100
Manganese	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Mercury	mg/kg	0.01	0.29	0.29	0.15
Molybdenum	mg/kg	0.01	0.41	0.18	0.29
Nickel	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Potassium	mg/kg	2	150000	70500	150000
Rubidium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Selenium	mg/kg	0.1	0.3	0.2	0.3
Silver	mg/kg	0.01	0.78	1.61	3.56
Sodium	mg/kg	5	2130	910	1710
Strontium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Thallium	mg/kg	0.01	513.	299.	332.
Tin	mg/kg	0.01	3.96	< 0.01	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Uranium	mg/kg	0.01	0.29	< 0.01	< 0.02
Vanadium	mg/kg	0.1	39.6	17.1	31.4
Zinc	mg/kg	0.1	371.	317.	653.

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-047	127275-048	127275-049
Client Sample ID:			S3A3-BT8 Liver	S3A3-BT9 Liver	S3A3-BT10 Liver
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	33.4	25.4	3.3
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Arsenic	mg/kg	0.1	6.8	9.6	4.9
Barium	mg/kg	0.1	< 0.2	< 0.2	0.1
Beryllium	mg/kg	0.01	0.11	0.03	< 0.01
Bismuth	mg/kg	0.1	< 0.2	< 0.2	1.5
Boron	mg/kg	0.1	0.3	< 0.2	< 0.1
Cadmium	mg/kg	0.001	163.	80.8	20.1
Calcium	mg/kg	5	270	190	154
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Cobalt	mg/kg	0.01	4.92	15.7	3.31
Copper	mg/kg	0.1	1740	937.	195.
Iron	mg/kg	2	12	11	3
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Lithium	mg/kg	0.01	0.39	0.33	0.09
Magnesium	mg/kg	1	58800	60400	41200
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Mercury	mg/kg	0.01	0.24	0.15	0.16
Molybdenum	mg/kg	0.01	0.26	0.30	0.08
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Potassium	mg/kg	2	141000	150000	94400
Rubidium	mg/kg	0.01	< 0.02	< 0.02	0.01
Selenium	mg/kg	0.1	0.3	0.2	< 0.1
Silver	mg/kg	0.01	4.98	2.02	0.47
Sodium	mg/kg	5	1910	1300	635
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Thallium	mg/kg	0.01	278.	809.	111.
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Vanadium	mg/kg	0.1	134.	35.5	4.3
Zinc	mg/kg	0.1	751.	601.	233.

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-050	127275-051	127275-052
Client Sample ID:			S3A3-BT12 Liver	S3A3-BT23 Liver	S3A3-Comp1 Liver
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	41.7	14.6	13.9
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	9.5	6.8	8.1
Barium	mg/kg	0.1	0.3	< 0.2	< 0.2
Beryllium	mg/kg	0.01	0.09	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	77.4	44.6	42.1
Calcium	mg/kg	5	290	170	320
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	8.81	6.51	6.88
Copper	mg/kg	0.1	1260	682.	821.
Iron	mg/kg	2	9	7	9
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	0.41	0.29	0.25
Magnesium	mg/kg	1	70900	67600	75100
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Mercury	mg/kg	0.01	0.16	0.12	0.14
Molybdenum	mg/kg	0.01	0.27	0.28	0.33
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	165000	187000	198000
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Selenium	mg/kg	0.1	0.3	0.2	0.3
Silver	mg/kg	0.01	4.10	1.77	2.08
Sodium	mg/kg	5	1580	1220	1440
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	396.	377.	435.
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	24.7	8.4	16.6
Zinc	mg/kg	0.1	736.	539.	517.

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-053	127275-054	127275-055
Client Sample ID:			S3A3-Comp2 Liver	W4A17-BT1 Liver	W4A17-BT2 Liver
Date Sampled:			26-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	7.2	3.8	9.0
Antimony	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Arsenic	mg/kg	0.1	8.1	1.6	3.2
Barium	mg/kg	0.1	0.9	0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Boron	mg/kg	0.1	0.5	< 0.1	< 0.2
Cadmium	mg/kg	0.001	45.7	3.25	7.46
Calcium	mg/kg	5	190	124	220
Chromium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cobalt	mg/kg	0.01	5.20	0.99	1.77
Copper	mg/kg	0.1	624.	503.	472.
Iron	mg/kg	2	9	4	5
Lead	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Lithium	mg/kg	0.01	0.29	0.57	0.44
Magnesium	mg/kg	1	66100	31600	90500
Manganese	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Mercury	mg/kg	0.01	0.15	0.22	0.25
Molybdenum	mg/kg	0.01	0.33	0.11	0.15
Nickel	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Potassium	mg/kg	2	180000	82500	240000
Rubidium	mg/kg	0.01	< 0.02	< 0.01	0.03
Selenium	mg/kg	0.1	0.3	< 0.1	< 0.2
Silver	mg/kg	0.01	2.25	2.08	1.90
Sodium	mg/kg	5	1420	727	690
Strontium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Thallium	mg/kg	0.01	510.	63.7	225.
Tin	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Uranium	mg/kg	0.01	< 0.02	0.04	0.04
Vanadium	mg/kg	0.1	11.7	8.4	12.8
Zinc	mg/kg	0.1	443.	345.	584.

METALS CONT'D

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-056	127275-057	127275-058
Client Sample ID:			W4A17-BT6 Liver	W4A17-BT9 Liver	W4A17-BT12 Liver
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	17.8	13.7	20.1
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	2.9	2.3	4.1
Barium	mg/kg	0.1	0.4	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	0.09	0.09
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	0.4
Cadmium	mg/kg	0.001	8.78	7.39	14.9
Calcium	mg/kg	5	190	240	180
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	1.81	8.09	2.88
Copper	mg/kg	0.1	369.	333.	1740
Iron	mg/kg	2	9	9	14
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	0.78	0.91	0.95
Magnesium	mg/kg	1	62700	60600	65700
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Mercury	mg/kg	0.01	0.17	0.11	0.20
Molybdenum	mg/kg	0.01	0.26	0.66	0.25
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	163000	174000	190000
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Selenium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Silver	mg/kg	0.01	1.53	1.31	6.79
Sodium	mg/kg	5	1340	1550	1220
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	54.9	116.	77.7
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.02	0.05	< 0.02
Uranium	mg/kg	0.01	0.03	0.07	0.12
Vanadium	mg/kg	0.1	25.2	180.	33.6
Zinc	mg/kg	0.1	564.	511.	864.

Report ID: 127275-IAS
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CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-059	127275-060	127275-061
Client Sample ID:			W4A17-BT13 Liver	W4A17-BT20 Liver	W4A17-BT23 Liver
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	14.1	9.3	21.6
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Arsenic	mg/kg	0.1	5.7	3.1	5.4
Barium	mg/kg	0.1	< 0.2	< 0.2	2.6
Beryllium	mg/kg	0.01	< 0.02	0.02	< 0.05
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Cadmium	mg/kg	0.001	11.0	6.75	20.8
Calcium	mg/kg	5	180	220	2200
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Cobalt	mg/kg	0.01	2.54	3.95	6.19
Copper	mg/kg	0.1	255.	286.	1590
Iron	mg/kg	2	6	9	20
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Lithium	mg/kg	0.01	0.87	0.92	2.48
Magnesium	mg/kg	1	65700	64300	163000
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Mercury	mg/kg	0.01	0.07	0.22	0.17
Molybdenum	mg/kg	0.01	0.21	0.22	0.60
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Potassium	mg/kg	2	199000	174000	414000
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Selenium	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Silver	mg/kg	0.01	1.27	1.35	6.15
Sodium	mg/kg	5	1350	1530	3730
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Thallium	mg/kg	0.01	76.0	85.1	199.
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Uranium	mg/kg	0.01	< 0.02	0.18	< 0.05
Vanadium	mg/kg	0.1	15.2	24.9	35.0
Zinc	mg/kg	0.1	523.	470.	1210

Report ID: 127275-IAS
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CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-062	127275-062 Dup	127275-063
Client Sample ID:			W4A17-BT24 Liver	Lab Duplicate	W4A17-Comp1 Liver
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	1.9	2.1	3.4
Antimony	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Arsenic	mg/kg	0.1	1.1	1.3	1.3
Barium	mg/kg	0.1	< 0.1	< 0.1	0.2
Beryllium	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Bismuth	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Boron	mg/kg	0.1	< 0.1	< 0.1	0.3
Cadmium	mg/kg	0.001	3.22	3.21	3.22
Calcium	mg/kg	5	112	113	99
Chromium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Cobalt	mg/kg	0.01	0.70	0.64	0.77
Copper	mg/kg	0.1	64.9	62.2	302.
Iron	mg/kg	2	< 2	< 2	3
Lead	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Lithium	mg/kg	0.01	0.28	0.27	0.46
Magnesium	mg/kg	1	37600	35000	34600
Manganese	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Mercury	mg/kg	0.01	0.14	0.14	0.27
Molybdenum	mg/kg	0.01	0.06	0.06	0.11
Nickel	mg/kg	0.1	< 0.1	< 0.1	0.3
Potassium	mg/kg	2	88900	87500	103000
Rubidium	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Selenium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Silver	mg/kg	0.01	0.16	0.15	0.94
Sodium	mg/kg	5	670	633	573
Strontium	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Tellurium	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Thallium	mg/kg	0.01	39.9	40.2	84.3
Tin	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Tungsten	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Uranium	mg/kg	0.01	0.06	0.05	0.04
Vanadium	mg/kg	0.1	5.3	5.4	7.6
Zinc	mg/kg	0.1	239.	242.	266.

Report ID: 127275-IAS
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CERTIFICATE OF ANALYSIS

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Tel: 506.452.1212
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-064	127275-065	127275-066
Client Sample ID:			W4A21-BT1 Liver	W4A21-BT2 Liver	W4A21-BT3 Liver
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	1.9	2.2	7.2
Antimony	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Arsenic	mg/kg	0.1	3.9	2.0	1.9
Barium	mg/kg	0.1	0.2	0.3	0.5
Beryllium	mg/kg	0.01	< 0.01	0.01	< 0.02
Bismuth	mg/kg	0.1	280.	< 0.1	< 0.2
Boron	mg/kg	0.1	0.6	0.3	1.2
Cadmium	mg/kg	0.001	5.47	8.81	15.6
Calcium	mg/kg	5	106	91	220
Chromium	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Cobalt	mg/kg	0.01	2.87	1.09	2.48
Copper	mg/kg	0.1	250.	167.	642.
Iron	mg/kg	2	2	3	6
Lead	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Lithium	mg/kg	0.01	0.18	0.31	0.92
Magnesium	mg/kg	1	33900	32800	64200
Manganese	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Mercury	mg/kg	0.01	0.10	0.11	0.18
Molybdenum	mg/kg	0.01	0.12	0.08	0.21
Nickel	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Potassium	mg/kg	2	96200	90100	196000
Rubidium	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Selenium	mg/kg	0.1	0.2	< 0.1	< 0.2
Silver	mg/kg	0.01	0.92	0.64	4.75
Sodium	mg/kg	5	548	619	1340
Strontium	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Tellurium	mg/kg	0.01	0.01	< 0.01	< 0.02
Thallium	mg/kg	0.01	383.	33.9	72.6
Tin	mg/kg	0.01	0.94	0.16	< 0.02
Tungsten	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Uranium	mg/kg	0.01	0.24	0.02	< 0.02
Vanadium	mg/kg	0.1	8.8	6.1	10.7
Zinc	mg/kg	0.1	304.	247.	663.

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-067	127275-068	127275-069
Client Sample ID:			W4A21-BT4 Liver	W4A21-BT5 Liver	W4A21-BT6 Liver
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	5.7	10.2	5.5
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	4.0	4.4	2.7
Barium	mg/kg	0.1	0.5	0.4	0.9
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	0.3	0.8	1.0
Cadmium	mg/kg	0.001	13.4	19.6	21.6
Calcium	mg/kg	5	150	180	190
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	1.96	2.13	2.48
Copper	mg/kg	0.1	1100	1430	768.
Iron	mg/kg	2	< 4	12	6
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	0.60	0.54	0.63
Magnesium	mg/kg	1	67700	61600	63900
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Mercury	mg/kg	0.01	0.18	0.18	0.17
Molybdenum	mg/kg	0.01	0.17	0.20	0.20
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	184000	177000	182000
Rubidium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Selenium	mg/kg	0.1	< 0.2	0.2	< 0.2
Silver	mg/kg	0.01	3.78	5.91	5.15
Sodium	mg/kg	5	1000	1270	1320
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	93.4	102.	149.
Tin	mg/kg	0.01	< 0.02	1.57	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	0.05	< 0.02
Vanadium	mg/kg	0.1	10.7	17.2	12.8
Zinc	mg/kg	0.1	820.	627.	570.

METALS CONT'D

Report ID: 127275-IAS
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CERTIFICATE OF ANALYSIS

for
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-070	127275-071	127275-072
Client Sample ID:			W4A21-BT9 Liver	W4A21-Comp1 Liver	W4A21-Comp2 Liver
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	4.2	17.8	6.2
Antimony	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Arsenic	mg/kg	0.1	4.1	12.2	2.8
Barium	mg/kg	0.1	0.9	5.6	1.0
Beryllium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Boron	mg/kg	0.1	0.5	13.2	1.3
Cadmium	mg/kg	0.001	20.0	25.3	10.2
Calcium	mg/kg	5	200	510	270
Chromium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Cobalt	mg/kg	0.01	2.72	7.78	3.48
Copper	mg/kg	0.1	370.	990.	337.
Iron	mg/kg	2	7	10	4
Lead	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Lithium	mg/kg	0.01	0.60	3.26	0.90
Magnesium	mg/kg	1	60900	191000	79100
Manganese	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Mercury	mg/kg	0.01	0.12	0.12	0.16
Molybdenum	mg/kg	0.01	0.15	0.54	0.20
Nickel	mg/kg	0.1	< 0.2	1.0	< 0.2
Potassium	mg/kg	2	202000	524000	205000
Rubidium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Selenium	mg/kg	0.1	0.2	< 0.5	< 0.2
Silver	mg/kg	0.01	2.45	4.26	1.48
Sodium	mg/kg	5	1270	3820	1690
Strontium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Tellurium	mg/kg	0.01	< 0.02	0.06	< 0.02
Thallium	mg/kg	0.01	92.2	313.	125.
Tin	mg/kg	0.01	< 0.02	< 0.05	1.65
Tungsten	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Vanadium	mg/kg	0.1	12.0	17.3	11.3
Zinc	mg/kg	0.1	388.	1320	530.

METALS CONT'D

Report ID: 127275-IAS
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CERTIFICATE OF ANALYSIS

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-073	127275-074	127275-075
Client Sample ID:			W4A21-Comp3 Liver	W4A31-BT1 Liver	W4A31-BT2 Liver
Date Sampled:			27-Sep-11	15-Sep-11	15-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	7.3	1.8	7.2
Antimony	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Arsenic	mg/kg	0.1	5.5	6.7	17.7
Barium	mg/kg	0.1	0.7	0.5	0.9
Beryllium	mg/kg	0.01	< 0.02	0.01	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Boron	mg/kg	0.1	0.6	0.2	0.4
Cadmium	mg/kg	0.001	27.9	13.8	40.8
Calcium	mg/kg	5	200	106	210
Chromium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cobalt	mg/kg	0.01	3.45	1.68	3.74
Copper	mg/kg	0.1	374.	149.	717.
Iron	mg/kg	2	7	3	8
Lead	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Lithium	mg/kg	0.01	0.75	0.29	0.67
Magnesium	mg/kg	1	68000	33400	67500
Manganese	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Mercury	mg/kg	0.01	0.11	0.05	0.06
Molybdenum	mg/kg	0.01	0.21	0.10	0.24
Nickel	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Potassium	mg/kg	2	191000	85000	179000
Rubidium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Selenium	mg/kg	0.1	0.2	0.3	0.6
Silver	mg/kg	0.01	1.79	0.57	3.74
Sodium	mg/kg	5	1360	642	1330
Strontium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Thallium	mg/kg	0.01	124.	98.9	228.
Tin	mg/kg	0.01	5.18	< 0.01	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Vanadium	mg/kg	0.1	16.1	7.2	18.2
Zinc	mg/kg	0.1	511.	269.	671.

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
845 Prospect Street
Fredericton, NB E3B 2T7

rpc
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Tel: 506.452.1212
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-076	127275-076 Dup	127275-077
Client Sample ID:			W4A31-BT3 Liver	Lab Duplicate	W4A31-BT6 Liver
Date Sampled:			15-Sep-11	15-Sep-11	15-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	4.2	3.2	3.5
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	16.4	15.4	9.1
Barium	mg/kg	0.1	0.3	0.5	1.1
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	1.1
Cadmium	mg/kg	0.001	34.9	32.0	31.9
Calcium	mg/kg	5	200	230	170
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	5.20	5.54	3.01
Copper	mg/kg	0.1	394.	249.	376.
Iron	mg/kg	2	5	4	8
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	0.46	0.40	0.53
Magnesium	mg/kg	1	78100	78600	69000
Manganese	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Mercury	mg/kg	0.01	0.06	0.05	0.06
Molybdenum	mg/kg	0.01	0.12	0.11	0.25
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	215000	210000	202000
Rubidium	mg/kg	0.01	0.03	0.03	< 0.02
Selenium	mg/kg	0.1	0.4	0.3	0.5
Silver	mg/kg	0.01	2.08	1.14	2.10
Sodium	mg/kg	5	1150	1180	1290
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	194.	184.	168.
Tin	mg/kg	0.01	2.12	3.48	3.16
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	19.1	18.9	15.6
Zinc	mg/kg	0.1	448.	395.	491.

Report ID: 127275-IAS
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-078	127275-079	127275-080
Client Sample ID:			W4A31-BT7 Liver	W4A31-BT8 Liver	W4A31-BT9 Liver
Date Sampled:			15-Sep-11	15-Sep-11	15-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	2.5	11.5	76.0
Antimony	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Arsenic	mg/kg	0.1	7.6	13.3	53.8
Barium	mg/kg	0.1	0.2	0.3	1.8
Beryllium	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Bismuth	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Boron	mg/kg	0.1	0.2	< 0.2	1.7
Cadmium	mg/kg	0.001	19.3	40.2	113.
Calcium	mg/kg	5	72	190	710
Chromium	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Cobalt	mg/kg	0.01	1.79	4.39	11.2
Copper	mg/kg	0.1	188.	542.	1830
Iron	mg/kg	2	3	8	30
Lead	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Lithium	mg/kg	0.01	0.15	0.64	2.39
Magnesium	mg/kg	1	31100	68500	188000
Manganese	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Mercury	mg/kg	0.01	0.05	0.06	0.07
Molybdenum	mg/kg	0.01	0.11	0.24	0.71
Nickel	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Potassium	mg/kg	2	91400	184000	489000
Rubidium	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Selenium	mg/kg	0.1	0.4	0.6	2.2
Silver	mg/kg	0.01	1.20	1.88	8.51
Sodium	mg/kg	5	550	1330	3840
Strontium	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Tellurium	mg/kg	0.01	0.02	< 0.02	< 0.05
Thallium	mg/kg	0.01	146.	173.	335.
Tin	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Tungsten	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Uranium	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Vanadium	mg/kg	0.1	7.5	12.7	80.6
Zinc	mg/kg	0.1	245.	635.	2040

METALS CONT'D

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-081	127275-081 Dup	127275-082
Client Sample ID:			W4A31-BT10 Liver	Lab Duplicate	W4A31-Comp1 Liver
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	4.7	3.7	394
Antimony	mg/kg	0.01	< 0.01	< 0.01	< 0.1
Arsenic	mg/kg	0.1	7.4	6.3	67
Barium	mg/kg	0.1	0.1	0.2	6
Beryllium	mg/kg	0.01	0.03	0.03	< 0.1
Bismuth	mg/kg	0.1	< 0.1	< 0.1	< 1
Boron	mg/kg	0.1	< 0.1	< 0.1	3
Cadmium	mg/kg	0.001	14.8	13.7	117.
Calcium	mg/kg	5	176	167	1640
Chromium	mg/kg	0.1	< 0.1	< 0.1	< 1
Cobalt	mg/kg	0.01	4.14	3.77	22.8
Copper	mg/kg	0.1	75.9	93.3	1700
Iron	mg/kg	2	2	2	< 20
Lead	mg/kg	0.01	< 0.01	< 0.01	< 0.1
Lithium	mg/kg	0.01	0.13	0.15	5.2
Magnesium	mg/kg	1	39600	40400	400000
Manganese	mg/kg	0.1	< 0.1	< 0.1	< 1
Mercury	mg/kg	0.01	0.09	0.09	< 0.1
Molybdenum	mg/kg	0.01	0.05	0.05	1.2
Nickel	mg/kg	0.1	< 0.1	< 0.1	< 1
Potassium	mg/kg	2	105000	106000	1050000
Rubidium	mg/kg	0.01	< 0.01	< 0.01	< 0.1
Selenium	mg/kg	0.1	0.2	0.2	3
Silver	mg/kg	0.01	0.26	0.35	9.1
Sodium	mg/kg	5	548	539	7240
Strontium	mg/kg	0.1	< 0.1	< 0.1	< 1
Tellurium	mg/kg	0.01	< 0.01	< 0.01	< 0.1
Thallium	mg/kg	0.01	146.	152.	1370
Tin	mg/kg	0.01	< 0.01	< 0.01	< 0.1
Tungsten	mg/kg	0.01	< 0.01	< 0.01	< 0.1
Uranium	mg/kg	0.01	0.01	< 0.01	< 0.1
Vanadium	mg/kg	0.1	10.9	10.9	69
Zinc	mg/kg	0.1	216.	200.	3790

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General Report Comments

The samples were homogenized and portions were prepared by Microwave Assisted Digestion in nitric acid.
The resulting solutions were analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.

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Project #: 121810356
Location: Sisson Project

QA/QC Report

RPC Sample ID:			CRM000628	CRM000629	CRM000630
Type:			CRM DORM-3	CRM DORM-3	CRM DORM-3
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1350	1340	1340
Antimony	mg/kg	0.005	0.012	< 0.005	< 0.005
Arsenic	mg/kg	0.05	5.89	6.11	6.16
Barium	mg/kg	0.05	5.17	5.06	5.18
Beryllium	mg/kg	0.005	0.019	0.016	0.016
Bismuth	mg/kg	0.05	0.11	0.06	< 0.05
Boron	mg/kg	0.05	9.00	8.98	8.81
Cadmium	mg/kg	0.0005	0.282	0.285	0.283
Calcium	mg/kg	2	2130	2170	2160
Chromium	mg/kg	0.05	1.79	1.75	1.86
Cobalt	mg/kg	0.005	0.241	0.251	0.254
Copper	mg/kg	0.05	14.6	14.7	14.8
Iron	mg/kg	1	328	318	323
Lead	mg/kg	0.005	0.449	0.410	0.407
Lithium	mg/kg	0.005	1.20	1.19	1.16
Magnesium	mg/kg	0.5	878.	869.	852.
Manganese	mg/kg	0.05	2.92	2.89	2.90
Mercury	mg/kg	0.01	0.26	0.35	0.36
Molybdenum	mg/kg	0.005	0.297	0.280	0.281
Nickel	mg/kg	0.05	1.22	1.23	1.24
Potassium	mg/kg	1	12800	12800	12800
Rubidium	mg/kg	0.005	5.81	5.80	5.88
Selenium	mg/kg	0.05	3.12	3.28	3.27
Silver	mg/kg	0.005	0.015	0.021	0.021
Sodium	mg/kg	2	13700	13500	13400
Strontium	mg/kg	0.05	9.21	9.19	9.28
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.013	0.011	0.011
Tin	mg/kg	0.005	0.078	0.081	0.078
Tungsten	mg/kg	0.005	0.066	0.061	0.061
Uranium	mg/kg	0.005	0.065	0.063	0.058
Vanadium	mg/kg	0.05	1.59	1.57	1.59
Zinc	mg/kg	0.05	44.3	46.0	46.9

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Project #: 121810356
Location: Sisson Project

QA/QC Report

RPC Sample ID:			CRM000635	CRM000636	CRM000637
Type:			CRM DORM-3	CRM DORM-3	CRM DORM-3
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1310	1280	1580
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	5.80	5.70	6.98
Barium	mg/kg	0.05	5.43	5.28	6.46
Beryllium	mg/kg	0.005	0.013	0.015	0.017
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	8.89	8.87	10.9
Cadmium	mg/kg	0.0005	0.288	0.282	0.341
Calcium	mg/kg	2	2180	2220	2780
Chromium	mg/kg	0.05	1.73	1.77	2.18
Cobalt	mg/kg	0.005	0.248	0.249	0.305
Copper	mg/kg	0.05	14.5	14.5	18.2
Iron	mg/kg	1	333	324	401
Lead	mg/kg	0.005	0.833	0.421	0.527
Lithium	mg/kg	0.005	1.17	1.14	1.41
Magnesium	mg/kg	0.5	908.	902.	1080
Manganese	mg/kg	0.05	3.43	3.01	3.54
Mercury	mg/kg	0.01	0.37	0.38	0.45
Molybdenum	mg/kg	0.005	0.282	0.278	0.358
Nickel	mg/kg	0.05	1.18	1.26	1.52
Potassium	mg/kg	1	12900	13000	16100
Rubidium	mg/kg	0.005	5.91	5.97	7.43
Selenium	mg/kg	0.05	3.11	3.07	3.55
Silver	mg/kg	0.005	0.018	0.018	0.024
Sodium	mg/kg	2	13900	13900	17200
Strontium	mg/kg	0.05	9.53	9.57	12.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.011	0.013
Tin	mg/kg	0.005	0.061	0.069	0.074
Tungsten	mg/kg	0.005	0.063	0.074	0.091
Uranium	mg/kg	0.005	0.059	0.057	0.073
Vanadium	mg/kg	0.05	1.51	1.51	1.88
Zinc	mg/kg	0.05	49.1	41.0	49.9

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Project #: 121810356
Location: Sisson Project

QA/QC Report

RPC Sample ID:			CRM000642	CRM000643	CRM000644
Type:			CRM DORM-3	CRM DORM-3	CRM DORM-3
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1280	1260	1240
Antimony	mg/kg	0.005	0.012	0.010	0.006
Arsenic	mg/kg	0.05	6.15	6.15	5.94
Barium	mg/kg	0.05	5.27	5.10	6.42
Beryllium	mg/kg	0.005	0.013	0.015	0.012
Bismuth	mg/kg	0.05	0.11	0.05	< 0.05
Boron	mg/kg	0.05	8.78	8.76	8.67
Cadmium	mg/kg	0.0005	0.291	0.294	0.289
Calcium	mg/kg	2	2190	2150	2170
Chromium	mg/kg	0.05	1.82	1.81	1.78
Cobalt	mg/kg	0.005	0.248	0.259	0.240
Copper	mg/kg	0.05	15.1	15.0	15.0
Iron	mg/kg	1	356	315	319
Lead	mg/kg	0.005	0.349	0.300	0.313
Lithium	mg/kg	0.005	1.16	1.10	1.11
Magnesium	mg/kg	0.5	873.	869.	850.
Manganese	mg/kg	0.05	3.09	2.87	2.94
Mercury	mg/kg	0.01	0.38	0.36	0.37
Molybdenum	mg/kg	0.005	0.301	0.301	0.294
Nickel	mg/kg	0.05	1.22	1.30	1.22
Potassium	mg/kg	1	13100	13000	12900
Rubidium	mg/kg	0.005	5.96	5.96	5.91
Selenium	mg/kg	0.05	3.33	3.36	3.20
Silver	mg/kg	0.005	0.021	0.023	0.022
Sodium	mg/kg	2	13800	13700	13600
Strontium	mg/kg	0.05	9.63	9.53	9.64
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.010	0.010
Tin	mg/kg	0.005	0.091	0.075	0.069
Tungsten	mg/kg	0.005	0.061	0.066	0.067
Uranium	mg/kg	0.005	0.055	0.055	0.052
Vanadium	mg/kg	0.05	1.47	1.46	1.45
Zinc	mg/kg	0.05	45.9	45.6	44.8

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Project #: 121810356
Location: Sisson Project

QA/QC Report

RPC Sample ID:			CRM000649	CRM000650	CRM000651
Type:			CRM DOLT-3	CRM DOLT-3	CRM DOLT-3
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	27.1	24.5	22.8
Antimony	mg/kg	0.005	0.02	0.02	0.02
Arsenic	mg/kg	0.05	8.7	7.3	7.6
Barium	mg/kg	0.05	0.2	0.2	0.2
Beryllium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Bismuth	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Boron	mg/kg	0.05	0.7	0.7	0.7
Cadmium	mg/kg	0.0005	17.9	16.1	16.4
Calcium	mg/kg	2	526	537	539
Chromium	mg/kg	0.05	3.4	2.9	2.9
Cobalt	mg/kg	0.005	0.30	0.30	0.29
Copper	mg/kg	0.05	31.3	30.9	30.8
Iron	mg/kg	1	1420	1450	1430
Lead	mg/kg	0.005	0.30	0.32	0.27
Lithium	mg/kg	0.005	0.04	0.04	0.04
Magnesium	mg/kg	0.5	1170	1210	1200
Manganese	mg/kg	0.05	10.0	10.1	10.2
Mercury	mg/kg	0.01	3.20	3.23	3.02
Molybdenum	mg/kg	0.005	3.85	3.67	3.65
Nickel	mg/kg	0.05	3.5	2.6	2.6
Potassium	mg/kg	1	10700	10900	10800
Rubidium	mg/kg	0.005	3.52	3.57	3.58
Selenium	mg/kg	0.05	6.2	4.8	5.0
Silver	mg/kg	0.005	1.17	1.18	1.16
Sodium	mg/kg	2	8520	8800	8630
Strontium	mg/kg	0.05	4.0	4.0	4.1
Tellurium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Thallium	mg/kg	0.005	0.01	0.01	0.01
Tin	mg/kg	0.005	0.50	0.50	0.48
Tungsten	mg/kg	0.005	0.14	0.21	0.12
Uranium	mg/kg	0.005	0.05	0.05	0.05
Vanadium	mg/kg	0.05	0.3	0.4	0.3
Zinc	mg/kg	0.05	83.0	68.1	70.3

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Project #: 121810356
Location: Sisson Project

QA/QC Report

RPC Sample ID:			RB002076	RB002077	RB002078
Type:			Blank	Blank	Blank
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.05	0.06	< 0.05
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Barium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	< 0.0005	< 0.0005	< 0.0005
Calcium	mg/kg	2	< 2	< 2	< 2
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Copper	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Iron	mg/kg	1	< 1	< 1	< 1
Lead	mg/kg	0.005	< 0.005	0.007	< 0.005
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	< 0.5	< 0.5	< 0.5
Manganese	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Mercury	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	< 1	< 1	< 1
Rubidium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Selenium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	< 2	< 2	< 2
Strontium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	< 0.05	< 0.05	< 0.05

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
845 Prospect Street
Fredericton, NB E3B 2T7

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Project #: 121810356
Location: Sisson Project

QA/QC Report

RPC Sample ID:			RB002089	RB002090	RB002091
Type:			Blank	Blank	Blank
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.07	0.05	0.11
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Barium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	< 0.0005	< 0.0005	< 0.0005
Calcium	mg/kg	2	< 2	< 2	< 2
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Copper	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Iron	mg/kg	1	< 1	< 1	< 1
Lead	mg/kg	0.005	< 0.005	< 0.005	0.005
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	< 0.5	< 0.5	< 0.5
Manganese	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Mercury	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	< 1	< 1	< 1
Rubidium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Selenium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	< 2	< 2	< 2
Strontium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tin	mg/kg	0.005	< 0.005	< 0.005	0.006
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	< 0.05	< 0.05	< 0.05

Report ID: 127275-IAS
Report Date: 12-Dec-11
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for
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Project #: 121810356
Location: Sisson Project

QA/QC Report

RPC Sample ID:			RB002098	RB002099	RB002100
Type:			Blank	Blank	Blank
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Antimony	mg/kg	0.005	0.006	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Barium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	< 0.0005	< 0.0005	< 0.0005
Calcium	mg/kg	2	< 2	< 2	< 2
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Copper	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Iron	mg/kg	1	< 1	< 1	< 1
Lead	mg/kg	0.005	0.023	< 0.005	< 0.005
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	< 0.5	< 0.5	< 0.5
Manganese	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Mercury	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	< 1	< 1	< 1
Rubidium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Selenium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	< 2	< 2	< 2
Strontium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	< 0.05	< 0.05	< 0.05

Report ID: 127275-IAS
Report Date: 12-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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Fredericton, NB E3B 2T7

rpc
921 College Hill Rd
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Project #: 121810356
Location: Sisson Project

QA/QC Report

RPC Sample ID:			RB002109	RB002110	RB002111
Type:			Blank	Blank	Blank
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	< 0.05	< 0.1	< 0.1
Antimony	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Arsenic	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Barium	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Beryllium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Bismuth	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Boron	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Cadmium	mg/kg	0.0005	< 0.001	< 0.001	< 0.001
Calcium	mg/kg	2	< 5	< 5	< 5
Chromium	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Cobalt	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Copper	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Iron	mg/kg	1	< 2	< 2	< 2
Lead	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Lithium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Magnesium	mg/kg	0.5	< 1	< 1	< 1
Manganese	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Mercury	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Molybdenum	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Nickel	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Potassium	mg/kg	1	< 2	< 2	< 2
Rubidium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Selenium	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Silver	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Sodium	mg/kg	2	< 5	< 5	< 5
Strontium	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Tellurium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Thallium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Tin	mg/kg	0.005	0.01	< 0.01	0.04
Tungsten	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Uranium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Vanadium	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Zinc	mg/kg	0.05	0.3	< 0.1	< 0.1

Report ID: 127275-IAS
Report Date: 20-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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845 Prospect Street
Fredericton, NB E3B 2T7

rpc
921 College Hill Rd
Fredericton NB
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-001	B2A2-BT1; Liver	8-Sep-11	0.3240
127275-002	B2A2-BT3; Liver	8-Sep-11	0.3494
127275-003	B2A2-BT4; Liver	8-Sep-11	0.1390
127275-004	B2A2-BT5; Liver	8-Sep-11	0.2436
127275-005	BEA2-BT6; Liver	8-Sep-11	0.1092
127275-006	B2A2-BT8; Liver	8-Sep-11	0.0737
127275-007	B2A2-BT16; Liver	8-Sep-11	0.1052
127275-008	B2A2-BT18; Liver	8-Sep-11	0.1278
127275-009	B2A2-Comp.1; Liver	8-Sep-11	0.1047
127275-010	B2A2-Comp.2; Liver	8-Sep-11	0.0946
127275-011	B3A9-BT1; Liver	14-Sep-11	0.4391
127275-012	B3A9-BT2; Liver	14-Sep-11	0.0794
127275-013	B3A9-BT4; Liver	14-Sep-11	0.0774
127275-014	B3A9-BT5; Liver	14-Sep-11	0.0928
127275-015	B3A9-BT7; Liver	14-Sep-11	0.4736
127275-016	B3A9-BT9; Liver	14-Sep-11	0.3902
127275-017	B3A9-BT13; Liver	14-Sep-11	0.1454
127275-018	B3A9-BT14; Liver	14-Sep-11	0.3656
127275-019	B3A9-Comp1; Liver	14-Sep-11	0.0757
127275-020	B3A9-Comp2; Liver	14-Sep-11	0.0259

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 127275-IAS
Report Date: 20-Dec-11
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-021	EBNB1-BT1; Liver	19-Sep-11	0.1526
127275-022	EBNB1-BT2; Liver	19-Sep-11	0.1071
127275-023	EBNB1-BT3; Liver	19-Sep-11	0.0112
127275-024	M3C3-BT1; Liver	13-Sep-11	0.7222
127275-025	M3C3-BT2; Liver	13-Sep-11	0.1441
127275-026	M3C3-BT3; Liver	13-Sep-11	0.0419
127275-027	M3C3-BT4; Liver	13-Sep-11	0.0857
127275-028	M3C3-BT5; Liver	13-Sep-11	0.1176
127275-029	M3C3-BT6; Liver	13-Sep-11	0.2065
127275-030	M3C3-BT7; Liver	13-Sep-11	0.7723
127275-031	M3C3-BT8; Liver	13-Sep-11	0.3840
127275-032	M3C3-BT9; Liver	13-Sep-11	0.2115
127275-033	M3C3-BT10; Liver	13-Sep-11	0.1138
127275-034	S2A2-BT3; Liver	12-Sep-11	0.2217
127275-035	S2A2-BT4; Liver	12-Sep-11	0.2364
127275-036	S2A2-BT11; Liver	12-Sep-11	0.2441
127275-037	S2A2-BT13; Liver	12-Sep-11	0.0952
127275-038	S2A2-BT15; Liver	12-Sep-11	0.1808
127275-039	S2A2-BT22; Liver	12-Sep-11	0.0884
127275-040	S2A2-BT23; Liver	12-Sep-11	0.5752

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-041	S2A2-BT24; Liver	12-Sep-11	0.0439
127275-042	S2A2-Comp1; Liver	12-Sep-11	0.0741
127275-043	S2A2-Comp2; Liver	12-Sep-11	0.1016
127275-044	S3A3-BT1; Liver	26-Sep-11	0.2756
127275-045	S3A3-BT4; Liver	26-Sep-11	0.1691
127275-046	S3A3-BT5; Liver	26-Sep-11	0.1263
127275-047	S3A3-BT8; Liver	26-Sep-11	0.1162
127275-048	S3A3-BT9; Liver	26-Sep-11	0.0991
127275-049	S3A3-BT10; Liver	26-Sep-11	0.3463
127275-050	S3A3-BT12; Liver	26-Sep-11	0.0878
127275-051	S3A3-BT23; Liver	26-Sep-11	0.0746
127275-052	S3A3-Comp1; Liver	26-Sep-11	0.0727
127275-053	S3A3-Comp2; Liver	26-Sep-11	0.1215
127275-054	W4A17-BT1; Liver	29-Sep-11	0.1707
127275-055	W4A17-BT2; Liver	29-Sep-11	0.2456
127275-056	W4A17-BT6; Liver	29-Sep-11	0.1160
127275-057	W4A17-BT9; Liver	29-Sep-11	0.0904
127275-058	W4A17-BT12; Liver	29-Sep-11	0.0908
127275-059	W4A17-BT13; Liver	29-Sep-11	0.0739
127275-060	W4A17-BT20; Liver	29-Sep-11	0.1417

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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-061	W4A17-BT23; Liver	29-Sep-11	0.0558
127275-062	W4A17-BT24; Liver	29-Sep-11	0.6507
127275-063	W4A17-Comp1; Liver	29-Sep-11	0.1613
127275-064	W4A21-BT1; Liver	27-Sep-11	0.1905
127275-065	W4A21-BT2; Liver	27-Sep-11	0.1544
127275-066	W4A21-BT3; Liver	27-Sep-11	0.0717
127275-067	W4A21-BT4; Liver	27-Sep-11	0.2231
127275-068	W4A21-BT5; Liver	27-Sep-11	0.1445
127275-069	W4A21-BT6; Liver	27-Sep-11	0.0932
127275-070	W4A21-BT9; Liver	27-Sep-11	0.0916
127275-071	W4A21-Comp1; Liver	27-Sep-11	0.0368
127275-072	W4A21-Comp2; Liver	27-Sep-11	0.0767
127275-073	W4A21-Comp3; Liver	27-Sep-11	0.1053
127275-074	W4A31-BT1; Liver	15-Sep-11	0.1616
127275-075	W4A31-BT2; Liver	15-Sep-11	0.0784
127275-076	W4A31-BT3; Liver	15-Sep-11	0.4504
127275-077	W4A31-BT6; Liver	15-Sep-11	0.0903
127275-078	W4A31-BT7; Liver	15-Sep-11	0.1820
127275-079	W4A31-BT8; Liver	15-Sep-11	0.1043
127275-080	W4A31-BT9; Liver	15-Sep-11	0.0610

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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-081	W4A31-BT10; Liver	28-Sep-11	1.2
127275-082	W4A31-Comp1; Liver	28-Sep-11	0.0277
127275-083	B2A2-BT1; Carcass	8-Sep-11	27.8
127275-084	B2A2-BT3; Carcass	8-Sep-11	26.0
127275-085	B2A2-BT4; Carcass	8-Sep-11	10.3
127275-086	B2A2-BT5; Carcass	8-Sep-11	6.99
127275-087	BEA2-BT6; Carcass	8-Sep-11	8.55
127275-088	B2A2-BT8; Carcass	8-Sep-11	7.08
127275-089	B2A2-BT16; Carcass	8-Sep-11	12.6
127275-090	B2A2-BT18; Carcass	8-Sep-11	4.86
127275-091	B2A2-Comp.1; Carcass	8-Sep-11	11.0
127275-092	B2A2-Comp.2; Carcass	8-Sep-11	8.75
127275-093	B3A9-BT1; Carcass	14-Sep-11	16.7
127275-094	B3A9-BT2; Carcass	14-Sep-11	8.08
127275-095	B3A9-BT4; Carcass	14-Sep-11	9.6
127275-096	B3A9-BT5; Carcass	14-Sep-11	5.88
127275-097	B3A9-BT7; Carcass	14-Sep-11	20.3
127275-098	B3A9-BT9; Carcass	14-Sep-11	33.4
127275-099	B3A9-BT13; Carcass	14-Sep-11	10.1
127275-100	B3A9-BT14; Carcass	14-Sep-11	10.9

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Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-101	B3A9-Comp1; Carcass	14-Sep-11	8.93
127275-102	B3A9-Comp2; Carcass	14-Sep-11	8.58
127275-103	EBNB1-BT1; Carcass	19-Sep-11	15.1
127275-104	EBNB1-BT2; Carcass	19-Sep-11	11.0
127275-105	EBNB1-BT3; Carcass	19-Sep-11	1.92
127275-106	M3C3-BT1; Carcass	13-Sep-11	28.9
127275-107	M3C3-BT2; Carcass	13-Sep-11	13.6
127275-108	M3C3-BT3; Carcass	13-Sep-11	5.87
127275-109	M3C3-BT4; Carcass	13-Sep-11	9.81
127275-110	M3C3-BT5; Carcass	13-Sep-11	9.17
127275-111	M3C3-BT6; Carcass	13-Sep-11	11.5
127275-112	M3C3-BT7; Carcass	13-Sep-11	26.8
127275-113	M3C3-BT8; Carcass	13-Sep-11	12.5
127275-114	M3C3-BT9; Carcass	13-Sep-11	19.1
127275-115	M3C3-BT10; Carcass	13-Sep-11	10.3
127275-116	S2A2-BT3; Carcass	12-Sep-11	12.7
127275-117	S2A2-BT4; Carcass	12-Sep-11	12.8
127275-118	S2A2-BT11; Carcass	12-Sep-11	23.1
127275-119	S2A2-BT13; Carcass	12-Sep-11	8.58
127275-120	S2A2-BT15; Carcass	12-Sep-11	28.0

Report ID: 127275-IAS
Report Date: 20-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
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Fredericton, NB E3B 2T7

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921 College Hill Rd
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-121	S2A2-BT22; Carcass	12-Sep-11	8.05
127275-122	S2A2-BT23; Carcass	12-Sep-11	41.6
127275-123	S2A2-BT24; Carcass	12-Sep-11	6.77
127275-124	S2A2-Comp1; Carcass	12-Sep-11	7.97
127275-125	S2A2-Comp2; Carcass	12-Sep-11	9.19
127275-126	S3A3-BT1; Carcass	26-Sep-11	25.2
127275-127	S3A3-BT4; Carcass	26-Sep-11	15.8
127275-128	S3A3-BT5; Carcass	26-Sep-11	16.9
127275-129	S3A3-BT8; Carcass	26-Sep-11	10.3
127275-130	S3A3-BT9; Carcass	26-Sep-11	7.31
127275-131	S3A3-BT10; Carcass	26-Sep-11	9.00
127275-132	S3A3-BT12; Carcass	26-Sep-11	7.67
127275-133	S3A3-BT23; Carcass	26-Sep-11	5.98
127275-134	S3A3-Comp1; Carcass	26-Sep-11	6.92
127275-135	S3A3-Comp2; Carcass	26-Sep-11	10.0
127275-136	W4A17-BT1; Carcass	29-Sep-11	18.1
127275-137	W4A17-BT2; Carcass	29-Sep-11	10.7
127275-138	W4A17-BT6; Carcass	29-Sep-11	11.8
127275-139	W4A17-BT9; Carcass	29-Sep-11	6.57
127275-140	W4A17-BT12; Carcass	29-Sep-11	9.35

Report ID: 127275-IAS
Report Date: 20-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
845 Prospect Street
Fredericton, NB E3B 2T7

rpc
921 College Hill Rd
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-141	W4A17-BT13; Carcass	29-Sep-11	6.23
127275-142	W4A17-BT20; Carcass	29-Sep-11	13.5
127275-143	W4A17-BT23; Carcass	29-Sep-11	7.24
127275-144	W4A17-BT24; Carcass	29-Sep-11	25.1
127275-145	W4A17-Comp1; Carcass	29-Sep-11	11.2
127275-146	W4A21-BT1; Carcass	27-Sep-11	19.2
127275-147	W4A21-BT2; Carcass	27-Sep-11	10.6
127275-148	W4A21-BT3; Carcass	27-Sep-11	6.69
127275-149	W4A21-BT4; Carcass	27-Sep-11	18.0
127275-150	W4A21-BT5; Carcass	27-Sep-11	13.3
127275-151	W4A21-BT6; Carcass	27-Sep-11	5.84
127275-152	W4A21-BT9; Carcass	27-Sep-11	7.18
127275-153	W4A21-Comp1; Carcass	27-Sep-11	4.13
127275-154	W4A21-Comp2; Carcass	27-Sep-11	5.66
127275-155	W4A21-Comp3; Carcass	27-Sep-11	10.4
127275-156	W4A31-BT1; Carcass	15-Sep-11	16.0
127275-157	W4A31-BT2; Carcass	15-Sep-11	8.21
127275-158	W4A31-BT3; Carcass	15-Sep-11	24.4
127275-159	W4A31-BT6; Carcass	28-Sep-11	8.73
127275-160	W4A31-BT7; Carcass	28-Sep-11	15.6

Report ID: 127275-IAS
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-161	W4A31-BT8; Carcass	28-Sep-11	9.39
127275-162	W4A31-BT9; Carcass	28-Sep-11	9.03
127275-163	W4A31-BT10; Carcass	28-Sep-11	38.6
127275-164	W4A31-Comp1; Carcass	28-Sep-11	3.26
127275-165	B2A2-BT1; Viscera	8-Sep-11	9.1
127275-166	B2A2-BT3; Viscera	8-Sep-11	5.99
127275-167	B2A2-BT4; Viscera	8-Sep-11	4.87
127275-168	B2A2-BT5; Viscera	8-Sep-11	2.97
127275-169	BEA2-BT6; Viscera	8-Sep-11	2.8
127275-170	B2A2-BT8; Viscera	8-Sep-11	2.4
127275-171	B2A2-BT16; Viscera	8-Sep-11	5.4
127275-172	B2A2-BT18; Viscera	8-Sep-11	2.2
127275-173	B2A2-Comp.1; Viscera	8-Sep-11	5.48
127275-174	B2A2-Comp.2; Viscera	8-Sep-11	4.01
127275-175	B3A9-BT1; Viscera	14-Sep-11	5.54
127275-176	B3A9-BT2; Viscera	14-Sep-11	2.86
127275-177	B3A9-BT4; Viscera	14-Sep-11	4.46
127275-178	B3A9-BT5; Viscera	14-Sep-11	3.12
127275-179	B3A9-BT7; Viscera	14-Sep-11	6.12
127275-180	B3A9-BT9; Viscera	14-Sep-11	11.0

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CERTIFICATE OF ANALYSIS

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Tel: 506.452.1212
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-181	B3A9-BT13; Viscera	14-Sep-11	5.76
127275-182	B3A9-BT14; Viscera	14-Sep-11	5.82
127275-183	B3A9-Comp1; Viscera	14-Sep-11	5.33
127275-184	B3A9-Comp2; Viscera	14-Sep-11	4.71
127275-185	EBNB1-BT1; Viscera	19-Sep-11	6.56
127275-186	EBNB1-BT2; Viscera	19-Sep-11	5.2
127275-187	EBNB1-BT3; Viscera	19-Sep-11	1.05
127275-188	M3C3-BT1; Viscera	13-Sep-11	8.02
127275-189	M3C3-BT2; Viscera	13-Sep-11	6.43
127275-190	M3C3-BT3; Viscera	13-Sep-11	2.87
127275-191	M3C3-BT4; Viscera	13-Sep-11	4.25
127275-192	M3C3-BT5; Viscera	13-Sep-11	4.64
127275-193	M3C3-BT6; Viscera	13-Sep-11	5.86
127275-194	M3C3-BT7; Viscera	13-Sep-11	10.2
127275-195	M3C3-BT8; Viscera	13-Sep-11	5.2
127275-196	M3C3-BT9; Viscera	13-Sep-11	9.7
127275-197	M3C3-BT10; Viscera	13-Sep-11	5.25
127275-198	S2A2-BT3; Viscera	12-Sep-11	4.71
127275-199	S2A2-BT4; Viscera	12-Sep-11	5.33
127275-200	S2A2-BT11; Viscera	12-Sep-11	10.0

Report ID: 127275-IAS
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Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-201	S2A2-BT13; Viscera	12-Sep-11	3.81
127275-202	S2A2-BT15; Viscera	12-Sep-11	12.4
127275-203	S2A2-BT22; Viscera	12-Sep-11	3.33
127275-204	S2A2-BT23; Viscera	12-Sep-11	15.5
127275-205	S2A2-BT24; Viscera	12-Sep-11	2.91
127275-206	S2A2-Comp1; Viscera	12-Sep-11	3.84
127275-207	S2A2-Comp2; Viscera	12-Sep-11	4.31
127275-208	S3A3-BT1; Viscera	26-Sep-11	14.5
127275-209	S3A3-BT4; Viscera	26-Sep-11	7.08
127275-210	S3A3-BT5; Viscera	26-Sep-11	8.9
127275-211	S3A3-BT8; Viscera	26-Sep-11	5.78
127275-212	S3A3-BT9; Viscera	26-Sep-11	4.06
127275-213	S3A3-BT10; Viscera	26-Sep-11	4.67
127275-214	S3A3-BT12; Viscera	26-Sep-11	4.08
127275-215	S3A3-BT23; Viscera	26-Sep-11	3.29
127275-216	S3A3-Comp1; Viscera	26-Sep-11	3.6
127275-217	S3A3-Comp2; Viscera	26-Sep-11	5.81
127275-218	W4A17-BT1; Viscera	29-Sep-11	9.38
127275-219	W4A17-BT2; Viscera	29-Sep-11	6.2
127275-220	W4A17-BT6; Viscera	29-Sep-11	6.92

Report ID: 127275-IAS
Report Date: 20-Dec-11
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-221	W4A17-BT9; Viscera	29-Sep-11	3.94
127275-222	W4A17-BT12; Viscera	29-Sep-11	5.86
127275-223	W4A17-BT13; Viscera	29-Sep-11	3.11
127275-224	W4A17-BT20; Viscera	29-Sep-11	6.47
127275-225	W4A17-BT23; Viscera	29-Sep-11	4.13
127275-226	W4A17-BT24; Viscera	29-Sep-11	9.34
127275-227	W4A17-Comp1; Viscera	29-Sep-11	7.14
127275-228	W4A21-BT1; Viscera	27-Sep-11	10.2
127275-229	W4A21-BT2; Viscera	27-Sep-11	5.85
127275-230	W4A21-BT3; Viscera	27-Sep-11	3.49
127275-231	W4A21-BT4; Viscera	27-Sep-11	11.3
127275-232	W4A21-BT5; Viscera	27-Sep-11	7.18
127275-233	W4A21-BT6; Viscera	27-Sep-11	3.87
127275-234	W4A21-BT9; Viscera	27-Sep-11	3.83
127275-235	W4A21-Comp1; Viscera	27-Sep-11	2.26
127275-236	W4A21-Comp2; Viscera	27-Sep-11	3.98
127275-237	W4A21-Comp3; Viscera	27-Sep-11	5.62
127275-238	W4A31-BT1; Viscera	15-Sep-11	6.27
127275-239	W4A31-BT2; Viscera	15-Sep-11	4.72
127275-240	W4A31-BT3; Viscera	15-Sep-11	10.6

Report ID: 127275-IAS
Report Date: 20-Dec-11
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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

Analytes:			Total Weight
Units:			g
RL:			0.0001
RPC Sample ID	**Client Sample ID**	**Date Sampled**	
127275-241	W4A31-BT6; Viscera	28-Sep-11	4.77
127275-242	W4A31-BT7; Viscera	28-Sep-11	7.37
127275-243	W4A31-BT8; Viscera	28-Sep-11	4.48
127275-244	W4A31-BT9; Viscera	28-Sep-11	2.53
127275-245	W4A31-BT10; Viscera	28-Sep-11	16.1
127275-246	W4A31-Comp1; Viscera	28-Sep-11	1.86

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-083	127275-084	127275-085
Client Sample ID:			B2A2-BT1 Carcass	B2A2-BT3 Carcass	B2A2-BT4 Carcass
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.39	1.03	7.82
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.06	< 0.05	0.19
Barium	mg/kg	0.05	0.25	0.29	0.70
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0114	0.0020	0.0102
Calcium	mg/kg	2	4140	3070	7230
Chromium	mg/kg	0.05	0.10	0.15	< 0.05
Cobalt	mg/kg	0.005	0.022	0.026	0.056
Copper	mg/kg	0.05	0.38	0.43	0.39
Iron	mg/kg	1	6	8	10
Lead	mg/kg	0.005	0.023	0.018	0.035
Lithium	mg/kg	0.005	0.011	0.006	0.020
Magnesium	mg/kg	0.5	310.	295.	356.
Manganese	mg/kg	0.05	3.31	1.32	9.81
Mercury	mg/kg	0.01	0.15	0.15	0.13
Molybdenum	mg/kg	0.005	0.008	0.006	0.007
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4210	4080	4010
Rubidium	mg/kg	0.005	10.6	6.89	11.4
Selenium	mg/kg	0.05	0.28	0.21	0.38
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	609	661	746
Strontium	mg/kg	0.05	7.30	5.17	14.0
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.008	< 0.005	0.010
Tin	mg/kg	0.005	0.019	0.016	0.007
Tungsten	mg/kg	0.005	< 0.005	< 0.005	0.010
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	11.6	14.8	13.2

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-086	127275-087	127275-088
Client Sample ID:			B2A2-BT5 Carcass	BEA2-BT6 Carcass	B2A2-BT8 Carcass
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.13	2.40	1.39
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.007
Arsenic	mg/kg	0.05	0.30	0.20	0.13
Barium	mg/kg	0.05	0.52	0.54	0.48
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0047	0.0067	0.0065
Calcium	mg/kg	2	4840	5450	3380
Chromium	mg/kg	0.05	< 0.05	0.10	< 0.05
Cobalt	mg/kg	0.005	0.061	0.074	0.040
Copper	mg/kg	0.05	0.36	0.46	0.35
Iron	mg/kg	1	5	7	5
Lead	mg/kg	0.005	0.028	0.028	0.014
Lithium	mg/kg	0.005	0.008	0.009	0.008
Magnesium	mg/kg	0.5	337.	360.	313.
Manganese	mg/kg	0.05	5.55	8.34	3.54
Mercury	mg/kg	0.01	0.16	0.12	0.27
Molybdenum	mg/kg	0.005	0.007	0.008	0.007
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4240	3900	3890
Rubidium	mg/kg	0.005	11.2	8.87	7.37
Selenium	mg/kg	0.05	0.42	0.38	0.26
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	730	727	673
Strontium	mg/kg	0.05	9.68	10.1	9.10
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.010	0.011
Tin	mg/kg	0.005	0.007	0.007	0.017
Tungsten	mg/kg	0.005	0.012	0.007	0.006
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.1	22.0	14.3

Report ID: 127275-IAS Rev01
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-089	127275-090	127275-091
Client Sample ID:			B2A2-BT16 Carcass	B2A2-BT18 Carcass	B2A2-Comp.1 Carcass
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.39	0.56	0.76
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	0.20	0.20
Barium	mg/kg	0.05	0.41	0.33	0.47
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0026	0.0076	0.0075
Calcium	mg/kg	2	5120	2950	4400
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.017	0.040	0.035
Copper	mg/kg	0.05	0.39	0.37	0.39
Iron	mg/kg	1	5	4	5
Lead	mg/kg	0.005	0.012	0.020	0.019
Lithium	mg/kg	0.005	0.006	< 0.005	0.007
Magnesium	mg/kg	0.5	349.	313.	352.
Manganese	mg/kg	0.05	1.39	2.22	3.52
Mercury	mg/kg	0.01	0.21	0.15	0.13
Molybdenum	mg/kg	0.005	0.008	0.005	0.006
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4210	4060	3910
Rubidium	mg/kg	0.005	5.50	8.31	7.50
Selenium	mg/kg	0.05	0.15	0.39	0.46
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	606	565	681
Strontium	mg/kg	0.05	9.93	6.66	9.78
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.006	0.008	0.010
Tin	mg/kg	0.005	0.007	0.010	0.013
Tungsten	mg/kg	0.005	< 0.005	0.012	0.008
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	18.1	13.5	17.4

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-091 Dup	127275-092	127275-093
Client Sample ID:			Lab Duplicate	B2A2-Comp.2 Carcass	B3A9-BT1 Carcass
Date Sampled:			8-Sep-11	8-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.80	0.91	0.88
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.20	0.24	0.08
Barium	mg/kg	0.05	0.35	0.46	0.26
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0078	0.0067	0.0194
Calcium	mg/kg	2	3130	3870	4680
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.037	0.052	0.032
Copper	mg/kg	0.05	0.41	0.42	0.40
Iron	mg/kg	1	5	5	6
Lead	mg/kg	0.005	0.014	0.019	0.026
Lithium	mg/kg	0.005	0.006	0.007	0.008
Magnesium	mg/kg	0.5	319.	338.	318.
Manganese	mg/kg	0.05	2.25	3.31	2.87
Mercury	mg/kg	0.01	0.13	0.12	0.22
Molybdenum	mg/kg	0.005	0.006	0.006	0.007
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4020	4050	4020
Rubidium	mg/kg	0.005	7.64	9.48	13.6
Selenium	mg/kg	0.05	0.43	0.38	0.33
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	671	687	734
Strontium	mg/kg	0.05	6.89	8.85	7.87
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.009	0.006
Tin	mg/kg	0.005	0.008	0.017	0.008
Tungsten	mg/kg	0.005	0.007	0.008	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	15.7	15.9	15.1

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-094	127275-095	127275-096
Client Sample ID:			B3A9-BT2 Carcass	B3A9-BT4 Carcass	B3A9-BT5 Carcass
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.56	0.65	0.61
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.11	0.10	0.09
Barium	mg/kg	0.05	0.25	0.29	0.21
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0124	0.0129	0.0114
Calcium	mg/kg	2	3500	4590	3290
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.035	0.027	0.018
Copper	mg/kg	0.05	0.32	0.31	0.30
Iron	mg/kg	1	5	5	6
Lead	mg/kg	0.005	0.015	0.014	0.006
Lithium	mg/kg	0.005	0.006	0.007	0.005
Magnesium	mg/kg	0.5	329.	323.	332.
Manganese	mg/kg	0.05	2.42	2.31	1.37
Mercury	mg/kg	0.01	0.13	0.16	0.12
Molybdenum	mg/kg	0.005	0.005	0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4100	4090	4090
Rubidium	mg/kg	0.005	13.0	12.0	11.8
Selenium	mg/kg	0.05	0.31	0.32	0.26
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	635	657	636
Strontium	mg/kg	0.05	6.19	8.14	5.92
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.010	0.008
Tin	mg/kg	0.005	< 0.005	0.006	0.006
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	14.1	18.1	17.1

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-097	127275-098	127275-099
Client Sample ID:			B3A9-BT7 Carcass	B3A9-BT9 Carcass	B3A9-BT13 Carcass
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.46	0.43	0.41
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.017
Arsenic	mg/kg	0.05	0.40	0.10	0.11
Barium	mg/kg	0.05	0.41	0.13	0.32
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.28
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0085	0.0150	0.0161
Calcium	mg/kg	2	4540	1810	4740
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.046	0.049	0.028
Copper	mg/kg	0.05	0.39	0.38	0.32
Iron	mg/kg	1	6	4	4
Lead	mg/kg	0.005	0.006	0.021	0.017
Lithium	mg/kg	0.005	0.007	< 0.005	0.007
Magnesium	mg/kg	0.5	347.	284.	360.
Manganese	mg/kg	0.05	4.92	1.44	2.62
Mercury	mg/kg	0.01	0.09	0.15	0.15
Molybdenum	mg/kg	0.005	0.005	< 0.005	0.013
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4080	4070	4160
Rubidium	mg/kg	0.005	12.2	12.5	12.1
Selenium	mg/kg	0.05	0.55	0.29	0.30
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	645	583	623
Strontium	mg/kg	0.05	6.24	3.13	9.17
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.010	0.010
Tin	mg/kg	0.005	0.007	0.008	0.012
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.7	11.3	14.3

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-100	127275-101	127275-101 Dup
Client Sample ID:			B3A9-BT14 Carcass	B3A9-Comp1 Carcass	Lab Duplicate
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.52	0.68	0.81
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.11	0.12	0.12
Barium	mg/kg	0.05	0.28	0.27	0.24
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0132	0.0199	0.0210
Calcium	mg/kg	2	5580	4260	3950
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.038	0.018	0.020
Copper	mg/kg	0.05	0.30	0.30	0.33
Iron	mg/kg	1	3	4	4
Lead	mg/kg	0.005	0.030	0.015	0.011
Lithium	mg/kg	0.005	0.006	0.005	0.005
Magnesium	mg/kg	0.5	348.	337.	341.
Manganese	mg/kg	0.05	2.55	1.90	1.80
Mercury	mg/kg	0.01	0.20	0.15	0.13
Molybdenum	mg/kg	0.005	0.007	0.006	0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4060	3840	3890
Rubidium	mg/kg	0.005	12.5	9.54	9.69
Selenium	mg/kg	0.05	0.30	0.30	0.32
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	627	641	651
Strontium	mg/kg	0.05	9.15	7.79	7.28
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.009	0.009
Tin	mg/kg	0.005	0.005	0.006	0.011
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	14.6	18.8	19.4

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-102	127275-103	127275-104
Client Sample ID:			B3A9-Comp2 Carcass	EBNB1-BT1 Carcass	EBNB1-BT2 Carcass
Date Sampled:			14-Sep-11	19-Sep-11	19-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.57	0.76	1.09
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.09	0.51	0.41
Barium	mg/kg	0.05	0.43	0.51	0.31
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0139	0.0085	0.0071
Calcium	mg/kg	2	4410	4070	2890
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.027	0.044	0.043
Copper	mg/kg	0.05	0.29	0.29	0.32
Iron	mg/kg	1	4	5	5
Lead	mg/kg	0.005	0.011	0.008	< 0.005
Lithium	mg/kg	0.005	0.007	< 0.005	< 0.005
Magnesium	mg/kg	0.5	318.	345.	308.
Manganese	mg/kg	0.05	1.51	6.11	4.59
Mercury	mg/kg	0.01	0.15	0.05	0.05
Molybdenum	mg/kg	0.005	0.006	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3810	4130	4100
Rubidium	mg/kg	0.005	11.1	10.5	10.8
Selenium	mg/kg	0.05	0.28	0.99	0.84
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	638	551	573
Strontium	mg/kg	0.05	8.03	5.63	3.72
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.031	0.026
Tin	mg/kg	0.005	0.010	0.009	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	19.7	11.6	14.0

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-105	127275-106	127275-107
Client Sample ID:			EBNB1-BT3 Carcass	M3C3-BT1 Carcass	M3C3-BT2 Carcass
Date Sampled:			19-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.25	0.54	0.69
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.24	0.09	0.07
Barium	mg/kg	0.05	0.29	0.30	0.21
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0054	0.0034	0.0188
Calcium	mg/kg	2	2900	4370	3300
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.038	0.028	0.040
Copper	mg/kg	0.05	0.30	0.33	0.27
Iron	mg/kg	1	4	5	5
Lead	mg/kg	0.005	< 0.005	0.018	0.012
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	318.	345.	290.
Manganese	mg/kg	0.05	4.31	4.22	1.83
Mercury	mg/kg	0.01	0.04	0.13	0.12
Molybdenum	mg/kg	0.005	< 0.005	0.020	0.007
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4200	4200	3870
Rubidium	mg/kg	0.005	9.35	13.1	10.8
Selenium	mg/kg	0.05	0.55	0.29	0.22
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	529	562	650
Strontium	mg/kg	0.05	3.97	10.5	5.37
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.021	0.008	0.011
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	0.033	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	16.5	13.6	14.4

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-108	127275-109	127275-110
Client Sample ID:			M3C3-BT3 Carcass	M3C3-BT4 Carcass	M3C3-BT5 Carcass
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.79	0.65	0.48
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.09	0.06	< 0.05
Barium	mg/kg	0.05	0.32	0.41	0.16
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0214	0.0135	0.0085
Calcium	mg/kg	2	3910	5480	2800
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.041	0.041	0.024
Copper	mg/kg	0.05	0.29	0.29	0.46
Iron	mg/kg	1	4	4	3
Lead	mg/kg	0.005	0.011	0.022	0.046
Lithium	mg/kg	0.005	0.006	0.007	< 0.005
Magnesium	mg/kg	0.5	331.	354.	296.
Manganese	mg/kg	0.05	1.89	2.70	4.74
Mercury	mg/kg	0.01	0.07	0.06	0.10
Molybdenum	mg/kg	0.005	0.006	0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3970	3930	4070
Rubidium	mg/kg	0.005	9.04	10.3	7.14
Selenium	mg/kg	0.05	0.23	0.21	0.31
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	541	655	590
Strontium	mg/kg	0.05	6.72	10.4	3.55
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.013	0.005
Tin	mg/kg	0.005	< 0.005	0.007	0.018
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	18.1	17.9	11.9

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-111	127275-111 Dup	127275-112
Client Sample ID:			M3C3-BT6 Carcass	Lab Duplicate	M3C3-BT7 Carcass
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.50	0.53	0.29
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.017
Arsenic	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Barium	mg/kg	0.05	0.23	0.19	0.32
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.20
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0062	0.0067	0.0053
Calcium	mg/kg	2	4520	3010	5980
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.014	0.014	0.022
Copper	mg/kg	0.05	0.34	0.32	0.37
Iron	mg/kg	1	5	4	5
Lead	mg/kg	0.005	0.036	0.021	0.026
Lithium	mg/kg	0.005	0.007	0.005	0.006
Magnesium	mg/kg	0.5	315.	294.	355.
Manganese	mg/kg	0.05	2.25	1.61	4.39
Mercury	mg/kg	0.01	0.08	0.08	0.16
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	0.020
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4030	3880	3800
Rubidium	mg/kg	0.005	8.83	8.70	9.67
Selenium	mg/kg	0.05	0.17	0.18	0.18
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	717	671	614
Strontium	mg/kg	0.05	6.17	4.17	14.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.007	0.006	0.008
Tin	mg/kg	0.005	< 0.005	0.005	0.019
Tungsten	mg/kg	0.005	< 0.005	< 0.005	0.052
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	12.8	12.3	15.6

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-113	127275-114	127275-115
Client Sample ID:			M3C3-BT8 Carcass	M3C3-BT9 Carcass	M3C3-BT10 Carcass
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.37	0.21	0.51
Antimony	mg/kg	0.005	0.006	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.05	0.05	0.07
Barium	mg/kg	0.05	0.19	0.12	0.24
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0135	0.0126	0.0150
Calcium	mg/kg	2	3860	1920	2500
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.018	0.033	0.050
Copper	mg/kg	0.05	0.38	0.35	0.33
Iron	mg/kg	1	3	4	4
Lead	mg/kg	0.005	0.013	0.010	0.027
Lithium	mg/kg	0.005	0.006	< 0.005	0.006
Magnesium	mg/kg	0.5	332.	284.	268.
Manganese	mg/kg	0.05	5.07	2.44	2.22
Mercury	mg/kg	0.01	0.11	0.13	0.09
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4000	3970	3930
Rubidium	mg/kg	0.005	9.72	9.33	8.79
Selenium	mg/kg	0.05	0.28	0.26	0.26
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	535	554	728
Strontium	mg/kg	0.05	5.70	3.14	4.32
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.007	0.008	0.012
Tin	mg/kg	0.005	0.009	< 0.005	0.006
Tungsten	mg/kg	0.005	0.006	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	14.6	10.1	12.0

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-116	127275-117	127275-118
Client Sample ID:			S2A2-BT3 Carcass	S2A2-BT4 Carcass	S2A2-BT11 Carcass
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.47	0.39	0.48
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	0.06	0.06
Barium	mg/kg	0.05	0.43	0.31	0.28
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0077	0.0095	0.0075
Calcium	mg/kg	2	4930	4540	4290
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.007	0.015	0.015
Copper	mg/kg	0.05	0.45	0.34	0.48
Iron	mg/kg	1	6	5	5
Lead	mg/kg	0.005	0.010	0.010	0.019
Lithium	mg/kg	0.005	0.006	0.006	< 0.005
Magnesium	mg/kg	0.5	347.	312.	316.
Manganese	mg/kg	0.05	2.12	2.64	2.60
Mercury	mg/kg	0.01	0.09	0.17	0.16
Molybdenum	mg/kg	0.005	0.007	0.013	0.006
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4030	4030	3930
Rubidium	mg/kg	0.005	14.7	11.2	12.9
Selenium	mg/kg	0.05	0.22	0.25	0.29
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	678	677	675
Strontium	mg/kg	0.05	15.5	11.7	9.82
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.008	0.013	0.009
Tin	mg/kg	0.005	< 0.005	0.005	< 0.005
Tungsten	mg/kg	0.005	0.024	0.048	0.033
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	14.2	12.2	10.4

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-119	127275-120	127275-121
Client Sample ID:			S2A2-BT13 Carcass	S2A2-BT15 Carcass	S2A2-BT22 Carcass
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.33	0.42	0.24
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.06	0.05	0.08
Barium	mg/kg	0.05	0.55	0.33	0.19
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0045	0.0080	0.0052
Calcium	mg/kg	2	3940	5040	2910
Chromium	mg/kg	0.05	< 0.05	0.05	< 0.05
Cobalt	mg/kg	0.005	0.009	0.024	0.013
Copper	mg/kg	0.05	0.31	0.48	0.32
Iron	mg/kg	1	3	6	3
Lead	mg/kg	0.005	0.006	0.009	< 0.005
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	340.	341.	349.
Manganese	mg/kg	0.05	1.81	3.76	1.93
Mercury	mg/kg	0.01	0.10	0.19	0.12
Molybdenum	mg/kg	0.005	0.007	0.012	0.008
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3880	4050	4000
Rubidium	mg/kg	0.005	11.2	12.0	13.4
Selenium	mg/kg	0.05	0.24	0.20	0.30
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	550	644	573
Strontium	mg/kg	0.05	12.2	12.3	7.62
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.009	0.009
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	0.035	0.066	0.031
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.0	11.6	13.1

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-121 Dup	127275-122	127275-123
Client Sample ID:			Lab Duplicate	S2A2-BT23 Carcass	S2A2-BT24 Carcass
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.25	0.24	0.30
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.006
Arsenic	mg/kg	0.05	0.09	< 0.05	0.11
Barium	mg/kg	0.05	0.29	0.25	0.30
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0053	0.0072	0.0094
Calcium	mg/kg	2	5170	3050	4080
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.012	0.014	0.025
Copper	mg/kg	0.05	0.32	0.51	0.31
Iron	mg/kg	1	3	5	4
Lead	mg/kg	0.005	0.007	0.009	0.009
Lithium	mg/kg	0.005	< 0.005	< 0.005	0.005
Magnesium	mg/kg	0.5	358.	290.	299.
Manganese	mg/kg	0.05	3.06	1.99	3.81
Mercury	mg/kg	0.01	0.13	0.14	0.09
Molybdenum	mg/kg	0.005	0.011	0.007	0.020
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3990	4000	3740
Rubidium	mg/kg	0.005	13.3	9.77	12.2
Selenium	mg/kg	0.05	0.32	0.17	0.31
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	611	665	602
Strontium	mg/kg	0.05	13.3	6.83	10.4
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.008	0.013
Tin	mg/kg	0.005	0.007	< 0.005	0.008
Tungsten	mg/kg	0.005	0.061	0.029	0.066
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.5	10.9	12.8

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-124	127275-125	127275-126
Client Sample ID:			S2A2-Comp1 Carcass	S2A2-Comp2 Carcass	S3A3-BT1 Carcass
Date Sampled:			12-Sep-11	12-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.76	0.40	0.84
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.08	0.12	0.11
Barium	mg/kg	0.05	0.29	0.34	0.29
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0114	0.0101	0.0224
Calcium	mg/kg	2	5160	5040	3440
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.025	0.022	0.063
Copper	mg/kg	0.05	0.40	0.35	0.52
Iron	mg/kg	1	5	4	5
Lead	mg/kg	0.005	0.008	0.032	0.014
Lithium	mg/kg	0.005	0.006	0.006	< 0.005
Magnesium	mg/kg	0.5	347.	338.	280.
Manganese	mg/kg	0.05	2.52	2.97	4.03
Mercury	mg/kg	0.01	0.11	0.10	0.13
Molybdenum	mg/kg	0.005	0.026	0.010	0.006
Nickel	mg/kg	0.05	< 0.05	< 0.05	0.06
Potassium	mg/kg	1	3900	3850	4000
Rubidium	mg/kg	0.005	9.13	11.9	16.2
Selenium	mg/kg	0.05	0.34	0.35	0.34
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	634	606	665
Strontium	mg/kg	0.05	11.0	11.9	7.77
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.012	0.011	0.022
Tin	mg/kg	0.005	0.009	0.005	0.006
Tungsten	mg/kg	0.005	0.071	0.056	0.048
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	14.9	14.7	10.3

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-127	127275-128	127275-129
Client Sample ID:			S3A3-BT4 Carcass	S3A3-BT5 Carcass	S3A3-BT8 Carcass
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.04	1.38	0.74
Antimony	mg/kg	0.005	0.007	0.006	< 0.005
Arsenic	mg/kg	0.05	0.16	0.13	0.20
Barium	mg/kg	0.05	0.28	0.50	0.29
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0291	0.0238	0.0248
Calcium	mg/kg	2	5100	5390	5190
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.080	0.043	0.040
Copper	mg/kg	0.05	0.46	0.55	0.46
Iron	mg/kg	1	6	7	6
Lead	mg/kg	0.005	0.011	0.016	0.019
Lithium	mg/kg	0.005	0.005	0.005	0.007
Magnesium	mg/kg	0.5	340.	348.	306.
Manganese	mg/kg	0.05	3.10	5.18	4.10
Mercury	mg/kg	0.01	0.17	0.11	0.19
Molybdenum	mg/kg	0.005	0.010	0.007	0.010
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4030	3780	3710
Rubidium	mg/kg	0.005	16.3	13.0	15.4
Selenium	mg/kg	0.05	0.38	0.36	0.40
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	659	689	846
Strontium	mg/kg	0.05	10.2	12.6	9.49
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.025	0.015	0.022
Tin	mg/kg	0.005	< 0.005	0.031	0.010
Tungsten	mg/kg	0.005	0.079	0.061	0.124
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	12.3	13.6	10.9

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-130	127275-131	127275-131 Dup
Client Sample ID:			S3A3-BT9 Carcass	S3A3-BT10 Carcass	Lab Duplicate
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.35	0.82	0.96
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.22	0.24	0.23
Barium	mg/kg	0.05	0.20	0.17	0.21
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0244	0.0134	0.0156
Calcium	mg/kg	2	3540	2950	4150
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.157	0.057	0.062
Copper	mg/kg	0.05	0.35	0.36	0.41
Iron	mg/kg	1	5	4	5
Lead	mg/kg	0.005	0.024	0.014	0.011
Lithium	mg/kg	0.005	0.007	< 0.005	< 0.005
Magnesium	mg/kg	0.5	328.	306.	309.
Manganese	mg/kg	0.05	2.97	1.90	2.64
Mercury	mg/kg	0.01	0.12	0.15	0.14
Molybdenum	mg/kg	0.005	0.020	0.010	0.013
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3810	4020	3880
Rubidium	mg/kg	0.005	17.3	15.1	14.6
Selenium	mg/kg	0.05	0.35	0.37	0.35
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	600	628	641
Strontium	mg/kg	0.05	6.66	5.46	7.58
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.048	0.015	0.016
Tin	mg/kg	0.005	0.016	0.014	0.017
Tungsten	mg/kg	0.005	0.064	0.031	0.042
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	12.3	13.4	13.0

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-132	127275-133	127275-134
Client Sample ID:			S3A3-BT12 Carcass	S3A3-BT23 Carcass	S3A3-Comp1 Carcass
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.97	0.38	0.77
Antimony	mg/kg	0.005	0.019	0.005	< 0.005
Arsenic	mg/kg	0.05	0.22	0.16	0.19
Barium	mg/kg	0.05	0.22	0.20	0.20
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	0.20	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0188	0.0247	0.0233
Calcium	mg/kg	2	3400	3700	2880
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.085	0.060	0.068
Copper	mg/kg	0.05	0.35	0.39	0.36
Iron	mg/kg	1	4	5	5
Lead	mg/kg	0.005	0.011	0.013	0.012
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	305.	320.	312.
Manganese	mg/kg	0.05	4.02	2.75	1.74
Mercury	mg/kg	0.01	0.13	0.11	0.12
Molybdenum	mg/kg	0.005	0.018	0.009	0.009
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3870	3900	3820
Rubidium	mg/kg	0.005	16.3	13.5	14.3
Selenium	mg/kg	0.05	0.32	0.32	0.32
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	560	604	644
Strontium	mg/kg	0.05	6.99	7.56	5.65
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.027	0.019	0.019
Tin	mg/kg	0.005	0.018	< 0.005	0.008
Tungsten	mg/kg	0.005	0.045	0.031	0.028
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.0	12.6	14.5

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-135	127275-136	127275-137
Client Sample ID:			S3A3-Comp2 Carcass	W4A17-BT1 Carcass	W4A17-BT2 Carcass
Date Sampled:			26-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.35	0.39	0.70
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.23	< 0.05	< 0.05
Barium	mg/kg	0.05	0.29	0.21	0.26
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0193	0.0025	0.0026
Calcium	mg/kg	2	4500	3920	4780
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.054	0.016	0.033
Copper	mg/kg	0.05	0.32	0.31	0.32
Iron	mg/kg	1	5	4	4
Lead	mg/kg	0.005	0.020	0.021	0.049
Lithium	mg/kg	0.005	0.006	0.015	0.014
Magnesium	mg/kg	0.5	366.	332.	337.
Manganese	mg/kg	0.05	3.19	1.65	2.97
Mercury	mg/kg	0.01	0.10	0.15	0.22
Molybdenum	mg/kg	0.005	0.017	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	3830	4040	3970
Rubidium	mg/kg	0.005	14.6	15.3	14.9
Selenium	mg/kg	0.05	0.37	0.21	0.21
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	665	597	634
Strontium	mg/kg	0.05	9.07	5.88	8.18
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.023	0.008	0.007
Tin	mg/kg	0.005	0.457	0.008	0.008
Tungsten	mg/kg	0.005	0.042	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	13.6	11.9	15.6

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-138	127275-139	127275-140
Client Sample ID:			W4A17-BT6 Carcass	W4A17-BT9 Carcass	W4A17-BT12 Carcass
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.33	0.45	4.17
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Barium	mg/kg	0.05	0.21	0.28	0.29
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0018	0.0026	0.0024
Calcium	mg/kg	2	3160	4290	3620
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.016	0.043	0.031
Copper	mg/kg	0.05	0.26	0.26	0.27
Iron	mg/kg	1	3	5	6
Lead	mg/kg	0.005	0.013	0.032	0.064
Lithium	mg/kg	0.005	0.012	0.013	0.021
Magnesium	mg/kg	0.5	317.	328.	338.
Manganese	mg/kg	0.05	1.82	3.16	4.58
Mercury	mg/kg	0.01	0.14	0.12	0.14
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4080	4000	4120
Rubidium	mg/kg	0.005	17.3	13.4	16.1
Selenium	mg/kg	0.05	0.18	0.16	0.21
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	552	573	588
Strontium	mg/kg	0.05	6.23	7.97	6.78
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.007	0.014	0.010
Tin	mg/kg	0.005	0.007	0.006	0.006
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	10.4	14.2	16.1

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-141	127275-141 Dup	127275-142
Client Sample ID:			W4A17-BT13 Carcass	Lab Duplicate	W4A17-BT20 Carcass
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	5.19	0.71	0.43
Antimony	mg/kg	0.005	< 0.005	0.007	< 0.005
Arsenic	mg/kg	0.05	0.08	0.11	< 0.05
Barium	mg/kg	0.05	0.32	0.41	0.17
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0021	0.0022	0.0024
Calcium	mg/kg	2	3380	4340	3330
Chromium	mg/kg	0.05	0.08	0.05	< 0.05
Cobalt	mg/kg	0.005	0.032	0.032	0.029
Copper	mg/kg	0.05	0.35	0.29	0.28
Iron	mg/kg	1	8	5	4
Lead	mg/kg	0.005	0.096	0.083	< 0.005
Lithium	mg/kg	0.005	0.025	0.009	0.012
Magnesium	mg/kg	0.5	331.	350.	320.
Manganese	mg/kg	0.05	2.07	2.65	1.32
Mercury	mg/kg	0.01	0.10	0.10	0.18
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4150	4150	4110
Rubidium	mg/kg	0.005	10.6	10.8	15.7
Selenium	mg/kg	0.05	0.30	0.36	0.20
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	640	657	547
Strontium	mg/kg	0.05	8.49	11.0	5.37
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.010	0.010
Tin	mg/kg	0.005	0.011	0.014	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	17.9	19.1	14.5

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-143	127275-144	127275-145
Client Sample ID:			W4A17-BT23 Carcass	W4A17-BT24 Carcass	W4A17-Comp1 Carcass
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.47	0.42	0.41
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	0.09	< 0.05
Barium	mg/kg	0.05	0.32	0.24	0.27
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0045	0.0023	0.0022
Calcium	mg/kg	2	5240	4960	4160
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.030	0.010	0.016
Copper	mg/kg	0.05	0.38	0.40	0.37
Iron	mg/kg	1	4	5	4
Lead	mg/kg	0.005	< 0.005	< 0.005	0.008
Lithium	mg/kg	0.005	0.015	0.011	0.017
Magnesium	mg/kg	0.5	357.	322.	334.
Manganese	mg/kg	0.05	2.14	1.69	1.97
Mercury	mg/kg	0.01	0.14	0.15	0.17
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4180	4110	4150
Rubidium	mg/kg	0.005	17.4	17.7	13.5
Selenium	mg/kg	0.05	0.17	0.20	0.21
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	589	616	627
Strontium	mg/kg	0.05	10.4	7.61	6.83
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.006	0.009
Tin	mg/kg	0.005	< 0.005	0.005	0.006
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	15.6	14.4	17.1

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-146	127275-147	127275-148
Client Sample ID:			W4A21-BT1 Carcass	W4A21-BT2 Carcass	W4A21-BT3 Carcass
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	13.2	0.67	0.65
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.34	0.45	0.06
Barium	mg/kg	0.05	0.59	0.63	0.21
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0162	0.0071	0.0053
Calcium	mg/kg	2	5140	5500	3260
Chromium	mg/kg	0.05	0.08	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.076	0.026	0.017
Copper	mg/kg	0.05	0.51	0.44	0.39
Iron	mg/kg	1	63	6	4
Lead	mg/kg	0.005	0.040	0.016	< 0.005
Lithium	mg/kg	0.005	0.022	0.013	0.012
Magnesium	mg/kg	0.5	342.	356.	322.
Manganese	mg/kg	0.05	5.57	3.13	1.58
Mercury	mg/kg	0.01	0.11	0.08	0.13
Molybdenum	mg/kg	0.005	0.010	< 0.005	< 0.005
Nickel	mg/kg	0.05	0.06	< 0.05	< 0.05
Potassium	mg/kg	1	3770	4100	4040
Rubidium	mg/kg	0.005	11.1	10.7	15.8
Selenium	mg/kg	0.05	0.49	0.37	0.21
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	549	514	563
Strontium	mg/kg	0.05	7.40	9.92	6.29
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.025	0.009	0.008
Tin	mg/kg	0.005	0.013	0.011	0.006
Tungsten	mg/kg	0.005	0.012	< 0.005	< 0.005
Uranium	mg/kg	0.005	0.007	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	19.1	15.5	11.9

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-149	127275-150	127275-151
Client Sample ID:			W4A21-BT4 Carcass	W4A21-BT5 Carcass	W4A21-BT6 Carcass
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.28	0.62	0.67
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.024
Arsenic	mg/kg	0.05	0.14	0.11	0.13
Barium	mg/kg	0.05	0.36	0.19	0.40
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.39
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0040	0.0050	0.0133
Calcium	mg/kg	2	3160	3480	5600
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.017	0.020	0.035
Copper	mg/kg	0.05	0.43	0.44	0.36
Iron	mg/kg	1	4	8	5
Lead	mg/kg	0.005	< 0.005	0.010	0.005
Lithium	mg/kg	0.005	0.010	0.010	0.010
Magnesium	mg/kg	0.5	306.	338.	384.
Manganese	mg/kg	0.05	1.64	1.25	3.30
Mercury	mg/kg	0.01	0.13	0.13	0.16
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	0.020
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4200	4140	4320
Rubidium	mg/kg	0.005	11.9	15.4	13.5
Selenium	mg/kg	0.05	0.27	0.27	0.27
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	483	589	636
Strontium	mg/kg	0.05	6.12	5.56	10.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.005	0.007	0.013
Tin	mg/kg	0.005	< 0.005	< 0.005	0.015
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	12.0	16.6	23.5

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-151 Dup	127275-152	127275-153
Client Sample ID:			Lab Duplicate	W4A21-BT9 Carcass	W4A21-Comp1 Carcass
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.61	0.54	0.40
Antimony	mg/kg	0.005	0.007	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.12	0.34	0.06
Barium	mg/kg	0.05	0.29	0.28	0.34
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0113	0.0087	0.0064
Calcium	mg/kg	2	4390	3970	4450
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.031	0.031	0.032
Copper	mg/kg	0.05	0.42	0.37	0.41
Iron	mg/kg	1	5	4	5
Lead	mg/kg	0.005	< 0.005	0.010	< 0.005
Lithium	mg/kg	0.005	0.009	0.010	0.015
Magnesium	mg/kg	0.5	337.	332.	354.
Manganese	mg/kg	0.05	2.24	2.63	1.82
Mercury	mg/kg	0.01	0.15	0.16	0.08
Molybdenum	mg/kg	0.005	0.008	0.006	0.006
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4160	4180	4020
Rubidium	mg/kg	0.005	12.6	14.8	16.0
Selenium	mg/kg	0.05	0.27	0.35	0.23
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	594	601	637
Strontium	mg/kg	0.05	8.08	6.66	8.53
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.009	0.009
Tin	mg/kg	0.005	0.005	0.009	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	19.5	16.0	20.4

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-154	127275-155	127275-156
Client Sample ID:			W4A21-Comp2 Carcass	W4A21-Comp3 Carcass	W4A31-BT1 Carcass
Date Sampled:			27-Sep-11	27-Sep-11	15-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.55	0.75	0.35
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.09	0.22	1.32
Barium	mg/kg	0.05	0.42	0.52	0.43
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0089	0.0115	0.0120
Calcium	mg/kg	2	5270	4700	2530
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.037	0.031	0.028
Copper	mg/kg	0.05	0.39	0.48	0.40
Iron	mg/kg	1	5	5	5
Lead	mg/kg	0.005	< 0.005	0.008	0.019
Lithium	mg/kg	0.005	0.013	0.012	0.006
Magnesium	mg/kg	0.5	357.	351.	309.
Manganese	mg/kg	0.05	2.19	2.64	2.10
Mercury	mg/kg	0.01	0.11	0.09	0.07
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4120	4070	4260
Rubidium	mg/kg	0.005	15.2	13.1	15.5
Selenium	mg/kg	0.05	0.25	0.35	0.92
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	633	616	548
Strontium	mg/kg	0.05	9.77	8.06	4.95
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.007	0.012	0.016
Tin	mg/kg	0.005	< 0.005	0.006	0.010
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	18.7	15.4	13.0

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-157	127275-158	127275-159
Client Sample ID:			W4A31-BT2 Carcass	W4A31-BT3 Carcass	W4A31-BT6 Carcass
Date Sampled:			15-Sep-11	15-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.35	0.42	0.49
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	1.32	1.45	0.98
Barium	mg/kg	0.05	0.55	0.44	0.58
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0102	0.0138	0.0101
Calcium	mg/kg	2	4150	5050	3900
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.030	0.062	0.032
Copper	mg/kg	0.05	0.31	0.39	0.35
Iron	mg/kg	1	4	5	4
Lead	mg/kg	0.005	0.009	0.016	0.007
Lithium	mg/kg	0.005	0.010	0.009	0.009
Magnesium	mg/kg	0.5	341.	340.	332.
Manganese	mg/kg	0.05	2.54	3.43	3.17
Mercury	mg/kg	0.01	0.08	0.07	0.07
Molybdenum	mg/kg	0.005	< 0.005	0.007	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4310	4130	4150
Rubidium	mg/kg	0.005	16.2	15.2	13.4
Selenium	mg/kg	0.05	0.54	0.76	0.58
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	600	566	604
Strontium	mg/kg	0.05	7.09	9.05	7.59
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.017	0.016	0.015
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	15.8	13.8	12.7

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-160	127275-161	127275-161 Dup
Client Sample ID:			W4A31-BT7 Carcass	W4A31-BT8 Carcass	Lab Duplicate
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.27	1.02	0.94
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	1.77	0.91	0.91
Barium	mg/kg	0.05	0.47	0.39	0.44
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0102	0.0213	0.0182
Calcium	mg/kg	2	4500	2830	3480
Chromium	mg/kg	0.05	< 0.05	< 0.05	0.12
Cobalt	mg/kg	0.005	0.036	0.050	0.050
Copper	mg/kg	0.05	0.35	0.41	0.40
Iron	mg/kg	1	4	5	6
Lead	mg/kg	0.005	0.017	0.016	0.010
Lithium	mg/kg	0.005	0.007	0.007	0.008
Magnesium	mg/kg	0.5	344.	331.	347.
Manganese	mg/kg	0.05	3.57	2.04	2.28
Mercury	mg/kg	0.01	0.07	0.06	0.06
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	0.006
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4280	4140	4260
Rubidium	mg/kg	0.005	12.9	14.4	14.8
Selenium	mg/kg	0.05	0.98	0.66	0.62
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	548	529	528
Strontium	mg/kg	0.05	7.80	5.27	6.33
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.022	0.015	0.017
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	12.5	15.6	15.6

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-162	127275-163	127275-164
Client Sample ID:			W4A31-BT9 Carcass	W4A31-BT10 Carcass	W4A31-Comp1 Carcass
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.75	0.53	0.95
Antimony	mg/kg	0.005	0.009	< 0.005	0.006
Arsenic	mg/kg	0.05	1.29	0.95	0.72
Barium	mg/kg	0.05	0.46	0.30	0.50
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0092	0.0082	0.0093
Calcium	mg/kg	2	3390	3020	4300
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.041	0.076	0.063
Copper	mg/kg	0.05	0.56	0.48	0.43
Iron	mg/kg	1	5	6	4
Lead	mg/kg	0.005	0.010	0.012	0.014
Lithium	mg/kg	0.005	0.009	0.005	0.009
Magnesium	mg/kg	0.5	331.	311.	356.
Manganese	mg/kg	0.05	2.12	2.46	2.46
Mercury	mg/kg	0.01	0.07	0.09	0.07
Molybdenum	mg/kg	0.005	0.005	0.006	0.007
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	4230	4290	4200
Rubidium	mg/kg	0.005	15.2	14.3	14.9
Selenium	mg/kg	0.05	0.68	0.67	0.49
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	588	570	606
Strontium	mg/kg	0.05	5.71	4.99	7.86
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.018	0.014	0.026
Tin	mg/kg	0.005	< 0.005	< 0.005	0.009
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	18.2	12.3	20.4

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-165	127275-166	127275-167
Client Sample ID:			B2A2-BT1 Viscera	B2A2-BT3 Viscera	B2A2-BT4 Viscera
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	4.03	1.56	165.
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.09	0.06	0.33
Barium	mg/kg	0.05	0.97	0.74	1.44
Beryllium	mg/kg	0.005	< 0.005	< 0.005	0.011
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	0.06
Cadmium	mg/kg	0.0005	0.0950	0.0657	0.0888
Calcium	mg/kg	2	13000	8780	9890
Chromium	mg/kg	0.05	0.28	0.19	1.92
Cobalt	mg/kg	0.005	0.071	0.073	0.216
Copper	mg/kg	0.05	0.68	0.88	0.74
Iron	mg/kg	1	24	34	98
Lead	mg/kg	0.005	0.079	0.210	0.214
Lithium	mg/kg	0.005	0.018	0.010	0.231
Magnesium	mg/kg	0.5	342.	273.	308.
Manganese	mg/kg	0.05	13.8	4.81	29.9
Mercury	mg/kg	0.01	0.10	0.12	0.09
Molybdenum	mg/kg	0.005	0.015	0.017	0.021
Nickel	mg/kg	0.05	< 0.05	< 0.05	0.10
Potassium	mg/kg	1	2320	2420	2660
Rubidium	mg/kg	0.005	6.61	4.93	9.25
Selenium	mg/kg	0.05	0.38	0.31	0.48
Silver	mg/kg	0.005	0.006	0.013	0.012
Sodium	mg/kg	2	1650	1590	1680
Strontium	mg/kg	0.05	24.4	14.4	19.2
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.010	0.015
Tin	mg/kg	0.005	0.033	0.013	0.018
Tungsten	mg/kg	0.005	0.022	0.016	0.041
Uranium	mg/kg	0.005	< 0.005	< 0.005	0.015
Vanadium	mg/kg	0.05	0.05	< 0.05	0.12
Zinc	mg/kg	0.05	31.4	50.1	34.6

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-168	127275-169	127275-170
Client Sample ID:			B2A2-BT5 Viscera	BEA2-BT6 Viscera	B2A2-BT8 Viscera
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	16.5	251.	159.
Antimony	mg/kg	0.005	< 0.005	0.008	0.006
Arsenic	mg/kg	0.05	0.22	0.30	0.54
Barium	mg/kg	0.05	1.40	1.50	1.88
Beryllium	mg/kg	0.005	< 0.005	0.014	0.008
Bismuth	mg/kg	0.05	< 0.05	0.21	0.07
Boron	mg/kg	0.05	< 0.05	0.13	0.06
Cadmium	mg/kg	0.0005	0.0576	0.0575	0.0780
Calcium	mg/kg	2	13000	8230	12300
Chromium	mg/kg	0.05	0.15	3.83	0.85
Cobalt	mg/kg	0.005	0.197	0.269	0.324
Copper	mg/kg	0.05	0.81	0.77	0.94
Iron	mg/kg	1	26	146	114
Lead	mg/kg	0.005	0.134	0.324	0.307
Lithium	mg/kg	0.005	0.029	0.302	0.219
Magnesium	mg/kg	0.5	328.	309.	338.
Manganese	mg/kg	0.05	18.9	26.2	41.9
Mercury	mg/kg	0.01	0.10	0.08	0.15
Molybdenum	mg/kg	0.005	0.019	0.037	0.038
Nickel	mg/kg	0.05	< 0.05	0.22	0.10
Potassium	mg/kg	1	2410	2640	2620
Rubidium	mg/kg	0.005	7.79	7.92	6.07
Selenium	mg/kg	0.05	0.48	0.49	0.48
Silver	mg/kg	0.005	0.015	0.012	0.018
Sodium	mg/kg	2	1790	1610	1710
Strontium	mg/kg	0.05	26.7	15.6	32.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.016	0.020	0.021
Tin	mg/kg	0.005	0.019	< 0.005	0.010
Tungsten	mg/kg	0.005	0.044	0.039	0.071
Uranium	mg/kg	0.005	< 0.005	0.043	0.025
Vanadium	mg/kg	0.05	< 0.05	0.30	0.23
Zinc	mg/kg	0.05	45.4	41.9	52.0

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-171	127275-171 Dup	127275-172
Client Sample ID:			B2A2-BT16 Viscera	Lab Duplicate	B2A2-BT18 Viscera
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	10.5	9.12	39.0
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.06	0.06	0.18
Barium	mg/kg	0.05	0.79	0.84	1.25
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0311	0.0341	0.0732
Calcium	mg/kg	2	9780	11000	10800
Chromium	mg/kg	0.05	0.28	0.44	0.19
Cobalt	mg/kg	0.005	0.063	0.068	0.177
Copper	mg/kg	0.05	0.76	1.22	1.23
Iron	mg/kg	1	38	41	56
Lead	mg/kg	0.005	0.094	0.095	0.134
Lithium	mg/kg	0.005	0.016	0.015	0.046
Magnesium	mg/kg	0.5	297.	316.	313.
Manganese	mg/kg	0.05	4.43	4.94	19.8
Mercury	mg/kg	0.01	0.14	0.15	0.11
Molybdenum	mg/kg	0.005	0.024	0.024	0.023
Nickel	mg/kg	0.05	< 0.05	< 0.05	0.07
Potassium	mg/kg	1	2510	2590	2370
Rubidium	mg/kg	0.005	4.07	4.19	6.08
Selenium	mg/kg	0.05	0.25	0.24	0.51
Silver	mg/kg	0.005	0.006	0.007	0.044
Sodium	mg/kg	2	1750	1830	1720
Strontium	mg/kg	0.05	18.9	21.0	24.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.010	0.014
Tin	mg/kg	0.005	0.013	0.016	0.013
Tungsten	mg/kg	0.005	0.008	0.008	0.021
Uranium	mg/kg	0.005	0.006	< 0.005	0.016
Vanadium	mg/kg	0.05	< 0.05	< 0.05	0.11
Zinc	mg/kg	0.05	46.6	49.4	41.2

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-173	127275-174	127275-175
Client Sample ID:			B2A2-Comp.1 Viscera	B2A2-Comp.2 Viscera	B3A9-BT1 Viscera
Date Sampled:			8-Sep-11	8-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	50.2	42.3	2.06
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.33	0.22	0.11
Barium	mg/kg	0.05	1.38	1.20	0.56
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0758	0.0704	0.279
Calcium	mg/kg	2	11700	10700	11600
Chromium	mg/kg	0.05	0.37	0.12	0.15
Cobalt	mg/kg	0.005	0.141	0.170	0.093
Copper	mg/kg	0.05	1.03	0.93	0.74
Iron	mg/kg	1	57	49	28
Lead	mg/kg	0.005	0.127	0.100	0.068
Lithium	mg/kg	0.005	0.063	0.063	0.017
Magnesium	mg/kg	0.5	331.	325.	306.
Manganese	mg/kg	0.05	14.3	11.5	6.73
Mercury	mg/kg	0.01	0.09	0.08	0.18
Molybdenum	mg/kg	0.005	0.027	0.021	0.025
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2650	2670	2240
Rubidium	mg/kg	0.005	5.88	7.31	8.58
Selenium	mg/kg	0.05	0.58	0.53	0.41
Silver	mg/kg	0.005	0.026	0.017	0.016
Sodium	mg/kg	2	1660	1600	1920
Strontium	mg/kg	0.05	26.2	23.7	19.0
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.015	0.014	0.011
Tin	mg/kg	0.005	0.021	0.012	0.036
Tungsten	mg/kg	0.005	0.048	0.036	0.016
Uranium	mg/kg	0.005	0.010	0.016	< 0.005
Vanadium	mg/kg	0.05	0.10	0.07	< 0.05
Zinc	mg/kg	0.05	47.3	48.8	52.3

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-176	127275-177	127275-178
Client Sample ID:			B3A9-BT2 Viscera	B3A9-BT4 Viscera	B3A9-BT5 Viscera
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	353.	12.6	9.68
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	5.93	0.15	0.11
Barium	mg/kg	0.05	2.12	0.74	0.67
Beryllium	mg/kg	0.005	0.027	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.156	0.169	0.200
Calcium	mg/kg	2	9840	12300	10500
Chromium	mg/kg	0.05	0.90	0.23	0.08
Cobalt	mg/kg	0.005	0.539	0.092	0.067
Copper	mg/kg	0.05	0.78	0.66	0.81
Iron	mg/kg	1	1190	36	28
Lead	mg/kg	0.005	0.613	0.063	0.051
Lithium	mg/kg	0.005	0.354	0.032	0.020
Magnesium	mg/kg	0.5	400.	345.	311.
Manganese	mg/kg	0.05	41.8	8.72	8.75
Mercury	mg/kg	0.01	0.08	0.11	0.07
Molybdenum	mg/kg	0.005	0.092	0.025	0.036
Nickel	mg/kg	0.05	0.44	< 0.05	< 0.05
Potassium	mg/kg	1	2310	2540	2430
Rubidium	mg/kg	0.005	9.67	9.29	8.35
Selenium	mg/kg	0.05	0.40	0.42	0.37
Silver	mg/kg	0.005	0.014	0.014	0.012
Sodium	mg/kg	2	1620	1800	1670
Strontium	mg/kg	0.05	17.1	21.5	17.9
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.020	0.015	0.012
Tin	mg/kg	0.005	0.028	0.020	0.020
Tungsten	mg/kg	0.005	0.068	0.010	0.048
Uranium	mg/kg	0.005	0.031	< 0.005	< 0.005
Vanadium	mg/kg	0.05	0.90	< 0.05	< 0.05
Zinc	mg/kg	0.05	48.2	48.2	43.7

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-179	127275-180	127275-180 Dup
Client Sample ID:			B3A9-BT7 Viscera	B3A9-BT9 Viscera	Lab Duplicate
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.36	16.6	23.3
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.26	0.14	0.18
Barium	mg/kg	0.05	0.67	0.46	0.47
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.135	0.204	0.146
Calcium	mg/kg	2	8550	7200	7400
Chromium	mg/kg	0.05	0.21	0.13	0.30
Cobalt	mg/kg	0.005	0.118	0.134	0.132
Copper	mg/kg	0.05	1.01	0.66	0.64
Iron	mg/kg	1	34	39	54
Lead	mg/kg	0.005	0.030	0.065	0.082
Lithium	mg/kg	0.005	0.016	0.036	0.045
Magnesium	mg/kg	0.5	285.	272.	272.
Manganese	mg/kg	0.05	9.10	7.78	8.26
Mercury	mg/kg	0.01	0.07	0.11	0.11
Molybdenum	mg/kg	0.005	0.028	0.022	0.021
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2660	2720	2710
Rubidium	mg/kg	0.005	9.67	10.5	10.5
Selenium	mg/kg	0.05	0.70	0.41	0.38
Silver	mg/kg	0.005	0.084	0.017	0.011
Sodium	mg/kg	2	1600	1410	1420
Strontium	mg/kg	0.05	11.6	12.0	12.3
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.021	0.018	0.018
Tin	mg/kg	0.005	0.019	0.006	0.009
Tungsten	mg/kg	0.005	< 0.005	0.008	0.010
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	0.05	0.07
Zinc	mg/kg	0.05	44.4	42.5	40.1

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-181	127275-182	127275-183
Client Sample ID:			B3A9-BT13 Viscera	B3A9-BT14 Viscera	B3A9-Comp1 Viscera
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.15	19.9	10.0
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.20	0.21	0.12
Barium	mg/kg	0.05	0.64	0.75	0.61
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.132	0.236	0.178
Calcium	mg/kg	2	10400	12400	10200
Chromium	mg/kg	0.05	< 0.05	0.21	0.06
Cobalt	mg/kg	0.005	0.096	0.130	0.064
Copper	mg/kg	0.05	0.57	0.63	0.79
Iron	mg/kg	1	21	36	27
Lead	mg/kg	0.005	0.054	0.086	0.069
Lithium	mg/kg	0.005	0.019	0.030	0.019
Magnesium	mg/kg	0.5	314.	324.	298.
Manganese	mg/kg	0.05	6.82	7.01	7.20
Mercury	mg/kg	0.01	0.11	0.14	0.10
Molybdenum	mg/kg	0.005	0.018	0.028	0.041
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2510	2310	2510
Rubidium	mg/kg	0.005	8.48	8.46	7.39
Selenium	mg/kg	0.05	0.38	0.37	0.39
Silver	mg/kg	0.005	0.008	0.010	0.017
Sodium	mg/kg	2	1680	1720	1560
Strontium	mg/kg	0.05	19.3	19.8	18.4
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.013	0.013
Tin	mg/kg	0.005	0.014	0.015	0.013
Tungsten	mg/kg	0.005	0.009	0.015	0.012
Uranium	mg/kg	0.005	< 0.005	0.006	0.006
Vanadium	mg/kg	0.05	< 0.05	0.06	< 0.05
Zinc	mg/kg	0.05	43.1	49.5	51.9

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-184	127275-185	127275-186
Client Sample ID:			B3A9-Comp2 Viscera	EBNB1-BT1 Viscera	EBNB1-BT2 Viscera
Date Sampled:			14-Sep-11	19-Sep-11	19-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	8.80	252.	33.9
Antimony	mg/kg	0.005	< 0.005	0.006	< 0.005
Arsenic	mg/kg	0.05	0.14	0.41	0.28
Barium	mg/kg	0.05	0.92	2.62	1.19
Beryllium	mg/kg	0.005	< 0.005	0.012	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	0.09	< 0.05
Cadmium	mg/kg	0.0005	0.177	0.164	0.157
Calcium	mg/kg	2	11000	8970	10400
Chromium	mg/kg	0.05	0.06	0.42	0.22
Cobalt	mg/kg	0.005	0.105	0.218	0.197
Copper	mg/kg	0.05	0.86	0.97	0.58
Iron	mg/kg	1	28	280	72
Lead	mg/kg	0.005	0.084	0.116	0.043
Lithium	mg/kg	0.005	0.023	0.214	0.058
Magnesium	mg/kg	0.5	309.	303.	312.
Manganese	mg/kg	0.05	6.69	18.0	22.3
Mercury	mg/kg	0.01	0.10	0.04	0.04
Molybdenum	mg/kg	0.005	0.026	0.037	0.040
Nickel	mg/kg	0.05	< 0.05	0.30	0.10
Potassium	mg/kg	1	2460	2470	2610
Rubidium	mg/kg	0.005	8.58	7.72	8.03
Selenium	mg/kg	0.05	0.41	1.57	1.37
Silver	mg/kg	0.005	0.026	0.106	0.067
Sodium	mg/kg	2	1750	1550	1590
Strontium	mg/kg	0.05	19.4	11.9	12.9
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.013	0.045	0.038
Tin	mg/kg	0.005	0.008	0.055	0.010
Tungsten	mg/kg	0.005	0.009	0.006	0.007
Uranium	mg/kg	0.005	< 0.005	0.010	< 0.005
Vanadium	mg/kg	0.05	< 0.05	0.46	0.10
Zinc	mg/kg	0.05	52.2	46.5	45.5

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-187	127275-188	127275-189
Client Sample ID:			EBNB1-BT3 Viscera	M3C3-BT1 Viscera	M3C3-BT2 Viscera
Date Sampled:			19-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.72	8.68	174.
Antimony	mg/kg	0.005	< 0.005	0.011	0.006
Arsenic	mg/kg	0.05	0.13	0.09	0.13
Barium	mg/kg	0.05	0.88	0.65	1.37
Beryllium	mg/kg	0.005	< 0.005	< 0.005	0.006
Bismuth	mg/kg	0.05	< 0.05	0.21	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	0.06
Cadmium	mg/kg	0.0005	0.0974	0.0908	0.271
Calcium	mg/kg	2	8160	9920	13900
Chromium	mg/kg	0.05	0.09	1.56	0.70
Cobalt	mg/kg	0.005	0.153	0.088	0.216
Copper	mg/kg	0.05	0.72	0.77	0.82
Iron	mg/kg	1	24	31	149
Lead	mg/kg	0.005	0.019	0.056	0.178
Lithium	mg/kg	0.005	0.007	0.018	0.245
Magnesium	mg/kg	0.5	246.	297.	373.
Manganese	mg/kg	0.05	17.3	12.9	16.3
Mercury	mg/kg	0.01	0.03	0.09	0.08
Molybdenum	mg/kg	0.005	0.024	0.414	0.067
Nickel	mg/kg	0.05	0.06	< 0.05	0.21
Potassium	mg/kg	1	2370	2300	2500
Rubidium	mg/kg	0.005	6.23	8.62	8.27
Selenium	mg/kg	0.05	0.79	0.35	0.32
Silver	mg/kg	0.005	0.020	0.010	0.010
Sodium	mg/kg	2	1540	1630	1700
Strontium	mg/kg	0.05	11.2	23.4	21.5
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.027	0.012	0.016
Tin	mg/kg	0.005	< 0.005	0.011	0.016
Tungsten	mg/kg	0.005	0.008	0.116	0.057
Uranium	mg/kg	0.005	< 0.005	< 0.005	0.024
Vanadium	mg/kg	0.05	< 0.05	< 0.05	0.25
Zinc	mg/kg	0.05	41.8	43.8	42.1

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-190	127275-191	127275-192
Client Sample ID:			M3C3-BT3 Viscera	M3C3-BT4 Viscera	M3C3-BT5 Viscera
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	49.1	12.2	6.91
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.10	0.10	0.06
Barium	mg/kg	0.05	0.69	0.99	0.56
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.200	0.187	0.105
Calcium	mg/kg	2	9060	14600	13400
Chromium	mg/kg	0.05	0.23	0.12	0.08
Cobalt	mg/kg	0.005	0.147	0.136	0.077
Copper	mg/kg	0.05	1.42	0.75	0.51
Iron	mg/kg	1	59	49	26
Lead	mg/kg	0.005	0.104	0.085	0.049
Lithium	mg/kg	0.005	0.065	0.026	0.017
Magnesium	mg/kg	0.5	329.	353.	335.
Manganese	mg/kg	0.05	8.93	19.3	20.4
Mercury	mg/kg	0.01	0.05	0.04	0.05
Molybdenum	mg/kg	0.005	0.054	0.036	0.031
Nickel	mg/kg	0.05	0.07	0.05	< 0.05
Potassium	mg/kg	1	2390	2450	2470
Rubidium	mg/kg	0.005	6.15	7.25	4.86
Selenium	mg/kg	0.05	0.33	0.34	0.38
Silver	mg/kg	0.005	0.008	0.008	0.005
Sodium	mg/kg	2	1590	1700	1690
Strontium	mg/kg	0.05	15.2	25.8	16.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.012	0.016	0.008
Tin	mg/kg	0.005	0.010	0.008	0.007
Tungsten	mg/kg	0.005	0.027	0.020	0.027
Uranium	mg/kg	0.005	0.019	0.010	< 0.005
Vanadium	mg/kg	0.05	0.13	0.06	< 0.05
Zinc	mg/kg	0.05	47.0	49.7	42.2

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-193	127275-194	127275-194 Dup
Client Sample ID:			M3C3-BT6 Viscera	M3C3-BT7 Viscera	Lab Duplicate
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	2.63	5.50	4.96
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.05	0.11	0.10
Barium	mg/kg	0.05	0.61	0.93	0.86
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.102	0.203	0.183
Calcium	mg/kg	2	12500	14400	11600
Chromium	mg/kg	0.05	0.08	0.11	0.07
Cobalt	mg/kg	0.005	0.056	0.075	0.073
Copper	mg/kg	0.05	0.75	1.04	1.08
Iron	mg/kg	1	23	31	29
Lead	mg/kg	0.005	0.046	0.064	0.062
Lithium	mg/kg	0.005	0.016	0.021	0.018
Magnesium	mg/kg	0.5	337.	347.	318.
Manganese	mg/kg	0.05	9.04	61.1	88.7
Mercury	mg/kg	0.01	0.05	0.09	0.10
Molybdenum	mg/kg	0.005	0.053	0.064	0.060
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2490	2270	2230
Rubidium	mg/kg	0.005	5.89	6.92	6.76
Selenium	mg/kg	0.05	0.29	0.28	0.29
Silver	mg/kg	0.005	0.006	0.013	0.012
Sodium	mg/kg	2	1590	1730	1690
Strontium	mg/kg	0.05	16.5	31.6	27.2
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.009	0.010	0.010
Tin	mg/kg	0.005	0.005	0.011	0.013
Tungsten	mg/kg	0.005	0.012	0.112	0.101
Uranium	mg/kg	0.005	0.006	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	47.2	43.5	46.1

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-195	127275-196	127275-196 Dup
Client Sample ID:			M3C3-BT8 Viscera	M3C3-BT9 Viscera	Lab Duplicate
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	7.67	10.4	6.47
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.09	0.08	0.09
Barium	mg/kg	0.05	0.69	0.63	0.57
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.159	0.196	0.281
Calcium	mg/kg	2	13600	12200	11100
Chromium	mg/kg	0.05	0.06	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.065	0.107	0.107
Copper	mg/kg	0.05	0.61	0.71	0.79
Iron	mg/kg	1	28	26	24
Lead	mg/kg	0.005	0.067	0.059	0.056
Lithium	mg/kg	0.005	0.024	0.019	0.015
Magnesium	mg/kg	0.5	346.	330.	311.
Manganese	mg/kg	0.05	25.5	16.0	15.0
Mercury	mg/kg	0.01	0.07	0.07	0.07
Molybdenum	mg/kg	0.005	0.039	0.029	0.032
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2330	2760	2710
Rubidium	mg/kg	0.005	6.67	7.50	7.36
Selenium	mg/kg	0.05	0.38	0.35	0.39
Silver	mg/kg	0.005	0.014	0.007	0.009
Sodium	mg/kg	2	1650	1640	1610
Strontium	mg/kg	0.05	20.2	20.1	18.3
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.010	0.017	0.017
Tin	mg/kg	0.005	0.030	0.027	0.015
Tungsten	mg/kg	0.005	0.035	0.023	0.022
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	44.2	36.3	36.5

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-197	127275-198	127275-199
Client Sample ID:			M3C3-BT10 Viscera	S2A2-BT3 Viscera	S2A2-BT4 Viscera
Date Sampled:			13-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	2.04	2.13	15.4
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.017
Arsenic	mg/kg	0.05	0.06	0.05	0.07
Barium	mg/kg	0.05	1.03	0.91	0.82
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.22
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.122	0.0807	0.0979
Calcium	mg/kg	2	15200	11600	12000
Chromium	mg/kg	0.05	0.08	< 0.05	0.09
Cobalt	mg/kg	0.005	0.157	0.024	0.043
Copper	mg/kg	0.05	0.50	0.80	0.80
Iron	mg/kg	1	21	24	23
Lead	mg/kg	0.005	0.065	0.030	0.040
Lithium	mg/kg	0.005	0.021	0.014	0.018
Magnesium	mg/kg	0.5	359.	306.	311.
Manganese	mg/kg	0.05	11.7	26.1	10.6
Mercury	mg/kg	0.01	0.06	0.07	0.11
Molybdenum	mg/kg	0.005	0.025	0.057	0.144
Nickel	mg/kg	0.05	0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2380	2430	2180
Rubidium	mg/kg	0.005	6.00	10.3	6.04
Selenium	mg/kg	0.05	0.32	0.30	0.34
Silver	mg/kg	0.005	< 0.005	< 0.005	0.005
Sodium	mg/kg	2	1840	1920	1500
Strontium	mg/kg	0.05	24.7	36.0	30.7
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.018	0.011	0.020
Tin	mg/kg	0.005	0.018	0.022	0.032
Tungsten	mg/kg	0.005	0.029	0.080	0.163
Uranium	mg/kg	0.005	0.014	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	41.2	38.9	47.7

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-200	127275-200 Dup	127275-201
Client Sample ID:			S2A2-BT11 Viscera	Lab Duplicate	S2A2-BT13 Viscera
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	451.	211.	5.00
Antimony	mg/kg	0.005	0.018	0.012	0.008
Arsenic	mg/kg	0.05	2.30	1.21	0.08
Barium	mg/kg	0.05	1.71	1.24	0.98
Beryllium	mg/kg	0.005	0.012	0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	0.12	0.06	< 0.05
Cadmium	mg/kg	0.0005	0.0995	0.126	0.0815
Calcium	mg/kg	2	11300	12400	10900
Chromium	mg/kg	0.05	0.74	0.57	0.10
Cobalt	mg/kg	0.005	0.237	0.134	0.034
Copper	mg/kg	0.05	2.29	1.48	0.76
Iron	mg/kg	1	620	297	27
Lead	mg/kg	0.005	0.253	0.147	0.033
Lithium	mg/kg	0.005	0.638	0.290	0.017
Magnesium	mg/kg	0.5	396.	371.	303.
Manganese	mg/kg	0.05	24.2	17.1	8.56
Mercury	mg/kg	0.01	0.10	0.10	0.06
Molybdenum	mg/kg	0.005	0.682	0.374	0.095
Nickel	mg/kg	0.05	0.32	0.15	< 0.05
Potassium	mg/kg	1	2490	2520	2250
Rubidium	mg/kg	0.005	9.67	9.70	7.21
Selenium	mg/kg	0.05	0.38	0.39	0.32
Silver	mg/kg	0.005	0.012	0.010	0.005
Sodium	mg/kg	2	1730	1780	1680
Strontium	mg/kg	0.05	26.5	29.0	34.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.017	0.016	0.014
Tin	mg/kg	0.005	0.020	0.018	0.028
Tungsten	mg/kg	0.005	1.39	0.817	0.166
Uranium	mg/kg	0.005	0.039	0.018	< 0.005
Vanadium	mg/kg	0.05	1.05	0.50	< 0.05
Zinc	mg/kg	0.05	35.8	36.1	40.8

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-202	127275-203	127275-204
Client Sample ID:			S2A2-BT15 Viscera	S2A2-BT22 Viscera	S2A2-BT23 Viscera
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1.36	1.64	1.03
Antimony	mg/kg	0.005	0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.07	0.06	< 0.05
Barium	mg/kg	0.05	0.66	0.58	0.68
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.132	0.0959	0.0626
Calcium	mg/kg	2	11100	11100	10400
Chromium	mg/kg	0.05	< 0.05	< 0.05	0.05
Cobalt	mg/kg	0.005	0.064	0.042	0.042
Copper	mg/kg	0.05	0.84	0.71	0.59
Iron	mg/kg	1	21	26	28
Lead	mg/kg	0.005	0.043	0.016	0.028
Lithium	mg/kg	0.005	0.010	0.012	0.008
Magnesium	mg/kg	0.5	297.	291.	284.
Manganese	mg/kg	0.05	9.83	9.31	7.39
Mercury	mg/kg	0.01	0.12	0.07	0.09
Molybdenum	mg/kg	0.005	0.051	0.051	0.039
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2380	2260	2320
Rubidium	mg/kg	0.005	8.07	8.32	6.26
Selenium	mg/kg	0.05	0.27	0.45	0.23
Silver	mg/kg	0.005	0.009	0.010	< 0.005
Sodium	mg/kg	2	1700	1660	1840
Strontium	mg/kg	0.05	26.6	28.5	22.9
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.015	0.012	0.011
Tin	mg/kg	0.005	0.028	0.165	0.041
Tungsten	mg/kg	0.005	0.167	0.149	0.120
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	36.5	47.8	41.3

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-205	127275-206	127275-207
Client Sample ID:			S2A2-BT24 Viscera	S2A2-Comp1 Viscera	S2A2-Comp2 Viscera
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.00	8.43	4.47
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.005
Arsenic	mg/kg	0.05	0.09	0.10	0.09
Barium	mg/kg	0.05	0.82	0.56	0.81
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0814	0.116	0.115
Calcium	mg/kg	2	12400	10100	11700
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.081	0.077	0.077
Copper	mg/kg	0.05	0.88	0.85	0.71
Iron	mg/kg	1	29	32	26
Lead	mg/kg	0.005	0.042	0.030	0.026
Lithium	mg/kg	0.005	0.015	0.015	0.016
Magnesium	mg/kg	0.5	317.	296.	322.
Manganese	mg/kg	0.05	13.2	7.61	11.6
Mercury	mg/kg	0.01	0.06	0.08	0.06
Molybdenum	mg/kg	0.005	0.182	0.235	0.071
Nickel	mg/kg	0.05	0.07	< 0.05	< 0.05
Potassium	mg/kg	1	2320	2430	2260
Rubidium	mg/kg	0.005	8.54	6.41	8.07
Selenium	mg/kg	0.05	0.47	0.54	0.47
Silver	mg/kg	0.005	0.015	0.009	0.008
Sodium	mg/kg	2	1830	1590	1610
Strontium	mg/kg	0.05	32.1	22.5	28.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.017	0.015	0.015
Tin	mg/kg	0.005	< 0.005	0.012	0.018
Tungsten	mg/kg	0.005	0.223	0.201	0.156
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	47.5	46.8	46.8

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-208	127275-209	127275-210
Client Sample ID:			S3A3-BT1 Viscera	S3A3-BT4 Viscera	S3A3-BT5 Viscera
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.42	7.33	92.0
Antimony	mg/kg	0.005	0.006	0.005	< 0.005
Arsenic	mg/kg	0.05	0.14	0.25	0.21
Barium	mg/kg	0.05	0.99	0.71	0.87
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.267	0.375	0.247
Calcium	mg/kg	2	14000	12800	10500
Chromium	mg/kg	0.05	< 0.05	0.08	0.14
Cobalt	mg/kg	0.005	0.188	0.252	0.136
Copper	mg/kg	0.05	0.65	0.89	0.82
Iron	mg/kg	1	25	32	169
Lead	mg/kg	0.005	0.033	0.029	0.032
Lithium	mg/kg	0.005	0.013	0.019	0.065
Magnesium	mg/kg	0.5	331.	321.	350.
Manganese	mg/kg	0.05	13.3	8.63	11.8
Mercury	mg/kg	0.01	0.09	0.11	0.07
Molybdenum	mg/kg	0.005	0.039	0.090	0.064
Nickel	mg/kg	0.05	< 0.05	< 0.05	0.17
Potassium	mg/kg	1	2300	2170	2300
Rubidium	mg/kg	0.005	10.9	10.1	8.92
Selenium	mg/kg	0.05	0.42	0.49	0.44
Silver	mg/kg	0.005	0.006	0.009	0.012
Sodium	mg/kg	2	1830	1880	1710
Strontium	mg/kg	0.05	31.7	26.5	24.8
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.028	0.034	0.017
Tin	mg/kg	0.005	0.031	0.044	0.044
Tungsten	mg/kg	0.005	0.209	0.243	0.171
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	0.13
Zinc	mg/kg	0.05	41.1	49.9	54.1

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-210 Dup	127275-211	127275-212
Client Sample ID:			Lab Duplicate	S3A3-BT8 Viscera	S3A3-BT9 Viscera
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	9.44	3.07	808.
Antimony	mg/kg	0.005	< 0.005	< 0.005	0.005
Arsenic	mg/kg	0.05	0.18	0.25	4.56
Barium	mg/kg	0.05	0.89	0.67	2.07
Beryllium	mg/kg	0.005	< 0.005	< 0.005	0.044
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.10
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.229	0.247	0.503
Calcium	mg/kg	2	12000	12500	6900
Chromium	mg/kg	0.05	0.09	< 0.05	0.98
Cobalt	mg/kg	0.005	0.106	0.102	1.16
Copper	mg/kg	0.05	0.84	1.07	3.53
Iron	mg/kg	1	28	18	1680
Lead	mg/kg	0.005	0.028	0.031	0.681
Lithium	mg/kg	0.005	0.019	0.015	0.785
Magnesium	mg/kg	0.5	325.	321.	604.
Manganese	mg/kg	0.05	10.2	9.97	44.6
Mercury	mg/kg	0.01	0.08	0.12	0.08
Molybdenum	mg/kg	0.005	0.048	0.051	0.696
Nickel	mg/kg	0.05	< 0.05	0.05	0.96
Potassium	mg/kg	1	2370	2070	2340
Rubidium	mg/kg	0.005	9.25	9.57	13.1
Selenium	mg/kg	0.05	0.42	0.42	0.56
Silver	mg/kg	0.005	0.013	0.007	0.009
Sodium	mg/kg	2	1760	1770	1340
Strontium	mg/kg	0.05	29.1	23.5	14.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.018	0.023	0.074
Tin	mg/kg	0.005	0.046	0.058	0.086
Tungsten	mg/kg	0.005	0.171	0.377	1.32
Uranium	mg/kg	0.005	< 0.005	< 0.005	0.046
Vanadium	mg/kg	0.05	< 0.05	0.05	1.18
Zinc	mg/kg	0.05	41.9	44.2	50.3

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-213	127275-214	127275-215
Client Sample ID:			S3A3-BT10 Viscera	S3A3-BT12 Viscera	S3A3-BT23 Viscera
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	9.15	9.94	3.05
Antimony	mg/kg	0.005	0.005	0.006	0.023
Arsenic	mg/kg	0.05	0.39	0.44	0.27
Barium	mg/kg	0.05	0.92	0.82	0.69
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.29
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.379	0.247	0.432
Calcium	mg/kg	2	8850	14400	12800
Chromium	mg/kg	0.05	< 0.05	0.06	< 0.05
Cobalt	mg/kg	0.005	0.173	0.302	0.192
Copper	mg/kg	0.05	1.15	0.79	0.86
Iron	mg/kg	1	28	25	18
Lead	mg/kg	0.005	0.043	0.029	0.016
Lithium	mg/kg	0.005	0.014	0.023	0.013
Magnesium	mg/kg	0.5	286.	351.	348.
Manganese	mg/kg	0.05	12.2	16.9	9.64
Mercury	mg/kg	0.01	0.07	0.07	0.06
Molybdenum	mg/kg	0.005	0.117	0.095	0.041
Nickel	mg/kg	0.05	< 0.05	0.06	0.05
Potassium	mg/kg	1	2250	2360	2480
Rubidium	mg/kg	0.005	9.60	11.6	9.62
Selenium	mg/kg	0.05	0.48	0.47	0.46
Silver	mg/kg	0.005	0.015	0.012	0.012
Sodium	mg/kg	2	1500	1600	1530
Strontium	mg/kg	0.05	16.2	29.4	25.8
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.022	0.034	0.025
Tin	mg/kg	0.005	0.016	0.012	0.013
Tungsten	mg/kg	0.005	0.154	0.244	0.123
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	48.7	46.0	40.2

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-216	127275-217	127275-218
Client Sample ID:			S3A3-Comp1 Viscera	S3A3-Comp2 Viscera	W4A17-BT1 Viscera
Date Sampled:			26-Sep-11	26-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	6.94	119.	95.4
Antimony	mg/kg	0.005	0.010	0.008	0.005
Arsenic	mg/kg	0.05	0.30	0.68	0.09
Barium	mg/kg	0.05	0.66	1.25	0.69
Beryllium	mg/kg	0.005	< 0.005	0.007	0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.234	0.348	0.0327
Calcium	mg/kg	2	12500	9720	7490
Chromium	mg/kg	0.05	< 0.05	0.37	0.56
Cobalt	mg/kg	0.005	0.199	0.266	0.101
Copper	mg/kg	0.05	0.71	1.05	0.62
Iron	mg/kg	1	22	116	98
Lead	mg/kg	0.005	0.015	0.089	0.105
Lithium	mg/kg	0.005	0.016	0.142	0.185
Magnesium	mg/kg	0.5	345.	324.	276.
Manganese	mg/kg	0.05	7.40	17.8	13.5
Mercury	mg/kg	0.01	0.07	0.05	0.10
Molybdenum	mg/kg	0.005	0.044	0.149	0.028
Nickel	mg/kg	0.05	0.05	0.11	0.09
Potassium	mg/kg	1	2540	2460	2190
Rubidium	mg/kg	0.005	11.1	10.9	10.2
Selenium	mg/kg	0.05	0.54	0.54	0.32
Silver	mg/kg	0.005	< 0.005	0.012	0.007
Sodium	mg/kg	2	1570	1500	1520
Strontium	mg/kg	0.05	24.4	20.1	11.5
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.027	0.033	0.014
Tin	mg/kg	0.005	0.011	0.026	0.021
Tungsten	mg/kg	0.005	0.148	0.420	0.018
Uranium	mg/kg	0.005	< 0.005	0.009	0.023
Vanadium	mg/kg	0.05	< 0.05	0.21	0.11
Zinc	mg/kg	0.05	49.7	48.0	50.7

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-219	127275-220	127275-221
Client Sample ID:			W4A17-BT2 Viscera	W4A17-BT6 Viscera	W4A17-BT9 Viscera
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	29.1	77.3	52.6
Antimony	mg/kg	0.005	< 0.005	0.005	< 0.005
Arsenic	mg/kg	0.05	0.07	0.08	0.10
Barium	mg/kg	0.05	0.53	1.04	1.14
Beryllium	mg/kg	0.005	< 0.005	< 0.005	0.007
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0352	0.0380	0.0629
Calcium	mg/kg	2	8380	12400	9350
Chromium	mg/kg	0.05	0.63	0.23	0.21
Cobalt	mg/kg	0.005	0.112	0.070	0.229
Copper	mg/kg	0.05	0.65	0.61	0.53
Iron	mg/kg	1	38	43	73
Lead	mg/kg	0.005	0.058	0.044	0.188
Lithium	mg/kg	0.005	0.096	0.068	0.111
Magnesium	mg/kg	0.5	269.	341.	305.
Manganese	mg/kg	0.05	8.35	8.68	31.6
Mercury	mg/kg	0.01	0.15	0.09	0.09
Molybdenum	mg/kg	0.005	0.021	0.019	0.021
Nickel	mg/kg	0.05	< 0.05	< 0.05	0.06
Potassium	mg/kg	1	2150	2380	2300
Rubidium	mg/kg	0.005	9.90	11.9	9.11
Selenium	mg/kg	0.05	0.31	0.30	0.31
Silver	mg/kg	0.005	0.009	0.006	< 0.005
Sodium	mg/kg	2	1630	1870	1580
Strontium	mg/kg	0.05	14.5	24.2	18.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.013	0.026
Tin	mg/kg	0.005	0.019	0.024	0.018
Tungsten	mg/kg	0.005	0.010	0.011	0.009
Uranium	mg/kg	0.005	0.017	0.012	0.047
Vanadium	mg/kg	0.05	< 0.05	0.10	0.08
Zinc	mg/kg	0.05	44.1	43.3	43.7

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-222	127275-223	127275-224
Client Sample ID:			W4A17-BT12 Viscera	W4A17-BT13 Viscera	W4A17-BT20 Viscera
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	132.	68.5	7.89
Antimony	mg/kg	0.005	< 0.005	0.027	0.006
Arsenic	mg/kg	0.05	0.38	0.09	< 0.05
Barium	mg/kg	0.05	1.16	1.23	0.48
Beryllium	mg/kg	0.005	0.007	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	0.37	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0312	0.0349	0.0347
Calcium	mg/kg	2	11000	12000	11100
Chromium	mg/kg	0.05	0.31	0.18	0.13
Cobalt	mg/kg	0.005	0.125	0.133	0.101
Copper	mg/kg	0.05	0.83	0.65	0.48
Iron	mg/kg	1	93	48	22
Lead	mg/kg	0.005	0.119	0.094	0.035
Lithium	mg/kg	0.005	0.241	0.102	0.045
Magnesium	mg/kg	0.5	342.	342.	329.
Manganese	mg/kg	0.05	49.8	15.2	5.47
Mercury	mg/kg	0.01	0.09	0.06	0.12
Molybdenum	mg/kg	0.005	0.022	0.029	0.022
Nickel	mg/kg	0.05	0.07	0.09	0.05
Potassium	mg/kg	1	2210	2520	2480
Rubidium	mg/kg	0.005	11.7	7.35	10.2
Selenium	mg/kg	0.05	0.27	0.33	0.23
Silver	mg/kg	0.005	0.011	0.007	< 0.005
Sodium	mg/kg	2	1640	1730	1640
Strontium	mg/kg	0.05	20.2	30.3	17.9
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.016	0.014	0.012
Tin	mg/kg	0.005	0.099	0.022	0.008
Tungsten	mg/kg	0.005	0.009	0.007	< 0.005
Uranium	mg/kg	0.005	0.031	0.019	0.013
Vanadium	mg/kg	0.05	0.15	0.07	< 0.05
Zinc	mg/kg	0.05	45.1	42.2	29.9

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-225	127275-226	127275-227
Client Sample ID:			W4A17-BT23 Viscera	W4A17-BT24 Viscera	W4A17-Comp1 Viscera
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	127.	6.72	60.8
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.07	< 0.05	0.06
Barium	mg/kg	0.05	1.34	0.48	0.79
Beryllium	mg/kg	0.005	0.006	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0417	0.0334	0.0376
Calcium	mg/kg	2	7940	10500	9700
Chromium	mg/kg	0.05	0.19	< 0.05	0.10
Cobalt	mg/kg	0.005	0.119	0.027	0.076
Copper	mg/kg	0.05	0.85	0.55	0.81
Iron	mg/kg	1	128	19	41
Lead	mg/kg	0.005	0.093	0.020	0.076
Lithium	mg/kg	0.005	0.224	0.033	0.208
Magnesium	mg/kg	0.5	301.	323.	324.
Manganese	mg/kg	0.05	8.30	4.44	9.60
Mercury	mg/kg	0.01	0.11	0.10	0.11
Molybdenum	mg/kg	0.005	0.032	0.018	0.026
Nickel	mg/kg	0.05	0.13	< 0.05	0.09
Potassium	mg/kg	1	2450	2730	2730
Rubidium	mg/kg	0.005	11.8	13.2	9.69
Selenium	mg/kg	0.05	0.26	0.23	0.27
Silver	mg/kg	0.005	0.008	0.008	< 0.005
Sodium	mg/kg	2	1550	1670	1520
Strontium	mg/kg	0.05	15.6	15.7	15.8
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.015	0.010	0.012
Tin	mg/kg	0.005	0.012	< 0.005	0.005
Tungsten	mg/kg	0.005	0.006	0.005	0.006
Uranium	mg/kg	0.005	0.040	0.009	0.024
Vanadium	mg/kg	0.05	0.18	< 0.05	0.06
Zinc	mg/kg	0.05	34.8	46.6	38.5

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-228	127275-229	127275-230
Client Sample ID:			W4A21-BT1 Viscera	W4A21-BT2 Viscera	W4A21-BT3 Viscera
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	63.9	4.92	0.21
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.46	0.13	0.06
Barium	mg/kg	0.05	1.34	1.03	0.49
Beryllium	mg/kg	0.005	0.024	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0940	0.119	0.0329
Calcium	mg/kg	2	10900	9740	10500
Chromium	mg/kg	0.05	0.11	0.06	< 0.05
Cobalt	mg/kg	0.005	0.231	0.068	0.046
Copper	mg/kg	0.05	0.84	0.77	0.66
Iron	mg/kg	1	279	18	18
Lead	mg/kg	0.005	0.193	0.045	0.014
Lithium	mg/kg	0.005	0.101	0.029	0.031
Magnesium	mg/kg	0.5	311.	312.	334.
Manganese	mg/kg	0.05	14.5	7.96	4.50
Mercury	mg/kg	0.01	0.07	0.05	0.09
Molybdenum	mg/kg	0.005	0.038	0.014	0.006
Nickel	mg/kg	0.05	0.11	< 0.05	< 0.05
Potassium	mg/kg	1	2570	2660	2690
Rubidium	mg/kg	0.005	8.80	7.47	10.7
Selenium	mg/kg	0.05	0.57	0.38	0.23
Silver	mg/kg	0.005	0.010	< 0.005	0.005
Sodium	mg/kg	2	1590	1320	1560
Strontium	mg/kg	0.05	15.2	16.7	18.6
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.031	0.011	0.009
Tin	mg/kg	0.005	0.013	< 0.005	< 0.005
Tungsten	mg/kg	0.005	0.041	< 0.005	< 0.005
Uranium	mg/kg	0.005	0.035	0.005	< 0.005
Vanadium	mg/kg	0.05	0.13	< 0.05	< 0.05
Zinc	mg/kg	0.05	40.2	43.8	32.2

Report ID: 127275-IAS Rev01
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Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-231	127275-231 Dup	127275-232
Client Sample ID:			W4A21-BT4 Viscera	Lab Duplicate	W4A21-BT5 Viscera
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	4.44	10.8	7.17
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.08	0.07	0.07
Barium	mg/kg	0.05	1.24	1.14	0.51
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.104	0.0691	0.0474
Calcium	mg/kg	2	8370	10600	10600
Chromium	mg/kg	0.05	< 0.05	0.06	< 0.05
Cobalt	mg/kg	0.005	0.076	0.069	0.066
Copper	mg/kg	0.05	1.29	1.60	1.37
Iron	mg/kg	1	37	42	29
Lead	mg/kg	0.005	0.043	0.063	0.033
Lithium	mg/kg	0.005	0.031	0.040	0.032
Magnesium	mg/kg	0.5	287.	320.	353.
Manganese	mg/kg	0.05	11.4	7.51	6.93
Mercury	mg/kg	0.01	0.07	0.07	0.10
Molybdenum	mg/kg	0.005	0.030	0.032	0.018
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2410	2510	2700
Rubidium	mg/kg	0.005	8.15	8.73	10.9
Selenium	mg/kg	0.05	0.34	0.34	0.30
Silver	mg/kg	0.005	0.010	0.020	0.016
Sodium	mg/kg	2	1540	1640	1520
Strontium	mg/kg	0.05	15.0	19.7	16.5
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.012	0.012	0.010
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	0.006
Uranium	mg/kg	0.005	0.007	0.009	0.008
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	46.7	37.6	36.7

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-233	127275-234	127275-235
Client Sample ID:			W4A21-BT6 Viscera	W4A21-BT9 Viscera	W4A21-Comp1 Viscera
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.78	4.65	10.6
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.07	0.14	0.06
Barium	mg/kg	0.05	0.49	0.70	0.74
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.176	0.105	0.158
Calcium	mg/kg	2	6830	10200	8980
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	0.094	0.122	0.085
Copper	mg/kg	0.05	1.12	0.67	1.23
Iron	mg/kg	1	22	21	24
Lead	mg/kg	0.005	0.036	0.051	0.026
Lithium	mg/kg	0.005	0.018	0.029	0.037
Magnesium	mg/kg	0.5	285.	300.	303.
Manganese	mg/kg	0.05	10.0	7.70	10.0
Mercury	mg/kg	0.01	0.10	0.09	0.06
Molybdenum	mg/kg	0.005	0.030	0.014	0.024
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	2650	2420	2740
Rubidium	mg/kg	0.005	8.77	9.63	12.5
Selenium	mg/kg	0.05	0.30	0.46	0.37
Silver	mg/kg	0.005	0.014	0.012	0.013
Sodium	mg/kg	2	1610	1820	1410
Strontium	mg/kg	0.05	12.6	16.3	17.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.014	0.010	0.012
Tin	mg/kg	0.005	0.006	< 0.005	< 0.005
Tungsten	mg/kg	0.005	0.006	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	0.007	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	49.1	44.6	43.3

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-236	127275-237	127275-238
Client Sample ID:			W4A21-Comp2 Viscera	W4A21-Comp3 Viscera	W4A31-BT1 Viscera
Date Sampled:			27-Sep-11	27-Sep-11	15-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	51.1	46.8	14.7
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.14	0.16	0.42
Barium	mg/kg	0.05	0.94	1.29	1.61
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.106	0.116	0.204
Calcium	mg/kg	2	9780	11700	9760
Chromium	mg/kg	0.05	0.06	0.07	0.06
Cobalt	mg/kg	0.005	0.161	0.119	0.117
Copper	mg/kg	0.05	0.86	0.81	1.54
Iron	mg/kg	1	55	52	52
Lead	mg/kg	0.005	0.118	0.088	0.091
Lithium	mg/kg	0.005	0.090	0.091	0.039
Magnesium	mg/kg	0.5	305.	308.	285.
Manganese	mg/kg	0.05	13.7	9.90	15.0
Mercury	mg/kg	0.01	0.08	0.05	0.04
Molybdenum	mg/kg	0.005	0.032	0.021	0.030
Nickel	mg/kg	0.05	0.07	0.07	0.05
Potassium	mg/kg	1	2700	2520	2330
Rubidium	mg/kg	0.005	11.1	9.12	10.1
Selenium	mg/kg	0.05	0.31	0.41	1.35
Silver	mg/kg	0.005	0.011	0.007	0.028
Sodium	mg/kg	2	1620	1840	1680
Strontium	mg/kg	0.05	17.9	19.5	19.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.015	0.027
Tin	mg/kg	0.005	0.008	< 0.005	0.009
Tungsten	mg/kg	0.005	0.005	0.013	0.014
Uranium	mg/kg	0.005	0.024	0.015	0.007
Vanadium	mg/kg	0.05	0.07	0.07	0.08
Zinc	mg/kg	0.05	43.6	51.3	46.2

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-239	127275-240	127275-241
Client Sample ID:			W4A31-BT2 Viscera	W4A31-BT3 Viscera	W4A31-BT6 Viscera
Date Sampled:			15-Sep-11	15-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	2.57	114.	10.7
Antimony	mg/kg	0.005	< 0.005	0.063	0.022
Arsenic	mg/kg	0.05	0.42	1.05	0.27
Barium	mg/kg	0.05	1.53	2.14	1.26
Beryllium	mg/kg	0.005	< 0.005	0.011	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	0.32
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.123	0.449	0.360
Calcium	mg/kg	2	13400	13400	9910
Chromium	mg/kg	0.05	< 0.05	0.27	< 0.05
Cobalt	mg/kg	0.005	0.103	0.320	0.111
Copper	mg/kg	0.05	1.11	1.29	0.91
Iron	mg/kg	1	19	224	22
Lead	mg/kg	0.005	0.043	0.377	0.039
Lithium	mg/kg	0.005	0.029	0.192	0.029
Magnesium	mg/kg	0.5	373.	349.	312.
Manganese	mg/kg	0.05	9.62	16.1	8.87
Mercury	mg/kg	0.01	0.05	0.05	0.05
Molybdenum	mg/kg	0.005	0.027	0.064	0.035
Nickel	mg/kg	0.05	0.17	0.25	0.06
Potassium	mg/kg	1	2610	2360	2460
Rubidium	mg/kg	0.005	10.7	9.88	8.96
Selenium	mg/kg	0.05	0.67	1.21	0.73
Silver	mg/kg	0.005	0.044	0.032	0.024
Sodium	mg/kg	2	1710	1780	1690
Strontium	mg/kg	0.05	22.4	24.3	19.5
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.023	0.032	0.020
Tin	mg/kg	0.005	0.015	0.012	0.020
Tungsten	mg/kg	0.005	0.013	0.039	0.011
Uranium	mg/kg	0.005	0.006	0.046	0.006
Vanadium	mg/kg	0.05	< 0.05	0.30	< 0.05
Zinc	mg/kg	0.05	48.3	50.2	37.9

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-241 Dup	127275-242	127275-243
Client Sample ID:			Lab Duplicate	W4A31-BT7 Viscera	W4A31-BT8 Viscera
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	2.39	6.39	33.5
Antimony	mg/kg	0.005	0.006	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.28	0.46	0.36
Barium	mg/kg	0.05	1.41	1.18	1.31
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.380	0.293	0.109
Calcium	mg/kg	2	12300	12000	11300
Chromium	mg/kg	0.05	< 0.05	0.05	0.07
Cobalt	mg/kg	0.005	0.113	0.138	0.169
Copper	mg/kg	0.05	0.88	0.79	0.55
Iron	mg/kg	1	19	24	45
Lead	mg/kg	0.005	0.038	0.050	0.061
Lithium	mg/kg	0.005	0.027	0.022	0.074
Magnesium	mg/kg	0.5	341.	317.	334.
Manganese	mg/kg	0.05	9.71	9.90	8.13
Mercury	mg/kg	0.01	0.03	0.04	0.03
Molybdenum	mg/kg	0.005	0.024	0.021	0.017
Nickel	mg/kg	0.05	0.06	0.06	0.08
Potassium	mg/kg	1	2460	2580	2550
Rubidium	mg/kg	0.005	9.09	9.10	10.1
Selenium	mg/kg	0.05	0.77	1.36	0.77
Silver	mg/kg	0.005	0.045	0.072	0.007
Sodium	mg/kg	2	1740	1760	1590
Strontium	mg/kg	0.05	24.2	21.1	20.0
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.020	0.031	0.021
Tin	mg/kg	0.005	0.012	0.008	0.009
Tungsten	mg/kg	0.005	0.010	0.013	0.017
Uranium	mg/kg	0.005	< 0.005	< 0.005	0.008
Vanadium	mg/kg	0.05	< 0.05	< 0.05	0.08
Zinc	mg/kg	0.05	39.5	37.9	35.7

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Samples

RPC Sample ID:			127275-244	127275-245	127275-246
Client Sample ID:			W4A31-BT9 Viscera	W4A31-BT10 Viscera	W4A31-Comp1 Viscera
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	3.95	5.67	33.7
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	0.36	0.43	0.28
Barium	mg/kg	0.05	1.46	1.15	1.33
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	0.0945	0.115	0.365
Calcium	mg/kg	2	14700	13900	8420
Chromium	mg/kg	0.05	0.06	0.05	0.07
Cobalt	mg/kg	0.005	0.119	0.245	0.241
Copper	mg/kg	0.05	0.87	1.03	0.95
Iron	mg/kg	1	25	29	69
Lead	mg/kg	0.005	0.052	0.084	0.080
Lithium	mg/kg	0.005	0.031	0.025	0.063
Magnesium	mg/kg	0.5	375.	359.	286.
Manganese	mg/kg	0.05	9.17	11.6	12.2
Mercury	mg/kg	0.01	0.04	0.06	0.05
Molybdenum	mg/kg	0.005	0.016	0.035	0.048
Nickel	mg/kg	0.05	0.06	0.07	0.08
Potassium	mg/kg	1	2510	2540	2650
Rubidium	mg/kg	0.005	9.77	9.32	11.4
Selenium	mg/kg	0.05	0.72	0.64	0.75
Silver	mg/kg	0.005	0.015	0.013	0.021
Sodium	mg/kg	2	1680	1580	1610
Strontium	mg/kg	0.05	24.3	22.5	15.8
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.022	0.026	0.031
Tin	mg/kg	0.005	< 0.005	0.012	< 0.005
Tungsten	mg/kg	0.005	0.013	0.021	0.015
Uranium	mg/kg	0.005	0.006	0.012	0.018
Vanadium	mg/kg	0.05	< 0.05	0.07	0.12
Zinc	mg/kg	0.05	36.5	41.1	47.1

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-001	127275-002	127275-002 Dup
Client Sample ID:			B2A2-BT1 Liver	B2A2-BT3 Liver	Lab Duplicate
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	11.0	2.3	2.0
Antimony	mg/kg	0.01	0.03	0.02	0.01
Arsenic	mg/kg	0.1	< 0.2	< 0.1	< 0.1
Barium	mg/kg	0.1	< 0.2	< 0.1	< 0.1
Beryllium	mg/kg	0.01	< 0.02	< 0.01	< 0.01
Bismuth	mg/kg	0.1	< 0.2	< 0.1	< 0.1
Boron	mg/kg	0.1	< 0.2	< 0.1	< 0.1
Cadmium	mg/kg	0.001	0.590	0.069	0.060
Calcium	mg/kg	5	60	52	57
Chromium	mg/kg	0.1	< 0.2	< 0.1	< 0.1
Cobalt	mg/kg	0.01	0.09	0.10	0.11
Copper	mg/kg	0.1	52.4	13.5	10.1
Iron	mg/kg	2	345	268	254
Lead	mg/kg	0.01	0.03	0.04	0.04
Lithium	mg/kg	0.01	< 0.02	< 0.01	< 0.01
Magnesium	mg/kg	1	184	160	161
Manganese	mg/kg	0.1	2.8	2.0	2.0
Mercury	mg/kg	0.01	0.33	0.35	0.36
Molybdenum	mg/kg	0.01	0.31	0.30	0.26
Nickel	mg/kg	0.1	< 0.2	< 0.1	< 0.1
Potassium	mg/kg	2	2550	2760	2740
Rubidium	mg/kg	0.01	7.32	5.22	5.29
Selenium	mg/kg	0.1	0.7	0.4	0.3
Silver	mg/kg	0.01	2.37	0.49	0.33
Sodium	mg/kg	5	2180	1890	1880
Strontium	mg/kg	0.1	< 0.2	0.1	0.1
Tellurium	mg/kg	0.01	< 0.02	< 0.01	< 0.01
Thallium	mg/kg	0.01	0.02	0.03	0.03
Tin	mg/kg	0.01	0.02	0.04	< 0.01
Tungsten	mg/kg	0.01	< 0.02	0.02	< 0.01
Uranium	mg/kg	0.01	< 0.02	< 0.01	< 0.01
Vanadium	mg/kg	0.1	< 0.2	< 0.1	< 0.1
Zinc	mg/kg	0.1	35.3	21.0	25.2

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-003	127275-004	127275-005
Client Sample ID:			B2A2-BT4 Liver	B2A2-BT5 Liver	BEA2-BT6 Liver
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	4.3	4.3	4.4
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.282	0.266	0.206
Calcium	mg/kg	5	60	80	80
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.17	0.29	0.25
Copper	mg/kg	0.1	49.7	18.1	17.0
Iron	mg/kg	2	328	161	207
Lead	mg/kg	0.01	0.02	0.03	0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	214	217	180
Manganese	mg/kg	0.1	3.0	4.7	2.1
Mercury	mg/kg	0.01	0.30	0.20	0.21
Molybdenum	mg/kg	0.01	0.30	0.17	0.27
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	3630	3630	3080
Rubidium	mg/kg	0.01	12.8	21.1	8.60
Selenium	mg/kg	0.1	0.8	0.5	0.8
Silver	mg/kg	0.01	1.98	0.86	0.95
Sodium	mg/kg	5	2140	1490	2390
Strontium	mg/kg	0.1	< 0.2	< 0.2	0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.05	0.06	0.07
Tin	mg/kg	0.01	0.04	0.28	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	31.0	19.0	20.7

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-006	127275-007	127275-008
Client Sample ID:			B2A2-BT8 Liver	B2A2-BT16 Liver	B2A2-BT18 Liver
Date Sampled:			8-Sep-11	8-Sep-11	8-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	1.9	0.5	2.1
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.211	0.082	0.157
Calcium	mg/kg	5	50	40	70
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.16	0.07	0.07
Copper	mg/kg	0.1	32.9	19.2	27.5
Iron	mg/kg	2	163	157	82
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	182	201	242
Manganese	mg/kg	0.1	4.8	1.5	3.8
Mercury	mg/kg	0.01	0.54	0.69	0.17
Molybdenum	mg/kg	0.01	0.29	0.35	0.21
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	3520	3710	4570
Rubidium	mg/kg	0.01	7.94	5.39	15.7
Selenium	mg/kg	0.1	0.5	0.4	0.5
Silver	mg/kg	0.01	1.26	0.66	1.39
Sodium	mg/kg	5	1610	1700	1010
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.04	0.12	0.10
Tin	mg/kg	0.01	0.04	0.05	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	25.2	21.2	21.5

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-009	127275-010	127275-011
Client Sample ID:			B2A2-Comp.1 Liver	B2A2-Comp.2 Liver	B3A9-BT1 Liver
Date Sampled:			8-Sep-11	8-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	2.5	2.3	7.3
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.212	0.171	0.898
Calcium	mg/kg	5	70	70	50
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.18	0.24	0.08
Copper	mg/kg	0.1	23.7	41.3	26.4
Iron	mg/kg	2	127	184	276
Lead	mg/kg	0.01	< 0.02	< 0.02	0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	203	196	216
Manganese	mg/kg	0.1	2.5	1.7	2.1
Mercury	mg/kg	0.01	0.22	0.23	0.42
Molybdenum	mg/kg	0.01	0.31	0.31	0.21
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	4070	3740	3780
Rubidium	mg/kg	0.01	10.4	10.8	19.3
Selenium	mg/kg	0.1	1.0	0.9	0.5
Silver	mg/kg	0.01	1.11	1.52	1.09
Sodium	mg/kg	5	1960	1780	1210
Strontium	mg/kg	0.1	0.2	0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.06	0.09	0.10
Tin	mg/kg	0.01	< 0.02	< 0.02	0.05
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	27.4	29.3	27.9

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-012	127275-013	127275-014
Client Sample ID:			B3A9-BT2 Liver	B3A9-BT4 Liver	B3A9-BT5 Liver
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	6.2	4.9	1.9
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.747	0.646	0.416
Calcium	mg/kg	5	60	100	60
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.12	0.14	0.07
Copper	mg/kg	0.1	33.8	35.6	7.7
Iron	mg/kg	2	253	215	130
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	215	190	178
Manganese	mg/kg	0.1	2.0	1.5	1.6
Mercury	mg/kg	0.01	0.26	0.29	0.18
Molybdenum	mg/kg	0.01	0.40	0.33	0.29
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	3570	3510	3830
Rubidium	mg/kg	0.01	14.7	12.9	13.0
Selenium	mg/kg	0.1	0.7	0.8	0.5
Silver	mg/kg	0.01	1.53	1.19	0.34
Sodium	mg/kg	5	1710	1860	1590
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.10	0.11	0.09
Tin	mg/kg	0.01	0.05	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	33.2	29.1	17.6

METALS CONT'D

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-015	127275-015 Dup	127275-016
Client Sample ID:			B3A9-BT7 Liver	Lab Duplicate	B3A9-BT9 Liver
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	1.8	1.8	6.8
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.268	0.363	0.473
Calcium	mg/kg	5	60	60	40
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.13	0.14	0.12
Copper	mg/kg	0.1	13.9	15.7	14.3
Iron	mg/kg	2	90	108	200
Lead	mg/kg	0.01	< 0.02	< 0.02	0.06
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	223	234	171
Manganese	mg/kg	0.1	2.6	2.8	1.6
Mercury	mg/kg	0.01	0.08	0.08	0.23
Molybdenum	mg/kg	0.01	0.18	0.18	0.31
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	4140	4440	2930
Rubidium	mg/kg	0.01	25.3	27.2	10.2
Selenium	mg/kg	0.1	0.6	0.8	0.7
Silver	mg/kg	0.01	0.45	0.48	0.70
Sodium	mg/kg	5	1080	1140	1500
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.09	0.10	0.09
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	17.5	21.3	21.6

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-017	127275-018	127275-019
Client Sample ID:			B3A9-BT13 Liver	B3A9-BT14 Liver	B3A9-Comp1 Liver
Date Sampled:			14-Sep-11	14-Sep-11	14-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	8.8	7.0	5.5
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.568	0.890	0.457
Calcium	mg/kg	5	50	70	70
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.12	0.17	0.07
Copper	mg/kg	0.1	22.9	22.9	14.1
Iron	mg/kg	2	284	171	108
Lead	mg/kg	0.01	< 0.02	0.03	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	181	220	194
Manganese	mg/kg	0.1	1.2	2.7	1.4
Mercury	mg/kg	0.01	0.22	0.25	0.21
Molybdenum	mg/kg	0.01	0.29	0.20	0.37
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	2870	3490	3340
Rubidium	mg/kg	0.01	11.8	23.2	11.8
Selenium	mg/kg	0.1	0.7	0.5	0.7
Silver	mg/kg	0.01	1.35	1.24	0.72
Sodium	mg/kg	5	1690	1320	1860
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.07	0.06	0.08
Tin	mg/kg	0.01	< 0.02	< 0.02	0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	26.2	23.7	23.2

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-020	127275-021	127275-022
Client Sample ID:			B3A9-Comp2 Liver	EBNB1-BT1 Liver	EBNB1-BT2 Liver
Date Sampled:			14-Sep-11	19-Sep-11	19-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	14	2.0	2.1
Antimony	mg/kg	0.01	< 0.1	0.05	< 0.02
Arsenic	mg/kg	0.1	< 1	0.2	< 0.2
Barium	mg/kg	0.1	< 1	< 0.1	< 0.2
Beryllium	mg/kg	0.01	< 0.1	< 0.01	< 0.02
Bismuth	mg/kg	0.1	< 1	0.2	< 0.2
Boron	mg/kg	0.1	< 1	< 0.1	< 0.2
Cadmium	mg/kg	0.001	0.83	0.267	0.196
Calcium	mg/kg	5	120	47	50
Chromium	mg/kg	0.1	< 1	< 0.1	< 0.2
Cobalt	mg/kg	0.01	0.2	0.16	0.12
Copper	mg/kg	0.1	62	28.6	27.1
Iron	mg/kg	2	220	183	160
Lead	mg/kg	0.01	< 0.1	0.01	< 0.02
Lithium	mg/kg	0.01	< 0.1	< 0.01	< 0.02
Magnesium	mg/kg	1	280	204	185
Manganese	mg/kg	0.1	3	1.9	1.8
Mercury	mg/kg	0.01	0.2	0.04	0.03
Molybdenum	mg/kg	0.01	0.5	0.33	0.31
Nickel	mg/kg	0.1	< 1	< 0.1	< 0.2
Potassium	mg/kg	2	5000	3890	3470
Rubidium	mg/kg	0.01	19.7	15.9	11.9
Selenium	mg/kg	0.1	1	2.9	2.0
Silver	mg/kg	0.01	2.8	0.98	1.31
Sodium	mg/kg	5	2380	1350	1390
Strontium	mg/kg	0.1	< 1	< 0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.1	< 0.01	< 0.02
Thallium	mg/kg	0.01	0.1	0.29	0.15
Tin	mg/kg	0.01	< 0.1	0.04	0.07
Tungsten	mg/kg	0.01	< 0.1	< 0.01	< 0.02
Uranium	mg/kg	0.01	< 0.1	< 0.01	< 0.02
Vanadium	mg/kg	0.1	< 1	< 0.1	< 0.2
Zinc	mg/kg	0.1	39	32.2	24.7

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-023	127275-024	127275-024 Dup
Client Sample ID:			EBNB1-BT3 Liver	M3C3-BT1 Liver	Lab Duplicate
Date Sampled:			19-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	6	1.3	1.6
Antimony	mg/kg	0.01	< 0.2	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.2	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.29	0.168	0.171
Calcium	mg/kg	5	100	60	60
Chromium	mg/kg	0.1	< 2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.3	0.09	0.09
Copper	mg/kg	0.1	40	6.9	9.4
Iron	mg/kg	2	160	92	95
Lead	mg/kg	0.01	< 0.2	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.2	< 0.02	< 0.02
Magnesium	mg/kg	1	460	224	217
Manganese	mg/kg	0.1	7	2.8	3.0
Mercury	mg/kg	0.01	< 0.2	0.16	0.17
Molybdenum	mg/kg	0.01	0.6	0.21	0.23
Nickel	mg/kg	0.1	< 2	< 0.2	< 0.2
Potassium	mg/kg	2	8960	3880	3880
Rubidium	mg/kg	0.01	24.6	21.1	21.3
Selenium	mg/kg	0.1	3	0.4	0.5
Silver	mg/kg	0.01	1.4	0.19	0.29
Sodium	mg/kg	5	3500	1200	1220
Strontium	mg/kg	0.1	< 2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.2	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.6	0.05	0.05
Tin	mg/kg	0.01	2.9	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.2	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.2	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 2	< 0.2	< 0.2
Zinc	mg/kg	0.1	48	20.7	21.6

METALS CONT'D

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-025	127275-026	127275-027
Client Sample ID:			M3C3-BT2 Liver	M3C3-BT3 Liver	M3C3-BT4 Liver
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	2.2	14.6	3.4
Antimony	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Cadmium	mg/kg	0.001	0.569	0.982	0.551
Calcium	mg/kg	5	80	80	140
Chromium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Cobalt	mg/kg	0.01	0.19	0.16	0.15
Copper	mg/kg	0.1	39.9	53.9	24.9
Iron	mg/kg	2	241	220	146
Lead	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Magnesium	mg/kg	1	173	258	209
Manganese	mg/kg	0.1	1.5	1.9	2.5
Mercury	mg/kg	0.01	0.20	0.15	0.10
Molybdenum	mg/kg	0.01	0.27	0.41	0.31
Nickel	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Potassium	mg/kg	2	3410	4420	3800
Rubidium	mg/kg	0.01	11.9	12.8	14.1
Selenium	mg/kg	0.1	0.7	0.8	0.7
Silver	mg/kg	0.01	0.93	0.67	0.58
Sodium	mg/kg	5	1560	1510	1280
Strontium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Thallium	mg/kg	0.01	0.05	0.08	0.08
Tin	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Zinc	mg/kg	0.1	32.7	66.0	35.2

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-028	127275-029	127275-030
Client Sample ID:			M3C3-BT5 Liver	M3C3-BT6 Liver	M3C3-BT7 Liver
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	1.5	3.2	0.8
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.347	0.294	0.182
Calcium	mg/kg	5	60	50	90
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.13	0.09	0.08
Copper	mg/kg	0.1	25.2	26.4	9.1
Iron	mg/kg	2	95	250	79
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	174	173	221
Manganese	mg/kg	0.1	1.7	1.8	3.3
Mercury	mg/kg	0.01	0.13	0.11	0.19
Molybdenum	mg/kg	0.01	0.25	0.23	0.17
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	3430	3460	3910
Rubidium	mg/kg	0.01	6.68	8.94	20.3
Selenium	mg/kg	0.1	0.7	0.6	0.4
Silver	mg/kg	0.01	1.06	0.63	0.14
Sodium	mg/kg	5	1910	1320	1200
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.05	0.04	0.05
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	26.4	29.6	24.5

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-030 Dup	127275-031	127275-032
Client Sample ID:			Lab Duplicate	M3C3-BT8 Liver	M3C3-BT9 Liver
Date Sampled:			13-Sep-11	13-Sep-11	13-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	0.6	1.4	2.6
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.182	0.317	0.484
Calcium	mg/kg	5	80	70	60
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.07	0.05	0.14
Copper	mg/kg	0.1	16.5	10.8	33.8
Iron	mg/kg	2	88	86	132
Lead	mg/kg	0.01	< 0.02	< 0.02	0.03
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	222	222	176
Manganese	mg/kg	0.1	3.3	5.0	1.5
Mercury	mg/kg	0.01	0.20	0.12	0.18
Molybdenum	mg/kg	0.01	0.18	0.22	0.29
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	3820	3760	3360
Rubidium	mg/kg	0.01	19.7	18.2	9.92
Selenium	mg/kg	0.1	0.4	0.4	0.6
Silver	mg/kg	0.01	0.30	0.36	0.82
Sodium	mg/kg	5	1190	1290	1580
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.05	0.05	0.09
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	22.4	19.8	29.9

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-033	127275-034	127275-035
Client Sample ID:			M3C3-BT10 Liver	S2A2-BT3 Liver	S2A2-BT4 Liver
Date Sampled:			13-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	4.2	0.8	1.6
Antimony	mg/kg	0.01	< 0.02	< 0.02	0.07
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	0.6
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.407	0.270	0.306
Calcium	mg/kg	5	80	60	50
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.24	0.03	0.07
Copper	mg/kg	0.1	14.4	69.2	22.9
Iron	mg/kg	2	210	159	101
Lead	mg/kg	0.01	< 0.02	0.05	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	171	169	220
Manganese	mg/kg	0.1	2.2	1.8	3.5
Mercury	mg/kg	0.01	0.08	0.17	0.18
Molybdenum	mg/kg	0.01	0.25	0.27	0.26
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	3390	3010	3730
Rubidium	mg/kg	0.01	10.5	13.9	18.3
Selenium	mg/kg	0.1	0.7	0.6	0.5
Silver	mg/kg	0.01	0.38	0.72	0.42
Sodium	mg/kg	5	1840	1900	1160
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.15	0.05	0.11
Tin	mg/kg	0.01	< 0.02	< 0.02	0.04
Tungsten	mg/kg	0.01	< 0.02	< 0.02	0.03
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	22.6	44.5	22.4

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-036	127275-037	127275-038
Client Sample ID:			S2A2-BT11 Liver	S2A2-BT13 Liver	S2A2-BT15 Liver
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	7.7	1.4	2.0
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Cadmium	mg/kg	0.001	0.395	0.278	0.241
Calcium	mg/kg	5	70	80	67
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Cobalt	mg/kg	0.01	0.07	0.05	0.11
Copper	mg/kg	0.1	38.3	52.8	20.1
Iron	mg/kg	2	358	149	248
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Magnesium	mg/kg	1	173	195	181
Manganese	mg/kg	0.1	1.9	1.6	2.1
Mercury	mg/kg	0.01	0.25	0.16	0.41
Molybdenum	mg/kg	0.01	0.39	0.33	0.48
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Potassium	mg/kg	2	3030	3560	2770
Rubidium	mg/kg	0.01	11.3	12.7	8.91
Selenium	mg/kg	0.1	0.7	0.5	0.4
Silver	mg/kg	0.01	0.93	1.10	0.37
Sodium	mg/kg	5	1980	1840	2100
Strontium	mg/kg	0.1	< 0.2	0.2	0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Thallium	mg/kg	0.01	0.09	0.12	0.08
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Tungsten	mg/kg	0.01	0.03	0.03	0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Zinc	mg/kg	0.1	26.9	41.7	20.7

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-039	127275-040	127275-040 Dup
Client Sample ID:			S2A2-BT22 Liver	S2A2-BT23 Liver	Lab Duplicate
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	6.0	2.7	2.5
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.363	0.199	0.184
Calcium	mg/kg	5	60	60	50
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.06	0.07	0.08
Copper	mg/kg	0.1	19.2	16.8	13.0
Iron	mg/kg	2	129	253	257
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	179	149	114
Manganese	mg/kg	0.1	1.4	1.8	1.3
Mercury	mg/kg	0.01	0.17	0.21	0.15
Molybdenum	mg/kg	0.01	0.36	0.34	0.23
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	3230	2440	2510
Rubidium	mg/kg	0.01	13.9	6.37	6.36
Selenium	mg/kg	0.1	0.8	0.4	0.4
Silver	mg/kg	0.01	0.71	0.39	0.32
Sodium	mg/kg	5	1520	1830	1900
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.07	0.09	0.07
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	28.6	23.5	19.3

METALS CONT'D

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-041	127275-042	127275-043
Client Sample ID:			S2A2-BT24 Liver	S2A2-Comp1 Liver	S2A2-Comp2 Liver
Date Sampled:			12-Sep-11	12-Sep-11	12-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	11.7	10.0	5.3
Antimony	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.430	0.533	0.667
Calcium	mg/kg	5	70	80	70
Chromium	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.10	0.11	0.09
Copper	mg/kg	0.1	43.4	28.3	36.3
Iron	mg/kg	2	210	218	229
Lead	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Magnesium	mg/kg	1	192	253	235
Manganese	mg/kg	0.1	1.8	2.4	1.8
Mercury	mg/kg	0.01	0.11	0.18	0.15
Molybdenum	mg/kg	0.01	0.42	0.59	0.44
Nickel	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Potassium	mg/kg	2	3240	4280	4330
Rubidium	mg/kg	0.01	11.3	11.4	17.0
Selenium	mg/kg	0.1	0.8	1.1	1.0
Silver	mg/kg	0.01	1.33	0.92	1.20
Sodium	mg/kg	5	1900	2030	1500
Strontium	mg/kg	0.1	< 0.5	0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.13	0.17	0.25
Tin	mg/kg	0.01	< 0.05	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.05	0.05	0.02
Uranium	mg/kg	0.01	< 0.05	0.07	< 0.02
Vanadium	mg/kg	0.1	< 0.5	< 0.2	< 0.2
Zinc	mg/kg	0.1	32.8	35.7	33.4

METALS CONT'D

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-044	127275-045	127275-046
Client Sample ID:			S3A3-BT1 Liver	S3A3-BT4 Liver	S3A3-BT5 Liver
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	11.1	10.8	10.6
Antimony	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cadmium	mg/kg	0.001	1.26	1.56	1.18
Calcium	mg/kg	5	80	64	70
Chromium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cobalt	mg/kg	0.01	0.26	0.31	0.15
Copper	mg/kg	0.1	8.6	46.9	38.7
Iron	mg/kg	2	379	494	245
Lead	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Magnesium	mg/kg	1	217	179	189
Manganese	mg/kg	0.1	2.1	1.9	1.8
Mercury	mg/kg	0.01	0.29	0.29	0.15
Molybdenum	mg/kg	0.01	0.58	0.51	0.41
Nickel	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Potassium	mg/kg	2	2860	2690	2860
Rubidium	mg/kg	0.01	12.8	11.7	10.4
Selenium	mg/kg	0.1	1.1	1.2	1.0
Silver	mg/kg	0.01	0.26	1.06	1.17
Sodium	mg/kg	5	2530	2160	2030
Strontium	mg/kg	0.1	0.2	0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Thallium	mg/kg	0.01	0.29	0.34	0.19
Tin	mg/kg	0.01	0.05	< 0.01	< 0.02
Tungsten	mg/kg	0.01	0.06	0.05	0.03
Uranium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Zinc	mg/kg	0.1	18.3	31.3	32.3

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-047	127275-048	127275-049
Client Sample ID:			S3A3-BT8 Liver	S3A3-BT9 Liver	S3A3-BT10 Liver
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	16.7	12.7	3.3
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	3.03	1.50	0.747
Calcium	mg/kg	5	80	60	90
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.20	0.63	0.27
Copper	mg/kg	0.1	80.5	43.3	18.0
Iron	mg/kg	2	311	295	143
Lead	mg/kg	0.01	0.03	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	171	175	239
Manganese	mg/kg	0.1	2.0	1.9	2.9
Mercury	mg/kg	0.01	0.24	0.15	0.16
Molybdenum	mg/kg	0.01	0.37	0.42	0.21
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	2700	2870	3600
Rubidium	mg/kg	0.01	14.0	14.8	28.6
Selenium	mg/kg	0.1	1.1	0.8	0.7
Silver	mg/kg	0.01	1.64	0.66	0.31
Sodium	mg/kg	5	2260	1540	1510
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.16	0.46	0.13
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Tungsten	mg/kg	0.01	0.11	0.10	0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	37.1	29.7	23.1

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-050	127275-051	127275-052
Client Sample ID:			S3A3-BT12 Liver	S3A3-BT23 Liver	S3A3-Comp1 Liver
Date Sampled:			26-Sep-11	26-Sep-11	26-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	20.9	7.3	6.9
Antimony	mg/kg	0.01	0.08	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	1.44	0.828	0.782
Calcium	mg/kg	5	90	50	90
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.35	0.26	0.28
Copper	mg/kg	0.1	58.4	31.5	38.0
Iron	mg/kg	2	243	180	225
Lead	mg/kg	0.01	0.06	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	206	196	218
Manganese	mg/kg	0.1	2.8	1.5	2.0
Mercury	mg/kg	0.01	0.16	0.12	0.14
Molybdenum	mg/kg	0.01	0.38	0.39	0.46
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	3150	3570	3780
Rubidium	mg/kg	0.01	15.2	14.6	16.3
Selenium	mg/kg	0.1	1.0	0.9	1.0
Silver	mg/kg	0.01	1.35	0.58	0.68
Sodium	mg/kg	5	1880	1450	1710
Strontium	mg/kg	0.1	< 0.2	< 0.2	0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.22	0.21	0.24
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Tungsten	mg/kg	0.01	0.03	< 0.02	0.03
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	36.4	26.6	25.6

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

for
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-053	127275-054	127275-055
Client Sample ID:			S3A3-Comp2 Liver	W4A17-BT1 Liver	W4A17-BT2 Liver
Date Sampled:			26-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	3.6	3.8	4.5
Antimony	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cadmium	mg/kg	0.001	0.847	0.121	0.138
Calcium	mg/kg	5	60	73	70
Chromium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cobalt	mg/kg	0.01	0.21	0.08	0.07
Copper	mg/kg	0.1	28.8	46.5	21.8
Iron	mg/kg	2	223	223	133
Lead	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Lithium	mg/kg	0.01	< 0.02	0.02	< 0.02
Magnesium	mg/kg	1	192	183	263
Manganese	mg/kg	0.1	1.8	2.0	3.3
Mercury	mg/kg	0.01	0.15	0.22	0.25
Molybdenum	mg/kg	0.01	0.47	0.31	0.21
Nickel	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Potassium	mg/kg	2	3440	3150	4580
Rubidium	mg/kg	0.01	15.7	17.3	37.8
Selenium	mg/kg	0.1	1.0	0.5	0.5
Silver	mg/kg	0.01	0.74	1.37	0.62
Sodium	mg/kg	5	1690	1730	820
Strontium	mg/kg	0.1	< 0.2	0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Thallium	mg/kg	0.01	0.29	0.07	0.13
Tin	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Tungsten	mg/kg	0.01	0.03	< 0.01	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Zinc	mg/kg	0.1	21.9	34.1	28.9

METALS CONT'D

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-056	127275-057	127275-058
Client Sample ID:			W4A17-BT6 Liver	W4A17-BT9 Liver	W4A17-BT12 Liver
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	8.9	6.8	10.1
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.163	0.137	0.276
Calcium	mg/kg	5	60	70	50
Chromium	mg/kg	0.1	< 0.2	0.5	< 0.2
Cobalt	mg/kg	0.01	0.07	0.32	0.12
Copper	mg/kg	0.1	17.0	15.4	80.7
Iron	mg/kg	2	240	226	375
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	182	176	191
Manganese	mg/kg	0.1	1.3	2.0	2.9
Mercury	mg/kg	0.01	0.17	0.11	0.20
Molybdenum	mg/kg	0.01	0.37	0.93	0.35
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	3110	3310	3630
Rubidium	mg/kg	0.01	14.8	14.2	21.6
Selenium	mg/kg	0.1	0.5	0.5	0.6
Silver	mg/kg	0.01	0.50	0.43	2.23
Sodium	mg/kg	5	1590	1840	1450
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.03	0.07	0.04
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.02	0.90	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	0.2	< 0.2
Zinc	mg/kg	0.1	27.9	25.3	42.7

Report ID: 127275-IAS Rev01
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-059	127275-060	127275-061
Client Sample ID:			W4A17-BT13 Liver	W4A17-BT20 Liver	W4A17-BT23 Liver
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	7.0	4.7	4.3
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Cadmium	mg/kg	0.001	0.204	0.125	0.154
Calcium	mg/kg	5	50	60	260
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Cobalt	mg/kg	0.01	0.10	0.16	0.10
Copper	mg/kg	0.1	11.8	13.2	29.3
Iron	mg/kg	2	165	240	180
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Magnesium	mg/kg	1	191	187	190
Manganese	mg/kg	0.1	3.4	1.5	1.7
Mercury	mg/kg	0.01	0.07	0.22	0.17
Molybdenum	mg/kg	0.01	0.30	0.32	0.34
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Potassium	mg/kg	2	3800	3320	3160
Rubidium	mg/kg	0.01	14.1	16.6	16.0
Selenium	mg/kg	0.1	0.7	0.5	< 0.5
Silver	mg/kg	0.01	0.42	0.44	0.81
Sodium	mg/kg	5	1600	1820	1770
Strontium	mg/kg	0.1	< 0.2	< 0.2	0.6
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Thallium	mg/kg	0.01	0.04	0.05	< 0.05
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.05
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.5
Zinc	mg/kg	0.1	25.8	23.2	23.9

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-062	127275-062 Dup	127275-063
Client Sample ID:			W4A17-BT24 Liver	Lab Duplicate	W4A17-Comp1 Liver
Date Sampled:			29-Sep-11	29-Sep-11	29-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	1.9	2.1	3.4
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Cadmium	mg/kg	0.001	0.119	0.119	0.120
Calcium	mg/kg	5	70	70	58
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Cobalt	mg/kg	0.01	0.06	0.05	0.06
Copper	mg/kg	0.1	6.0	5.8	27.9
Iron	mg/kg	2	93	97	177
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Lithium	mg/kg	0.01	< 0.02	< 0.02	0.01
Magnesium	mg/kg	1	218	203	201
Manganese	mg/kg	0.1	2.1	2.0	1.4
Mercury	mg/kg	0.01	0.14	0.14	0.27
Molybdenum	mg/kg	0.01	0.18	0.18	0.32
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Potassium	mg/kg	2	3390	3340	3940
Rubidium	mg/kg	0.01	22.6	22.6	16.1
Selenium	mg/kg	0.1	0.4	0.4	0.5
Silver	mg/kg	0.01	0.10	0.10	0.62
Sodium	mg/kg	5	1590	1500	1360
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Thallium	mg/kg	0.01	0.04	0.05	0.09
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.01
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.1
Zinc	mg/kg	0.1	23.6	23.9	26.3

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-064	127275-065	127275-066
Client Sample ID:			W4A21-BT1 Liver	W4A21-BT2 Liver	W4A21-BT3 Liver
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	1.9	2.2	3.6
Antimony	mg/kg	0.01	0.04	< 0.01	< 0.02
Arsenic	mg/kg	0.1	0.1	< 0.1	< 0.2
Barium	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Beryllium	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Bismuth	mg/kg	0.1	0.1	< 0.1	< 0.2
Boron	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Cadmium	mg/kg	0.001	0.203	0.327	0.289
Calcium	mg/kg	5	62	54	60
Chromium	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Cobalt	mg/kg	0.01	0.23	0.09	0.10
Copper	mg/kg	0.1	23.1	15.4	29.7
Iron	mg/kg	2	130	168	147
Lead	mg/kg	0.01	< 0.01	0.02	< 0.02
Lithium	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Magnesium	mg/kg	1	197	191	186
Manganese	mg/kg	0.1	1.5	1.5	1.4
Mercury	mg/kg	0.01	0.10	0.11	0.18
Molybdenum	mg/kg	0.01	0.33	0.23	0.30
Nickel	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Potassium	mg/kg	2	3670	3440	3720
Rubidium	mg/kg	0.01	14.7	11.3	17.3
Selenium	mg/kg	0.1	1.6	0.6	0.4
Silver	mg/kg	0.01	0.60	0.42	1.56
Sodium	mg/kg	5	1300	1470	1590
Strontium	mg/kg	0.1	< 0.1	0.1	< 0.2
Tellurium	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Thallium	mg/kg	0.01	0.43	0.04	0.04
Tin	mg/kg	0.01	0.02	< 0.01	< 0.02
Tungsten	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Uranium	mg/kg	0.01	< 0.01	< 0.01	< 0.02
Vanadium	mg/kg	0.1	< 0.1	< 0.1	< 0.2
Zinc	mg/kg	0.1	30.1	24.4	32.8

Report ID: 127275-IAS Rev01
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CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-067	127275-068	127275-069
Client Sample ID:			W4A21-BT4 Liver	W4A21-BT5 Liver	W4A21-BT6 Liver
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	2.9	5.1	2.8
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.248	0.364	0.400
Calcium	mg/kg	5	40	50	60
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.08	0.09	0.10
Copper	mg/kg	0.1	50.7	66.2	35.5
Iron	mg/kg	2	94	304	154
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	196	179	186
Manganese	mg/kg	0.1	1.2	1.4	1.5
Mercury	mg/kg	0.01	0.18	0.18	0.17
Molybdenum	mg/kg	0.01	0.24	0.28	0.28
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	3510	3370	3460
Rubidium	mg/kg	0.01	12.0	16.0	11.5
Selenium	mg/kg	0.1	0.7	0.8	0.5
Silver	mg/kg	0.01	1.24	1.94	1.69
Sodium	mg/kg	5	1180	1510	1570
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.05	0.06	0.08
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	40.5	31.0	28.1

Report ID: 127275-IAS Rev01
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-070	127275-071	127275-072
Client Sample ID:			W4A21-BT9 Liver	W4A21-Comp1 Liver	W4A21-Comp2 Liver
Date Sampled:			27-Sep-11	27-Sep-11	27-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	2.1	3.6	3.1
Antimony	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Arsenic	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Cadmium	mg/kg	0.001	0.372	0.188	0.189
Calcium	mg/kg	5	60	60	80
Chromium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Cobalt	mg/kg	0.01	0.11	0.12	0.14
Copper	mg/kg	0.1	17.1	18.3	15.6
Iron	mg/kg	2	194	120	111
Lead	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Magnesium	mg/kg	1	177	222	230
Manganese	mg/kg	0.1	1.7	1.9	1.7
Mercury	mg/kg	0.01	0.12	0.12	0.16
Molybdenum	mg/kg	0.01	0.22	0.30	0.28
Nickel	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Potassium	mg/kg	2	3850	4000	3910
Rubidium	mg/kg	0.01	18.4	16.5	18.9
Selenium	mg/kg	0.1	0.9	0.7	0.6
Silver	mg/kg	0.01	0.80	0.56	0.49
Sodium	mg/kg	5	1510	1820	2000
Strontium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Thallium	mg/kg	0.01	0.05	0.07	0.07
Tin	mg/kg	0.01	< 0.02	< 0.05	0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.05	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.5	< 0.2
Zinc	mg/kg	0.1	19.2	26.1	26.2

METALS CONT'D

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-073	127275-074	127275-075
Client Sample ID:			W4A21-Comp3 Liver	W4A31-BT1 Liver	W4A31-BT2 Liver
Date Sampled:			27-Sep-11	15-Sep-11	15-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	3.6	1.8	3.6
Antimony	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Arsenic	mg/kg	0.1	< 0.2	0.2	0.3
Barium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cadmium	mg/kg	0.001	0.517	0.512	0.758
Calcium	mg/kg	5	60	62	60
Chromium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Cobalt	mg/kg	0.01	0.14	0.13	0.15
Copper	mg/kg	0.1	17.3	13.8	33.1
Iron	mg/kg	2	192	183	213
Lead	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Magnesium	mg/kg	1	197	194	196
Manganese	mg/kg	0.1	1.6	1.5	2.2
Mercury	mg/kg	0.01	0.11	0.05	0.06
Molybdenum	mg/kg	0.01	0.29	0.29	0.33
Nickel	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Potassium	mg/kg	2	3650	3240	3410
Rubidium	mg/kg	0.01	15.4	16.2	18.9
Selenium	mg/kg	0.1	0.8	2.6	2.2
Silver	mg/kg	0.01	0.59	0.37	1.23
Sodium	mg/kg	5	1620	1520	1570
Strontium	mg/kg	0.1	< 0.2	0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Thallium	mg/kg	0.01	0.07	0.11	0.13
Tin	mg/kg	0.01	0.06	< 0.01	< 0.02
Tungsten	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.01	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.1	< 0.2
Zinc	mg/kg	0.1	25.3	26.6	33.1

METALS CONT'D

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-076	127275-076 Dup	127275-077
Client Sample ID:			W4A31-BT3 Liver	Lab Duplicate	W4A31-BT6 Liver
Date Sampled:			15-Sep-11	15-Sep-11	15-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	2.1	1.6	1.7
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Arsenic	mg/kg	0.1	0.2	0.2	< 0.2
Barium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Boron	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cadmium	mg/kg	0.001	0.647	0.593	0.591
Calcium	mg/kg	5	60	70	50
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Cobalt	mg/kg	0.01	0.21	0.22	0.12
Copper	mg/kg	0.1	18.2	11.5	17.4
Iron	mg/kg	2	120	110	206
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Magnesium	mg/kg	1	227	228	200
Manganese	mg/kg	0.1	2.7	2.7	1.3
Mercury	mg/kg	0.01	0.06	0.05	0.06
Molybdenum	mg/kg	0.01	0.17	0.15	0.35
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Potassium	mg/kg	2	4100	4010	3860
Rubidium	mg/kg	0.01	33.2	32.0	16.5
Selenium	mg/kg	0.1	1.3	1.3	1.7
Silver	mg/kg	0.01	0.68	0.37	0.69
Sodium	mg/kg	5	1360	1400	1530
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Thallium	mg/kg	0.01	0.11	0.10	0.09
Tin	mg/kg	0.01	0.03	0.04	0.04
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.02
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 0.2
Zinc	mg/kg	0.1	22.1	19.5	24.3

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-078	127275-079	127275-080
Client Sample ID:			W4A31-BT7 Liver	W4A31-BT8 Liver	W4A31-BT9 Liver
Date Sampled:			15-Sep-11	15-Sep-11	15-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	2.5	5.7	15.2
Antimony	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Arsenic	mg/kg	0.1	0.2	< 0.2	< 0.5
Barium	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Beryllium	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Bismuth	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Boron	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Cadmium	mg/kg	0.001	0.718	0.746	0.836
Calcium	mg/kg	5	43	60	80
Chromium	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Cobalt	mg/kg	0.01	0.14	0.18	0.18
Copper	mg/kg	0.1	17.4	25.1	33.9
Iron	mg/kg	2	175	211	280
Lead	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Lithium	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Magnesium	mg/kg	1	180	199	219
Manganese	mg/kg	0.1	1.2	1.6	1.5
Mercury	mg/kg	0.01	0.05	0.06	0.07
Molybdenum	mg/kg	0.01	0.30	0.33	0.40
Nickel	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Potassium	mg/kg	2	3490	3500	3730
Rubidium	mg/kg	0.01	15.3	15.7	16.3
Selenium	mg/kg	0.1	2.7	2.2	3.3
Silver	mg/kg	0.01	0.79	0.62	1.12
Sodium	mg/kg	5	1300	1580	1820
Strontium	mg/kg	0.1	0.1	< 0.2	< 0.5
Tellurium	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Thallium	mg/kg	0.01	0.16	0.10	0.08
Tin	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Tungsten	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Uranium	mg/kg	0.01	< 0.01	< 0.02	< 0.05
Vanadium	mg/kg	0.1	< 0.1	< 0.2	< 0.5
Zinc	mg/kg	0.1	24.2	31.4	40.4

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
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*** Revised Report ***

Attention: Eva Walker
Project #: 121810356
Location: Sisson Project

Analysis of Metals

RPC Sample ID:			127275-081	127275-081 Dup	127275-082
Client Sample ID:			W4A31-BT10 Liver	Lab Duplicate	W4A31-Comp1 Liver
Date Sampled:			28-Sep-11	28-Sep-11	28-Sep-11
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.1	4.7	3.7	39
Antimony	mg/kg	0.01	< 0.02	< 0.02	< 0.1
Arsenic	mg/kg	0.1	0.2	< 0.2	< 1
Barium	mg/kg	0.1	< 0.2	< 0.2	< 1
Beryllium	mg/kg	0.01	< 0.02	< 0.02	< 0.1
Bismuth	mg/kg	0.1	< 0.2	< 0.2	< 1
Boron	mg/kg	0.1	< 0.2	< 0.2	< 1
Cadmium	mg/kg	0.001	0.551	0.508	0.43
Calcium	mg/kg	5	100	100	100
Chromium	mg/kg	0.1	< 0.2	< 0.2	< 1
Cobalt	mg/kg	0.01	0.33	0.30	0.2
Copper	mg/kg	0.1	7.0	8.6	16
Iron	mg/kg	2	128	130	100
Lead	mg/kg	0.01	< 0.02	< 0.02	< 0.1
Lithium	mg/kg	0.01	< 0.02	< 0.02	< 0.1
Magnesium	mg/kg	1	230	235	230
Manganese	mg/kg	0.1	3.0	3.0	2
Mercury	mg/kg	0.01	0.09	0.09	< 0.1
Molybdenum	mg/kg	0.01	0.14	0.15	0.3
Nickel	mg/kg	0.1	< 0.2	< 0.2	< 1
Potassium	mg/kg	2	3990	4050	4000
Rubidium	mg/kg	0.01	24.7	24.8	16.7
Selenium	mg/kg	0.1	1.4	1.2	2
Silver	mg/kg	0.01	0.17	0.23	0.6
Sodium	mg/kg	5	1300	1280	1720
Strontium	mg/kg	0.1	< 0.2	< 0.2	< 1
Tellurium	mg/kg	0.01	< 0.02	< 0.02	< 0.1
Thallium	mg/kg	0.01	0.16	0.17	0.2
Tin	mg/kg	0.01	< 0.02	< 0.02	< 0.1
Tungsten	mg/kg	0.01	< 0.02	< 0.02	< 0.1
Uranium	mg/kg	0.01	< 0.02	< 0.02	< 0.1
Vanadium	mg/kg	0.1	< 0.2	< 0.2	< 1
Zinc	mg/kg	0.1	21.3	19.8	37

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General Report Comments

The resulting solutions were analyzed for trace elements by ICP-MS.
Mercury was analysed by Cold Vapour AAS.
Corrected calculation error for Liver samples.

Revision Comments

The samples were homogenized and portions were prepared by Microwave Assisted Digestion in nitric acid.

Report ID: 127275-IAS Rev01
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Project #: 121810356
Location: Sisson Project
QA/QC Report

RPC Sample ID:			CRM000628	CRM000629	CRM000630
Type:			CRM DORM-3	CRM DORM-3	CRM DORM-3
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1350	1340	1340
Antimony	mg/kg	0.005	0.012	< 0.005	< 0.005
Arsenic	mg/kg	0.05	5.89	6.11	6.16
Barium	mg/kg	0.05	5.17	5.06	5.18
Beryllium	mg/kg	0.005	0.019	0.016	0.016
Bismuth	mg/kg	0.05	0.11	0.06	< 0.05
Boron	mg/kg	0.05	9.00	8.98	8.81
Cadmium	mg/kg	0.0005	0.282	0.285	0.283
Calcium	mg/kg	2	2130	2170	2160
Chromium	mg/kg	0.05	1.79	1.75	1.86
Cobalt	mg/kg	0.005	0.241	0.251	0.254
Copper	mg/kg	0.05	14.6	14.7	14.8
Iron	mg/kg	1	328	318	323
Lead	mg/kg	0.005	0.449	0.410	0.407
Lithium	mg/kg	0.005	1.20	1.19	1.16
Magnesium	mg/kg	0.5	878.	869.	852.
Manganese	mg/kg	0.05	2.92	2.89	2.90
Mercury	mg/kg	0.01	0.26	0.35	0.36
Molybdenum	mg/kg	0.005	0.297	0.280	0.281
Nickel	mg/kg	0.05	1.22	1.23	1.24
Potassium	mg/kg	1	12800	12800	12800
Rubidium	mg/kg	0.005	5.81	5.80	5.88
Selenium	mg/kg	0.05	3.12	3.28	3.27
Silver	mg/kg	0.005	0.015	0.021	0.021
Sodium	mg/kg	2	13700	13500	13400
Strontium	mg/kg	0.05	9.21	9.19	9.28
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.013	0.011	0.011
Tin	mg/kg	0.005	0.078	0.081	0.078
Tungsten	mg/kg	0.005	0.066	0.061	0.061
Uranium	mg/kg	0.005	0.065	0.063	0.058
Vanadium	mg/kg	0.05	1.59	1.57	1.59
Zinc	mg/kg	0.05	44.3	46.0	46.9

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS

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Project #: 121810356
Location: Sisson Project
QA/QC Report

RPC Sample ID:			CRM000635	CRM000636	CRM000637
Type:			CRM DORM-3	CRM DORM-3	CRM DORM-3
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1310	1280	1580
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	5.80	5.70	6.98
Barium	mg/kg	0.05	5.43	5.28	6.46
Beryllium	mg/kg	0.005	0.013	0.015	0.017
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	8.89	8.87	10.9
Cadmium	mg/kg	0.0005	0.288	0.282	0.341
Calcium	mg/kg	2	2180	2220	2780
Chromium	mg/kg	0.05	1.73	1.77	2.18
Cobalt	mg/kg	0.005	0.248	0.249	0.305
Copper	mg/kg	0.05	14.5	14.5	18.2
Iron	mg/kg	1	333	324	401
Lead	mg/kg	0.005	0.833	0.421	0.527
Lithium	mg/kg	0.005	1.17	1.14	1.41
Magnesium	mg/kg	0.5	908.	902.	1080
Manganese	mg/kg	0.05	3.43	3.01	3.54
Mercury	mg/kg	0.01	0.37	0.38	0.45
Molybdenum	mg/kg	0.005	0.282	0.278	0.358
Nickel	mg/kg	0.05	1.18	1.26	1.52
Potassium	mg/kg	1	12900	13000	16100
Rubidium	mg/kg	0.005	5.91	5.97	7.43
Selenium	mg/kg	0.05	3.11	3.07	3.55
Silver	mg/kg	0.005	0.018	0.018	0.024
Sodium	mg/kg	2	13900	13900	17200
Strontium	mg/kg	0.05	9.53	9.57	12.1
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.011	0.013
Tin	mg/kg	0.005	0.061	0.069	0.074
Tungsten	mg/kg	0.005	0.063	0.074	0.091
Uranium	mg/kg	0.005	0.059	0.057	0.073
Vanadium	mg/kg	0.05	1.51	1.51	1.88
Zinc	mg/kg	0.05	49.1	41.0	49.9

Report ID: 127275-IAS Rev01
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Project #: 121810356
Location: Sisson Project
QA/QC Report

RPC Sample ID:			CRM000642	CRM000643	CRM000644
Type:			CRM DORM-3	CRM DORM-3	CRM DORM-3
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	1280	1260	1240
Antimony	mg/kg	0.005	0.012	0.010	0.006
Arsenic	mg/kg	0.05	6.15	6.15	5.94
Barium	mg/kg	0.05	5.27	5.10	6.42
Beryllium	mg/kg	0.005	0.013	0.015	0.012
Bismuth	mg/kg	0.05	0.11	0.05	< 0.05
Boron	mg/kg	0.05	8.78	8.76	8.67
Cadmium	mg/kg	0.0005	0.291	0.294	0.289
Calcium	mg/kg	2	2190	2150	2170
Chromium	mg/kg	0.05	1.82	1.81	1.78
Cobalt	mg/kg	0.005	0.248	0.259	0.240
Copper	mg/kg	0.05	15.1	15.0	15.0
Iron	mg/kg	1	356	315	319
Lead	mg/kg	0.005	0.349	0.300	0.313
Lithium	mg/kg	0.005	1.16	1.10	1.11
Magnesium	mg/kg	0.5	873.	869.	850.
Manganese	mg/kg	0.05	3.09	2.87	2.94
Mercury	mg/kg	0.01	0.38	0.36	0.37
Molybdenum	mg/kg	0.005	0.301	0.301	0.294
Nickel	mg/kg	0.05	1.22	1.30	1.22
Potassium	mg/kg	1	13100	13000	12900
Rubidium	mg/kg	0.005	5.96	5.96	5.91
Selenium	mg/kg	0.05	3.33	3.36	3.20
Silver	mg/kg	0.005	0.021	0.023	0.022
Sodium	mg/kg	2	13800	13700	13600
Strontium	mg/kg	0.05	9.63	9.53	9.64
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	0.011	0.010	0.010
Tin	mg/kg	0.005	0.091	0.075	0.069
Tungsten	mg/kg	0.005	0.061	0.066	0.067
Uranium	mg/kg	0.005	0.055	0.055	0.052
Vanadium	mg/kg	0.05	1.47	1.46	1.45
Zinc	mg/kg	0.05	45.9	45.6	44.8

Report ID: 127275-IAS Rev01
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Project #: 121810356
Location: Sisson Project
QA/QC Report

RPC Sample ID:			CRM000649	CRM000650	CRM000651
Type:			CRM DOLT-3	CRM DOLT-3	CRM DOLT-3
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	27.1	24.5	22.8
Antimony	mg/kg	0.005	0.02	0.02	0.02
Arsenic	mg/kg	0.05	8.7	7.3	7.6
Barium	mg/kg	0.05	0.2	0.2	0.2
Beryllium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Bismuth	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Boron	mg/kg	0.05	0.7	0.7	0.7
Cadmium	mg/kg	0.0005	17.9	16.1	16.4
Calcium	mg/kg	2	526	537	539
Chromium	mg/kg	0.05	3.4	2.9	2.9
Cobalt	mg/kg	0.005	0.30	0.30	0.29
Copper	mg/kg	0.05	31.3	30.9	30.8
Iron	mg/kg	1	1420	1450	1430
Lead	mg/kg	0.005	0.30	0.32	0.27
Lithium	mg/kg	0.005	0.04	0.04	0.04
Magnesium	mg/kg	0.5	1170	1210	1200
Manganese	mg/kg	0.05	10.0	10.1	10.2
Mercury	mg/kg	0.01	3.20	3.23	3.02
Molybdenum	mg/kg	0.005	3.85	3.67	3.65
Nickel	mg/kg	0.05	3.5	2.6	2.6
Potassium	mg/kg	1	10700	10900	10800
Rubidium	mg/kg	0.005	3.52	3.57	3.58
Selenium	mg/kg	0.05	6.2	4.8	5.0
Silver	mg/kg	0.005	1.17	1.18	1.16
Sodium	mg/kg	2	8520	8800	8630
Strontium	mg/kg	0.05	4.0	4.0	4.1
Tellurium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Thallium	mg/kg	0.005	0.01	0.01	0.01
Tin	mg/kg	0.005	0.50	0.50	0.48
Tungsten	mg/kg	0.005	0.14	0.21	0.12
Uranium	mg/kg	0.005	0.05	0.05	0.05
Vanadium	mg/kg	0.05	0.3	0.4	0.3
Zinc	mg/kg	0.05	83.0	68.1	70.3

Report ID: 127275-IAS Rev01
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Project #: 121810356
Location: Sisson Project
QA/QC Report

RPC Sample ID:			RB002076	RB002077	RB002078
Type:			Blank	Blank	Blank
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.05	0.06	< 0.05
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Barium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	< 0.0005	< 0.0005	< 0.0005
Calcium	mg/kg	2	< 2	< 2	< 2
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Copper	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Iron	mg/kg	1	< 1	< 1	< 1
Lead	mg/kg	0.005	< 0.005	0.007	< 0.005
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	< 0.5	< 0.5	< 0.5
Manganese	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Mercury	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	< 1	< 1	< 1
Rubidium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Selenium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	< 2	< 2	< 2
Strontium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	< 0.05	< 0.05	< 0.05

Report ID: 127275-IAS Rev01
Report Date: 31-Jan-12
Date Received: 19-Oct-11

CERTIFICATE OF ANALYSIS
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Fax: 506.452.0594
www.rpc.ca

Project #: 121810356
Location: Sisson Project
QA/QC Report

RPC Sample ID:			RB002089	RB002090	RB002091
Type:			Blank	Blank	Blank
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	0.07	0.05	0.11
Antimony	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Barium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	< 0.0005	< 0.0005	< 0.0005
Calcium	mg/kg	2	< 2	< 2	< 2
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Copper	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Iron	mg/kg	1	< 1	< 1	< 1
Lead	mg/kg	0.005	< 0.005	< 0.005	0.005
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	< 0.5	< 0.5	< 0.5
Manganese	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Mercury	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	< 1	< 1	< 1
Rubidium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Selenium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	< 2	< 2	< 2
Strontium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tin	mg/kg	0.005	< 0.005	< 0.005	0.006
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	< 0.05	< 0.05	< 0.05

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Report Date: 31-Jan-12
Date Received: 19-Oct-11

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Project #: 121810356
Location: Sisson Project
QA/QC Report

RPC Sample ID:			RB002098	RB002099	RB002100
Type:			Blank	Blank	Blank
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Antimony	mg/kg	0.005	0.006	< 0.005	< 0.005
Arsenic	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Barium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Beryllium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Bismuth	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Boron	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/kg	0.0005	< 0.0005	< 0.0005	< 0.0005
Calcium	mg/kg	2	< 2	< 2	< 2
Chromium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Cobalt	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Copper	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Iron	mg/kg	1	< 1	< 1	< 1
Lead	mg/kg	0.005	0.023	< 0.005	< 0.005
Lithium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/kg	0.5	< 0.5	< 0.5	< 0.5
Manganese	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Mercury	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Molybdenum	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Nickel	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Potassium	mg/kg	1	< 1	< 1	< 1
Rubidium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Selenium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Silver	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Sodium	mg/kg	2	< 2	< 2	< 2
Strontium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Tellurium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Thallium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tin	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Tungsten	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/kg	0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	0.05	< 0.05	< 0.05	< 0.05

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Project #: 121810356
Location: Sisson Project
QA/QC Report

RPC Sample ID:			RB002109	RB002110	RB002111
Type:			Blank	Blank	Blank
Analytes	**Units**	**RL**			
Aluminum	mg/kg	0.05	< 0.05	< 0.1	< 0.1
Antimony	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Arsenic	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Barium	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Beryllium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Bismuth	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Boron	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Cadmium	mg/kg	0.0005	< 0.001	< 0.001	< 0.001
Calcium	mg/kg	2	< 5	< 5	< 5
Chromium	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Cobalt	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Copper	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Iron	mg/kg	1	< 2	< 2	< 2
Lead	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Lithium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Magnesium	mg/kg	0.5	< 1	< 1	< 1
Manganese	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Mercury	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Molybdenum	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Nickel	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Potassium	mg/kg	1	< 2	< 2	< 2
Rubidium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Selenium	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Silver	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Sodium	mg/kg	2	< 5	< 5	< 5
Strontium	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Tellurium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Thallium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Tin	mg/kg	0.005	0.01	< 0.01	0.04
Tungsten	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Uranium	mg/kg	0.005	< 0.01	< 0.01	< 0.01
Vanadium	mg/kg	0.05	< 0.1	< 0.1	< 0.1
Zinc	mg/kg	0.05	0.3	< 0.1	< 0.1

Appendix E-6

Benthic Invertebrates and Statistical Summaries

Table E-6.1 Benthic Macroinvertebrates Collected, Sisson Project, New Brunswick, 2011 (densities expressed per 0.093 m2)

STATION	B2A2					B3A9					S2A2					S3A3					M3C3					W4A17					W4A21					W4A31					EBNB1					NRC				
REPLICATE	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
HORSE-HAIR WORMS																																																	
P. Nematomorpha	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ROUNDWORMS																																																	
P. Nemata	5	1	10	5	25	-	1	3	2	-	4	8	6	-	-	-	-	-	-	1	-	-	-	1	4	5	1	4	-	1	-	-	2	-	-	1	-	-	1	4	2	6	2	4	4	2	-	-	-	3
FLATWORMS																																																	
P. Platyhelminthes																																																	
Cl. Turbellaria																																																	
indeterminate	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Tricladida	-	1	-	1	-	4	2	1	2	2	-	4	-	2	8	-	-	-	-	1	4	4	-	-	-	-	12	4	-	-	-	-	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDS																																																	
P. Annelida																																																	
WORMS																																																	
Cl. Oligochaeta																																																	
F. Branchiobdellidae	-	-	-	-	-	-	-	-	-	-	-	-	8	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Enchytraeidae	2	1	4	-	14	8	-	2	2	-	-	-	-	6	-	2	-	-	-	-	-	-	2	3	4	4	24	2	4	36	-	1	-	10	-	1	-	2	-	-	6	1	1	2	2	2	1	4	2	2
F. Naididae																																																	
Nais behningi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nais	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ophidonais serpentina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
F. Tubificidae																																																	
Rhyacodrilus ?sodalis	-	-	-	-	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	1	-	-	1	2	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	4	-	-
immatures without hair chaetae	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lumbricidae																																																	
Eiseniella tetraedra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae																																																	
Lumbriculus variegatus	-	1	-	-	-	-	7	20	4	34	40	32	14	14	32	5	9	17	75	34	20	10	10	-	-	-	-	-	-	8	-	1	4	2	4	-	-	-	-	2	6	-	-	1	-	-	-	2	-	-
LEECHES																																																	
Cl. Hirudinea																																																	
F. Glossiphoniidae																																																	
Helobdella stagnalis	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS																																																	
P. Arthropoda																																																	
MITES																																																	
Cl. Arachnida																																																	
O. Acarina	32	68	38	72	39	160	66	139	66	50	80	48	4	10	28	5	24	23	23	27	20	12	16	3	4	120	272	112	108	100	2	5	8	8	4	5	6	6	24	11	6	6	3	-	3	12	1	4	2	16
Wandesia	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS																																																	
Cl. Ostracoda	1	1	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
WATER SCUDS																																																	
O. Amphipoda																																																	
F. Hyalellidae																																																	
Hyalella	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRAYFISH																																																	
O. Decapoda																																																	
F. Cambaridae																																																	
Cambarus bartonii	-	-	-	-	-	-	-	-	-	-	-	2	-	3	2	-	-	-	-	-	-	-	-	1	-	1	-	1	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-
INSECTS																																																	
Cl. Insecta																																																	
BEETLES																																																	
O. Coleoptera																																																	
F. Dytiscidae																																																	
Liodessus affinus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Elmidae																																																	
Dubiraphia minima	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dubiraphia larvae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	2
Optioservus ampliatus	-	-	-	-	-	4	1	2	-	4	-	8	-	-	-	-	-	-	-	1	13	14	26	10	60	28	40	4	8	32	-	2	2	-	-	2	2	1	7	2	2	1	2	1	1	-	-	-	-
Optioservus trivittatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-	2	-	2	-	4	2	4
Optioservus larvae	1	2	-	-	-	**4**	**7**	**16**	30	**14**	4	**4**	-	2	8	2	1	6	6	**4**	**401**	**94**	**170**	**170**	**380**	**32**	**28**	**22**	**28**	**48**	16	**11**	**4**	8	8	**7**	**14**	**9**	**30**	**16**	**42**	**23**	**21**	**16**	**13**	**126**	38	**150**	**80**	**144**
Oulimnius latiusculus	-	22	6	16	12	76	9	76	30	70	28	32	2	-	8	39	50	18	95	68	4	-	2	2	4	32	56	6	12	56	-	2	2	6	-	6	10	13	12	6	-	1	1	1	-	2	-	2	2	-
Oulimnius larvae	4	**42**	**13**	**17**	**26**	**100**	**30**	**82**	**46**	**30**	**100**	**84**	**8**	8	**52**	**41**	**35**	**42**	**79**	**18**	**12**	10	**6**	**10**	**28**	**48**	**40**	**18**	**36**	**89**	8	**9**	**4**	**28**	16	**5**	**16**	**6**	**22**	**4**	14	**5**	**4**	**3**	-	**8**	-	**10**	-	8
Promoresia tardella	-	3	-	-	-	200	67	188	50	72	100	57	2	18	20	31	6	45	7	3	8	6	2	2	-	100	138	94	32	36	-	7	12	2	-	18	14	10	32	5	-	-	-	-	-	-	-	-	-	20
Promoresia	-	**18**	3	2	-	**388**	**206**	**553**	**258**	**116**	**248**	**112**	**6**	**40**	**128**	**45**	**29**	**101**	**35**	**5**	**8**	**12**	**2**	-	-	**516**	**546**	**248**	**197**	**214**	2	**22**	**36**	**22**	5	**67**	**46**	**32**	**161**	**8**	16	2	1	-	-	16	2	18	8	**47**
Stenelmis crenata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	18	13	4	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-
Stenelmis larvae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**122**	**36**	**34**	**57**	**88**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	**6**	2	6
F. Psephenidae																																																	
Ectopria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	10	4	3	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	4	1	-	2	2
Psephenus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	1	1	-	2
MAYFLIES																																																	
O. Ephemeroptera																																																	
F. Ameletidae																																																	
Ameletus	-	-	-	-	-	-	7	4	2	6	-	-	-	-	-	1	6	4	1	1	-	-	-	-	-	-	-	4	-	-	-	-	2	4	4	-	-	1	-	8	-	-	1	-	-	-	-	-	-	-
F. Baetidae																																																	
Acentrella	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	3	1	-	-	-	-	-	-	-	-	-	-	-	6	1	18	2	2	-	12	6	6	4	2	-	-	1	-	6	-	-	2	2
Acerpenna macdunnoughi	-	2	1	-	2	-	22	4	22	10	12	8	6	-	12	-	11	30	29	9	-	-	-	1	-	8	-	14	36	1	4	1	4	8	4	1	-	-	-	-	-	1	-	-	-	-	12	8	10	4	2
Baetis	1	-	-	-	-	-	-	-	-	4	-	12	-	-	-	-	-	-	-	-	8	2	-	-	-	-	4	2	-	-	2	-	-	-	2	-	-	-	-	-	-	2	1	1	-	-	-	1	2	-	-
Baetis brunneicolor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	14	9	24	8	-	-	-	-	-	-	-	-	-
Baetis flavistriga	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Diphetor hageni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-
F. Ephemeridae																																																	
Ephemera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	1	-	1	-	-	-	-
Litobrancha recurvata	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Ephemerellidae																																																	
Ephemerella	2	33	14	24	21	12	4	22	8	22	24	12	10	6	1	8	10	33	33	11	164	96	16	15	148	93	141	54	76	67	30	15	36	34	16	9	18	12	27	14	51	38	9	23	20	246	77	180	158	114
Eurylophella	23	62	26	39	42	16	76	33	62	24	68	60	83	78	104	1	5	8	23	3	-	8	8	2	24	4	54	12	36	65	-	2	2	2	14	-	10	4	2	-	-	1	5	-	-	42	22	34	10	56
Serratella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	2	-	-	-	1	6	-	2	12	2
F. Heptageniidae																																																	
Epeorus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	12	12	4	4	16	36	21	76	84	22	13	56	7	28	62	42	37	16	23	14	18	10	10	8	4
Heptagenia	-	-	-	-	-	-	6	8	-	-	28	36	26	12	65	21	15	14	30	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leucrocuta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	4	2	12	4	26	-	18	6	8	-	6	1	-	18	6	31	5	4	10	102	18	58	70	16
Maccaffertium mediopunctatum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	-	-	4	12	1	14	10	-
Maccaffertium pulchellum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	106	56	13	244	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maccaffertium vicarium	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	9	-	24	5	2	14	14	1	4	1	8	2	-	10	3	3	-	8	2	2	-	8
Rhithrogena	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	42	20	8	8	-	15	73	14	12	42	14	10	2	5	8	6	6	10	10	18
Stenacron	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-
F. Leptophlebiidae																																																	
Habrophlebia	-	-	-	-	-	8	34	-	2	16	96	104	192	148	245	-	1	3	-	-	60	8	20	3	280	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	4
Leptophlebia	-	-	-	-	-	-	2	-	4	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	9	-	2	6
Paraleptophlebia	4	15	2	-	3	-	7	9	4	18	-	-	2	4	48	-	9	15	27	13	81	74	43	1	168	32	128	44	92	48	82	23	38	60	54	11	24	5	12	42	36	30	8	16	10	46	12	16	33	6
AQUATIC MOTHS																																																	
O. Lepidoptera																																																	
F. Pyralidae	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Megaloptera																																																	
FISHFLIES & DOBSONFLIES																																																	
F. Corydalidae																																																	
Nigronia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	6	10	3	1	-	-	2	-	1	-	-	-	2	-	1	-	-	2	3	3	1	3	1	1	1	-	-	-	-
ALDERFLIES																																																	

Table E-6.1 Benthic Macroinvertebrates Collected, Sisson Project, New Brunswick, 2011 (densities expressed per 0.093 m2)

STATION	B2A2					B3A9					S2A2					S3A3					M3C3					W4A17					W4A21					W4A31					EBNB1					NRC				
REPLICATE	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
F. Sialidae																																																	
Sialis	4	-	2	-	-	-	1	1	-	2	4	12	28	4	4	-	-	-	1	1	5	4	9	5	9	-	4	-	-	-	-	-	-	-	-	1	-	-	-	2	4	8	4	6	2	-	2	2	-	-
O. Odonata																																																	
DAMSELFLIES																																																	
F. Calopterygidae																																																	
Calopteryx maculata	-	-	-	-	-	-	-	-	-	-	2	1	-	1	-	-	-	-	-	-	-	2	6	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DRAGONFLIES																																																	
F. Aeshnidae																																																	
Boyeria grafiana	-	-	-	-	-	-	-	-	-	-	6	-	2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-	-
F. Cordulegastridae																																																	
Cordulegaster	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-	-	-	4	2	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
F. Corduliidae																																																	
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Gomphidae																																																	
Lanthus parvulus	-	-	-	-	-	1	3	9	3	5	37	20	10	9	39	4	3	1	21	5	-	2	1	-	-	-	1	1	13	-	-	-	2	8	2	-	3	-	2	-	-	-	1	-	-	-	-	-	-	-
Ophiogomphus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	1	-	2	2	2	5
STONEFLIES																																																	
O. Plecoptera																																																	
F. Capniidae																																																	
Paracapnia	-	-	-	-	-	4	3	-	-	2	4	-	2	-	4	-	-	1	-	-	4	-	-	1	1	4	4	8	21	3	53	75	61	44	55	-	6	-	-	26	21	12	2	15	24	54	48	87	56	6
F. Chloroperlidae																																																	
Haploperla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	4	2	1	2	2	-	2	-	2	4
Sweltsa	2	17	6	15	5	8	4	15	8	32	41	8	2	2	8	52	25	9	35	35	8	2	-	-	4	4	28	10	-	10	32	18	18	80	24	60	70	70	125	123	4	14	10	4	6	2	-	2	2	-
F. Leuctridae																																																	
Leuctra	-	3	2	-	3	4	3	1	2	5	8	-	4	-	8	-	-	1	6	2	7	26	18	2	29	-	4	2	24	-	-	1	2	8	2	-	2	-	-	2	22	10	3	10	3	52	3	13	10	14
F. Nemouridae																																																	
Amphinemura	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nemoura	1	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Perlidae																																																
Acroneuria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	6	-	-	-	1	-	-	-	-	-	-	-	-	-	12	11	5	22	5	1	2	-	3	-	2	-	-	-	2
Agnetina	-	-	-	-	-	4	1	1	-	5	-	-	-	-	-	2	1	-	-	1	5	9	2	-	1	14	40	5	15	16	34	9	12	20	14	8	27	26	20	33	21	10	3	9	2	5	2	7	4	5
F. Perlodidae																																																
Isogenoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	2	2	2	5	2
Isoperla	-	2	3	-	-	20	5	10	2	2	16	4	4	6	-	3	3	6	2	2	12	10	14	4	40	69	56	92	32	16	-	-	2	4	2	1	-	5	6	2	6	-	-	-	2	8	1	8	2	14
F. Pteronarcyidae																																																
Pteronarcys	-	-	-	-	-	2	1	-	-	-	4	-	-	-	-	-	1	-	-	-	-	1	-	-	1	11	3	-	3	3	2	-	-	2	13	12	1	1	5	-	-	-	-	-	-	-	1	-	-
F. Taeniopterygidae																																																
Taeniopteryx	-	1	-	-	-	-	3	10	8	2	-	-	-	-	-	-	4	5	1	-	4	-	-	-	8	37	36	12	-	18	-	-	2	-	-	-	6	-	-	-	-	1	1	2	-	4	1	4	4	4
BUGS																																																
O. Hemiptera																																																
F. Veliidae																																																
Microvelia	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CADDISFLIES																																																
O. Trichoptera																																																
F. Apataniidae																																																
Apatania	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	4	-
F. Brachycentridae																																																
Brachycentrus appalachia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	5	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Micrasema	-	6	-	3	1	36	16	48	45	26	88	12	4	7	8	-	4	9	2	-	8	-	2	-	-	66	106	56	25	57	-	4	14	-	-	1	-	-	2	-	6	-	-	1	1	16	2	10	13	16
F. Glossosomatidae																																																
Agapetus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42	21	-	60	17	-	1	-	-	2	-	6	1	-	4	20	15	16	14	6	34	1	62	22	45
Glossosoma	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	1	-	-	2	1	-	2	-	2	-	13	4	-	-	-	4	8	-	6	2	19	18	14	18	36	11	2	1	-	5	-	-	-	-	-
F. Goeridae																																																
Goera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	3
F. Helicopsychidae																																																
Helicopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
F. Hydropsychidae																																																
Arctopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2	2	1	-	1	-	-	1	-	-	3	2	5	4	3	-	-	-	1	-	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	14	1	18	16	22
Diplectrona modesta	-	-	-	1	-	-	-	-	-	-	65	-	-	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Hydropsyche betteni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	12	5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche bronta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Hydropsyche morosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	4	-	-	1	-	-	-	-	2	2	-	-
Hydropsyche slossonae	-	-	-	-	-	-	-	9	-	-	16	-	-	-	-	1	-	-	2	1	4	-	-	-	-	1	13	-	-	18	4	7	12	3	8	5	6	4	5	-	6	-	-	-	-	-	1	-	-	-
Hydropsyche sparna	-	-	1	-	-	4	4	21	6	-	58	156	10	40	64	24	6	49	8	7	36	10	-	3	16	34	129	28	44	52	12	25	36	18	16	49	30	62	112	26	44	18	4	19	7	4	3	4	10	24
Parapsyche	-	12	-	1	-	-	-	-	-	-	-	-	-	-	-	3	1	6	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydroptilidae																																																
Hydroptila	-	2	-	2	-	12	44	10	16	-	429	36	30	54	24	3	6	5	3	2	-	-	-	-	-	-	-	2	12	1	-	-	-	-	-	-	-	-	-	-	-	6	13	8	-	4	3	2	-	4
Oxyethira	1	8	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Palaeagepetus celsus	-	8	1	-	-	4	1	7	6	2	16	24	8	2	12	-	1	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lepidostomatidae																																																
Lepidostoma	2	16	6	3	4	36	59	42	62	50	36	14	2	8	16	11	9	13	36	6	-	6	4	2	-	26	49	8	73	49	60	12	66	42	109	27	22	8	22	49	4	3	-	4	4	4	1	2	2	3
F. Leptoceridae																																																
Ceraclea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Mystacides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Oecetis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	8	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-
F. Limnephilidae																																																
Hydatophylax	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	7	2	1	11	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
F. Molannidae																																																
Molanna	3	6	3	-	2	-	-	-	-	-	1	8	16	26	9	-	1	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Odontoceridae																																																
Psilotreta	-	-	-	-	-	4	5	4	12	-	8	4	1	-	-	2	1	-	-	-	-	-	-	-	-	-	6	2	4	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	6	-	-	3	1
F. Philopotamidae																																																
Chimarra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dolophilodes	-	9	1	1	-	-	-	4	-	6	21	117	-	-	4	5	5	78	5	-	13	10	4	2	-	5	13	-	13	1	16	9	2	14	16	41	23	16	46	14	1	5	2	6	1	-	-	-	4
Wormaldia	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Phryganeidae																																																
Oligostomis	-	-	-	1	-	-	-	-	3	-	1	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Polycentropodidae																																																
Neureclipsis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-
Nyctiophylax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Polycentropus	-	-	-	-	-	-	-	-	-	-	4	-	2	4	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-	-	1	-	-	-
F. Psychomyiidae																																																
Lype diversa	2	5	3	2	4	-	-	-	2	8	-	-	-	-	-	-	-	-	3	-	8	6	-	-	8	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Rhyacophilidae																																																
Rhyacophila fuscula	-	5	-	5	-	4	-	6	-	2	-	4	-	-	-	3	7	4	7	4	-	-	-	-	-	2	13	6	-	12	6	3	4	2	-	-	4	-	7	-	2	-	-	2	-	-	-	-	-	-
Rhyacophila vibox	-	1	-	-	4	-	-	-	-	-	-	-	-	-	-	-	2	3	-	1	-	-	-	-	-	19	24	7	8	-	8	7	2	16	10	5	16	4	9	9	31	17	18	9	16	18	11	31	10	25
Rhyacophila	1	2	4	6	3	-	3	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	2	-	-	-	-	-	-	2	-	8	-	-	-	1	-	-	8	1	6	10	8
F. Uenoidae																																																
Neophylax	-	1	-	-	1	-	1	1	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUE FLIES																																																
O. Diptera																																																
indeterminate	38	23	14	7	3	-	2	1	2	-	-	-	-	2	4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
F. Athericidae																																																
Atherix	-	-	-	-	-	52	22	48	24	30	16	36	5	2	-	8	9	13	13	7	34	12	8	16	68	48	40	11	15	24	16	15	12	18	22	23	9	9	29	12	20	14	9	-	4	2	1	2	8	6

Table E-6.1 Benthic Macroinvertebrates Collected, Sisson Project, New Brunswick, 2011 (densities expressed per 0.093 m2)

STATION	B2A2					B3A9					S2A2					S3A3					M3C3					W4A17					W4A21					W4A31					EBNB1					NRC				
REPLICATE	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
BITING-MIDGE																																																	
F. Ceratopogonidae																																																	
Culicoides	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mallochohelea	-	-	-	-	-	-	-	-	-	-	-	-	4	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Probezzia	14	6	28	32	32	8	3	3	4	4	68	33	6	-	28	2	-	3	6	1	-	-	2	3	4	-	-	-	9	8	2	2	-	4	-	1	10	7	12	17	8	12	6	9	1	2	-	4	2	-
MIDGES																																																
F. Chironomidae																																																
chironomid pupae	**2**	**1**	**2**	**2**	**4**	-	-	**3**	**6**	**10**	**12**	**12**	**10**	**8**	**40**	**5**	**6**	**8**	**8**	**10**	**16**	**6**	**2**	**1**	**4**	**1**	-	-	-	-	**4**	**1**	**2**	**4**	**2**	**3**	**12**	**2**	**4**	**6**	**4**	**1**	-	-	-	**2**	-	-	**5**	-
S.F. Chironominae																																																
Constempellina	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Cryptochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Demicryptochironomus	-	-	-	-	-	-	-	1	-	-	-	4	-	-	-	-	-	-	1	1	-	-	-	2	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	2	2	1	4	-	-	-	-	-	-
Micropsectra	1	6	-	-	4	-	3	3	-	2	24	28	2	-	60	4	-	18	14	8	8	4	2	1	28	4	28	2	12	-	30	32	20	26	10	10	134	1	24	168	18	18	5	26	27	32	8	22	30	12
Microtendipes	6	5	-	5	-	-	1	-	-	4	-	8	8	8	-	-	-	-	-	-	4	6	4	-	16	-	12	2	20	16	2	-	4	2	4	1	4	1	2	6	20	3	7	3	1	36	3	14	4	12
Nilothauma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Polypedilum aviceps	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	4	-	-	-	-	-	24	3	22	12	14	4	4	1	2	6	-	-	-	-	-	6	3	6	2	-
Polypedilum halterale	3	-	-	1	2	-	1	2	-	4	4	-	-	-	4	-	-	-	3	1	-	-	-	-	4	-	-	-	16	-	6	-	-	-	-	2	2	2	2	2	-	1	-	1	-	-	-	-	-	-
Polypedilum scalaenum	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pseudochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rheotanytarsus	-	-	1	-	4	-	-	-	-	-	-	-	6	-	-	-	-	-	4	-	4	-	-	1	4	4	12	4	8	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	78	4	24	24	16
Stempellina	1	-	-	-	-	-	-	1	-	2	8	-	-	-	8	-	-	-	3	-	8	2	6	4	8	-	4	-	4	-	-	4	-	-	-	-	2	1	4	2	2	3	3	2	6	10	2	-	6	4
Stempellinella	-	-	5	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stenochironomus	-	4	1	2	-	-	-	-	2	1	4	-	-	-	-	-	1	-	-	-	4	4	-	-	8	-	-	2	4	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
Tribelos	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae																																																
Diamesa	-	1	-	1	2	-	-	-	-	-	-	4	-	-	4	-	1	3	3	4	-	-	-	-	-	-	-	-	-	-	1	-	4	4	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-
Potthastia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
S.F. Orthocladiinae																																																
Brillia	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Chaetocladius	2	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corynoneura	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-	20	2	-	6	-	16	-	-	-	-	-	-	2	-	-	-	-	-	-	8	1	3	-	1	14	-	12	2	6
Cricotopus/Orthocladius	-	-	2	-	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Eukiefferiella	-	-	1	1	-	-	-	-	2	-	-	-	-	-	-	-	1	6	1	1	-	-	-	-	-	32	24	6	8	4	-	-	2	-	2	-	6	-	-	-	-	-	1	-	-	-	-	-	-	2
Heterotrissocladius	1	-	1	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrobaenus	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lopescladius	-	-	-	-	2	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Orthocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Orthocladius (Symposiocladius) lu	1	2	2	-	-	-	1	-	-	4	-	-	-	-	-	-	1	3	3	-	-	-	-	-	-	-	8	2	4	12	-	1	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parachaetocladius	-	-	1	-	8	-	4	4	-	2	12	-	2	-	-	-	-	-	-	-	8	6	10	23	28	12	120	26	12	76	2	6	6	20	2	2	6	1	8	10	4	1	3	2	-	8	1	14	2	6
Parametriocnemus	-	1	2	-	-	4	-	1	-	-	-	-	-	4	4	-	-	-	-	-	8	-	-	-	4	-	-	-	4	-	-	-	4	-	4	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-
Psectrocladius	-	1	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	2	-	-	-	2	1	4	-	8	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tvetenia	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylotopus	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae																																																
Ablabesmyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Natarsia	-	-	6	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	-	-
Thienemannimyia complex	26	9	4	17	4	-	-	-	-	-	56	36	6	38	8	-	-	-	2	1	40	6	28	4	36	-	-	6	-	4	2	-	-	-	-	2	4	-	-	6	4	-	2	1	-	8	5	2	2	4
Trissopelopia	-	-	-	-	1	4	14	5	12	4	-	-	28	8	20	2	1	-	-	-	-	4	6	1	8	-	8	-	8	8	-	1	-	-	-	-	-	1	-	-	2	-	4	1	1	-	-	-	-	-
Zavrelimyia	-	-	-	-	-	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tanypodinae indeterminate	4	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Empididae																																																
Chelifera	-	2	1	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	4	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	1	1	-	-	-	-	-
Hemerodromia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57	22	22	92	233	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	1	-	2	-	6	1	4	-	6
Oreogeton	1	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pupae	-	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Nymphomyiidae																																																
Nymphomyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	1	6	-	-	-	8	2	-	1	1	-	-	-	-	-	-	-	-	-
F. Psychodidae																																																
Pericoma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Simuliidae																																																
Simulium	-	-	-	-	1	4	-	9	8	2	75	20	1	8	4	5	2	2	-	2	4	2	-	1	-	2	8	-	-	8	4	1	3	-	-	1	6	11	17	2	-	-	1	1	-	-	-	-	-	-
F. Tabanidae																																																
Chrysops	8	-	2	-	-	-	-	-	-	-	-	4	2	2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
F. Tipulidae																																																
Antocha	-	-	-	-	-	-	1	2	-	2	-	12	6	-	-	1	-	1	1	-	15	18	5	5	20	16	-	-	-	4	-	-	-	-	-	2	1	2	1	5	1	1	2	2	10	6	4	10	4
Dicranota	4	4	7	5	3	8	-	2	6	-	20	38	8	6	12	-	-	5	2	2	13	3	-	20	1	9	12	10	4	12	-	2	-	2	10	-	-	-	1	2	2	2	2	3	2	-	1	-	2	4
Hexatoma	1	5	10	1	5	-	-	-	-	-	5	-	-	-	2	3	2	2	7	3	-	-	6	-	-	-	-	-	-	-	1	3	4	4	3	10	13	6	16	7	1	3	1	1	-	6	1	4	-	2
Limnophila	-	1	3	-	2	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	2	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	2	-	-	-
Molophilus	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pilaria	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tipula	1	-	-	-	2	-	-	-	2	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCS																																																
P. Mollusca																																																
SNAILS																																																
Cl. Gastropoda																																																
F. Ancylidae																																																
Ferrissia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	2	8	10	-	16	21	15	57	23	36	2	30	12	54
F. Hydrobiidae																																																
Amnicola limosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	20	10	40	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
F. Lymnaeidae																																																
indeterminate	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Physidae																																																
Physella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLAMS																																																
Cl. Bivalvia																																																
F. Sphaeriidae																																																
Pisidium (Cyclocalyx)	22	75	52	3	60	44	38	40	50	70	560	132	118	62	308	8	9	9	17	13	12	18	56	16	-	8	44	62	80	52	-	-	2	-	20	8	12	11	7	14	12	30	12	8	5	22	2	4	2	20
F. Unionidae																																																
Elliptio complanata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Strophitus undulatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
TOTAL NUMBER OF ORGANISMS	236	537	314	306	379	1247	806	1492	895	782	2565	1450	714	697	1523	356	331	645	697	339	1405	762	739	533	2137	1545	2401	1036	1254	1356	612	401	615	681	588	495	828	435	975	869	610	465	260	349	257	1225	354	957	719	874
TOTAL NUMBER OF TAXA [a]	42	52	50	37	41	30	47	49	42	40	45	47	46	43	47	34	43	47	50	41	47	49	47	49	49	41	49	47	43	49	37	41	46	44	48	44	55	51	51	48	53	58	62	52	47	59	56	54	54	63

Notes:

[a] Bold entries excluded from taxa count

Table E-6.2 Calculation of Subsampling Error for Benthic Macroinvertebrate Samples Collected from Sisson Project (2011)

Station	Whole Organisms	Number of Organisms in Fraction								Actual Density*	Precision % range		Accuracy	
		1	2	3	4	5	6	7	8				min	max
B3A9-2	4	186	199	207	210	-	-	-	-	802	1.4	11.4	0.7	7.2
W4A21-2	10	193	198	-	-	-	-	-	-	391	2.5	-	1.3	-
EBNB1-3	14	118	128	-	-	-	-	-	-	246	7.8	-	4.1	-

Notes:

* whole large organisms excluded in calculations.

min = minimum absolute % error

max = maximum absolute % error

Table E-6.3 Percent Recovery of Benthic Macroinvertebrates Samples Collected from Sisson Project (2011)

Station	Number of Organisms Recovered	Number of Organisms in Re-sort	Percent Recovery
S3A3-1	349	7	98.0%
S3A3-2	316	15	95.5%
M3C3-4	516	17	96.8%
EBNB1-4	347	2	99.4%
NRC-5	423	23	94.8%
		Average % Recovery	**96.9%**

Table E-6.4 Sample Fractions Sorted from Sisson Project (2011)

Station	Fraction Sorted	Station	Fraction Sorted
B2A2-1	Whole	S2A2-1	1/4
B2A2-2	Whole	S2A2-2	1/4
B2A2-3	Whole	S2A2-3	1/2
B2A2-4	Whole	S2A2-4	1/2
B2A2-5	Whole	S2A2-5	1/4
B3A9-1	1/4	S3A3-1	Whole
B3A9-2	Whole[a]	S3A3-2	Whole
B3A9-3	Whole	S3A3-3	Whole
B3A9-4	1/2	S3A3-4	Whole
B3A9-5	1/2	S3A3-5	Whole
M3C3-1	1/4	W4A21-1	1/2
M3C3-2	1/2	W4A21-2	Whole[b]
M3C3-3	1/2	W4A21-3	1/2
M3C3-4	Whole	W4A21-4	1/2
M3C3-5	1/4	W4A21-5	1/2
EBNB1-1	1/2	W4A17-1	1/4
EBNB1-2	Whole	W4A17-2	1/4
EBNB1-3	Whole[b]	W4A17-3	1/2
EBNB1-4	Whole	W4A17-4	1/4
EBNB1-5	Whole	W4A17-5	1/4
NRC-1	1/2	W4A31-1	Whole
NRC-2	Whole	W4A31-2	1/2
NRC-3	1/2	W4A31-3	Whole
NRC-4	1/2	W4A31-4	1/2
NRC-5	1/2	W4A31-5	1/2

Notes:

[a] Four quarters sorted for subsampling error calculations.

[b] Two halves sorted for subsampling error calculations.

QA/QC Notes

Pupae were not counted toward total number of taxa unless they were the sole representative of their taxa group.
Immatures were not counted toward total number of taxa unless they were the sole representative of their taxa group
Beetle larvae were not counted toward total number of taxa unless they were the sole representative of their taxa gro

Table E-6.5 Tukey HSD Multiple Comparisons for log10-transformed Abundance
Matrix of pairwise comparison probabilities

	B2A2	B3A9	EBNB1	M3C3	NRC	S2A2	S3A3	W4A17	W4A21	W4A31
B2A2	1.000									
B3A9	**0.003**	1.000								
EBNB1	1.000	**0.008**	1.000							
M3C3	**0.005**	1.000	**0.012**	1.000						
NRC	**0.061**	0.982	0.132	0.992	1.000					
S2A2	**0.000**	0.999	**0.001**	0.996	0.700	1.000				
S3A3	0.984	**0.058**	0.999	**0.078**	0.480	**0.008**	1.000			
W4A17	**0.000**	0.894	**0.000**	0.840	0.263	0.999	**0.001**	1.000		
W4A21	0.545	0.427	0.760	0.506	0.972	0.106	0.990	**0.018**	1.000	
W4A31	0.169	0.860	0.317	0.909	1.000	0.404	0.773	0.104	0.999	1.000

Table E-6.6 Tukey HSD Multiple Comparisons for log10-transformed Richness
Matrix of pairwise comparison probabilities

	B2A2	B3A9	EBNB1	M3C3	NRC	S2A2	S3A3	W4A17	W4A21	W4A31
B2A2	1.000									
B3A9	1.000	1.000								
EBNB1	**0.058**	**0.018**	1.000							
M3C3	0.786	0.493	0.848	1.000						
NRC	**0.012**	**0.003**	1.000	0.479	1.000					
S2A2	0.995	0.930	0.361	0.998	0.114	1.000				
S3A3	1.000	1.000	**0.034**	0.660	**0.007**	0.981	1.000			
W4A17	0.999	0.968	0.274	0.993	**0.079**	1.000	0.994	1.000		
W4A21	1.000	1.000	**0.024**	0.565	**0.004**	0.957	1.000	0.983	1.000	
W4A31	0.858	0.586	0.774	1.000	0.391	1.000	0.748	0.998	0.658	1.000

Table E-6.7 Tukey HSD Multiple Comparisons for Simpson's Diversity Index
Matrix of pairwise comparison probabilities

	B2A2	B3A9	EBNB1	M3C3	NRC	S2A2	S3A3	W4A17	W4A21	W4A31
B2A2	1.000									
B3A9	**0.000**	1.000								
EBNB1	0.694	**0.000**	1.000							
M3C3	0.931	**0.025**	**0.067**	1.000						
NRC	1.000	**0.000**	0.812	0.855	1.000					
S2A2	1.000	**0.002**	0.366	0.997	0.999	1.000				
S3A3	0.987	**0.010**	0.139	1.000	0.960	1.000	1.000			
W4A17	0.896	**0.033**	**0.052**	1.000	0.802	0.993	1.000	1.000		
W4A21	0.990	**0.000**	0.997	0.372	0.998	0.876	0.574	0.313	1.000	
W4A31	1.000	**0.000**	0.916	0.724	1.000	0.993	0.888	0.657	1.000	1.000

Notes:
Bold and underlined values represent $p < 0.100$.

Table E-6.8 Tukey HSD Multiple Comparisons for Simpson's Evenness Index
Matrix of pairwise comparison probabilities

	B2A2	B3A9	EBNB1	M3C3	NRC	S2A2	S3A3	W4A17	W4A21	W4A31
B2A2	1.000									
B3A9	**0.006**	1.000								
EBNB1	**0.013**	**0.000**	1.000							
M3C3	0.232	0.888	**0.000**	1.000						
NRC	0.713	0.408	**0.000**	0.998	1.000					
S2A2	0.979	0.109	**0.000**	0.875	0.999	1.000				
S3A3	0.794	0.329	**0.000**	0.993	1.000	1.000	1.000			
W4A17	0.702	0.419	**0.000**	0.998	1.000	0.999	1.000	1.000		
W4A21	0.120	**0.000**	0.996	**0.000**	**0.001**	**0.007**	**0.001**	**0.001**	1.000	
W4A31	1.000	**0.007**	**0.012**	0.245	0.733	0.983	0.810	0.721	0.112	1.000

Table E-6.9 Tukey HSD Multiple Comparisons for Bray-Curtis Dissimilarity Index
Matrix of pairwise comparison probabilities

	B2A2	B3A9	EBNB1	M3C3	NRC	S2A2	S3A3	W4A17	W4A21	W4A31
B2A2	1.000									
B3A9	**0.000**	1.000								
EBNB1	1.000	**0.000**	1.000							
M3C3	1.000	**0.000**	1.000	1.000						
NRC	0.890	**0.000**	0.812	0.882	1.000					
S2A2	0.863	**0.000**	0.776	0.853	1.000	1.000				
S3A3	0.738	**0.000**	0.629	0.725	1.000	1.000	1.000			
W4A17	**0.000**	0.147	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	1.000		
W4A21	0.944	**0.000**	0.889	0.938	1.000	1.000	1.000	**0.000**	1.000	
W4A31	0.897	**0.000**	0.821	0.889	1.000	1.000	1.000	**0.000**	1.000	1.000

Table E-6.10 Tukey HSD Multiple Comparisons for EPT/C Index
Matrix of pairwise comparison probabilities

	B2A2	B3A9	EBNB1	M3C3	NRC	S2A2	S3A3	W4A17	W4A21	W4A31
B2A2	1.000									
B3A9	**0.001**	1.000								
EBNB1	0.970	**0.029**	1.000							
M3C3	0.999	**0.010**	1.000	1.000						
NRC	0.852	**0.076**	1.000	0.998	1.000					
S2A2	0.943	**0.041**	1.000	1.000	1.000	1.000				
S3A3	0.310	0.432	0.949	0.789	0.995	0.974	1.000			
W4A17	0.961	**0.033**	1.000	1.000	1.000	1.000	0.960	1.000		
W4A21	0.799	**0.097**	1.000	0.996	1.000	1.000	0.998	1.000	1.000	
W4A31	0.178	0.627	0.843	0.603	0.967	0.899	1.000	0.866	0.982	1.000

Notes:
Bold and underlined values represent $p < 0.100$.

Appendix E-7

Data Summary Table for Periphyton and Associated RPC data
(Chlorophyll *a*, TSS, VSS)

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		B2A2		B2A2		B2A2		B3A9		B3A9		B3A9		S2A2		S2A2		S2A2		S3A3		S3A3	
Replicate		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2	
Date sampled		22-Jul-11		22-Jul-11		22-Jul-11		7-Aug-11		7-Aug-11		7-Aug-11		25-Jul-11		25-Jul-11		25-Jul-11		29-Jul-11		29-Jul-11	
Lab ID		BIO-01	BIO-01	BIO-02	BIO-02	BIO-03	BIO-03	BIO-07	BIO-07	BIO-08	BIO-08	BIO-09	BIO-09	BIO-16	BIO-16	BIO-17	BIO-17	BIO-18	BIO-18	BIO-28	BIO-28	BIO-29	BIO-29
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																						
Achnanthes altaica (Poretzky) Cleve-Euler	*Psammothidium altaicum (Poretzky)* Bukht. In Bukht. & Round	0	0	314	9.21E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes clevei Grunow	*Karayevia clevei* (Grunow in Cleve & Grunow) Round & Bukht.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes exigua Grunow	Achnanthidium exiguum (Grunow) Czarn.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes flexella var. *alpestris* Brun.	Eucocconeis flexella car alpestris (Brun.) Hustedt	0	0	0	0	0	0	0	0	128	0.0298165	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes hungarica (Grunow) Grunow	Achnanthidium hungaricum Grunow	129	0.0310913	0	0	1368	0.3351903	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achanthes kriegeri Krasske	*Achanthes kriegeri* Krasske	777	7.00E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes lanceolata (Brebisson) Grunow	Planothidium lanceolatum (Breb.) Round & Bukht.	1165	8.02E-02	1731	0.1623514	4299	0.4031079	159	1.50E-02	1281	0.1200987	210	0.0196931	0	0	64	6.03E-03	175	1.64E-02	279	2.62E-02	0	0
Achnanthes lapisosa Krasske	*Achnanthes lapisosa* Krasske	388	7.00E-02	2991	0.5384161	3518	0.6332459	159	5.09E-02	384	6.92E-02	0	0	0	0	64	0.0157465	0	0	0	0	0	0
Achnanthes levanderi Hustedt	*Psammothidium levanderi* (Hust.) Bukht. & Round	0	0	0	0	390	2.35E-02	0	0	0	0	0	0	89	6.71E-03	64	1.50E-02	0	0	0	0	0	0
Achnanthes minutissima Kuetzing	*Achnanthidium minutissimum* (Kuetzing) Czarn.	1165	0.03410328	4722	0.1487729	11726	0.3693934	3432	0.1081376	10504	0.3072605	7562	0.2382077	3490	0.1099638	0	0	1664	0.05241826	15535	0.489359	10657	0.3357126
Achnanthes pusilla (Grunow) De Toni	*Achnanthes pusilla (Grunow) De Toni*	129	1.04E-02	629	5.04E-02	586	7.33E-02	558	6.99E-02	384	3.07E-02	420	3.36E-02	268	2.15E-02	4370	0.3496366	788	6.31E-02	4930	0.3944268	715	0.0572644
Achnanthes subatomoides (Hustedt) Lange-Bertalot	*Achnanthes subatomoides (Hustedt) Lange-Bertalot*	1943	0.1214504	4250	0.2656659	0	0	718	5.39E-02	4099	0.2818316	840	3.36E-02	179	1.12E-02	257	1.61E-02	613	3.83E-02	930	5.81E-02	318	1.99E-02
Achnanthes suchlandtii Hustedt	*Achnanthes suchlandtii* Hustedt	0	0	0	0	17003	1.062739	79	3.19E-03	896	5.60E-02	630	0.0393862	0	0	0	0	0	0	93	5.81E-03	0	0
Amphora pediculus (Kuetzing) Grunow	*Amphora pediculus* (Kuetzing) Grunow	0	0	0	0	195	3.18E-03	0	0	0	0	0	0	0	0	64	1.05E-03	0	0	0	0	0	0
Anomoeoneis brachysira (Brebisson) Grunow	*Anomoeoneis brachysira* (Brebisson) Grunow	0	0	157	1.97E-02	0	0	79	1.30E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anomoeoneis vitrea (Grunow) Ross	*Brachysira vitrea* (Grunow) R. Ross in B.Hartley	129	0.0291481	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asterionella ralfsii W. Smith	*Asterionella ralfsii* W. Smith	0	0	0	0	195	1.72E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aulacoseira ambigua (Grunow) Simonsen	*Aulacoseira ambigua* (Grunow) Simonsen	129	4.99E-02	0	0	390	0.2256496	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aluacoseira crenulata (Ehrenberg) Thwaites	*Aluacoseira crenulata (Ehrenberg) Thwaites*	906	0.8546669	5824	5.489905	2540	2.394649	0	0	0	0	420	0.3959532	0	0	0	0	0	0	0	0	0	0
Aulacoseira distans (Ehrenberg) Simonsen	*Aulacoseira distans* (Ehrenberg) Simonsen	2850	0.335762	6612	0.778973	7036	0.8289169	0	0	896	0.1056443	420	4.95E-02	179	2.11E-02	0	0	613	7.22E-02	93	1.10E-02	159	1.87E-02
Aulacoseira valida (Grun.) Krammer	*Aulacoseira valida* (Grun.) Krammer	388	1.323208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caloneis bacillum (Grunow) Cleve	*Caloneis bacillum* (Grunow) Cleve	0	0	0	0	195	2.44E-02	0	0	0	0	420	5.25E-02	179	2.24E-02	0	0	175	1.26E-02	0	0	0	0
Caloneis silicula (Ehrenberg) Cleve	*Caloneis ventricosa* (Ehren.) F.Meister	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cocconeis pediculus Ehrenberg	*Cocconeis pediculus* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cocconeis placentula var *lineata* (Ehrenberg) Van Heurck	*Cocconeis placentula* var *lineata* (Ehrenberg) Van Heurck	0	0	0	0	0	0	1277	0.8114514	3971	2.402615	1470	1.164571	89	4.92E-02	321	0.6501056	87	5.83E-02	11256	7.4909	1670	1.111526
Cyclotella pseudostelligera Hustedt	*Cyclotella pseudostelligera Hustedt*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella gracilis (Ehrenberg) Kuetzing	*Encyonema gracilis* Rabenh.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella microcephala Grunow	*Cymbella microcephala* Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	128	1.26E-03	0	0	0	0	0	0
Cymbella minuta Hilse	*Encyonema minutum* (Hilse *ex* Rabenh.) D.G.Mann in Round, Crawford & Mann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella naviculiformis Auersw *ex* Heib.	*Cymbella naviculiformis* Auersw *ex* Heib.	0	0	0	0	0	0	0	0	0	0	210	0.0611039	0	0	0	0	0	0	0	0	0	0
Cymbella pusilla Grunow	*Cymbella pusilla* Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella minuta var. silesiaca (Bleisch ex. Rabenhorst) C.W. Reimer	*Encyonema silesiacum* (Bleisch *ex.* Rabenh.) D.G. Mann in Round, Crawford & Mann	0	0	0	0	0	0	79	0.003762175	0	0	0	0	0	0	0	0	175	0.06222752	0	0	0	0
Cymbella sinuata W. Greg.	*Reimeria sinuata* (W.Greg) Kociolek & Stoermer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella tumida (Brebisson) Van Heurck	*Cymbella tumida (Brebisson) Van Heurck*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diatoma anceps (Ehrenberg) Grunow	*Meridion anceps* (Ehrenberg) D.M.Williams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diatoma mesodon (Ehrenberg) Kuetzing	*Diatoma mesodon (Ehrenberg) Kuetzing*	129	7.46E-02	157	2.31E-02	0	0	0	0	128	2.35E-02	0	0	179	2.42E-02	0	0	0	0	837	0.1640964	477	8.77E-02
Eunotia bilunaris (Ehrenberg) Mills	*Eunotia bilunaris* (Ehrenberg) Mills	0	0	629	0.1007562	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia bilunaris var. *mucophila Lange-Bertalot & Norpel*	*Eunotia bilunaris* var. *mucophila Lange-Bertalot & Norpel*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia exigua Brebisson (Rabenhorst)	*Eunotia exigua* Brebisson (Rabenhorst)	0	0	1574	5.31E-02	1172	3.96E-02	239	1.44E-02	640	2.82E-02	210	4.73E-03	447	2.15E-02	0	0	87	3.50E-03	0	0	477	1.18E-02

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		S3A3		M3C3		M3C3		M3C3		W4A21		W4A21		W4A21		W4A31		W4A31		W4A31		W4A17	
Replicate		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1	
Date sampled		29-Jul-11		28-Jul-11		28-Jul-11		28-Jul-11		3-Aug-11		3-Aug-11		3-Aug-11		2-Aug-11		2-Aug-11		2-Aug-11		4-Aug-11	
Lab ID		BIO-30	BIO-30	BIO-04	BIO-04	BIO-05	BIO-05	BIO-06	BIO-06	BIO-19	BIO-19	BIO-20	BIO-20	BIO-21	BIO-21	BIO-22	BIO-22	BIO-23	BIO-23	BIO-24	BIO-24	BIO-25	BIO-25
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																						
Achnanthes altaica (Poretzky) Cleve-Euler	*Psammothidium altaicum (Poretzky)* Bukht. In Bukht. & Round	0	0	0	0	131	3.85E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes clevei Grunow	*Karayevia clevei* (Grunow in Cleve & Grunow) Round & Bukht.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes exigua Grunow	Achnanthidium exiguum (Grunow) Czarn.	0	0	99	8.74E-03	0	0	0	0	0	0	79	6.46E-03	0	0	0	0	0	0	0	0	0	0
Achnanthes flexella var. *alpestris* Brun.	Eucocconeis flexella car alpestris (Brun.) Hustedt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes hungarica (Grunow) Grunow	Achnanthidium hungaricum Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achanthes kriegeri Krasske	*Achanthes kriegeri* Krasske	0	0	99	2.92E-03	65	1.78E-03	82	2.41E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes lanceolata (Brebisson) Grunow	Planothidium lanceolatum (Breb.) Round & Bukht.	0	0	399	3.74E-02	0	0	247	0.0231598	656	6.15E-02	79	7.45E-03	822	7.71E-02	74	6.94E-03	0	0	0	0	379	3.56E-02
Achnanthes lapisosa Krasske	*Achnanthes lapisosa* Krasske	0	0	199	4.89E-02	65	1.61E-02	164	4.03E-02	0	0	0	0	0	0	0	0	0	0	0	0	94	2.33E-02
Achnanthes levanderi Hustedt	*Psammothidium levanderi* (Hust.) Bukht. & Round	85	8.03E-03	99	7.49E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes minutissima Kuetzing	*Achnanthidium minutissimum* (Kuetzing) Czarn.	10278	0.3237589	10183	0.3207737	5261	0.1538917	25609	0.8067023	10369	0.3266491	2383	0.07508177	1645	0.05551958	4443	0.1599775	19012	0.6416786	32900	0.9623353	2944	0.09275004
Achnanthes pusilla (Grunow) De Toni	*Achnanthes pusilla (Grunow) De Toni*	942	7.54E-02	99	1.25E-02	131	1.05E-02	164	2.06E-02	525	4.20E-02	79	6.36E-03	274	2.19E-02	222	1.78E-02	1098	7.91E-02	775	5.58E-02	379	3.04E-02
Achnanthes subatomoides (Hustedt) Lange-Bertalot	*Achnanthes subatomoides (Hustedt) Lange-Bertalot*	770	4.82E-02	599	3.00E-02	394	2.47E-02	164	1.03E-02	1837	0.1148555	635	2.54E-02	274	1.71E-02	148	9.26E-03	84	5.28E-03	602	3.77E-02	1139	7.12E-02
Achnanthes suchlandtii Hustedt	*Achnanthes suchlandtii* Hustedt	85	5.35E-03	0	0	0	0	164	1.03E-02	393	1.26E-02	79	4.97E-03	274	1.71E-02	0	0	0	0	0	0	189	1.19E-02
Amphora pediculus (Kuetzing) Grunow	*Amphora pediculus* (Kuetzing) Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anomoeoneis brachysira (Brebisson) Grunow	*Anomoeoneis brachysira* (Brebisson) Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anomoeoneis vitrea (Grunow) Ross	*Brachysira vitrea* (Grunow) R. Ross in B.Hartley	0	0	99	2.70E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asterionella ralfsii W. Smith	*Asterionella ralfsii* W. Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aulacoseira ambigua (Grunow) Simonsen	*Aulacoseira ambigua* (Grunow) Simonsen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	2.05E-02
Aluacoseira crenulata (Ehrenberg) Thwaites	*Aluacoseira crenulata (Ehrenberg) Thwaites*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aulacoseira distans (Ehrenberg) Simonsen	*Aulacoseira distans* (Ehrenberg) Simonsen	171	2.02E-02	0	0	0	0	247	2.91E-02	0	0	79	9.36E-03	0	0	0	0	0	0	0	0	0	0
Aulacoseira valida (Grun.) Krammer	*Aulacoseira valida* (Grun.) Krammer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caloneis bacillum (Grunow) Cleve	*Caloneis bacillum* (Grunow) Cleve	0	0	0	0	0	0	0	0	131	1.64E-02	0	0	0	0	0	0	0	0	0	0	0	0
Caloneis silicula (Ehrenberg) Cleve	*Caloneis ventricosa* (Ehren.) F.Meister	0	0	0	0	0	0	0	0	0	0	0	0	137	4.07E-02	0	0	0	0	0	0	0	0
Cocconeis pediculus Ehrenberg	*Cocconeis pediculus* Ehrenberg	0	0	0	0	0	0	0	0	0	0	158	0.6729551	0	0	0	0	0	0	0	0	94	0.2849464
Cocconeis placentula var *lineata* (Ehrenberg) Van Heurck	*Cocconeis placentula* var *lineata* (Ehrenberg) Van Heurck	5481	5.130809	199	0.0998362	197	0.163362	0	0	6825	14.30155	1747	1.772406	959	0.9730321	1925	1.952615	5070	5.141034	9904	6.591483	3704	2.465213
Cyclotella pseudostelligera Hustedt	*Cyclotella pseudostelligera Hustedt*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella gracilis (Ehrenberg) Kuetzing	*Encyonema gracilis* Rabenh.	85	6.50E-03	199	0.0177732	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella microcephala Grunow	*Cymbella microcephala* Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172	1.80E-03	0	0
Cymbella minuta Hilse	*Encyonema minutum* (Hilse *ex* Rabenh.) D.G.Mann in Round, Crawford & Mann	171	3.74E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella naviculiformis Auersw *ex* Heib.	*Cymbella naviculiformis* Auersw *ex* Heib.	0	0	99	2.90E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella pusilla Grunow	*Cymbella pusilla* Grunow	171	9.34E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*Cymbella minuta var. silesiaca (*Bleisch ex. Rabenhorst) C.W. Reimer	*Encyonema silesiacum* (Bleisch *ex.* Rabenh.) D.G. Mann in Round, Crawford & Mann	0	0	0	0	0	0	0	0	0	0	0	0	137	0.01025824	0	0	84	0.006022177	0	0	284	0.02030745
Cymbella sinuata W. Greg.	*Reimeria sinuata* (W.Greg) Kociolek & Stoermer	0	0	0	0	0	0	0	0	262	7.16E-03	317	8.67E-03	0	0	0	0	0	0	0	0	0	0
Cymbella tumida (Brebisson) Van Heurck	*Cymbella tumida (Brebisson) Van Heurck*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diatoma anceps (Ehrenberg) Grunow	*Meridion anceps* (Ehrenberg) D.M.Williams	85	1.61E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diatoma mesodon (Ehrenberg) Kuetzing	*Diatoma mesodon (Ehrenberg) Kuetzing*	1284	0.5395982	0	0	0	0	0	0	1181	0.302431	238	0.0321779	0	0	0	0	0	0	775	0.1364245	94	1.82E-02
Eunotia bilunaris (Ehrenberg) Mills	*Eunotia bilunaris* (Ehrenberg) Mills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia bilunaris var. *mucophila Lange-Bertalot & Norpel*	*Eunotia bilunaris* var. *mucophila Lange-Bertalot & Norpel*	0	0	0	0	65	1.05E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia exigua Brebisson (Rabenhorst)	*Eunotia exigua* Brebisson (Rabenhorst)	85	2.31E-03	299	0.0114562	65	3.16E-03	82	2.78E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		W4A17		W4A17		EBNB1		EBNB1		EBNB1		NRC		NRC		NRC	
Replicate		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3	
Date sampled		4-Aug-11		4-Aug-11		8-Aug-11		8-Aug-11		8-Aug-11		28-Sep-11		28-Sep-11		28-Sep-11	
Lab ID		BIO-26	BIO-26	BIO-27	BIO-27	BIO-13	BIO-13	BIO-14	BIO-14	BIO-15	BIO-15	BIO-10	BIO-10	BIO-11	BIO-11	BIO-12	BIO-12
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																
Achnanthes altaica (Poretzky) Cleve-Euler	*Psammothidium altaicum (Poretzky)* Bukht. In Bukht. & Round	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes clevei Grunow	*Karayevia clevei* (Grunow in Cleve & Grunow) Round & Bukht.	70	1.90E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes exigua Grunow	Achnanthidium exiguum (Grunow) Czarn.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes flexella var. *alpestris* Brun.	Eucocconeis flexella car alpestris (Brun.) Hustedt	0	0	0	0	0	0	0	0	257	3.83E-02	0	0	0	0	0	0
Achnanthes hungarica (Grunow) Grunow	Achnanthidium hungaricum Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achanthes kriegeri Krasske	*Achanthes kriegeri* Krasske	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes lanceolata (Brebisson) Grunow	Planothidium lanceolatum (Breb.) Round & Bukht.	421	3.96E-02	651	6.11E-02	0	0	0	0	343	3.22E-02	0	0	270	2.54E-02	387	3.63E-02
Achnanthes lapisosa Krasske	*Achnanthes lapisosa* Krasske	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes levanderi Hustedt	*Psammothidium levanderi* (Hust.) Bukht. & Round	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achnanthes minutissima Kuetzing	*Achnanthidium minutissimum* (Kuetzing) Czarn.	9844	0.3101045	4085	0.119497	12734	0.4011476	9523	0.3000013	29898	0.9418155	29997	0.8774146	39752	1.25890956	16276	0.5127226
Achnanthes pusilla (Grunow) De Toni	*Achnanthes pusilla (Grunow) De Toni*	210	1.69E-02	296	2.37E-02	244	1.67E-02	432	4.60E-02	171	1.37E-02	18601	1.190499	69770	3.907141	12692	0.8122952
Achnanthes subatomoides (Hustedt) Lange-Bertalot	*Achnanthes subatomoides (Hustedt) Lange-Bertalot*	1265	9.49E-02	2368	0.1480205	122	7.65E-03	144	1.30E-02	85	5.37E-03	167	1.05E-02	811	5.07E-02	387	2.42E-02
Achnanthes suchlandtii Hustedt	*Achnanthes suchlandtii* Hustedt	70	4.39E-03	236	1.48E-02	0	0	0	0	0	0	335	2.09E-02	540	3.38E-02	0	0
Amphora pediculus (Kuetzing) Grunow	*Amphora pediculus* (Kuetzing) Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	1.69E-03
Anomoeoneis brachysira (Brebisson) Grunow	*Anomoeoneis brachysira* (Brebisson) Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anomoeoneis vitrea (Grunow) Ross	*Brachysira vitrea* (Grunow) R. Ross in B.Hartley	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asterionella ralfsii W. Smith	*Asterionella ralfsii* W. Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aulacoseira ambigua (Grunow) Simonsen	*Aulacoseira ambigua* (Grunow) Simonsen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aluacoseira crenulata (Ehrenberg) Thwaites	*Aluacoseira crenulata (Ehrenberg) Thwaites*	0	0	0	0	0	0	0	0	0	0	167	0.1579418	270	0.3823083	0	0
Aulacoseira distans (Ehrenberg) Simonsen	*Aulacoseira distans* (Ehrenberg) Simonsen	0	0	59	6.98E-03	0	0	0	0	0	0	0	0	0	0	193	1.46E-02
Aulacoseira valida (Grun.) Krammer	*Aulacoseira valida* (Grun.) Krammer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caloneis bacillum (Grunow) Cleve	*Caloneis bacillum* (Grunow) Cleve	140	1.32E-02	118	1.85E-02	0	0	0	0	0	0	0	0	0	0	0	0
Caloneis silicula (Ehrenberg) Cleve	*Caloneis ventricosa* (Ehren.) F.Meister	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cocconeis pediculus Ehrenberg	*Cocconeis pediculus* Ehrenberg	0	0	0	0	0	0	72	0.2308812	0	0	0	0	270	0.8112835	96	0.2906591
Cocconeis placentula var *lineata* (Ehrenberg) Van Heurck	*Cocconeis placentula* var *lineata* (Ehrenberg) Van Heurck	3445	1.895083	1302	0.8668673	1346	2.72489	1587	4.011128	2319	4.69284	5362	7.842812	11898	17.40203	6491	9.493652
Cyclotella pseudostelligera Hustedt	*Cyclotella pseudostelligera Hustedt*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	2.38E-03
Cymbella gracilis (Ehrenberg) Kuetzing	*Encyonema gracilis* Rabenh.	0	0	0	0	0	0	0	0	0	0	167	2.51E-02	0	0	0	0
Cymbella microcephala Grunow	*Cymbella microcephala* Grunow	421	0.0041421	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella minuta Hilse	*Encyonema minutum* (Hilse *ex* Rabenh.) D.G.Mann in Round, Crawford & Mann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella naviculiformis Auersw *ex* Heib.	*Cymbella naviculiformis* Auersw *ex* Heib.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella pusilla Grunow	*Cymbella pusilla* Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbella minuta var. silesiaca (Bleisch ex. Rabenhorst) C.W. Reimer	*Encyonema silesiacum* (Bleisch *ex.* Rabenh.) D.G. Mann in Round, Crawford & Mann	70	0.00501143	59	0.004852572	612	0.04581544	288	0.02056794	0	0	335	0.0327583	811	0.07929358	0	0
Cymbella sinuata W. Greg.	*Reimeria sinuata* (W.Greg) Kociolek & Stoermer	0	0	0	0	0	0	0	0	773	2.25E-02	167	4.57E-03	0	0	0	0
Cymbella tumida (Brebisson) Van Heurck	*Cymbella tumida (Brebisson) Van Heurck*	0	0	0	0	0	0	0	0	0	0	167	0.2289303	0	0	193	0.198409
Diatoma anceps (Ehrenberg) Grunow	*Meridion anceps* (Ehrenberg) D.M.Williams	0	0	0	0	0	0	0	0	85	1.55E-02	0	0	0	0	0	0
Diatoma mesodon (Ehrenberg) Kuetzing	*Diatoma mesodon (Ehrenberg) Kuetzing*	0	0	177	3.26E-02	0	0	72	7.79E-03	85	1.47E-02	0	0	0	0	0	0
Eunotia bilunaris (Ehrenberg) Mills	*Eunotia bilunaris* (Ehrenberg) Mills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia bilunaris var. *mucophila Lange-Bertalot & Norpel*	*Eunotia bilunaris* var. *mucophila Lange-Bertalot & Norpel*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia exigua Brebisson (Rabenhorst)	*Eunotia exigua* Brebisson (Rabenhorst)	70	4.22E-03	0	0	0	0	0	0	85	3.67E-03	0	0	0	0	0	0

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		B2A2		B2A2		B2A2		B3A9		B3A9		B3A9		S2A2		S2A2		S2A2		S3A3		S3A3	
Replicate		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2	
Date sampled		22-Jul-11		22-Jul-11		22-Jul-11		7-Aug-11		7-Aug-11		7-Aug-11		25-Jul-11		25-Jul-11		25-Jul-11		29-Jul-11		29-Jul-11	
Lab ID		BIO-01	BIO-01	BIO-02	BIO-02	BIO-03	BIO-03	BIO-07	BIO-07	BIO-08	BIO-08	BIO-09	BIO-09	BIO-16	BIO-16	BIO-17	BIO-17	BIO-18	BIO-18	BIO-28	BIO-28	BIO-29	BIO-29
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																						
Eunotia flexuosa Brebisson *ex.* Kuetzing	*Eunotia flexuosa* Brebisson *ex.* Kuetzing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia formica Ehrenberg	*Eunotia formica* Ehrenberg	0	0	0	0	390	0.6879708	79	0.4023726	1409	3.956916	0	0	0	0	0	0	350	1.210744	0	0	0	0
Eunotia incisa W. Smith	*Eunotia incisa* W. Smith	129	1.62E-02	1416	0.1771106	390	6.11E-02	0	0	512	0.1199066	0	0	0	0	64	1.61E-02	262	6.57E-02	0	0	636	0.1272542
Eunotia monodon Ehrenberg	*Eunotia monodontiforma* Lange-Bert & Nopel In Lange-Bert.	129	0.4210281	944	3.434528	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia musicola Krasske	*Eunotia musicola* Krasske	1554	0.1057104	3935	0.2676338	1954	0.1329035	0	0	128	1.02E-02	420	3.36E-02	0	0	0	0	175	1.40E-02	0	0	0	0
Eunotia musicola var tridentula Norpel & Lange-Bertalot	*Eunotia musicola var tridentula* Norpel & Lange-Bertalot	0	0	0	0	0	0	0	0	0	0	0	0	89	5.37E-03	0	0	0	0	0	0	0	0
Eunotia naegelii Migula	*Eunotia naegeli* Migula	0	0	314	5.67E-02	586	0.2204634	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia paludosa Grunow	*Eunotia paludosa* Grunow	777	6.22E-02	2991	0.3469793	977	0.0781785	0	0	0	0	0	0	0	0	0	0	262	1.12E-02	0	0	79	9.54E-03
Eunotia praerupta Ehrenberg	*Eunotia praerupta* Ehrenberg	129	0.6477355	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia pectinalis (O. Mull.) Rabenhorst	*Eunotia pectinalis* (O. Mull.) Rabenhorst	647	0.1740789	4093	0.8186445	1759	0.4727357	718	0.134723	1665	0.4683849	630	0.196931	984	0.2276927	0	0	1576	0.5249709	651	0.1220956	715	0.1789513
Eunotia pectinalis var. *undulata* (Ralfs) Rabenhorst	*Eunotia pectinalis* var. *undulata* (Ralfs) Rabenhorst	129	5.26E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia praerupta Ehrenberg	*Eunotia praerupta* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia serra Ehrenberg	*Eunotia serra* Ehrenberg	0	0	0	0	195	0.7915574	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia tecta Krasske	*Eunotia tecta* Krasske	0	0	0	0	0	0	0	0	0	0	420	0.4201195	0	0	0	0	0	0	0	0	0	0
Eunotia spp	*Eunotia* spp	259	0.4210281	2676	0.8430464	781	0.1710155	159	0.02993844	256	0.04803948	210	0.0393862	179	0.02237766	449	0.05811745	875	0.05605295	2139	0.59443097	556	0.13085313
Fragilaria brevistriata Grunow	*Pseudostaurosira brevistriata* (Grunow in VanHeurck) D.M. Williams & Round	0	0	629	3.94E-02	0	0	79	9.98E-03	896	7.29E-02	420	0.0393862	0	0	0	0	0	0	0	0	0	0
Fragilaria capucina Desmazieres	*Fragilaria capucina* Desmazieres	129	6.70E-03	944	0.1813612	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria construens (Ehrenberg) Grunow	*Staurosira construens* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria construens var. *venter* (Ehrenberg) Grunow	*Staurosira construens* var. *venter* (Ehrenb.) P.B.Ham. In Hamilton, Poulin, Charles & Angell	2979	0.1303568	8816	0.2468528	2736	0.1197108	479	1.34E-02	640	1.79E-02	210	5.04E-03	358	1.00E-02	128	3.60E-03	87	2.45E-03	0	0	79	1.91E-03
Synedra rumpens var. *scotica* Grunow	*Synedra rumpens* var. *scotica* Grunow	0	0	0	0	0	0	2474	0.3365878	3715	0.5349677	3571	0.3053218	358	0.03222384	0	0	87	0.008867751	1023	0.1036068	795	0.07158051
Fragilaria pinnata (Ehrenberg)	Staurosirella pinnata (Ehreb.) D.M. Williams & Round	0	0	0	0	0	0	0	0	384	7.06E-02	0	0	0	0	0	0	87	2.45E-03	0	0	0	0
Fragilaria pulchella (Ralfs) Lange-Bertlaot	*Fragilaria pulchella* (Ralfs) Lange-Bertlaot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria virescens Ralfs	*Fragilariforma virescens* (Ralfs) D.M. Williams & Round	24741	9.7832685	24557	9.1459902	11920	4.6438028	1276	0.5403289	896	0.3228253	210	0.0756215	0	0	64	0.02602993	262	0.1087777	0	0	556	0.2004254
Fragilaria virescens var. *exigua*	*Fragilariforma virescens* var exigua (Ralfs) D.M. Williams & Round	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria vaucheriae (Kuetzing) J.B.Petersen	*Fragilaria vaucheriae* (Kuetzing) J.B.Petersen	0	0	314	1.63E-02	195	2.35E-02	159	1.66E-02	0	0	0	0	0	0	0	0	0	0	372	2.98E-02	0	0
Frustulia rhomboides (Ehrenberg) de Toni	*Frustulia rhomboides* (Ehrenberg) de Toni	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frustulia rhomboides var. saxonica (Ehrenberg) de Toni	*Frustulia rhomboides var. saxonica* (Ehrenberg) de Toni	0	0	0	0	0	0	0	0	0	0	420	0.5251493	0	0	0	0	87	0.1313741	0	0	0	0
Frustulia vulgaris (Thwaites) De Toni	*Frustulia vulgaris* (Thwaites) De Toni	388	0.6583584	472	0.5903686	1172	1.465847	159	0.4023726	128	0.1601316	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema acuminatum Ehrenberg	*Gomphonema acuminatum* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema minutum (Agardh) Agardh	*Gomphonema minutum* (Agardh) Agardh	0	0	0	0	0	0	79	1.62E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema olivaceum (Lyngb.) Kuetzing	Gomphoneis olivacea (Horenemann) P.A.Dawson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	159	9.51E-02
Gomphonema parvulum (Kuetzing) Kuetzing	*Gomphonema parvulum* (Kuetzing) Kuetzing	0	0	157	2.31E-02	977	0.1380537	479	7.04E-02	1281	0.2710277	420	5.94E-02	1074	0.1517423	321	4.72E-02	175	2.47E-02	279	4.10E-02	238	4.85E-02
Gomphonema pseudotenellum Lange-Bertalot	*Gomphonema pseudotenellum* Lange-Bertalot	0	0	0	0	0	0	0	0	256	1.20E-02	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema cf. *entolejum* Oestrup	*Gomphonema* cf. *entolejum* Oestrup	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	6.54E-03	0	0	0	0	795	0.0898862
Gomphonema sp.	*Gomphonema* sp.	0	0	0	0	781	0.1908455	159	0.009239289	0	0	0	0	0	0	0	0	0	0	1023	0.31119529	0	0
Gomphonema subtile Ehrenberg	*Gomphonema subtile* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema truncatum Ehrenberg	*Gomphonema truncatum Ehrenberg*	0	0	0	0	195	0.3180758	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meridion circulare (Greville) C. Agardh	*Meridion circulare* (Greville) C. Agardh	1684	0.4663134	4408	1.220554	2540	0.7035217	558	0.1728036	1152	0.3192393	2100	0.8375526	0	0	0	0	0	0	744	0.1682137	477	0.1078634
Meridion circulare var. *constrictum (Ralfs) Van Heurck*	*Meridion circulare* var. *constrictum (Ralfs) Van Heurck*	518	0.143481	1731	0.4795032	2149	0.5952877	159	5.85E-02	512	0.1667863	210	5.82E-02	268	6.07E-02	0	0	350	8.91E-02	93	3.41E-02	397	6.47E-02

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		S3A3		M3C3		M3C3		M3C3		W4A21		W4A21		W4A21		W4A31		W4A31		W4A31		W4A17	
Replicate		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1	
Date sampled		29-Jul-11		28-Jul-11		28-Jul-11		28-Jul-11		3-Aug-11		3-Aug-11		3-Aug-11		2-Aug-11		2-Aug-11		2-Aug-11		4-Aug-11	
Lab ID		BIO-30	BIO-30	BIO-04	BIO-04	BIO-05	BIO-05	BIO-06	BIO-06	BIO-19	BIO-19	BIO-20	BIO-20	BIO-21	BIO-21	BIO-22	BIO-22	BIO-23	BIO-23	BIO-24	BIO-24	BIO-25	BIO-25
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																						
Eunotia flexuosa Brebisson *ex.* Kuetzing	*Eunotia flexuosa* Brebisson *ex.* Kuetzing	0	0	0	0	0	0	164	9.75E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia formica Ehrenberg	*Eunotia formica* Ehrenberg	256	0.7400205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia incisa W. Smith	*Eunotia incisa* W. Smith	85	1.39E-02	0	0	0	0	82	1.29E-02	131	1.64E-02	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia monodon Ehrenberg	*Eunotia monodontiforma* Lange-Bert & Nopel In Lange-Bert.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia musicola Krasske	*Eunotia musicola* Krasske	85	2.31E-03	0	0	0	0	0	0	262	1.79E-02	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia musicola var tridentula Norpel & Lange-Bertalot	*Eunotia musicola var tridentula* Norpel & Lange-Bertalot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia naegelii Migula	*Eunotia naegeli* Migula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia paludosa Grunow	*Eunotia paludosa* Grunow	85	1.28E-02	399	3.67E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia praerupta Ehrenberg	*Eunotia praerupta* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia pectinalis (O. Mull.) Rabenhorst	*Eunotia pectinalis* (O. Mull.) Rabenhorst	1627	0.30513	1098	0.3431869	591	0.184966	658	0.1185782	1443	0.3609745	715	0.1117288	411	6.68E-02	0	0	84	1.58E-02	0	0	1329	0.2825718
Eunotia pectinalis var. *undulata* (Ralfs) Rabenhorst	*Eunotia pectinalis* var. *undulata* (Ralfs) Rabenhorst	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia praerupta Ehrenberg	*Eunotia praerupta* Ehrenberg	85	1.71E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia serra Ehrenberg	*Eunotia serra* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia tecta Krasske	*Eunotia tecta* Krasske	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia spp	*Eunotia* spp	942	0.211985	998	0.155994	722	0.10193681	246	0.05733338	262	0.03281587	158	0.02085605	0	0	0	0	0	0	172	0.0301443	949	0.2137098
Fragilaria brevistriata Grunow	*Pseudostaurosira brevistriata* (Grunow in VanHeurck) D.M. Williams & Round	0	0	1597	0.2396069	1578	0.1677025	164	9.88E-03	0	0	0	0	0	0	0	0	0	0	86	8.07E-03	94	8.90E-03
Fragilaria capucina Desmazieres	*Fragilaria capucina* Desmazieres	0	0	0	0	657	9.47E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria construens (Ehrenberg) Grunow	*Staurosira construens* Ehrenberg	0	0	99	2.08E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria construens var. *venter* (Ehrenberg) Grunow	*Staurosira construens* var. *venter* (Ehrenb.) P.B.Ham. In Hamilton, Poulin, Charles & Angell	171	4.80E-03	1297	4.15E-02	723	2.03E-02	576	2.02E-02	0	0	0	0	0	0	0	0	0	0	0	0	1994	4.79E-02
Synedra rumpens var. *scotica* Grunow	*Synedra rumpens* var. *scotica* Grunow	1713	0.1734423	0	0	0	0	0	0	1050	0.09450969	0	0	1096	0.1061041	0	0	0	0	2756	0.2108379	664	0.05983873
Fragilaria pinnata (Ehrenberg)	Staurosirella pinnata (Ehreb.) D.M. Williams & Round	85	7.71E-03	99	4.39E-03	0	0	247	1.28E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria pulchella (Ralfs) Lange-Bertlaot	*Fragilaria pulchella* (Ralfs) Lange-Bertlaot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria virescens Ralfs	*Fragilariforma virescens* (Ralfs) D.M. Williams & Round	428	0.1657338	1396	0.60201218	0	0	905	0.32609	262	0.1063234	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria virescens var. *exigua*	*Fragilariforma virescens* var exigua (Ralfs) D.M. Williams & Round	0	0	0	0	0	0	247	2.47E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria vaucheriae (Kuetzing) J.B.Petersen	*Fragilaria vaucheriae* (Kuetzing) J.B.Petersen	0	0	99	7.99E-03	0	0	0	0	262	2.31E-02	0	0	0	0	0	0	0	0	0	0	0	0
Frustulia rhomboides (Ehrenberg) de Toni	*Frustulia rhomboides* (Ehrenberg) de Toni	85	0.4385307	0	0	0	0	82	8.44E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frustulia rhomboides var. saxonica (Ehrenberg) de Toni	*Frustulia rhomboides var. saxonica* (Ehrenberg) de Toni	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frustulia vulgaris (Thwaites) De Toni	*Frustulia vulgaris* (Thwaites) De Toni	0	0	0	0	131	0.293578	82	0.1913514	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema acuminatum Ehrenberg	*Gomphonema acuminatum* Ehrenberg	0	0	0	0	263	5.78E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema minutum (Agardh) Agardh	*Gomphonema minutum* (Agardh) Agardh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema olivaceum (Lyngb.) Kuetzing	Gomphoneis olivacea (Horenemann) P.A.Dawson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	591	0.1834358	0	0	379	9.27E-02
Gomphonema parvulum (Kuetzing) Kuetzing	*Gomphonema parvulum* (Kuetzing) Kuetzing	513	0.0755032	3494	0.7108358	197	2.79E-02	247	3.49E-02	0	0	158	0.0224483	0	0	74	1.05E-02	169	0.0343799	0	0	94	1.34E-02
Gomphonema pseudotenellum Lange-Bertalot	*Gomphonema pseudotenellum* Lange-Bertalot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema cf. *entolejum* Oestrup	*Gomphonema* cf. *entolejum* Oestrup	171	2.42E-02	0	0	0	0	0	0	0	0	0	0	274	1.49E-02	0	0	0	0	258	0.0423416	0	0
Gomphonema sp.	*Gomphonema* sp.	0	0	199	0.02820777	591	0.09073704	0	0	262	0.0296698	0	0	274	0.04461947	148	0.0325441	0	0	172	0.06104976	0	0
Gomphonema subtile Ehrenberg	*Gomphonema subtile* Ehrenberg	85	2.23E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema truncatum Ehrenberg	*Gomphonema truncatum Ehrenberg*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meridion circulare (Greville) C. Agardh	*Meridion circulare* (Greville) C. Agardh	1370	0.4014447	0	0	0	0	0	0	131	2.60E-02	0	0	0	0	0	0	0	0	258	0.0423416	94	3.48E-02
Meridion circulare var. *constrictum (Ralfs) Van Heurck*	*Meridion circulare* var. *constrictum (Ralfs) Van Heurck*	256	0.1149972	0	0	0	0	329	0.1206113	1181	0.2336496	317	5.39E-02	137	0.0501969	0	0	0	0	0	0	0	0

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		W4A17		W4A17		EBNB1		EBNB1		EBNB1		NRC		NRC		NRC	
Replicate		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3	
Date sampled		4-Aug-11		4-Aug-11		8-Aug-11		8-Aug-11		8-Aug-11		28-Sep-11		28-Sep-11		28-Sep-11	
Lab ID		BIO-26	BIO-26	BIO-27	BIO-27	BIO-13	BIO-13	BIO-14	BIO-14	BIO-15	BIO-15	BIO-10	BIO-10	BIO-11	BIO-11	BIO-12	BIO-12
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																
Eunotia flexuosa Brebisson *ex.* Kuetzing	*Eunotia flexuosa* Brebisson *ex.* Kuetzing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia formica Ehrenberg	*Eunotia formica* Ehrenberg	0	0	0	0	0	0	72	0.363638	0	0	167	0.8446106	0	0	0	0
Eunotia incisa W. Smith	*Eunotia incisa* W. Smith	0	0	0	0	0	0	0	0	0	0	0	0	811	0.2190465	0	0
Eunotia monodon Ehrenberg	*Eunotia monodontiforma* Lange-Bert & Nopel In Lange-Bert.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia musicola Krasske	*Eunotia musicola* Krasske	0	0	0	0	367	3.23E-02	0	0	0	0	0	0	0	0	0	0
Eunotia musicola var tridentula Norpel & Lange-Bertalot	*Eunotia musicola var tridentula* Norpel & Lange-Bertalot	0	0	0	0	0	0	0	0	85	2.90E-03	0	0	0	0	0	0
Eunotia naegelii Migula	*Eunotia naegeli* Migula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia paludosa Grunow	*Eunotia paludosa* Grunow	210	3.38E-02	0	0	122	1.96E-02	0	0	0	0	0	0	0	0	0	0
Eunotia praerupta Ehrenberg	*Eunotia praerupta* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia pectinalis (O. Mull.) Rabenhorst	*Eunotia pectinalis* (O. Mull.) Rabenhorst	0	0	59	2.66E-02	0	0	0	0	257	0.0547717	0	0	0	0	0	0
Eunotia pectinalis var. *undulata* (Ralfs) Rabenhorst	*Eunotia pectinalis* var. *undulata* (Ralfs) Rabenhorst	0	0	0	0	0	0	72	2.75E-02	0	0	0	0	0	0	0	0
Eunotia praerupta Ehrenberg	*Eunotia praerupta* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia serra Ehrenberg	*Eunotia serra* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia tecta Krasske	*Eunotia tecta* Krasske	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunotia spp	*Eunotia* spp	1404	0.26817705	1184	0.24127338	122	0.03306162	0	0	343	0.07517685	0	0	0	0	579	0.16761343
Fragilaria brevistriata Grunow	*Pseudostaurosira brevistriata* (Grunow in VanHeurck) D.M. Williams & Round	281	3.87E-02	296	2.78E-02	1959	0.1836756	432	4.06E-02	85	5.50E-03	0	0	1081	0.1081711	1550	0.1453295
Fragilaria capucina Desmazieres	*Fragilaria capucina* Desmazieres	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria construens (Ehrenberg) Grunow	*Staurosira construens* Ehrenberg	0	0	0	0	0	0	0	0	85	1.31E-02	0	0	0	0	0	0
Fragilaria construens var. *venter* (Ehrenberg) Grunow	*Staurosira construens* var. *venter* (Ehrenb.) P.B.Ham. In Hamilton, Poulin, Charles & Angell	0	0	296	9.47E-03	428	2.14E-02	288	8.08E-03	3007	8.42E-02	0	0	540	1.51E-02	1453	4.07E-02
Synedra rumpens var. *scotica* Grunow	*Synedra rumpens* var. *scotica* Grunow	1406	0.1202446	236	0.02131495	795	0.1273484	865	0.07792241	687	0.06649929	10054	0.8823163	15414	1.387295	3100	0.3662304
Fragilaria pinnata (Ehrenberg)	Staurosirella pinnata (Ehreb.) D.M. Williams & Round	140	1.58E-02	0	0	0	0	72	2.02E-03	171	1.86E-02	0	0	0	0	96	8.72E-03
Fragilaria pulchella (Ralfs) Lange-Bertlaot	*Fragilaria pulchella* (Ralfs) Lange-Bertlaot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	6.98E-02
Fragilaria virescens Ralfs	*Fragilariforma virescens* (Ralfs) D.M. Williams & Round	843	0.3873142	0	0	0	0	0	0	0	0	167	0.06032932	270	0.09248632	0	0
Fragilaria virescens var. *exigua*	*Fragilariforma virescens* var exigua (Ralfs) D.M. Williams & Round	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria vaucheriae (Kuetzing) J.B.Petersen	*Fragilaria vaucheriae* (Kuetzing) J.B.Petersen	0	0	0	0	428	3.09E-02	0	0	343	1.55E-02	670	5.36E-02	811	6.49E-02	387	0.0113357
Frustulia rhomboides (Ehrenberg) de Toni	*Frustulia rhomboides* (Ehrenberg) de Toni	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frustulia rhomboides var. saxonica (Ehrenberg) de Toni	*Frustulia rhomboides var. saxonica* (Ehrenberg) de Toni	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frustulia vulgaris (Thwaites) De Toni	*Frustulia vulgaris* (Thwaites) De Toni	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema acuminatum Ehrenberg	*Gomphonema acuminatum* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema minutum (Agardh) Agardh	*Gomphonema minutum* (Agardh) Agardh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema olivaceum (Lyngb.) Kuetzing	Gomphoneis olivacea (Horenemann) P.A.Dawson	0	0	0	0	0	0	288	6.58E-02	85	2.52E-02	0	0	0	0	0	0
Gomphonema parvulum (Kuetzing) Kuetzing	*Gomphonema parvulum* (Kuetzing) Kuetzing	421	6.20E-02	236	3.35E-02	1102	0.1793519	360	5.10E-02	687	9.71E-02	335	3.22E-02	1081	0.1589262	387	5.47E-02
Gomphonema pseudotenellum Lange-Bertalot	*Gomphonema pseudotenellum* Lange-Bertalot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema cf. *entolejum* Oestrup	*Gomphonema* cf. *entolejum* Oestrup	0	0	0	0	122	2.69E-02	144	3.17E-02	343	6.99E-02	8714	1.914548	11087	2.435972	2131	0.468298
Gomphonema sp.	*Gomphonema* sp.	280	0.04107075	0	0	611	0.058455441	72	0.02348399	256	0.020138424	335	0.02651519	540	0.1100258	0	0
Gomphonema subtile Ehrenberg	*Gomphonema subtile* Ehrenberg	0	0	59	1.45E-02	0	0	0	0	0	0	0	0	0	0	0	0
Gomphonema truncatum Ehrenberg	*Gomphonema truncatum Ehrenberg*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meridion circulare (Greville) C. Agardh	*Meridion circulare* (Greville) C. Agardh	0	0	355	5.82E-02	0	0	0	0	0	0	0	0	0	0	96	2.37E-02
Meridion circulare var. *constrictum (Ralfs) Van Heurck*	*Meridion circulare* var. *constrictum (Ralfs) Van Heurck*	70	1.43E-02	0	0	0	0	0	0	171	3.88E-02	0	0	0	0	0	0

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		B2A2		B2A2		B2A2		B3A9		B3A9		B3A9		S2A2		S2A2		S2A2		S3A3		S3A3	
Replicate		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2	
Date sampled		22-Jul-11		22-Jul-11		22-Jul-11		7-Aug-11		7-Aug-11		7-Aug-11		25-Jul-11		25-Jul-11		25-Jul-11		29-Jul-11		29-Jul-11	
Lab ID		BIO-01	BIO-01	BIO-02	BIO-02	BIO-03	BIO-03	BIO-07	BIO-07	BIO-08	BIO-08	BIO-09	BIO-09	BIO-16	BIO-16	BIO-17	BIO-17	BIO-18	BIO-18	BIO-28	BIO-28	BIO-29	BIO-29
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																						
Navicula angusta Grunow	*Navicula angusta* Grunow	0	0	0	0	0	0	0	0	128	7.49E-02	0	0	0	0	0	0	0	0	0	0	0	0
Navicula contenta Grunow	*Diadesmis contenta* (Grunow *ex* VanHeurck) D.G.Mann *in* Round, Crawford & Mann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	79	3.18E-03
Navicula cryptocephala Kuetzing	*Navicula cryptocephala* Lange-Bert.	0	0	0	0	0	0	159	4.89E-02	384	0.110683	0	0	0	0	0	0	0	0	0	0	0	0
Navicula cryptotenella Lange-Bertalot	*Navicula cryptotenella* Lange-Bertalot	0	0	0	0	195	2.44E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula decussis Oestrup	*Geissleria decussis* (Oestrup) Lange-Bert. & Metzeltin in Lange-Bert.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula gregaria Donkin	*Navicula gregaria* Donkin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula lepostriata Jorgensen	*Navicula lepostriata* Jorgensen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	128	2.65E-02	87	0.0283768	0	0	0	0
Navicula mediocris Krasske	*Navicula mediocris* Krasske	0	0	0	0	977	2.42E-02	0	0	384	9.51E-03	0	0	0	0	0	0	0	0	0	0	159	4.65E-03
Navicula pupula var. *mutata* (Krasske) Hustedt	*Sellaphora mutata* (Krasske) Lange-Bertalot	0	0	157	0.1000084	0	0	0	0	0	0	210	5.15E-02	0	0	0	0	87	6.62E-02	0	0	0	0
Navicula pupula Kuetzing	Sellaphora mutata (Kuetz.) Mereschk	0	0	0	0	0	0	79	0.0383212	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula reinhardtii (Grunow) Grunow in Cleve & Moller	*Navicula reinhardtii* (Grunow) Grunow in Cleve & Moller	0	0	0	0	0	0	0	0	0	0	210	0.1008287	0	0	0	0	0	0	0	0	0	0
Navicula sp	*Navicula* sp	129	0.04145507	1101	0.19269635	390	0.07739671	79	0.0383212	128	0.04099369	0	0	0	0	64	0.0803393	0	0	0	0	0	0
Navicula saprophila Lange-Bertalot	*Navicula saprophila* Lange-Bertalot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula trivialis Lange-Bartalot	*Navicula trivialis* Lange-Bartalot	0	0	0	0	195	0.2443078	0	0	256	0.3202632	0	0	0	0	0	0	0	0	0	0	0	0
Navicula veneta Kuetzing	*Navicula veneta Kuetzing*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium ampliatum (Ehrenberg) Krammer	*Neidium ampliatum* (Ehrenberg) Krammer	0	0	157	0.3117146	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium bisculatum (Lagerstedt) Cleve	*Neidium bisculatum* (Lagerstedt) Cleve	0	0	0	0	0	0	0	0	128	8.20E-02	0	0	0	0	0	0	0	0	0	0	0	0
Neidium septentrionale Cleve-Euler	*Neidium septentrionale* Cleve-Euler	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium sp.	*Neidium* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitzschia acicularis (Kuetzing) W. Smith	*Nitzschia acicularis* (Kuetzing) W. Smith	0	0	629	0.1007562	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitzschia dissipata (Kuetzing) Grunow	*Nitzschia dissipata* (Kuetzing) Grunow	0	0	0	0	195	7.04E-02	79	4.49E-02	640	0.1681382	0	0	0	0	0	0	0	0	186	5.81E-02	0	0
Nitzschia fonticola Grunow	*Nitzschia fonticola* Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	186	3.11E-02	0	0
Nitzschia gracilis Hantzsch	*Nitzschia gracilis* Hantzsch	388	9.33E-02	0	0	0	0	79	0.0191606	512	0.1229811	0	0	89	1.79E-02	0	0	0	0	0	0	0	0
Nitzschia palea (Kuetzing) W. Smith	*Nitzschia palea* (Kuetzing) W. Smith	0	0	0	0	390	0.0469071	159	2.43E-02	0	0	0	0	0	0	0	0	175	2.80E-02	0	0	0	0
Nitzschia perminuta (Grunow) M.Perag.	*Nitzschia perminuta* (Grunow) M.Perag.	0	0	314	1.77E-02	195	1.10E-02	0	0	0	0	0	0	0	0	0	0	175	9.06E-03	0	0	0	0
Nitzschia paleacae Grunow	*Nitzschia paleacae* Grunow	0	0	0	0	0	0	159	0.0111371	0	0	0	0	0	0	128	7.23E-03	0	0	0	0	159	8.23E-03
Pinnularia abaujensis var. *lacustris* Charles & Camburn	*Pinnularia abaujensis* var. *lacustris* Charles & Camburn	0	0	157	3.54E-02	0	0	0	0	0	0	0	0	89	2.42E-02	0	0	0	0	0	0	0	0
Pinnularia maior (Kuetzing) Rabenhorst	*Pinnularia maior* (Kuetzing) Rabenhorst	0	0	0	0	195	1.129679	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia sp.	*Pinnularia* sp.	0	0	314	0.09068062	0	0	159	0.3908762	0	0	0	0	0	0	0	0	87	0.03152978	0	0	0	0
Pinnularia stomatophora (Grunow) Cleve	*Pinnularia stomatophora* (Grunow) Cleve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia viridis (Nitzsch) Ehrenberg	*Pinnularia viridis* (Nitzsch) Ehrenberg	0	0	0	0	0	0	79	0.4715304	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stauroneis anceps Ehrenberg	*Stauroneis anceps* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stauroneis kriegerii R.M. Patrick	*Stauroneis kriegerii* R.M. Patrick	129	1.62E-02	157	1.97E-02	4104	0.5130464	79	9.98E-03	640	0.0800658	420	5.25E-02	0	0	0	0	0	0	0	0	0	0
Stauroneis producta Grunow	*Stauroneis producta* Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Synedra rumpens Kuetzing	*Synedra rumpens* Kuetzing	647	0.03238678	1574	0.05667539	1368	0.03420309	2395	0.0479015	3202	0.1441184	1260	0.102	358	0.02416787	128	0.002827943	613	0.0344857	465	0.02093067	1749	0.1023601
Synedra ulna (Nitzsch) Ehr.	*Synedra ulna* (Nitzsch) Ehr.	0	0	0	0	0	0	0	0	0	0	420	0.604972	0	0	64	6.94E-02	0	0	0	0	79	0.1574771
Tabellaria flocculosa (Roth) Kuetzing	*Tabellaria flocculosa* (Roth) Kuetzing	777	0.1608975	1573	0.4193979	585	0.16197608	159	0.1149636	0	0	0	0	0	0	192	0.06170058	262	0.08985988	0	0	159	0.03579025
CHLOROPHYCEAE																							
Closterium ehrenbergii Meneghini	*Closterium ehrenbergii* Meneghini	0	0	0	0	0	0	0	0	128	11.80534	0	0	0	0	0	0	0	0	0	0	0	0

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		S3A3		M3C3		M3C3		M3C3		W4A21		W4A21		W4A21		W4A31		W4A31		W4A31		W4A17	
Replicate		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1	
Date sampled		29-Jul-11		28-Jul-11		28-Jul-11		28-Jul-11		3-Aug-11		3-Aug-11		3-Aug-11		2-Aug-11		2-Aug-11		2-Aug-11		4-Aug-11	
Lab ID		BIO-30	BIO-30	BIO-04	BIO-04	BIO-05	BIO-05	BIO-06	BIO-06	BIO-19	BIO-19	BIO-20	BIO-20	BIO-21	BIO-21	BIO-22	BIO-22	BIO-23	BIO-23	BIO-24	BIO-24	BIO-25	BIO-25
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																						
Navicula angusta Grunow	*Navicula angusta* Grunow	0	0	0	0	0	0	0	0	0	0	0	0	137	0.1425688	0	0	0	0	0	0	94	0.1662187
Navicula contenta Grunow	*Diadesmis contenta* (Grunow *ex* VanHeurck) D.G.Mann *in* Round, Crawford & Mann	0	0	99	3.99E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula cryptocephala Kuetzing	*Navicula cryptocephala* Lange-Bert.	85	2.31E-02	0	0	0	0	0	0	131	2.95E-02	0	0	0	0	74	1.34E-02	0	0	0	0	0	0
Navicula cryptotenella Lange-Bertalot	*Navicula cryptotenella* Lange-Bertalot	0	0	0	0	0	0	0	0	131	5.47E-02	0	0	0	0	0	0	0	0	0	0	0	0
Navicula decussis Oestrup	*Geissleria decussis* (Oestrup) Lange-Bert. & Metzeltin in Lange-Bert.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula gregaria Donkin	*Navicula gregaria* Donkin	0	0	0	0	0	0	0	0	131	4.66E-02	0	0	0	0	0	0	0	0	0	0	94	0.0302518
Navicula lepostriata Jorgensen	*Navicula lepostriata* Jorgensen	0	0	99	6.11E-02	65	1.23E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula mediocris Krasske	*Navicula mediocris* Krasske	0	0	0	0	65	1.48E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula pupula var. *mutata* (Krasske) Hustedt	*Sellaphora mutata* (Krasske) Lange-Bertalot	0	0	99	3.03E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	5.46E-02
Navicula pupula Kuetzing	Sellaphora mutata (Kuetz.) Mereschk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula reinhardtii (Grunow) Grunow in Cleve & Moller	*Navicula reinhardtii* (Grunow) Grunow in Cleve & Moller	85	2.31E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula sp	*Navicula* sp	0	0	0	0	0	0	82	0.01482227	0	0	0	0	0	0	0	0	0	0	86	0.07751392	0	0
Navicula saprophila Lange-Bertalot	*Navicula saprophila* Lange-Bertalot	0	0	0	0	0	0	0	0	131	5.25E-03	0	0	0	0	0	0	0	0	0	0	0	0
Navicula trivialis Lange-Bartalot	*Navicula trivialis* Lange-Bartalot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula veneta Kuetzing	*Navicula veneta Kuetzing*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	1.34E-02	0	0	0	0	0	0
Neidium ampliatum (Ehrenberg) Krammer	*Neidium ampliatum* (Ehrenberg) Krammer	0	0	99	0.1247952	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium bisculatum (Lagerstedt) Cleve	*Neidium bisculatum* (Lagerstedt) Cleve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium septentrionale Cleve-Euler	*Neidium septentrionale* Cleve-Euler	0	0	0	0	65	1.23E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium sp.	*Neidium* sp.	0	0	0	0	0	0	0	0	131	0.2215071	0	0	0	0	0	0	0	0	0	0	0	0
Nitzschia acicularis (Kuetzing) W. Smith	*Nitzschia acicularis* (Kuetzing) W. Smith	171	3.43E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitzschia dissipata (Kuetzing) Grunow	*Nitzschia dissipata* (Kuetzing) Grunow	0	0	0	0	65	1.64E-02	82	2.16E-02	262	7.38E-02	79	2.04E-02	411	0.1285176	0	0	0	0	0	0	0	0
Nitzschia fonticola Grunow	*Nitzschia fonticola* Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitzschia gracilis Hantzsch	*Nitzschia gracilis* Hantzsch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitzschia palea (Kuetzing) W. Smith	*Nitzschia palea* (Kuetzing) W. Smith	0	0	399	4.79E-02	0	0	0	0	525	5.25E-02	0	0	0	0	0	0	0	0	0	0	379	3.80E-02
Nitzschia perminuta (Grunow) M.Perag.	*Nitzschia perminuta* (Grunow) M.Perag.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	4.84E-03	0	0
Nitzschia paleacae Grunow	*Nitzschia paleacae* Grunow	0	0	199	1.03E-02	0	0	0	0	525	2.84E-02	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia abaujensis var. *lacustris* Charles & Camburn	*Pinnularia abaujensis* var. *lacustris* Charles & Camburn	85	2.62E-02	299	8.09E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia maior (Kuetzing) Rabenhorst	*Pinnularia maior* (Kuetzing) Rabenhorst	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	0.3077421
Pinnularia sp.	*Pinnularia* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia stomatophora (Grunow) Cleve	*Pinnularia stomatophora* (Grunow) Cleve	0	0	0	0	0	0	0	0	262	0.9004673	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia viridis (Nitzsch) Ehrenberg	*Pinnularia viridis* (Nitzsch) Ehrenberg	85	0.2202289	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stauroneis anceps Ehrenberg	*Stauroneis anceps* Ehrenberg	85	6.85E-02	99	0.1812027	131	0.2427083	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stauroneis kriegerii R.M. Patrick	*Stauroneis kriegerii* R.M. Patrick	85	1.18E-02	0	0	197	2.47E-02	0	0	131	1.64E-02	0	0	0	0	0	0	0	0	0	0	0	0
Stauroneis producta Grunow	*Stauroneis producta* Grunow	0	0	0	0	0	0	82	3.03E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Synedra rumpens Kuetzing	*Synedra rumpens* Kuetzing	1969	0.1152428	4792	0.1293877	920	0.02209727	741	0.05502769	1443	0.03176576	317	0.01930674	137	0.007094169	0	0	338	0.01749169	172	0.009301671	189	0.0153871
Synedra ulna (Nitzsch) Ehr.	*Synedra ulna* (Nitzsch) Ehr.	342	0.5858495	0	0	0	0	0	0	0	0	158	1.44E-01	0	0	0	0	0	0	0	0	0	0
Tabellaria flocculosa (Roth) Kuetzing	*Tabellaria flocculosa* (Roth) Kuetzing	342	0.07708547	698	0.1195039	525	0.07850779	329	0.06859419	0	0	0	0	0	0	0	0	0	0	86	0.02110101	0	0
CHLOROPHYCEAE																							
Closterium ehrenbergii Meneghini	*Closterium ehrenbergii* Meneghini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		W4A17		W4A17		EBNB1		EBNB1		EBNB1		NRC		NRC		NRC	
Replicate		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3	
Date sampled		4-Aug-11		4-Aug-11		8-Aug-11		8-Aug-11		8-Aug-11		28-Sep-11		28-Sep-11		28-Sep-11	
Lab ID		BIO-26	BIO-26	BIO-27	BIO-27	BIO-13	BIO-13	BIO-14	BIO-14	BIO-15	BIO-15	BIO-10	BIO-10	BIO-11	BIO-11	BIO-12	BIO-12
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																
Navicula angusta Grunow	*Navicula angusta* Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula contenta Grunow	*Diadesmis contenta* (Grunow *ex* VanHeurck) D.G.Mann *in* Round, Crawford & Mann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula cryptocephala Kuetzing	*Navicula cryptocephala* Lange-Bert.	70	1.90E-02	0	0	0	0	0	0	85	1.61E-02	0	0	0	0	0	0
Navicula cryptotenella Lange-Bertalot	*Navicula cryptotenella* Lange-Bertalot	0	0	118	2.22E-02	61	7.65E-03	0	0	0	0	0	0	0	0	193	5.06E-02
Navicula decussis Oestrup	*Geissleria decussis* (Oestrup) Lange-Bert. & Metzeltin in Lange-Bert.	70	4.13E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula gregaria Donkin	*Navicula gregaria* Donkin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula lepostriata Jorgensen	*Navicula lepostriata* Jorgensen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula mediocris Krasske	*Navicula mediocris* Krasske	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula pupula var. *mutata* (Krasske) Hustedt	*Sellaphora mutata* (Krasske) Lange-Bertalot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula pupula Kuetzing	Sellaphora mutata (Kuetz.) Mereschk	0	0	59	8.06E-02	0	0	0	0	0	0	0	0	0	0	0	0
Navicula reinhardtii (Grunow) Grunow in Cleve & Moller	*Navicula reinhardtii* (Grunow) Grunow in Cleve & Moller	0	0	0	0	61	1.60E-02	0	0	0	0	167	4.22E-02	0	0	0	0
Navicula sp	*Navicula* sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula saprophila Lange-Bertalot	*Navicula saprophila* Lange-Bertalot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navicula trivialis Lange-Bartalot	*Navicula trivialis* Lange-Bartalot	140	0.1582166	0	0	0	0	72	9.02E-02	0	0	0	0	0	0	0	0
Navicula veneta Kuetzing	*Navicula veneta Kuetzing*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium ampliatum (Ehrenberg) Krammer	*Neidium ampliatum* (Ehrenberg) Krammer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium bisculatum (Lagerstedt) Cleve	*Neidium bisculatum* (Lagerstedt) Cleve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium septentrionale Cleve-Euler	*Neidium septentrionale* Cleve-Euler	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neidium sp.	*Neidium* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitzschia acicularis (Kuetzing) W. Smith	*Nitzschia acicularis* (Kuetzing) W. Smith	0	0	59	9.47E-03	0	0	0	0	0	0	0	0	540	7.30E-02	0	0
Nitzschia dissipata (Kuetzing) Grunow	*Nitzschia dissipata* (Kuetzing) Grunow	70	1.98E-02	0	0	122	3.44E-02	144	2.02E-02	0	0	167	4.08E-02	0	0	484	0.1362464
Nitzschia fonticola Grunow	*Nitzschia fonticola* Grunow	0	0	0	0	0	0	0	0	0	0	335	1.51E-02	0	0	193	6.54E-03
Nitzschia gracilis Hantzsch	*Nitzschia gracilis* Hantzsch	70	7.91E-03	0	0	0	0	144	4.51E-02	0	0	0	0	0	0	0	0
Nitzschia palea (Kuetzing) W. Smith	*Nitzschia palea* (Kuetzing) W. Smith	140	2.64E-02	177	4.44E-02	0	0	0	0	0	0	0	0	540	0.0865369	193	3.10E-02
Nitzschia perminuta (Grunow) M.Perag.	*Nitzschia perminuta* (Grunow) M.Perag.	0	0	355	1.84E-02	0	0	0	0	85	4.45E-03	335	1.73E-02	0	0	0	0
Nitzschia paleacae Grunow	*Nitzschia paleacae* Grunow	0	0	0	0	122	5.51E-03	0	0	0	0	335	1.66E-02	0	0	871	6.87E-02
Pinnularia abaujensis var. *lacustris* Charles & Camburn	*Pinnularia abaujensis* var. *lacustris* Charles & Camburn	0	0	118	4.05E-02	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia maior (Kuetzing) Rabenhorst	*Pinnularia maior* (Kuetzing) Rabenhorst	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia sp.	*Pinnularia* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia stomatophora (Grunow) Cleve	*Pinnularia stomatophora* (Grunow) Cleve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia viridis (Nitzsch) Ehrenberg	*Pinnularia viridis* (Nitzsch) Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stauroneis anceps Ehrenberg	*Stauroneis anceps* Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stauroneis kriegerii R.M. Patrick	*Stauroneis kriegerii* R.M. Patrick	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	0.0121108
Stauroneis producta Grunow	*Stauroneis producta* Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Synedra rumpens Kuetzing	*Synedra rumpens* Kuetzing	210	0.01091694	592	0.03064025	366	0.017143062	288	0.01623384	773	0.01546495	3686	0.07742263	7030	0.22688897	1937	0.1046373
Synedra ulna (Nitzsch) Ehr.	*Synedra ulna* (Nitzsch) Ehr.	70	7.59E-02	0	0	306	0.2782686	72	4.55E-02	343	0.312392	4189	3.808289	6760	6.145472	3681	3.346648
Tabellaria flocculosa (Roth) Kuetzing	*Tabellaria flocculosa* (Roth) Kuetzing	0	0	59	0.03996554	0	0	0	0	0	0	0	0	540	0.1022217	96	0.01307966
CHLOROPHYCEAE																	
Closterium ehrenbergii Meneghini	*Closterium ehrenbergii* Meneghini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		B2A2		B2A2		B2A2		B3A9		B3A9		B3A9		S2A2		S2A2		S2A2		S3A3		S3A3	
Replicate		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2	
Date sampled		22-Jul-11		22-Jul-11		22-Jul-11		7-Aug-11		7-Aug-11		7-Aug-11		25-Jul-11		25-Jul-11		25-Jul-11		29-Jul-11		29-Jul-11	
Lab ID		BIO-01	BIO-01	BIO-02	BIO-02	BIO-03	BIO-03	BIO-07	BIO-07	BIO-08	BIO-08	BIO-09	BIO-09	BIO-16	BIO-16	BIO-17	BIO-17	BIO-18	BIO-18	BIO-28	BIO-28	BIO-29	BIO-29
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																						
Monoraphidium circinale (Nygaard) Nygaard	*Monoraphidium circinale* (Nygaard) Nygaard	0	0	0	0	0	0	0	0	0	0	210	6.74E-02	0	0	0	0	0	0	0	0	0	0
Oocystis solitaria Wittrock	*Oocystis solitaria* Wittrock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scenedesmus sp	*Scenedesmus* sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CYANOBACTERIA																							
Stigeoclonium sp	*Stigeoclonium* sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	642	0.7753524	875	1.056573	0	0	954	1.151369
Anabaena sp	*Anabaena sp*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1590	2.50E-02
Leibleinia sp	*Leibleinia* sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnothrix sp	*Limnothrix* sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11134	0.1749042
Phormidium chalybeum (Mertens ex Gomont) Anagnostidis et Komarek	*Phormidium chalybeum* (Mertens ex Gomont) Anagnostidis et Komarek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phormidium formosum (Bory ex Gomont) Anagnostidis et Komarek	*Phormidium formosum* (Bory ex Gomont) Anagnostidis et Komarek	0	0	0	0	3713	0.583312	0	0	2562	0.4024546	3150	0.4949415	2685	0.421809	899	0.1413403	1751	0.2751493	0	0	0	0
Phormidium sp	*Phormidium* sp	0	0	0	0	1954	0.0828917	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectonema sp.	*Plectonema* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudanabaena limnetica Komarek	*Pseudanabaena limnetica* Komarek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL		**46489**	**16.45465105**	**94120**	**26.87315463**	**94766**	**20.25222152**	**17459**	**4.617136795**	**46233**	**23.3683677**	**27933**	**6.162591277**	**11630**	**1.285874018**	**8667**	**2.377212564**	**13124**	**4.248827824**	**41114**	**10.15442932**	**36017**	**4.432235046**

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		S3A3		M3C3		M3C3		M3C3		W4A21		W4A21		W4A21		W4A31		W4A31		W4A31		W4A17	
Replicate		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1	
Date sampled		29-Jul-11		28-Jul-11		28-Jul-11		28-Jul-11		3-Aug-11		3-Aug-11		3-Aug-11		2-Aug-11		2-Aug-11		2-Aug-11		4-Aug-11	
Lab ID		BIO-30	BIO-30	BIO-04	BIO-04	BIO-05	BIO-05	BIO-06	BIO-06	BIO-19	BIO-19	BIO-20	BIO-20	BIO-21	BIO-21	BIO-22	BIO-22	BIO-23	BIO-23	BIO-24	BIO-24	BIO-25	BIO-25
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																						
Monoraphidium circinale (Nygaard) Nygaard	*Monoraphidium circinale* (Nygaard) Nygaard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oocystis solitaria Wittrock	*Oocystis solitaria* Wittrock	0	0	0	0	65	0.1349846	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scenedesmus sp	*Scenedesmus* sp	0	0	0	0	0	0	329	1.55E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CYANOBACTERIA																							
Stigeoclonium sp	*Stigeoclonium* sp	0	0	599	0.7226373	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anabaena sp	*Anabaena sp*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leibleinia sp	*Leibleinia* sp	0	0	28652	0.45008	328	5.17E-03	0	0	0	0	0	0	0	0	2221	3.49E-02	0	0	0	0	0	0
Limnothrix sp	*Limnothrix* sp	0	0	16472	0.2587568	5918	9.30E-02	2058	3.23E-02	2625	4.12E-02	0	0	0	0	0	0	0	0	0	0	0	0
Phormidium chalybeum (Mertens ex Gomont) Anagnostidis et Komarek	*Phormidium chalybeum* (Mertens ex Gomont) Anagnostidis et Komarek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phormidium formosum (Bory ex Gomont) Anagnostidis et Komarek	*Phormidium formosum* (Bory ex Gomont) Anagnostidis et Komarek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phormidium sp	*Phormidium* sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectonema sp.	*Plectonema* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudanabaena limnetica Komarek	*Pseudanabaena limnetica* Komarek	856	1.35E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL		**31925**	**10.10470031**	**76051**	**5.066007947**	**20171**	**2.071082592**	**34655**	**2.295095252**	**33853**	**17.62862133**	**7775**	**3.013873453**	**7399**	**1.773643139**	**9403**	**2.251326058**	**26530**	**6.124260233**	**49260**	**8.293087788**	**15935**	**4.440384324**

Table E-7.1 Periphytic Algal Density (individuals/cm2) and Biomass (microgram/cm2) of Sisson Project Waterbodies (2011)

Site ID		W4A17		W4A17		EBNB1		EBNB1		EBNB1		NRC		NRC		NRC	
Replicate		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3		Rep 1		Rep 2		Rep 3	
Date sampled		4-Aug-11		4-Aug-11		8-Aug-11		8-Aug-11		8-Aug-11		28-Sep-11		28-Sep-11		28-Sep-11	
Lab ID		BIO-26	BIO-26	BIO-27	BIO-27	BIO-13	BIO-13	BIO-14	BIO-14	BIO-15	BIO-15	BIO-10	BIO-10	BIO-11	BIO-11	BIO-12	BIO-12
Diatoms		Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Old Name	**New Name**																
Monoraphidium circinale (Nygaard) Nygaard	*Monoraphidium circinale* (Nygaard) Nygaard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oocystis solitaria Wittrock	*Oocystis solitaria* Wittrock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scenedesmus sp	*Scenedesmus* sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CYANOBACTERIA																	
Stigeoclonium sp	*Stigeoclonium* sp	0	0	0	0	0	0	0	0	0	0	837	0.8844742	0	0	968	1.022708
Anabaena sp	*Anabaena sp*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leibleinia sp	*Leibleinia* sp	0	0	1184	0.0186008	0	0	0	0	0	0	45246	0.7107381	147383	2.315089	9204	0.1445793
Limnothrix sp	*Limnothrix* sp	0	0	0	0	0	0	0	0	0	0	10054	0.1579418	28394	0.4460264	4844	7.61E-02
Phormidium chalybeum (Mertens ex Gomont) Anagnostidis et Komarek	*Phormidium chalybeum* (Mertens ex Gomont) Anagnostidis et Komarek	0	0	0	0	0	0	0	0	0	0	5027	0.789709	0	0	0	0
Phormidium formosum (Bory ex Gomont) Anagnostidis et Komarek	*Phormidium formosum* (Bory ex Gomont) Anagnostidis et Komarek	0	0	0	0	1836	0.288517	288	4.53E-02	0	0	57145	8.976358	40564	6.371805	8235	1.293604
Phormidium sp	*Phormidium* sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectonema sp.	*Plectonema* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29065	26.29822
Pseudanabaena limnetica Komarek	*Pseudanabaena limnetica* Komarek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL		**21921**	**3.747215141**	**14793**	**2.03425256**	**23988**	**4.556671569**	**15791**	**5.583609325**	**41992**	**6.716478367**	**203430**	**29.74259945**	**387778**	**44.30985228**	**106842**	**45.34806244**

Table E-7.2 Periphyton Water Quality Measures and Surface Area Sampled

Station /Sample #	Chlorophyll-a (mg/m^3)	Solids - Total Suspended (mg/L)	Solids - Volatile Suspended (mg/L)	Rock Surface Area (cm^2)
	Detction Limit 10	Detection Limit 5	Detection Limit 5	-
B2A2; #1	1230	2440	1180	772.69
B2A2; #2	2340	3210	1790	635.83
B2A2; #3	4850	7690	2800	768.24
B3A9-1	375	1010	233	626.91
B3A9-2	3570	2470	1240	586.04
B3A9-3	958	908	365	476.53
S2A2; #1	790	1360	370	670.98
S2A2; #2	1380	1150	560	667.48
S2A2; #3	780	1300	450	685.75
S3A2; #1	616	1120	220	645.63
S3A2; #2	701	1710	440	629.29
S3A2; #3	816	2070	630	584.35
M3C3; #1	1020	1640	1160	751.98
M3C3; #2	816	973	660	913.24
M3C3; #3	915	987	453	729.36
W4A17-1	725	908	365	526.94
W4A17-2	595	631	200	610.08
W4A17-3	406	411	144	633.99
W4A21; #1	715	1290	410	571.94
W4A21; #2	752	1900	440	539.95
W4A21; #3	599	1250	333	547.65
W4A31; #1	746	1790	400	579.23
W4A31; #2	636	825	240	592.3
W4A31; #3	1110	630	325	581.12
EBNB1-1	603	1480	570	700.69
EBNB1-2	608	1670	513	594.59
EBNB1-3	694	1860	493	699.05
NRC	3440	1810	910	597.32
NRC	2990	1540	800	555.23
NRC	1880	4680	1970	619.9

Report ID: Stantec 121810356
Report Date: 04-Apr-12
Date Received: Jul-Sep-11

CERTIFICATE OF ANALYSIS

for
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Fredericton, NB E3B 2T7

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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

Analytes:			Chlorophyll-a	Solids - Total Suspended	Solids - Volatile Suspended
Units:			mg/m³	mg/L	mg/L
RL:			10	5	5
RPC Sample ID	Client Sample ID	Date Sampled			
122743-10	S2A2; #1	-	790	1360	370
122743-11	S2A2; #2	-	1380	1150	560
122743-12	S2A2; #3	-	780	1300	450
122913-01	S3A2; #1	-	616	1120	220
122913-02	S3A2; #2	-	701	1710	440
122913-03	S3A2; #3	-	816	2070	630
126277-01	NRC-1	28-Sep-11	3440	1810	910
126277-02	NRC-2	28-Sep-11	2990	1540	800
126277-03	NRC-3	28-Sep-11	1880	4680	1970
122513-04	B2A2; #1	-	1230	2440	1180
122513-05	B2A2; #2	-	2340	3210	1790
122513-06	B2A2; #3	-	4850	7690	2800
123282-01	B3A9-1	5-Aug-11	375	1010	233
123282-02	B3A9-2	5-Aug-11	3570	2470	1240
123282-03	B3A9-3	5-Aug-11	958	908	365
123282-07	W4A17-1	4-Aug-11	725	908	365
123282-08	W4A17-2	4-Aug-11	595	631	200
123282-09	W4A17-3	4-Aug-11	406	411	144
122913-07	M3C3; #1	-	1020	1640	1160
122913-08	M3C3; #2	-	816	973	660
122913-09	M3C3; #3	-	915	987	453
123390-4	EBNB1-1	9-Aug-11	603	1480	570
123390-5	EBNB1-2	9-Aug-11	608	1670	513
123390-6	EBNB1-3	9-Aug-11	694	1860	493
123153-01	W4A21; #1	-	715	1290	410
123153-02	W4A21; #2	-	752	1900	440
123153-03	W4A21; #3	-	599	1250	333
123153-10	W4A31; #1	-	746	1790	400
123153-11	W4A31; #2	-	636	825	240
123153-12	W4A31; #3	-	1110	630	325

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

A. Ross Kean, M.Sc.
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Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: Stantec 121810356
Report Date: 04-Apr-12
Date Received: Jul-Sep-11

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Attention: Eva Walker
Project #: 121810356
Location: Sisson

Analysis of Water

Analytes:			Chlorophyll-a	Solids - Total Suspended	Solids - Volatile Suspended
Units:			mg/m³	mg/L	mg/L
RL:			10	5	5
RPC Sample ID	Client Sample ID	Date Sampled			
122743-10	S2A2; #1	-	790	1360	370
122743-11	S2A2; #2	-	1380	1150	560
122743-12	S2A2; #3	-	780	1300	450
122913-01	S3A2; #1	-	616	1120	220
122913-02	S3A2; #2	-	701	1710	440
122913-03	S3A2; #3	-	816	2070	630
126277-01	NRC-1	28-Sep-11	3440	1810	910
126277-02	NRC-2	28-Sep-11	2990	1540	800
126277-03	NRC-3	28-Sep-11	1880	4680	1970
122513-04	B2A2; #1	-	1230	2440	1180
122513-05	B2A2; #2	-	2340	3210	1790
122513-06	B2A2; #3	-	4850	7690	2800
123282-01	B3A9-1	5-Aug-11	375	1010	233
123282-02	B3A9-2	5-Aug-11	3570	2470	1240
123282-03	B3A9-3	5-Aug-11	958	908	365
123282-07	W4A17-1	4-Aug-11	725	908	365
123282-08	W4A17-2	4-Aug-11	595	631	200
123282-09	W4A17-3	4-Aug-11	406	411	144
122913-07	M3C3; #1	-	1020	1640	1160
122913-08	M3C3; #2	-	816	973	660
122913-09	M3C3; #3	-	915	987	453
123390-4	EBNB1-1	9-Aug-11	603	1480	570
123390-5	EBNB1-2	9-Aug-11	608	1670	513
123390-6	EBNB1-3	9-Aug-11	694	1860	493
123153-01	W4A21; #1	-	715	1290	410
123153-02	W4A21; #2	-	752	1900	440
123153-03	W4A21; #3	-	599	1250	333
123153-10	W4A31; #1	-	746	1790	400
123153-11	W4A31; #2	-	636	825	240
123153-12	W4A31; #3	-	1110	630	325

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General Report Comments

Chlorophyll a was determined according to Method 10200 H (trichromatic method) from Stardard Methods for the Examination of Water and Wastewater.

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry

Appendix F

Napadogan Brook DFO/NBDNR Habitat Survey

Appendix F-1

Data Summary Table followed by DFO/NBDNR Field Forms

Table F-1.1 Stream Survey Forms, Modified from NBDNR/DFO, for Napadogan Brook

Watercourse		Longitude	Latitude	Reach No	Stream Type	Channel Type	Length (m)	Avg Width (m)		Substrate (%)						Avg. Bankfull Depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris Vegetation	Embeddedness	Obstructions to Fish Passage	Comments	% Site		% Shade	Stream Banks										pH	DO_2 (mg/L)	Specific Conductivity (µg/cm)	Temp. C		Sinuosity (>2 or<2)	Grade (>4% or <4%)	Pool Rating Criteria		Pool Tail	
																												Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%															
								Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		L	R	L	R					Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water	Air			No.	Letter	Embeddedness	% Turbulence
Reach 1	West Branch Napadogan Brook	24596581	7487195	1	4	1	150	7-9	10	5	20	35	10	10	15	5	60	30	10	10	10	10	10	1	n	Bedrock control LB at end of reach, overflow channels.	100	0	10	5	35	40	20	50	0	0	50	0	0	6.6	9.02	27.5	15.8	19	<2	1%	0	0	0	0
Reach 2	West Branch Napadogan Brook	2459696	7487140	2	8	1	30	10	12	5	25	35	5	15	10	5	70	50	5	5	10	10	10	1	n	Valley wall further away more floodplain, LWD on banks at end of reach.	100	0	10	10	40	40	10	45	5	0	45	5	0						<2	1%	0	0	0	0
Reach 3	West Branch Napadogan Brook	2459743	7487076	3	4	1	30	10	12	10	20	35	10	10	10	5	60	30	2	2	10	10	10	1	n	More bedrock in bed and banks end is a good point for hydro cross section.	100	0	10	10	30	40	20	45	5	0	45	5	0						<2	1%	0	0	0	0
Reach 4	West Branch Napadogan Brook	2459774	7487029	4	8	1	15	12	14	5	20	40	20	10	5	0	100	60	5	5	10	10	15	1	n	Good spot for flow cross section uniform, bedrock control at end. Deeper run almost a pool.	100	0	5	20	20	40	20	45	5	0	45	5	0						<2	1%	0	0	0	0
Reach 5	West Branch Napadogan Brook	2459796	7487021	5	4/9	1	10	12	14	40	10	15	20	10	5	0	90	45	0	0	10	10	10	1	n	Plunge pool bedrock controlled approx. 0.70 m deep, drop of approx. 1 m. LWD on LB.	90	10	10	5	40	40	15	50	0	0	50	0	0						<2	3	3	b	1	0
Reach 6	West Branch Napadogan Brook	2459890	7486889	6	4	1	90	12-6	14	30	10	15	25	15	5	0	100	45	5	5	10	10	10	1	n	Long riffle section ending in small pool just before waterfall. Collected WQ at the pool US of the waterfall, tributary enters on the LB above the falls.	90	10	10	5	40	40	15	50	0	0	50	0	0	7.0	8.75	27.9	16.2	20	<2	2	3	b	0	10
Reach 7	West Branch Napadogan Brook	2459889	7486871	7	6/2	1	15	2&5	20	80	5	5	10	0	0	0	100	40	0	0	5	5	5	0	n	Waterfall flow is split around bedrock outcrop LB width is approx. 2 m RB approx. 5 m pools at top of waterfall and bottom of waterfall, this is not a barrier to fish passage.	80	20	5	50	30	10	10	50	0	0	50	0	0						<2	5	3	b	0	10
Reach 8	West Branch Napadogan Brook	2459867	7486701	8	4	1	170	7	8	60	20	10	5	5	0	0	40	60	5	5	10	10	2	1	n	Watercourse confined within the valley wall bedrock banks, changes to more open feel DS. One continuous riffle with reach 9, steeper in next reach.	100	0	10	0	40	40	20	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 9	West Branch Napadogan Brook	2459729	7486476	9	4/16	1	270	7-4	8-20	40	30	10	10	10	0	0	90	55	10	10	20	20	2	1	n	Watercourse narrows, increase in sinuosity and grade . Riffle pool complex small pools 5 to 8 m long and 60 to 80 cm deep within reach. Increase in canopy cover, valley walls still close, overflow channels on LB.	80	20	60	10	35	35	20	50	0	0	50	0	0						<2	2.5-3.5	3	b	1	60
Reach 10	West Branch Napadogan Brook	2459700	7486482	10	4	1	30	8	10	40	30	10	10	10	0	0	90	60	5	5	20	20	5	1	n	Large lateral bars at start of reach, bedrock still present in bank and valley wall has moved back in places. Reach ends at a pool.	100	0	40	20	30	30	20	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 11	West Branch Napadogan Brook	2459700	7486482	11	16	1	10	7	10	20	30	20	10	10	5	5	150	120	0	0	10	10	0	1	n	Reach is a pool approx. 10 m long.	0	100	10	20	20	40	20	50	0	0	50	0	0	7.2	8.71	27.8	16.5		<2	<1	3	b	1	100
Reach 12	West Branch Napadogan Brook	2459639	7486456	12	4/6	1	70	7	10	50	20	10	15	5	0	0	60	50	2	2	15	15	0	1	n	Sinuous reach, bedrock in bed and banks, overflow channel on LB, one of the 20 Qualitative stations at end of reach.	95	5	40	20	20	40	20	50	0	0	50	0	0						<2	1.5	3	b	1	100
Reach 13	West Branch Napadogan Brook	2459681	7486315	13	4	1	150	7-15	10-17	0	40	40	15	5	0	0	60	50	5	5	15	15	3	1	n	Bedrock in banks but not channel valley wall approx. 2 to 10 m away.	100	0	10	5	55	30	10	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 14	West Branch Napadogan Brook	2459691	7486228	14	4	1	95	10	12	50	20	20	10	0	0	0	60	50	0	0	15	15	0	1	n	Drop then run then drop. Bedrock outcropping.	100	0	15	5	55	30	10	50	0	0	50	0	0						<2	3.5	0	0	0	0
Reach 15	West Branch Napadogan Brook	2459773	7485936	15	4/8	1	215	8-10	12	20	40	20	10	10	0	0	60	40	10	10	15	15	10	1	n	LWD on banks creates bend (see photos), bedrock ledge at end of reach, forest opens up, watercourse widens out, ends at mouth of Sisson brook.	100	0	15	10	40	40	10	50	0	0	50	0	0	7.1	8.75	27.6	16.6		<2	2	0	0	0	0
Reach 16	West Branch Napadogan Brook	2459773	7485936	16	8	1	20	15	17	5	5	30	40	10	10	0	50	30	10	10	10	10	5	1	n	Reach end at top of riffle just below Sisson Brook.	100	0	5	0	60	30	10	50	0	0	50	0	0	7.1	8.87	27.7	16.4		<2	1	0	0	0	0
Reach 17	West Branch Napadogan Brook	2459830	7485789	17	4	1	150	12	14	5	10	35	30	15	5	0	60	40	15	15	15	15	5	1	n	Lateral bars poorly sorted, watercourse at high flow has pushed up surface materials from bank in places; LWD on banks, bedrock in valley walls are further away 5 to 30 m.	100	0	10	15	35	35	15	40	5	5	40	5	5						<2	1.5	0	0	0	0
Reach 18	West Branch Napadogan Brook	2459824	7485737	18	8	1	70	15	17	5	15	30	30	10	10	0	70	50	10	10	15	15	5	1	n	Some beaver chewing on banks. Nice spot for adults to hold after coming up the riffle below.	100	0	15	5	30	45	20	40	5	5	40	5	5						<2	<1	0	0	0	0
Reach 19	West Branch Napadogan Brook	2459764	7485644	19	4/8	1	130	10	12	5	30	45	10	10	0	0	90	50	15	15	20	20	20	1	n	Overflow channels present, LWD on banks and bank vegetation pushed up by watercourse flows or ice, LB eroding where valley wall meets watercourse. Braided valley wall goes from left to right bank at end of reach, grass tuffs in watercourse.	100	0	15	10	30	40	20	45	0	5	50	0	0						<2	1.5	0	0	0	0
Reach 20	West Branch Napadogan Brook	2459771	7485568	20	4/8	1	90	10	12	15	30	35	10	10	0	0	60	40	0	0	15	15	0	1	n	Stand of cedars on RB at start of reach and valley wall on RB right next to watercourse is bedrock, new reach starts just below wall goes away. Tufts of grass in watercourse.	100	0	15	20	50	20	10	40	10	0	30	20	0						<2	1	0	0	0	0
Reach 21	West Branch Napadogan Brook	2459893	7485391	21	3/8	1	205	15-20	17-22	5	25	40	20	10	0	0	70	50	5	5	20	20	30	1	n	Valley wall on RB for most of reach. Small pool in reach 60 cm deep, 10 m long. Ended reach at pool, substrate size increased lots of LWD on banks.	90	10	30	10	30	40	20	50	0	0	50	0	0	7.2	8.7	27.8	16.3		<2	1	3	b	1	100
Reach 22	West Branch Napadogan Brook	2459969	7485170	22	4/8	1	240	20	22	5	40	45	10	0	0	0	70	40	5	5	20	20	30	1	n	Overflow channels and tufts of grass on bars along edge of watercourse in places, uniform reach, ends in bedrock outcrop/waterfall.	100	0	20	10	40	40	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 23	West Branch Napadogan Brook	2459916	7485004	23	4/8	1	180	15	17	5	45	40	10	0	0	0	70	40	5	5	20	20	20	1	n	Reach ends in pool 10 m long 70 cm deep. Increase in grade downstream (reach 24). Valley walls approx. 10 cm away.	90	10	20	5	45	40	10	50	0	0	50	0	0						<2	2	3	b	1	80
Reach 24	West Branch Napadogan Brook	2460026	7484853	24	4	1	205	10	14	5	45	45	5	0	0	0	80	50	0	0	20	20	10	1	n	Cedar trees all along the banks of this reach, watercourse has deposited gravel on LB near end of reach approx. 1 m above current water level.	100	0	25	10	40	40	10	50	0	0	50	0	0	7.0	8.78	27.7	16.3		<2	3	0	0	0	0

Table F-1.1 Stream Survey Forms, Modified from NBDNR/DFO, for Napadogan Brook

Watercourse		Longitude	Latitude	Reach No	Stream Type	Channel Type	Length (m)	Avg Width (m)		Substrate (%)							Avg. Bankfull Depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris Vegetation	Embeddedness	Obstructions to Fish Passage	Comments	% Site		% Shade	Stream Banks									pH	DO_2 (mg/L)	Specific Conductivity (µg/cm)	Temp. C		Sinuosity (>2 or<2)	Grade (>4% or <4%)	Pool Rating Criteria		Pool Tail	
																													Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%															
								Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines			L	R	L	R					Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water	Air			No.	Letter	Embeddedness	% Turbulence
Reach 25	West Branch Napadogan Brook	2460061	7484840	25	16/8	1	75	10	10	10	35	35	10	5	0	5	90	70	0	0	5	5	5	1	n	Pool, run, pool, depth varies from >1 m to 60 cm, pool is confined between bedrock banks, long pool would be good holding pool.	50	50	30	40	30	20	10	50	0	0	50	0	0						<2	<1	3	b	1	70
Reach 26	West Branch Napadogan Brook	2460169	7484812	26	4	1	90	12	15	5	35	40	10	10	0	0	60	40	0	0	10	10	5	1	n	Very large boulders on/in banks, Valley walls approx. 2 to 5 m away.	100	0	30	10	50	30	10	50	0	0	50	0	0						<2	2	0	0	0	0
Reach 27	West Branch Napadogan Brook	2460267	7484776	27	8	1	110	10	12	0	10	40	40	10	0	0	70	50	5	5	10	10	5	1	n	Deeper in sections approx. 70 cm, thalweg moves to LB DS.	100	0	20	10	50	30	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 28	West Branch Napadogan Brook	2460348	7484735	28	4	1	145	10	12	30	30	30	10	0	0	0	60	30	0	0	10	10	0	1	n	Lots of LWD by watercourse, bedrock control, overflow channel.	100	0	20	20	50	20	10	50	0	0	50	0	0						<2	4	0	0	0	0
Reach 29	West Branch Napadogan Brook	2460476	7484727	29	16	1	80	17	19	20	40	30	10	0	0	0	80	60	0	0	5	5	0	1	n	Pool, run deeper on LB.	10	90	20	20	40	20	20	50	0	0	50	0	0						<2	1	3	b	1	100
Reach 30	West Branch Napadogan Brook	2460552	7484683	30	4/8	1	80	15	19	10	30	40	10	10	0	0	60	40	0	0	5	5	0	1	n	Reach is similar to all others.	100	0	15	10	50	30	10	50	0	0	50	0	0						<2	2	0	0	0	0
Reach 31	West Branch Napadogan Brook	2460616	7484625	31	6	1	90	8	10	80	0	5	5	5	5	0	70	50	0	0	5	5	0	0	n	Series of drops (4) controlled by bedrock in bed and banks. pH probe malfunction had to use uncalibrated probe reach 31-33.	100	0	10	50	30	20	0	50	0	0	50	0	0	7.5	8.56	27.9	16.1		<2	4	0	0	0	0
Reach 32	West Branch Napadogan Brook	2460684	7484490	32	4/8	1	150	5-10	6-12	40	30	10	10	5	5	0	80	50	5	5	10	10	5	1	n	Bedrock in banks and channel, brook reach at grade change watercourse widens out.	100	0	20	10	50	30	10	50	0	0	50	0	0						<2	2.5	0	0	0	0
Reach 33	West Branch Napadogan Brook	2460695	7484232	33	4/8	1	350	7-15	8-17	5	30	35	20	10	0	0	50	30	5	5	15	15	5	1	n	Valley wall on RB.	100	0	15	5	60	25	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 34	West Branch Napadogan Brook	2460572	7484163	34	9	1	100	5-7	10	5	35	35	20	5	0	0	60	40	0	0	10	10	0	1	n	Bedrock in banks, deeper rapid section, large lateral bar on LWD overflow channel behind LWD at end of reach. New pH probe used from this point forward.	100	0	20	20	60	10	10	50	0	0	50	0	0	6.5	9.15	27.9	13.9	15	<2	2	0	0	0	0
Reach 35	West Branch Napadogan Brook	653110	5135562	35	16	1	12	8	12	0	40	30	20	10	0	0	150	100	0	0	0	20	20	1	n	Pool between riffles on a bend end of large lateral bar. Nomad malfunction swich to garmin GPS.	0	100	40	50	30	10	10	50	0	0	50	0	0						<2	1	3	b	1	100
Reach 36	West Branch Napadogan Brook	653135	5135596	36	4	1	40	8	12	0	40	30	20	10	0	0	60	40	0	0	15	15	10	1	n	Riffle, sinuosity increases.	100	0	30	5	40	45	10	50	0	0	50	0	0						<2	2	0	0	0	0
Reach 37	West Branch Napadogan Brook	653149	5135593	37	16	1	15	8	12	0	40	30	20	10	0	0	150	100	0	0	5	0	0	1	n	Pool.	0	100	15	40	40	10	10	50	0	0	50	0	0						<2	1	3	b	1	100
Reach 38	West Branch Napadogan Brook	653340	5135482	38	4	1	290	10	15	0	40	30	30	0	0	0	60	30	0	0	5	10	30	1	n	Long riffle, valley walls have moved away completely, no bedrock until very end of reach at ATV bridge.	100	0	20	10	40	40	10	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 39	West Branch Napadogan Brook	653358	5135441	39	16/8	1	40	10	12	10	30	30	30	0	0	0	60	40	5	5	5	5	40	1	n	Run, pool under ATV bridge, depth varies 30 to 70 cm.	50	50	20	5	45	40	10	50	0	0	50	0	0						<2	1	3	b	1	100
Reach 40	West Branch Napadogan Brook	653420	5135364	40	4	1	150	10	12	5	40	30	25	0	0	0	60	30	10	10	10	10	20	1	n	Start of riffle section, some pushing up of bank vegetation at mid lower end of reach.	100	0	20	10	50	30	10	50	0	0	50	0	0	7.1	9.27	27.7	14.7		<2	1.5	0	0	0	0
Reach 41	West Branch Napadogan Brook	653499	5135287	41	8	1	190	20	23	0	30	40	15	10	5	0	80	60	10	10	10	10	5	1	n	Beaver trying to build dam at end of reach (riffle) naturally ponded area.	100	0	10	0	10	80	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 42	West Branch Napadogan Brook	653555	5135203	42	4	1	95	15	20	0	30	40	15	10	5	0	60	30	10	10	10	10	5	1	n	Ends at confluence with EBNR very strait section, LWD jam just downstream of where the two channels meet (reach 43 st).	100	0	10	0	10	80	10	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 43	Napadogan Brook	653514	5135043	43	3	1	250	10	15	0	20	20	30	20	5	5	60	40	15	15	10	10	20	1	n	Start of reach LWD jam (photos) and beaver dam at mouth of EBNR. Lateral bars along RB from overflow channel of WBNR. Some clay in banks overflow channel re-joins main on RB approx. 250 m DS where we ended reach. Saw a merganser duck.	100	0	15	5	15	70	10	50	0	0	50	0	0	7.3	9.02	29.7	15.7	23	<2	1.5	0	0	0	0
Reach 44	Napadogan Brook	653518	5134958	44	3	1	90	20	22	0	20	30	30	10	5	5	100	60	10	10	15	15	5	1	n	Change in grade and depth and velocity.	100	0	15	0	40	50	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 45	Napadogan Brook	653535	5134874	45	8	1	220	20	22	0	20	25	35	10	5	5	100	50	10	10	10	10	5	1	n	Run with more depth less grade.	100	0	10	0	45	45	10	50	0	0	50	0	0						<2	0.5	0	0	0	0
Reach 46	Napadogan Brook	653551	5134841	46	3	1	40	20	22	0	15	25	40	10	5	5	60	30	5	5	10	10	0	1	n	Riffle.	100	0	0	0	60	40	0	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 47	Napadogan Brook	653572	5134792	47	8	1	90	20	22	0	15	25	40	10	5	5	60	30	5	5	15	15	0	1	n	Run, last 3 to 4 reaches may be good AS spawning habitat.	100	0	5	0	30	50	20	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 48	Napadogan Brook	653615	5134721	48	13	1	100	25	27	30	5	15	20	10	15	5	100	60	0	0	15	15	5	1	n	Beaver backwater channel bed still maintains 1% slope. Bedrock outcrop throughout most of the reach on RB.	0	100	5	0	5	85	10	50	0	0	50	0	0	7.4	8.95	31.3	16.9		<2	0	0	0	0	0
Reach 49	Napadogan Brook	653682	5134538	49	8	1	250	20	22	0	10	35	30	10	10	5	60	30	20	20	15	15	40	1	n	Braided below beaver dam most flow on LB, Reach ends with weirdness. Good spot for AS spawning.	100	0	10	0	30	60	10	50	0	0	50	0	0						<2	1	0	0	0	0

Table F-1.1 Stream Survey Forms, Modified from NBDNR/DFO, for Napadogan Brook

Watercourse		Longitude	Latitude	Reach No	Stream Type	Channel Type	Length (m)	Avg Width (m)		Substrate (%)							Avg. Bankfull Depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris Vegetation	Embeddedness	Obstructions to Fish Passage	Comments	% Site		% Shade	Stream Banks										pH	DO_2 (mg/L)	Specific Conductivity (µg/cm)	Temp. C		Sinuosity (>2 or<2)	Grade (>4% or <4%)	Pool Rating Criteria		Pool Tail	
																													Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%															
								Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines			L	R	L	R					Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water	Air			No.	Letter	Embeddedness	% Turbulence
Reach 50	Napadogan Brook	653661	5134486	50	3	1	50	5-20	22	0	0	30	30	20	10	10	60	40	10	10	10	10	20	1	n	Channel avulsion, clay deposits, flow divides into two, LWD on banks, clay likely underwater, overflow channel into wetland.	100	0	15	10	30	50	10	50	0	0	50	0	0						2	1.5	0	0	0	0
Reach 51	Napadogan Brook	653702	5134416	51	13/16	1	146	25	27	30	5	15	20	10	10	10	100	75	5	0	10	15	50	2	n	Run/pool due to beaver dam at end of reach. Beaver lodge in reach RB all bedrock intrudes into channel.	50	50	30	20	5	40	35	30	20	0	50	0	0						<2	0.2	3	a	2	70
Reach 52	Napadogan Brook	653818	5134260	52	3	1	478	10-20	12-22	0	5	30	30	20	10	5	60	40	10	10	10	10	40	1	n	Channel braids several times 10 m width generally on each side. Lots of LWD at heads and sides of islands and banks.	100	0	10	0	40	40	20	50	0	0	50	0	0	7.1	8.69	31.7	18.0		>2	1.5	0	0	0	0
Reach 53	Napadogan Brook	653822	5134201	53	8	1	110	20	22	0	0	40	30	20	5	5	60	40	10	10	10	10	20	1	n	Straight riffle ends at braided channel around islands.	100	0	10	0	10	80	10	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 54	Napadogan Brook	653835	5134098	54	3	1	50	18	20	0	5	35	30	20	5	5	60	30	0	0	10	20	5	1	n	Reach ends at bridge, overflow channel braiding on LB.	100	0	30	0	40	20	40	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 55	Napadogan Brook	653854	5134072	55	16	1	40	20	22	0	20	30	30	10	5	5	120	100	0	0	5	5	0	1	n	Pool at bridge.	0	100	5	60	30	10	0	50	0	0	50	0	0						<2	0.2	3	a	1	100
Reach 56	Napadogan Brook	653898	5133954	56	3/8	1	100	15	17	0	5	40	30	15	5	5	60	20-40	10	10	10	5	0	1	n	Riffle, run, into long run.	100	0	10	20	30	40	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 57	Napadogan Brook	653915	5133876	57	8	1	100	23	25	0	25	30	10	20	10	5	80	40-60	5	5	5	5	5	1	n	Deeper run more boulders (small) than last reach, large substrate not good for spawning.	100	0	5	20	45	20	15	50	0	0	50	0	0	6.9	10.15	31.3	14.2		<2	0.2	0	0	0	0
Reach 58	Napadogan Brook	653933	5133691	58	4/8	1	210	25	27	0	25	40	20	10	3	2	80	40-60	10	10	10	10	0	1	n	Start of reach splits approx. 10% of flow to other channel. Island has trees pushed over. Reach ends at a second channel divide.	100	0	10	5	30	50	15	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 59	Napadogan Brook	653913	5133557	59	4	1	135	8-15	18	0	40	25	15	10	5	5	60	30	30	0	15	15	5	1	n	All channels Right and left re-join. RB channel approx. 8 m wide, LB approx. 1m wide, mid channel 15 m wide. Well established island with lots of veg/trees.	100	0	15	10	30	50	10	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 60	Napadogan Brook	653909	5133493	60	4/8	1	87	23	25	0	40	25	15	10	5	5	80	40	20	5	15	15	0	1	n	Riffle, run more boulders.	100	0	15	5	35	50	10	50	0	0	50	0	0						<2	0.5	0	0	0	0
Reach 61	Napadogan Brook	653882	5133436	61	8	1	50	25	26	20	30	20	10	10	7	3	80	40	5	5	10	10	0	1	n	Bedrock in channel at start of reach and throughout, a run but weird due to bedrock.	100	0	15	10	20	50	20	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 62	Napadogan Brook	653890	5133353	62	3/8/16	1	100	15	20	0	20	20	40	10	10	0	80	60	0	0	5	5	0	1	n	Flow is constricted creating riffle pool complex, large erratic boulders in reach mid-channel forms 1 pool due to scour. Increased sinuosity in reach.	50	50	10	20	20	50	10	50	0	0	50	0	0	7.3	9.03	31.9	15.0	20	<2	1	3	b	1	80
Reach 63	Napadogan Brook	653968	5133222	63	8/16	1	160	20	22	0	10	30	40	10	5	5	80	40	0	0	10	10	0	1	n	Pool is approx. 20 m in length and 60 to 80 cm deep with several large erratic's in it.	90	10	15	5	20	65	10	50	0	0	50	0	0						<2	0.5	3	b	1	80
Reach 64	Napadogan Brook	653992	5133180	64	3	1	60	20	22	0	5	45	40	10	0	0	40	20	0	0	10	10	0	1	n	May be the confluence with Manzer Brook? Low flow in trib.	100	0	10	10	20	60	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 65	Napadogan Brook	653994	5133121	65	16	1	75	25	27	0	10	40	30	10	10	0	100	80	0	0	5	5	0	1	n	Pool. Valley wall on LB.	0	100	10	10	60	15	15	50	0	0	50	0	0						<2	0.2	3	b	1	100
Reach 66	Napadogan Brook	653964	5133080	66	4	1	30	25	27	0	15	45	30	10	0	0	80	40	0	0	10	10	0	1	n	Riffle after pool, at end of riffle left bank valley wall cuts away.	100	0	20	5	65	20	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 67	Napadogan Brook	653967	5132897	67	8	1	200	28	30	0	5	30	40	10	10	5	80	50	5	5	10	10	0	1	n	Nice deep run with good AS spawning gravels, thalweg sticks to right bank. Reach maybe surrounded by wetland.	100	0	10	5	40	50	5	50	0	0	50	0	0	7.3	9.09	31.9	15.9		<2	0.2	0	0	0	0
Reach 68	Napadogan Brook	653973	5132782	68	3/8	1	70	16	18	0	5	30	40	15	5	5	80	50	0	0	15	15	0	1	n	Riffle, run and then deeper run. Channel constricts a bit, overflow channels at start of reach.	100	0	20	0	30	60	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 69	Napadogan Brook	654022	5132739	69	8	1	75	20	22	0	10	20	20	20	20	10	80	50	0	0	10	10	50	1	n	LWD at start of reach. Channel braids around established islands, large erratic boulders with deeper spots around them. Lateral bars of gravel and sand.	100	0	15	15	40	35	10	50	0	0	50	0	0						<2	0.5	0	0	0	0
Reach 70	Napadogan Brook	654059	5132719	70	3/4	1	60	25	27	0	15	30	20	15	15	5	80	40	5	5	10	10	20	1	n	Riffle run with large boulders.	100	0	10	10	40	40	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 71	Napadogan Brook	654074	5132652	71	4/8	1	100	25	27	0	15	30	30	10	10	5	80	50	0	0	10	10	10	1	n	Riffle run with deep spots nice spawning gravel erratic's, valley wall in close on right bank.	100	0	15	15	35	30	20	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 72	Napadogan Brook	654086	5132628	72	16	1	20	30	32	0	5	25	25	25	10	10	150	90	0	5	5	5	5	2	n	Tributary enters in RB at start of reach, pool near LB >1m.	0	100	5	0	20	60	20	50	0	0	50	0	0						<2	0.2	3	a	1	0
Reach 73	Napadogan Brook	654301	5132437	73	8	1	320	30	32	0	5	20	30	25	15	5	80	60	5	5	5	5	10	1	n	Riffle run with 2 small pools. Substrate good for AS spawning.	90	10	5	0	20	50	30	50	0	0	50	0	0	7.4	8.41	32	18.0		<2	0.5	3	b	1	50

Table F-1.1 Stream Survey Forms, Modified from NBDNR/DFO, for Napadogan Brook

Watercourse		Longitude	Latitude	Reach No	Stream Type	Channel Type	Length (m)	Avg Width (m)		Substrate (%)							Avg. Bankfull Depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris Vegetation	Embeddedness	Obstructions to Fish Passage	Comments	% Site		% Shade	Stream Banks										pH	DO_2 (mg/L)	Specific Conductivity (µg/cm)	Temp. C		Sinuosity (>2 or<2)	Grade (>4% or <4%)	Pool Rating Criteria		Pool Tail	
																													Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%															
								Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines			L	R	L	R					Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water	Air			No.	Letter	Embeddedness	% Turbulence
Reach 74	Napadogan Brook	654370	5132354	74	3/8	1	145	30	32	0	5	20	30	35	10	0	50	20	10	10	5	5	5	1	n	Channel braids at start of reach, several small islands of grass throughout. Reach made up of 2 riffles 15 m long and 2 runs.	100	0	10	0	40	50	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 75	Napadogan Brook	654383	5132284	75	3	1	50	25	28	0	5	35	35	25	0	0	50	20	0	0	5	5	0	1	n	Riffle.	100	0	5	0	60	30	10	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 76	Napadogan Brook	654406	5132202	76	8	1	110	30	32	0	5	30	40	15	10	0	80	40	0	0	5	5	10	1	n	Run with deeper (0.60 m) spots closer to RB.	100	0	5	0	40	50	10	50	0	0	50	0	0						<2	0.5	0	0	0	0
Reach 77	Napadogan Brook	654449	5132031	77	3	1	200	25-30	32	0	5	30	40	25	0	0	60	30	0	0	5	5	5	1	n	Long riffle , ice scars on trees 1 to 2 m above water level, reach turns a corner at end.	100	0	10	0	40	45	15	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 78	Napadogan Brook	654440	5132029	78	16	1	10	20	22	0	15	35	30	20	0	0	90	60	0	0	2	2	0	1	n	Pool faster water around a bend.	0	100	5	0	60	10	30	50	0	0	50	0	0						<2	0.2	0	0	0	0
Reach 79	Napadogan Brook	654421	5131862	79	4/8	1	300	25	27	0	30	30	20	20	0	0	100	40-70	0	0	5	5	10	1	n	Sinuous section, boulders increase in numbers as you move downstream.	90	10	5	5	55	20	20	50	0	0	50	0	0	7.5	8.37	31.9	19.4		1.3	2	3	b	1	80
Reach 80	Napadogan Brook	654518	5131786	80	4/8	1	130	25	27	0	30	25	20	20	5	0	80	60	5	5	5	5	5	1	n	Sinuosity ends grade decreases slightly.	100	0	5	0	50	40	10	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 81	Napadogan Brook	654492	5131664	81	4	1	125	30	32	0	20	30	20	20	5	5	70	50	0	0	5	5	20	1	n	Riffle changes grade to run.	100	0	5	10	40	30	20	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 82	Napadogan Brook	654501	5131518	82	3/8	1	150	10-20	15-22	0	5	30	40	10	10	5	60	30	0	0	10	10	20	1	n	Channel splits into two sections, RB section longer, both are riffle, end of reach is a mess braided with islands, LWD. Beaver dam at mouth of tributary.	100	0	10	5	45	40	10	50	0	0	50	0	0						<2	0.5	0	0	0	0
Reach 83	Napadogan Brook	654544	5131504	83	3/16	1	50	15	18	0	3	17	40	20	10	10	80	40	5	5	10	10	20	1	n	All channels meet lot of LWD on banks.	90	10	30	10	40	30	20	50	0	0	30	0	20						<2	0.2	3	b	2	100
Reach 84	Napadogan Brook	654630	5131527	84	8	1	70	25	27	5	15	20	30	10	15	5	80	40	0	0	10	10	5	1	n	Run with large boulders and some out cropping at of granite bedrock in channel.	100	0	10	5	20	65	10	50	0	0	50	0	0	6.9	8.96	34	16.0	20	<2	0.5	0	0	0	0
Reach 85	Napadogan Brook	654689	5131495	85	4	1	65	20	22	0	15	25	30	20	10	0	90	50	0	0	10	10	0	1	n	Riffle with large boulders.	100	0	10	0	10	80	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 86	Napadogan Brook	654765	5131476	86	8	1	85	20	22	0	5	20	40	25	10	0	80	40-60	0	0	10	10	0	1	n	Run with several grassy islands in LB and Mid-channel at end of reach. Substrate smaller and looks paved, still low embeddedness.	100	0	5	0	30	70	0	50	0	0	50	0	0						<2	0.2	0	0	0	0
Reach 87	Napadogan Brook	654788	5131455	87	3	1	40	20	22	0	2	23	30	25	15	5	60	30	0	0	5	5	10	1	n	Short braided riffle with grassy islands.	100	0	5	5	50	45	0	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 88	Napadogan Brook	654862	5131419	88	8	1	120	22	24	0	5	20	30	25	15	5	60	40	0	0	5	5	0	1	n	Run, thalweg on LB.	100	0	5	10	5	85	0	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 89	Napadogan Brook	655062	5131400	89	8	1	300	25	27	0	10	25	30	20	15	0	80	50	0	0	5	5	5	1	n	Long run nice substrate for spawning with deep spots, tributary enters on LB (small) unnamed.	100	0	5	5	15	70	10	50	0	0	50	0	0						<2	0.5	0	0	0	0
Reach 90	Napadogan Brook	655090	5131389	90	3	1	20	25	27	0	10	20	35	25	10	0	60	40	0	0	5	5	0	1	n	Short riffle, tributary enters above lateral bar on RB.	100	0	10	5	30	50	15	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 91	Napadogan Brook	655148	5131355	91	8	1	60	22	24	0	10	25	35	25	5	0	80	50	0	0	5	5	0	1	n	Thalweg on LB approx. 60 cm deep, run.	100	0	5	0	20	70	10	50	0	0	50	0	0						<2	0.5	0	0	0	0
Reach 92	Napadogan Brook	655219	5131254	92	8	1	170	22	25	0	20	40	30	5	5	0	100	40	0	0	5	5	5	1	n	Clay on LB under small tributary at start of reach, LB also armoured with boulders in LB at the start of reach.	100	0	5	5	30	55	10	50	0	0	50	0	0	7.3	9.42	33.3	17.5	23	<2	1	0	0	0	0
Reach 93	Napadogan Brook	655366	5131126	93	8	1	185	25	27	0	20	30	40	5	5	0	100	40-60	0	0	5	5	0	1	n	Run, grade change have seen several fish jumping very uniform flow.	100	0	5	0	30	60	10	50	0	0	50	0	0						<2	0.5	0	0	0	0
Reach 94	Napadogan Brook	655426	5131062	94	4	1	100	20	22	0	30	35	20	15	0	0	100	40	0	0	10	10	0	1	n	Short riffle.	100	0	5	5	35	40	20	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 95	Napadogan Brook	655464	5130971	95	3/8	1	130	25	27	0	35	30	20	10	5	0	80	50	0	0	5	5	0	1	n	Large boulders armouring LB, riffle run.	100	0	5	5	40	40	15	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 96	Napadogan Brook	655513	5130904	96	16	1	100	20	21	0	20	35	20	10	10	5	90	70	0	5	5	5	0	1	n	Long pool that sticks to the RB (deepest part) good flow and substrate.	5	95	20	10	40	20	30	50	0	0	30	10	10						<2	0.1	3	a	1	100
Reach 97	Napadogan Brook	655552	5130880	97	3	1	50	25	27	0	5	45	30	15	5	0	90	40	0	0	2	2	0	1	n	Riffle after pool, slow flowing trib enters on LB at top of riffle.	100	0	2	5	55	30	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 98	Napadogan Brook	655582	5130785	98	8	1	120	25	27	0	10	40	30	10	10	0	90	50	0	0	2	2	0	1	n	Run deeper near LB.	100	0	2	0	10	80	10	50	0	0	50	0	0						<2	0.5	0	0	0	0
Reach 99	Napadogan Brook	655599	5130733	99	3	1	55	30	32	0	10	30	40	15	5	0	50	25	0	0	2	2	0	1	n	Shallow and wide riffle.	100	0	2	0	5	95	0	50	0	0	50	0	0	7.5	9.11	33.1	19.5		<2	1	0	0	0	0

Table F-1.1 Stream Survey Forms, Modified from NBDNR/DFO, for Napadogan Brook

Watercourse		Longitude	Latitude	Reach No	Stream Type	Channel Type	Length (m)	Avg Width (m)		Substrate (%)							Avg. Bankfull Depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris Vegetation	Embeddedness	Obstructions to Fish Passage	Comments	% Site		% Shade	Stream Banks										pH	DO_2 (mg/L)	Specific Conductivity (µg/cm)	Temp. C		Sinuosity (>2 or<2)	Grade (>4% or <4%)	Pool Rating Criteria		Pool Tail	
																													Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%															
								Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines			L	R	L	R					Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water	Air			No.	Letter	Embeddedness	% Turbulence
Reach 100	Napadogan Brook	655609	5130672	100	8	1	70	25	27	0	10	30	40	10	5	5	100	60	10	0	30	0	0	1	n	Start of reach lateral bar with grass on RB, sandy bar above that , deep (70 cm) around the bend in watercourse. RB lateral bar rock.	100	0	30	30	30	15	25	50	0	0	50	0	0						<2	0.5	3	a	1	100
Reach 101	Napadogan Brook	655541	5130489	101	4/8	1	250	20-25	22-27	0	25	30	25	10	5	5	120	20-70	0	0	0	10	0	1	n	Riffle run RB at end eroding, deep spots as watercourse turns bends.	100	0	30	10	35	35	20	50	0	0	30	10	10						<2	1	0	0	0	0
Reach 102	Napadogan Brook	655558	5130268	102	3/8	1	250	30	32	0	15	35	20	20	10	0	80	40-60	0	0	5	5	0	2	n	Some paving of substrate.	100	0	5	0	30	50	20	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 103	Napadogan Brook	655582	5130205	103	8	1	75	30	32	0	10	40	20	20	10	0	60	30	0	0	5	5	0	1	n	Run.	100	0	5	0	10	80	10	50	0	0	50	0	0						<2	0.2	0	0	0	0
Reach 104	Napadogan Brook	655602	5130158	104	3	1	60	30	32	0	5	40	30	15	10	0	60	30	0	0	5	5	0	1	n	Riffle.	100	0	5	5	10	70	15	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 105	Napadogan Brook	655633	5130084	105	8	1	55	30	32	0	5	40	30	15	10	0	80	40	0	0	5	5	0	1	n	Run.	100	0	5	0	10	90	0	50	0	0	50	0	0	7.6	8.79	32.9	21.0		<2	0.2	0	0	0	0
Reach 106	Napadogan Brook	655650	5130049	106	3	1	30	30	32	0	0	50	30	10	10	0	80	40	0	0	10	5	0	1	n	Riffle, possible old redds in reach.	100	0	15	0	40	50	10	50	0	0	50	0	0						<2	1	0	0	0	0
Reach 107	Napadogan Brook	655714	5130021	107	8/16	1	80	20	22	0	5	45	30	10	10	0	130	80	0	20	5	15	60	1	n	Run/pool short goes into bend with deeper flow LWD at start of reach causing scour pool.	30	70	20	20	40	20	20	50	0	0	20	10	20						<2	0.2	3	a	1	100
Reach 108	Napadogan Brook	655836	5130021	108	8/16	1	110	25	27	0	0	30	20	20	15	15	140	90	0	0	10	5	0	1	n	Start of reach small riffle goes to pool/run. Slower flow than last reach. Brook trout (10-12 cm long) observed at end of reach along with creek chub.	20	80	20	20	20	50	10	50	0	0	50	0	0						<2	0.2	3	a	1	100
Reach 109	Napadogan Brook	655997	5129861	109	3/8/16	1	330	20-35	25-37	0	0	15	20	35	20	10	40-150	120-200	5	5	15	15	40	1	n	Messy reach lots of braiding, several deep scour pools between riffle runs caused by rapid change in direction and flow constriction. Tributary possibly enters, several gravel rock lateral and medal bars reach ends at tributary, really mobile substrate.	80	20	20	15	35	30	20	50	0	0	50	0	0						>2	1.5	3	a	1	100
Reach 110	Napadogan Brook	656191	5129773	110	3/8	1	240	10-20	15-22	0	10	15	25	30	10	10	60-100	30-70	5	10	10	10	5	1	n	Deeper (70 cm) run at start of reach, more boulders compared to last reach. Approx. 30 % run and 70% riffle. Channel has several small island lateral and medial bars.	100	0	10	10	40	30	20	50	0	0	50	0	0	7.4	8.63	32.8	21.6		<2	1.5	0	0	0	0
Reach 111	Napadogan Brook	656266	5129723	111	8	1	120	25	27	0	20	30	20	25	5	0	80	50	0	0	5	5	0	1	n	Boulders start to armour banks. Slightly sinuous.	100	0	10	0	40	40	20	50	0	0	50	0	0						<2	0.5	0	0	0	0
Reach 112	Napadogan Brook	656426	5129582	112	4/8	1	307	25	27	0	30	30	5	5	20	10	90	60	0	0	5	5	5	1	n	Channel narrows and flow increases, banks are sort of armoured by boulders. Deep run (80 cm) at start of reach approx. 20 m, the rest is one long riffle.	100	0	10	0	30	50	20	50	0	0	50	0	0						<2	1.5	0	0	0	0
Reach 113	Napadogan Brook	656748	5129098	113	4/8	1	650	30	32	0	30	25	10	15	15	5	100	50	0	0	2	2	0	1	n	Very uniform reach all riffle run, banks are armoured by boulders. Reach break at constriction with lateral bar on LB.	100	0	5	0	80	10	10	50	0	0	50	0	0	7.5	8.37	32.7	21.8		<2	1.5	0	0	0	0
Reach 114	Napadogan Brook	656832	5128791	114	4	1	438	28-30	32	0	20	35	15	15	10	5	100	40	0	0	2	2	0	1	n	End of reach 40 m wide meets the Nashwaak River (nice delta), reach is one long riffle, evidence of 2 to 2.5 m high flow, ice scars and debris, more bank erosion in this reach.	100	0	10	5	65	10	20	30	5	15	30	5	15						<2	1.5	0	0	0	0

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan Brook below confluence w Bird Brk **Date:** Aug 16, 2011 **Job Number:** 12181035 6

Personnel: _____ **Coordinates Start:** 459541.8472 7487293.6254 **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
1	100	0	10	5	35	40	20	50	–	–	50	–	–	6.6 *	9.02 92.1%	27.6	15.6	19	<2	1%	–	–	–	–
2	100	0	10	10	40	30	10	45	5	–	45	5	–						<2	1%	–	–	–	–
3	100	0	10	10	30	40	20	45	5	–	45	5	–						<2	1%	–	–	–	–
4	100	0	5	15	15	40	20	45	5	–	45	5	–						<2	1%	–	–	–	–
5	90	10	10	5	40	40	15	50	0	0	50	–	–		89.0%	0.0 ppt			<2	3%	3	b	2	0
6	90	10	10	5	30	40	15	50	–	–	50	–	–	7.0	6.75	27.9	16.2	20	<2	2	3	b	0	10
7	80	20	5	50	20	10	10	50	–	–	50	–	–	–	–	–	–		<2	5%	3	b	0	10
8	100	–	10	0	50	40	20	50	–	–	50	–	–						<2	1.5	–	–	–	–
9	80	20	60	10	35	35	20	50	–	–	50	–	–						<2	2.5-3.5	3	b	1	60
10	100	0	40	20	30	30	20	50	–	–	50	–	–						<2	1.5	–	–	–	–

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

* pH meter calibrates 7.0 to pH of 6.6

(8) WC confined w/in valley wall bedrock banks, changes to more open feel DS one continuous riffle to reach 9. seep in reach
(9) WC narrows ↑ sinuosity + grade, Riffle/pool complex small pools 5-8 m long 60-80 cm deep ↑ canopy cover valley walls still close, overflow channels on LB.
(10) Large lateral bars @ st of reach, bedrock still present in bank valley wall mixed bank in places, ends @ pool

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan Brk dsof Brd Brk main **Date:** Aug 16, 2011 **Job Number:** 121810356

Personnel: EMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
																						end of Reach
1	4	1	150	7-9	10	5	20	30	10	10	15	5	60	30	10	10	10	10	10	1	0	E 2459681 N 7487194.9
2	8	1	30	10	12	5	25	35	5	15	10	5	.70	.50	5	5	10	10	10	1	N	E2459695.7 N7487140.11
3	4	1	30	10	12	10	20	35	10	10	10	5	.60	.30	2	2	10	10	10	1	N	E 2459743 N 7487076
4	8	1	15	12	14	5	20	40	20	10	5	—	100	.60	5	5	10	10	15	1	N	E 2459774 N 7487029
5	4/9	1	10	12	14	40	10	15	20	10	5	—	.40	.20 .70	0	0	10	10	10	1	N	E 2459796 N 7487021
6	4	1	90	12-6	14	30	10	15	20	15	5	—	100	20-70	5	5	10	10	10	1	N	E 2459840 N 7486869
7	6/2	1	15	2+5	20	80	5	5	10	—	—	—	100	30-50	0	0	5	5	5	0	N	E 2459889 N 7486871
8	4	1	170	7	8	60	10	10	5	5	—	—	40	60	5	5	10	10	2	1	N	E 2459867 N 7486701
9	4/16 (cont)	1	270	7-4	8-20	40	30	10	10	10	—	—	90	30-80	10	10	20	20	2	1	N	E 2459729 N 7486476
10	4	1	30	8	10	40	30	10	10	10	—	—	40	.60	5	5	20	20	5	1	N	E 2459706 N 7486482

① bedrock control LB @ end of reach, overflow channels
② valley wall further away more flood plane, LWD on banks @ end of reach
③ more bedrock in bed + banks end is a good pt for Hyro x section,
④ good sp for flow x section uniform, bedrock control @ end. deeper run, almost a pool.
⑤ Plunge pool bedrock controlled ≈ .70m deep. drop of ≈ 1m, LWD on RB
⑥ long riffle section ending in small pool just before waterfall collected WQ @ pool, Invib enderson LB above falls
⑦ waterfall is split around bedrock outcrop LB width is ≈ 2m, RB ≈ 5m pools at top + bottom not a barrier

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Nyadoyan Brk **Date:** Aug 16, 2011 **Job Number:** 1218103560

Personnel: EMW JOK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site: Riffle / Run	% Site: Pools	% Shade	Stream Banks: Vegetation %: Bare Ground	Grasses	Shrubs	Trees	Bank Erosion 0-50% Left Bank*: Stable	Bare Stable	Eroding	Bank Erosion 0-50% Right Bank *: Stable	Bare Stable	Eroding	ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp: Water (°C)	Air (°C)	Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria: No.	Letter	Pool Tail: Embeddedness	% Turbulence
11	0	100	10	20	20	40	20	50	—	—	50	—	—	7.2	8.71	27.8	16.5°C		<2	<1%	3	b	1	100
12	95	5	40	30	20	40	20	50	—	—	50	—	—						<2	1.5	3	b	1	100
13	100	0	10	5	50	20	10	50	—	—	50	—	—						<2	1.5	—	—	—	—
14	100	0	15	5	55	30	10	50	—	—	50	—	—				0.0ppt		<2	3.5	—	—	—	—
15	100	0	15	10	40	40	10	50	—	—	50	—	—	7.1	8.75	27.6	16.6		<2	2	—	—	—	—
16	100	0	5	0	60	30	10	50	—	—	50	—	—	7.1	4.87	27.7	16.4	0.0 ppt	<2	1	—	—	—	—
17	100	0	10	15	35	35	15	40	5	5	40	5	5						<2	1.5	—	—	—	—
18	100	0	15	5	30	45	20	40	5	5	40	5	5						<2	<1%	—	—	—	—
19	100	0	15	10	30	40	20	50	—	5	50	—	—						<2	1.5	—	—	—	—
20	100	0	15	20	50	20	10	40	20	—	50	20	—						<2	11	—	—	—	—

Depth 1.2m

Reach #	Wet width (m)	Depth (m): 1/4	1/2	3/4	Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec): Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

(18) Some beaver chew on both banks. Nice spot for adults to hold after coming up riffle below

(19) Overflow channels present LWD on banks and bank veg pushed up by WC flows. LB eroding where valley wall meets sw & braided valley wall goes from LB to RB @ end of reach. grass tufts in WC

(20) Stand of Leadres on RB @ st of reach + valley wall on RB right next to WC it's bed rock. New reach starts just below valley wall goes away Tufts of grass

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan Brk **Date:** Aug 16, 2011 **Job Number:** 12810356

Personnel: EMW JPK **Coordinates Start:** 2459700 7486482 **Coordinates End:**

Reach No.	Stream Type (Rbo)	Channel Type	Length (m)	Ave. Width (m) Wet	Ave. Width (m) Bankfull Width	Substrate (%) Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)	Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank *L	% Undercut Bank *R	% Overhanging Bank Vegetation *L	% Overhanging Bank Vegetation *R	Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
11	16*	1	10	7	10	20	30	20	10	10	5	5	1.5	1.2m	0	0	10	10	0	1	N	E 2459700 N 7486482
12	4/6	1	70	7	10	50	20	10	15	5	5	5	.6	.5	2	2	15	15	0	1	N	E 2459634 N 7486456
13	4	1	150	7 15	10-17	0	30	40	15	5	—	—	.6	.5	5	5	15	15	3	1	N	E 2459681 N 7486815
14	4	1	95	10	12	50	20	20	10	+	—	—	.6	.5	0	0	15	15	0	1	N	E 2459691 N 7486228
15	4/6	1	215	8 10	12	20	40	20	10	10	—	—	.6	.4	10	10	15	15	10	1	N	E 2459773 N 7486936
16	4	1	20	15	17	5	5	30	40	20	10	—	.50	.30	10	10	10	10	5	1	N	E 2459773 N 7486936
17	4	1	150	12	14	5	10	35	30	15	5	—	.60	.40	15	15	15	15	5	1	N	E 2459836 N 7485784
18	8	1	70	15	17	5	15	30	30	10	10	—	.70	.50	10	10	15	15	5	1	N	E 2459824 N 7485737
19	4/6	1	130	10	12	5	30	45	10	10	—	—	.90	.36 .70	15	15	20	20	20	1	N	E 2459764 N 7485644
20	4/6	1	90	10	12	15	30	35	10	10	—	—	.60	.40	0	0	15	15	0	1	N	E 2459771 N 7485568

(11) Reach is a pool ≃ 10m through
(12) Sinuous reach, bedrock in bed + banks, overflow channel on LB, one of 20 stations @ end of reach
(13) Bedrock in banks but not channel Valley wall ≃ 2-10m away
(14) Drop then run then drop bedrock out cropping
(15) LWD on banks creates bend (see photos), bedrock ledge @ end of reach, Forest opens up, WC widens out, ends @ mouth of Sissonbrk
(16) Reach end @ top of Riffle just below sisson
(17) Lateral bars poorly sorted, WC @ high flow has pushed up surface bank material in places; LWD on banks, bedrock valley walls are. Further away ~ 20

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 16, 2011 **Job Number:** 12181035G

Personnel: EMW + PIC **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
21	3/8	1	205	15-20	17-20	5	25	40	20	10	—	—	.70	.50	5	5	20	20	30	1	N	end E 2459893 N 7485391
22	4/8	1	240	20	22	5	40	45	10	—	—	—	.70	.40	5	5	20	20	30	1	N	E 2459969 N 7485170
23	4/8	1	180	15	17	5	45	40	10	—	—	—	.70	.40	5	5	20	20	20	1	N	E 2459916 N 7485004
24	4	1	205	10	14	5	45	45	5	—	—	—	.80	.50	0	0	20	20	10	1	N	E 2460026 N 7484853
25	16/8	1	75	10	10	10	35	35	10	—	—	5	.90	.70	0	0	5	5	5	1	N	E 2460061 N 7484840
26	4	1	90	12	15	5	35	40	10	10	—	—	.60	.40	0	0	10	10	5	1	N	E 2460169 N 7484817
27	8	1	110	10	12	0	10	40	40	10	—	—	.80	.50	5	5	10	10	5	1	N	E 2460267 N 7484776
28	4	1	145	10	12	30	30	30	10	—	—	—	.60	.30	0	0	10	10	0	1	N	E 2460348 N 7484735
29	16 pool	1	80	17	19	20	40	30	10	—	—	—	.80	.60	0	0	5	5	0	1	N	E 2460476 N 7484727
30	4/8	1	80	15	19	10	30	40	10	10	—	—	.60	.40	0	0	5	5	0	1	N	E 2460552 N 7484683

(21) Valley wall on RB for most of Reach small pool. ~~mid~~ in reach .60cm deep, 10m long ended reach @ pool. Substrate size ↑ Lots of LWD on banks. Overflow cha

(22) overflow channels + tufts of grass on bars along edge of WC in places, uniform reach ends in bedrock outcrop/waterfall

(23) reach ends in pool 10m long 70cm deep. ↑ in grade. DS (Reach 24). Valley walls ≃ 10 m away

(24) cedar trees all along the banks. WC has deposited gravel on LB near end of reach ≃ 1m above current water level

(25) Pool + Run Pool dept varries from >1m to .60cm pool is confined b/w bedrock banks. long pool would be good holding pool.

(26) Very large boulders on bank LS Valley walls ≃ 2-5 m away

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan Brk **Date:** Aug/6, 2011 **Job Number:** 12180356

Personnel: EMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
															88.8%		0.0ppt.							
21	90	10	30	10	30	40	20	50	—	—	50	—	—	7.2	8.70	27.8	16.3		<2	1%	3	b	1	100%
22	100	—	20	10	40	40	10	50	—	—	50	—	—				16.3		<2	1%	—	—	—	—
23	90	10	20	5	45	40	10	50	—	—	50	—	—						<2	2%	3	b	1	80
24	100	0	25	10	40	40	10	50	—	—	50	—	—	7.0	8.78	27.7	16.3		<2	3%	—	—	—	—
25	50	50	30	40	30	20	10	50	—	—	50	—	—						<2	<1	3	b	1	70
26	100	0	30	10	50	30	10	50	—	—	50	—	—						<2	2	—	—	—	—
27	100	0	20	10	50	30	10	50	—	—	50	—	—						<2	1%	—	—	—	—
28	100	—	20	20	50	20	10	50	—	—	50	—	—						<2	4%	—	—	—	—
29	10	90	20	20	40	20	20	50	—	—	50	—	—						<2	1%	3	b	1	100%
30	100	0	15	10	50	30	10	50	—	—	50	—	—						<2	2%	—	—	—	—

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

(27) Deeper in sections ≈ .70 cm Thalweg closer to LB DS
(28) Lots of LWD by WC, bedrock control, overflow channel
(29) Pool/Run deeper on LB
(30) Reach is similar to all others

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 16, 2011 **Job Number:** 121810356

Personnel: EMW JPIL **Coordinates Start:** **Coordinates End:**

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
														*	87.4%		0.0ppt							
31	100	0	10	40	30	20	—	50	—	—	50	—	—	7.5	8.56	27.9	16.1°C		<2	4%	—	—	—	—
32	100	0	20	10	50	30	10	50	—	—	50	—	—						<2	2.5	—	—	—	—
33	100	0	15	5	60	25	10	50	—	—	50	—	—		88.2				<2	1%	—	—	—	—
34	100	0	20	20	30	10	10	50	—	—	50	—	—	6.5	9.15	27.9	13.9	15	<2	2%	—	—	—	—
35	0	100	40	50	30	20	10	50	—	—	50	—	—						<2	1	3	b	1	100
36	100	0	30	5	40	45	10	50	—	—	50	—	—						<2	2%	—	—	—	—
37	0	100	15	40	40	10	10	50	—	—	50	—	—						<2	1	3	b	1	100
38	100	0	20	10	40	40	10	50	—	—	50	—	—						<2	1.5	—	—	—	—
39	50	50	20	5	45	40	10	50	—	—	50	—	—		93.3		0.0ppt		<2	1	3	b	1	100
40	100	0	20	10	50	30	10	50	—	—	50	—	—	7.1	9.17	27.7	14.7		<2	1.5	—	—	—	—

New pH meter used uncalibrate

New pH probe

Aug 17 2011

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

(39) run/pool under ATV Bridge depth varries .70 - .30 cm

(40) strait riffle section some pushing up of bank very @ mid lower end

St John

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 16, 2011 **Job Number:** 12180356

Personnel: EMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (64-179 mm)	Gravel (2.6-63 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
31	6	1	90	8	10	80	—	5	5	5	5	—	.70	.50	0	0	5	5	0	0	N	E 2460616 N 7484625
32	4/6	1	150	5-10	6-12	40	30	10	10	5	5	—	.80	.50	5	5	10	10	5	1	N	E 2460684 N 7484490
33	4/8	1	350	7-15	8-17	5	30	35	20	10	—	—	.50	.30	5	5	15	15	5	1	N	E 2460695 N 7484232
34	9	1	100	5-7	10-7	5	35	35	20	5	—	—	.60	.40	0	0	10	10	0	1	N	E 2460572 N 7484163
35	16	1	12	8	12	0	40	30	20	10	—	—	1.5	1.0	0	0	0	20	20	1	N	E 653110 N 5135562
36	4	1	40	8	12	0	40	30	20	10	—	—	.60	.40	0	0	15	15	10	1	N	E 653135 N 5135596
37	16	1	15	8	12	0	40	30	20	10	—	—	1.5	1.0	0	0	5	0	0	1	N	E 653149 N 5135593
38	4	1	290	10	15	0	40	30	30	—	—	—	.60	.30	0	0	5	10	30	1	N	E 653340 N 5135482
39	16	1	40	10	12	10	30	30	30	—	—	—	.60	.40	5	5	5	5	40	1	N	E 653358 N 5135441
40	4	1	150	10	12	5	40	30	25	—	—	—	.60	.30	10	10	10	10	20	1	N	E 653420 N 5135364

Use GPS UTM

Aug 17, 2011

(31) series of drops(4) controlled by bedrock in bed + banks
(32) bedrock in banks and channel. Break reach in grad change width change
(33) Valley wall on RB
(34) Bedrock in banks deeper rapid section, large lateral bar on LB overflow channels behind LWD @ end of Reach
(35) Pool between Riffles on a bend end of large lateral bar
(36) Riffle - sinuosity ↑
(37) Pool
(38) long riffle, valley walls have moved away completely no bedrock until very end of Reach @ ATV bridge

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan Brk **Date:** Aug 17, 2011 **Job Number:** 121810356

Personnel: EMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
41	6	1	190	20	23	0	30	40	15	10	5	—	.80	.60	10	10	10	10	5	1	N	E 653449 N 5135287
42	4	1	95	15	20	0	30	40	15	10	5	—	.60	120. 40	10	10	10	10	5	1	N	E 653555 N 5135203
43	3	1	250	10	15	0	20	20	30	20	5	5	.60	.40	15	15	10	10	20	1	N	E 653514 N 5135043
44	3	1	90	20	22	0	20	30	30	10	5	5	100	.60	10	10	15	15	5	1	N	E 653518 N 5134958
45	6	1	220	20	22	0	10	25	35	10	5	5	100	.50	10	10	10	10	5	1	N	E 653535 N 5134874
46	3	1	40	20	22	0	15	25	40	10	5	5	.60	.30	5	5	10	10	0	1	N	E 653551 N 5134841
47	6	1	90	20	22	0	15	25	40	10	5	5	.60	.30	5	5	15	15	0	1	N	E 653572 N 5134792
48	13	1	100	25	27	30	5	15	20	10	15	5	1.00	.60	0	0	15	15	5	1	N	E 653615 N 5134721
49	8	1	250	20	22	0	10	35	30	15	10	5	.60	.30	20	20	15	15	40	1	N	E 653682 N 5134538
50	3	1	50	5-20	22	0	0	30	30	20	10	10	.60	.40	10	10	10	10	20	1	N	E 653661 N 5134486

(41) beaver trying to build dam @ end of reach (riffle) Natural ponded area

(42) ends @ confluence w EBNR very strait section, LWD jam just DS of where to two meet (Reach 43 st)

(43) St of reach LWD jam (photos) + beaver dam at mouth of EBNR. Lateral bars along RB from overflow channel of WBNR. Some dry in banks overflow channel rejoins main on RB ≃ 250m DS ended reach. Saw merganzer

(44) change in grade + depth + velocity

(45) Run more depth less grade

(46) Riffle

(47) Run last 3-4 Reaches might be good AS spawning Habitat.

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan Brk **Date:** Aug 17, 2011 **Job Number:** 1218103S6

Personnel: EMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
41	100	0	10	0	10	80	10	50	–	–	50	–	–						<2	1	–	–	–	–
42	100	0	10	0	10	80	10	50	–	–	50	–	–		91.0%		0.0 ppt		<2	1.5	–	–	–	–
43	100	0	15	5	15	80	10	50	–	–	50	–	–	7.3	9.02	29.7	15.7	23	<2	1.5	–	–	–	–
44	100	0	15	0	40	50	10	50	–	–	50	–	–	7.4					<2	1.0	–	–	–	–
45	Run 100	0	10	0	45	45	10	50	–	–	50	–	–						<2	.5%	–	–	–	–
46	Riffle 100	0	0	0	50	40	0	50	–	–	50	–	–						<2	1%	–	–	–	–
47	Run 100	0	5	0	60	50	20	50	–	–	50	–	–		93%		0.0 ppt		<2	1%	–	–	–	–
48	0	100	5	0	5	85	10	50	–	–	50	–	–	7.4	8.95	31.3	16.9		<2	0%	–	–	–	–
49	Run 100	0	10	0	30	60	10	50	–	–	50	–	–						<2	1%	–	–	–	–
50	Riffle 100	0	15	10	30	50	10	50	–	–	50	–	–						2%	1.5%	–	–	–	–

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

(48) beaver backwater channel bed still maintains 1% slope bedrock outcrop throughout most of reach on RB

(49) braided below beaver dam most flow on LO. Reach ends @ weirdness. Good spot for AS spawning

(50) channel avulsion, clay deposits, Flow devices into two, LWD on banks, clay lilley under water, overflow channel into wetland.

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan Brk **Date:** Aug 17, 2011 **Job Number:** 12180356

Personnel: EMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
51	50	50	30	20	5	40	35	50	20	—	50	—	—		92%		0.0 ppt		<2	0.2	3	a	2	70
52	100	0	10	0	40	40	20	50	—	—	50	—	—	7.1	8.69	31.7	18.0		22	1.5	—	—	—	—
53	100	0	10	0	10	80	10	50	—	—	50	—	—						<2	1.5	—	—	—	—
54	100	0	30	0	40	20	40	50	—	—	50	—	—						<2	1%	—	—	—	—
55	100	100	5	60	30	10	0	50	—	—	50	—	—						<2	0.2	3	a	1	100
56	100	0	10	20	30	40	10	50	—	—	50	—	—		96.4%		0.0 ppt		<2	1%	—	—	—	—
57	run 100	0	5	20	35	20	15	50	—	—	50	—	—	6.9	10.15	31.3	14.2		<2	0.2	—	—	—	—
58	100	0	10	5	30	50	15	50	—	—	50	—	—						<2	1%	—	—	—	—
59	100	0	15	10	30	50	10	50	—	—	50	—	—						<2	1.5%	—	—	—	—
60	100	0	15	5	35	50	10	50	—	—	50	—	—						<2	.5%	—	—	—	—

Aug 18 2011

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

(58) 5% of reach channels splits 30% of flow island has trees pushed over reach ends at a second channel divide
(59) all channels Rt + Lt rejoin RB channel ≈ 8 m LB ≈ 1 m mid ≈ 15 m. Well established island w lots of veg/trees.
(60) riffle Run more boulders.

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan Brk **Date:** Aug 17, 2011 **Job Number:** 1218\0356

Personnel: EMW JPL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
51	13/16	1	146	25	27	30	5	15	20	10	10	10	1.00	75	5	0	10	15	50	2	N	E 653702 N 5134416
52	3	1	478	10-20	12-22	0	5	30	30	20	10	5	.60	.40	10	10	10	10	40	1	N	E 653818 N 5134260
53	8	1	110	20	22	0	0	40	30	20	5	5	.60	.40	10	10	10	10	20	1	N	E 653822 N 5134201
54	3	1	130	18	20	0	5	35	30	20	5	5	.60	.30	0	0	10	20	5	1	N	E 653835 N 5134098
55	16	1	90	20	22	0	20	30	30	10	5	5	1.2	1.0	0	0	5	5	0	1	N	E 653854 N 5134072
56	3/4	1	100	15	17	0	5	40	30	15	5	5	.60	.26-.40	10	10	10	5	0	1	N	E 653848 N 5133954
57	4	1	106	13	25	0	20	30	10	20	10	5	.80	.40-.60	5	5	5	5	5	1	N	E 653915 N 5133876
58	4/4	1	210	25	27	0	25	40	20	10	3	2	.80	.40-.60	10	10	10	10	0	1	N	E 653933 N 5133691
59	4	1	135	9-15	18	0	40	25	15	20	5	5	.60	.30	30	0	15	15	5	1	N	E 653913 N 5133557
60	4/4	1	87	23	25	0	40	25	15	10	5	5	.80	.40	20	5	15	15	0	1	N	E 653900 N 5133493

Aug 18 2011

(51) Run/Pool due to beaver dam @ end of reach beaver lodge in reach RB all bedrock intrudes into channel
(52) Channel braids several times 10 m width generally on each side lots of LWD at heads + sides of islands + banks Flow comes in from RB just us of end of reach from wetland maybe?
(53) Strait riffle ends @ braided channel around islands.
(54) Reach ends @ bridge. overFlow channels/braiding on LB.
(55) Pool @ bridge
(56) Riffle run into long run.
(57) Deeper run more boulders (small) than last reach large substrate not good for spawning...

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

12181035 6

Watercourse: Napadogan **Coordinates (x, y)** N. _____ E. _____

Personnel: EMW JPIC **Date:** Aug 18, 2011 **Center Line: (Chainage)** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (#)	Temp.		Embeddedness	Comments
				Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		L	R	L	R		Water	Air		
61	8	1	50	25	26	20	30	20	10	10	7	3	.40	5	5	10	10	0			1	E 653882 N5133436
62	3/4/16	1	100	15	20	0	10	10	40	30	10	—	.60	0	0	5	5	0	15.0	20	1	E 653890 N5133353
63	8/16	1	160	20	22	0	10	30	40	10	5	5	.40	0	0	10	10	0			1	E 653968 N5133222
64	3	1	60	20	22	0	5	45	40	10	—	—	.80	6	0	10	10	0			1	E 653942 N5133180
65	16	1	75	25	27	0	10	40	30	10	10	—	.80	0	0	5	5	0			1	E 653994 N5133121
66	4	1	30	25	27	0	15	45	30	10	—	—	.40	0	0	10	10	0			1	E 653964 N5133080
67	8	1	200	28	30	0	5	30	40	10	10	5	.50	5	5	10	10	0	15.9°		1	E 653967 N5132897
68	3/8	1	70	16	18	0	5	30	40	15	5	5	.50	0	0	15	15	0			1	E 653973 N5132788
69	8	1	75	20	22	0	10	20	20	20	20	10	.50	0	0	10	10	50			1	E 654022 N5132739
70	3/4	1	60	25	27	0	15	30	20	15	15	5	.40	5	5	10	10	20			1	E 654059 N5132710
71	4/4	1	100	25	27	0	15	30	30	10	10	5	.50	0	0	10	10	10			1	E 654074 N5132652

(68) Riffle after pool, at end of Riffle LB valley wall cuts away
(67) Nice deep Run is good AS spawning gravels thalwag sticks to RB maybe surrounded by wetland
(68) Riffle Run, deeper run + channel constricts a bit, overflow channels @ st of reach
(69) LWP @ st of Reach channel braids arround established islands, large rrratics in deeper spots around them lateral bars of gravel/sand sinuous.

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Coordinates (x, y)** N. _____ E. _____ 12181035 6

Personnel: EMW JPIC **Date:** Aug 18, 2011 **Center Line: (Chainage)** _____

Reach No.	% Site		% Shade	Stream Banks										O_2 (mg/L)	pH	Specific Conductivity (µs/cm)	Depth			Pool Rating Critria		Pool Tail	grade sinu
				Vegetation %				Bank Erosion Left Bank 0-50%			Bank Erosion Right Bank 0-50%						1/4 (cm)	1/2 (cm)	3/4 (cm)				
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Wet L	Wet	Wet R	No.	Letter	Embeddedness	
61	100	0	15	10	20	50	20	50	—	—	50	—	—	89.9%		0.0ppt	34	40	28	—	—	—	1% <2
62	50	50	10	20	20	50	10	50	—	—	50	—	—	9.03	7.3	31.9	20	70	40	3	b	1	1% <2
63	90	10	15	5	20	65	10	50	—	—	50	—	—				40	80	60	3	b	1	.5% <2
64	100	0	10	10	20	60	10	50	—	—	50	—	—				23	28	22	—	—	—	1% <2
65	0	100	10	10	60	15	15	50	—	—	50	—	—				40	100	80	3	b	1	.2 <2
66	100	0	20	5	65	20	10	50	—	—	50	—	—	92.3		0.0ppt	30	40	35	—	—	—	1% <2
67	100	0	10	5	45	50	5	50	—	—	50	—	—	9.09	7.3	31.9	20	50	65	—	—	—	.2% <2
68	100	0	20	0	30	60	10	50	—	—	50	—	—				20	50	40	—	—	—	1% <2
69	100	0	15	15	40	35	10	50	—	—	50	—	—				30	70	40	—	—	—	.5% <2
70	100	0	10	10	40	40	10	50	—	—	50	—	—				20	40	28	—	—	—	1% <2
71	100	0	15	15	35	30	20	50	—	—	50	—	—				30	60	40	—	—	—	1% <2

(61) bedrock in channel at start of reach + throughout, a run but weird due to bedrock.
(62) Flow is constricted creating riffle pool complex, large irratic boulder in reach mid channel forms 1 pool. ↑ sinuosity
(63) pool is ± 20m in length and 60 to 80 cm deep w several large irratics in it.
(64) may be the confluence w Manzer? low flow
(65) Pool valley wall on LB
(70) Riffle Run w large boulders
(71) Riffle run w deep spots nice spawning gravel irratics valley wall close in on RB

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 18, 2011 **Job Number:** 121810356

Personnel: EMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *						Water (°C)	Air (°C)			No.	Letter	Embeddedness	% Turbulence
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding											
72	0	100	5	0	20	60	20	50	—	—	50	—	—		88.8%		0.0 ppt		<2	.2	3	a	1	0
73	90	10	5	0	20	50	30	50	—	—	50	—	—	7.4	8.41	32.0	18.0°		<2	.5	3	b	1	50
74	100	0	10	0	90	50	10	50	—	—	50	—	—						<2	1½	—	—	—	—
75	100	0	5	0	60	30	10	50	—	—	50	—	—						<2	1.5	—	—	—	—
76	100	0	5	0	40	50	10	50	—	—	50	—	—						<2	.5	—	—	—	—
77	100	0	10	0	40	45	15	50	—	—	50	—	—						<2	1.5	—	—	—	—
78	0	100	5	0	60	10	30	50	—	—	50	—	—		91.0%		0.0 ppt		<2	.2	—	—	—	—
79	90	10	5	5	55	20	20	50	—	—	50	—	—	7.5	8.37	3.9	19.4		1.3	2	3	b	1	80
80	100	0	5	0	50	40	10	50	—	—	50	—	—						<2	1.5	—	—	—	—
81	100	0	5	10	40	30	20	50	—	—	50	—	—						<2	1	—	—	—	—

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

(80) Sinuosity ends grade decreases slightly

(81) Riffle changes Grade to run.

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 18, 2011 **Job Number:** 121810356

Personnel: EMW JPL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
72	16	1	20	30	32	0	5	25	30	30	10	10	1.5	.90	0	5	5	5	5	2	N	E 654086 N 5132628
73	8	1	320	30	32	C	5	20	30	25	10	5	.8	.60	5	5	5	5	10	1	N	E 654301 N 5132457
74	3/8	1	145	30	32	0	5	20	30	30	10	—	.5	.20	10	10	5	5	5	1	N	E 654370 N 5132354
75	3	1	50	25	28	0	5	35	35	25	—	—	.5	.20	0	0	5	5	0	1	N	E 654383 N 5132284
76	8	1	110	30	32	C	5	30	40	15	10	—	.80	.40	0	0	5	5	10	1	N	E 654406 N 5132202
77	3	1	200	25-30	32	0	5	30	40	10	—	—	.60	.30	0	0	5	5	5	1	N	E 654449 N 5132031
78	16	1	10	20	22	0	15	35	30	20	—	—	.80	.60	0	0	2	2	0	1	N	E 654440 N 5132029
79	4/8	1	300	25	27	0	30	30	20	20	—	—	1.0	.46 .70	0	0	5	5	10	1	N	E 654421 N 5131862
80	4/8	1	130	25	27	0	30	25	20	20	5	—	.80	.60	5	5	5	5	5	1	N	E 654518 N 5131786
81	4	1	120	30	32	0	20	30	20	20	5	5	.70	.50	0	0	5	5	20	1	N	E 654492 N 5131664

(72) trib enters on RB @ st of Reach, Pool Near LB >1m
(73) Riffle/run w 2 small pools. substrate good for AS.
(74) Channel braids @ st of Reach, several small islands of grass throughout. Reach made up of 2 riffles 15m long & Runs
(75) Riffle.
(76) Run w deeper (.60cm) spots closer to RB
(77) long riffle. Ice scars 1-2m above water level, reach turns a corner @ end.
(78) Pool faster water around a bend
(79) Sinuous section boulders ↑ as you move DS

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 18, 2011 / Aug 19, 2011 **Job Number:** 121810356

Personnel: EMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
82	3/8	1	150	10-20	15-22	0	5	30	40	10	10	5	.60	.30	0	0	10	10	20	1	N	E 654501 N 5131518
83	3/16	1	50	15	18	0	3	17	40	30	10	10	.80	.40	5	5	10	10	20	1	N	E 654544 N 5131504
84	8	1	70	25	27	5	15	20	30	10	15	5	.80	.40	0	0	10	10	5	1	N	E 654630 N 5131527
85	4	1	65	20	22	0	15	25	30	20	10	—	.90	.50	0	0	10	10	0	1	N	E 654689 N 5131495
86	8	1	85	20	22	0	5	20	40	35	10	—	.80	.40-.60	0	0	10	10	0	1	N	E 654765 N 5131976
87	3	1	40	20	22	0	2	23	30	30	15	5	.60	.30	0	0	5	5	10	1	N	E 654788 N 5131455
88	8	1	120	22	24	0	5	20	30	25	15	5	.60	.40	0	0	5	5	0	1	N	E 654862 N 5131419
89	8	1	300	25	27	0	10	25	30	20	15	—	.80	.50	0	0	5	5	5	1	N	E 655062 N 5131400
90	3	1	20	25	27	0	10	20	35	20	15	—	.60	.40	0	0	5	5	0	1	N	E 655090 N 5131389
91	8	1	60	22	24	0	10	25	35	25	5	—	.80	.50	0	0	5	5	0	1	N	E 655148 N 5131355

Aug 19, 2011

(82) channel splits into 2 sections RB section larger both riffley, end of reach is a mess braided w islands LWD. Beaver dam @ mouth of trib

(83) all channels meet Lots of LWD on banks

(84) Run w large boulders + some at croping of granit bedrock in channel

(85) Riffle w large boulders

(86) Run w several grassy islands on LB + midchannel @ end. Substrate smaller + looks paved still low embeddedness

(87) Short braided riffle w grassy islands.

(88) run thalweg on LB

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Nepadogan **Date:** Aug 18, 2021 **Job Number:** 121810356

Personnel: EMW JPK **Coordinates Start:** **Coordinates End:**

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *						Water (°C)	Air (°C)			No.	Letter	Embeddedness	% Turbulence
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding											
82	100	0	10	5	45	40	10	50	—	—	50	—	—						<2	.5	—	—	—	—
83	90	10	30	10	40	30	20	50	—	—	30	—	20		91%		0.0 ppt		<2	.2	3	b	2	100
84	100	0	10	5	30	65	10	50	—	—	50	—	—	6.9	8.96	34.0	16°C	20	<2	.5	—	—	—	—
85	100	0	10	0	10	80	10	50	—	—	50	—	—						<2	1	—	—	—	—
86	100	0	5	0	30	70	—	50	—	—	50	—	—						<2	.2	—	—	—	—
87	100	0	5	5	50	45	—	50	—	—	50	—	—						<2	1.5	—	—	—	—
88	100	0	5	10	5	85	—	50	—	—	50	—	—						<2	1	—	—	—	—
89	100	0	5	5	15	70	10	50	—	—	50	—	—						<2	.5	—	—	—	—
90	100	0	10	5	30	50	15	50	—	—	50	—	—						<2	1.	—	—	—	—
91	100	0	5	0	20	70	10	50	—	—	50	—	—						<2	.5	—	—	—	—

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

(89) long run Nice substrate for spawning w deep spots. trib enters on LB (small) unnamed
(90) short riffle trib enters above lateral bar on RB
(91) Thalweg on LB ≈ 60cm deep Run.

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Nepisiguit **Date:** Aug 19, 2011 **Job Number:** 1218103560

Personnel: EMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
92	8	1	170	22	25	0	20	40	30	5	5	—	100	.40	0	0	5	5	5	1	N	E655219 N5131254
93	8	1	185	25	27	0	20	30	40	5	5	—	100	.40-.60	0	0	5	5	0	1	N	E655366 N5131126
94	4	1	100	20	22	0	30	35	20	10	—	—	100	.40	0	0	10	10	0	1	N	E655426 N5131062
95	3/8	1	130	25	27	0	35	30	20	10	5	—	.80	.50	0	0	5	5	0	1	N	E655464 N5130971
96	16	1	100	20	21	0	20	35	20	10	10	5	.90	.70	0	5	5	5	0	1	N	E655513 N5130904
97	3	1	50	25	27	0	5	45	30	15	5	—	.90	.40	0	0	2	2	0	1	N	E655552 N5130880
98	8	1	120	25	27	0	10	40	30	10	10	—	.90	.50	0	0	2	2	0	1	N	E655582 N5130785
99	3	1	55	30	32	0	10	30	40	15	5	—	.50	.25	0	0	2	2	0	1	N	E655599 N5130735
100	8	1	70	25	27	0	10	30	40	10	5	5	1.00	.60	10	0	30	0	0	1	N	E655609 N5130672
101	4/8	1	250	20-25	22-27	0	25	30	25	10	5	5	1.2	.20-.70	0	0	0	10	0	1	N	E655541 N5130489

(92) clay on LB under small trib @ st of reach. LB also armored w boulders on LB @ st of reach
(93) Run grade change have seen several Fish jumping. very uniform Flat
(94) Short Riffle
(95) Large boulders armoring LB. Riffle/Run.
(96) long pool that sticks to the RB (deepest part) good flow + substrate
(97) riffle after pool. slow flowing trib enters on LB @ TOR.
(98) Run deeper near LB
(99) Shallow transition Riffle

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 19, 2011 **Job Number:** 121810356

Personnel: EMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *										No.	Letter		
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding				Water (°C)	Air (°C)					Embeddedness	% Turbulence
92	100	0	5	5	30	55	10	50	–	–	50	–	–	7.3	9.42 98.1%	33.3	17.5 0.0ppt	23	<2	1	–	–	–	–
93	100	0	5	0	30	60	10	50	–	–	50	–	–						<2	.5	–	–	–	–
94	100	0	5	5	35	40	20	50	–	–	50	–	–						<2	1.5	–	–	–	–
95	100	0	5	5	40	40	15	50	–	–	50	–	–						<2	1	–	–	–	–
96	5	95	20	10	40	20	30	50	–	–	30	10	10						<2	.1	3	a	1	100
97	100	0	2	5	55	30	10	50	–	–	50	–	–						<2	1	–	–	–	–
98	100	0	2	0	10	80	10	50	–	–	50	–	–		99.5%		0.0 ppt		<2	.5	–	–	–	–
99	100	0	2	0	5	95	0	50	–	–	50	–	–	7.5	9.11	33.1	14.5		<2	1	–	–	–	–
100	100	0	30	30	30	15	25	50	–	–	50	–	–						<2	.5	3	a	1	100
101	100	0	30	10	30	30	20	50	–	–	30	10	10						<2	1	–	–	–	–

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

(100) Start reach Lateral bar w grass RB + sandy bar above that; deep RB cm around bend in wc RB Lateral bar (rock)

(101) Riffle/Run RB @ end eroding deepspots as wc turns around bends.

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 19, 2011 **Job Number:** 121810356

Personnel: EMW JDK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
107	3/4	1	250	30	32	0	15	35	20	20	10	—	.80	.46 .60	0	0	5	5	0	2	N	E655558 N5130268
103	8	1	75	30	32	0	10	40	20	20	10	—	.60	.30	0	0	5	5	0	1	N	E655582 N5130205
104	3	1	60	30	32	0	5	40	30	15	10	—	.60	.30	0	0	5	5	0	1	N	E655602 N5130158
105	8	1	55	30	32	0	5	40	30	15	10	—	.80	.46	0	0	5	5	0	1	N	E655633 N5130084
106	3	1	30	30	32	0	0	50	30	10	10	—	.80	.46	0	0	10	5	0	1	N	E655650 N5130049
107	8/16	1	80	20	22	0	5	45	30	10	10	—	1.3	.80	0	20	5	15	60	1	N	E655714 N5130021
108	8/16	1	110	25	27	0	0	30	30	20	15	15	1.4	.9	0	0	10	5	0	1	N	E655836 N5130021
109	3/8/16	1	330	20-35	25-37	0	0	10	20	35	20	10	1.5-.40	1.2-.20	0	5	15	15	40	1	N	E655997 N5129861
110	3/8	1	240	10-20	15-22	0	10	15	25	30	10	10	.66-100	.36-.70	5	10	10	10	5	1	N	E656191 N5129773
111	8	1	120	25	27	0	20	30	20	25	5	—	.80	.50	0	0	5	5	0	1	N	E656266 N5129723

(102) some Raving of substrate occuring
(103) Run
(104) Riffle
(105) Run
(106) ~~Riffle~~ possible old redds in reach.
(107) ~~Run~~/pool start goes into bend w deeper flow 2wds at st of ~~start~~ reach causing scower pool
(108) start of reach small riffle goes to pool/run slower than last one. BT 10-12cm observed @ end of reach along w creek emb

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 19, 2011 **Job Number:** 12181035 6

Personnel: Emm JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *						Water (°C)	Air (°C)			No.	Letter	Embeddedness	% Turbulence
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding											
102	100	0	5	0	30	50	20	50	—	—	50	—	—						<2	1	—	—	—	—
103	100	0	5	0	10	80	10	50	—	—	50	—	—						<2	.2	—	—	—	—
104	100	0	5	5	10	90	15	50	—	—	50	—	—		99.9		0.0ppt		<2	1	—	—	—	—
105	100	0	5	0	10	90	—	50	—	—	50	—	—	7.6	8.79	32.9	21.0		<2	.2	—	—	—	—
106	100	0	15	0	40	50	10	50	—	—	50	—	—						<2	1	—	—	—	—
107	30	70	20	20	50	20	20	50	—	—	20	10	70						<2	.2	3	a	1	100
108	20	80	20	20	20	50	10	50	—	—	50	—	—						<2	.2	3	a	1	100
109	80	20	20	15	35	30	20	50	—	—	50	—	—		97.4		0.0ppt		>2	1.5	3	b	1	100
110	100	0	10	10	40	30	20	50	—	—	50	—	—	7.4	8.63	32.8	21.6		<2	1.5	—	—	—	—
111	100	0	10	0	40	40	20	50	—	—	50	—	—						<2	.5	—	—	—	—

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

(09) messy reach lots of braiding several deep scoured pools between riffle runs caused by rapid change in direction + flow constriction trib possibly enters. several gravel rock lateral + medial bars reach ends at trib. really mobile substrate

(10) Deeper .70cm run @ st of reach. more boulders compared to last reach ≃30 run 70 riffle channel has several small islands lateral + medial bars

(11) boulders st to [illegible] slightly

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 19, 2011 **Job Number:** 121810356

Personnel: EMW JPIL **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	Stream Type	Channel Type	Length (m)	Ave. Width (m)		Substrate (%)							Average Bankfull depth (cm)	Avg. Depth Wet Width (cm)	% Undercut Bank		% Overhanging Bank Vegetation		Large Woody Debris in Stream (m)	Embeddedness	obstructions to fish passage ?	Comments
				Wet	Bankfull Width	Bedrock	Boulder (>463 mm)	Rock (180-460 mm)	Rubble (54-179 mm)	Gravel (2.6-53 mm)	Sand (0.006-2.5 mm)	Fines (0.0005mm)			*L	*R	*L	*R				
112	4/4	1	307	25	27	0	30	30	5	5	20	10	.90	.60	0	0	5	5	5	1	N	E656426 N5129582
113	4/4	1	650	30	32	0	30	20	10	15	15	5	100	.50	0	0	2	2	0	1	N	E656748 N5129098
114	4	1	438	30	32	0	20	30	15	15	10	5	100	.40	0	0	2	2	0	1	N	E656852 N5128791
115																						
116																						
117																						
118																						
119																						
120																						
121																						

(112) channel narrows + flow ↑ banks are sort of armored by boulders. Deep run. 80cm @ start of reach ~20m the rest is 1 long riffle.

(113) Very uniform reach all riffle run; banks somewhat armored by boulders. reach break @ constriction w lateral bar on LB.

(114) end of reach 40m wide meets the Nashwaak, reach is 1 long riffle. evidance of 2-2.5m high flow. ice scars + debris, more bank erosion, delta in this reach.

Based on DNRE/DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

Watercourse: Napadogan **Date:** Aug 19, 2011 **Job Number:** 121610356

Personnel: EHMW JPK **Coordinates Start:** _____ **Coordinates End:** _____

Reach No.	% Site		% Shade	Stream Banks										ph	O_2 (mg/L)	Specific Conductivity (µs/cm)	Temp		Sinuosity (>2 or <2)	Grade (> 4% or < 4%)	Pool Rating Critria		Pool Tail	
				Vegetation %				Bank Erosion 0-50% Left Bank*			Bank Erosion 0-50% Right Bank *						Water (°C)	Air (°C)			No.	Letter	Embeddedness	% Turbulence
	Riffle / Run	Pools		Bare Ground	Grasses	Shrubs	Trees	Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding											
112	100	0	10	0	30	50	20	50	—	—	50	—	—		9.38		0.0 ppt		<2	1.5	—	—	—	—
113	100	0	5	0	80	10	10	50	—	—	50	—	—	7.5	8.37	32.7	21.8		<2	1.5	—	—	—	—
114	100	0	10	5	65	20	20	30	5	15	30	5	15						<2	1.5	—	—	—	—
115																								
116																								
117																								
118																								
119																								
126																								
121																								

Reach #	Wet width (m)	Depth (m)			Smooth 0.9 Rough 0.8	Length (m)	Float Time (sec)			
		1/4	1/2	3/4			Run	1/4 way	1/2 way	3/4 way
							1st			
							2nd			
							3rd			

Appendix F-2

Representative Photos of Napadogan Brook Reaches

Lower Napadogan Habitat Survey Photographs

Photo 1 Reach 1 mouth of Bird Brook.

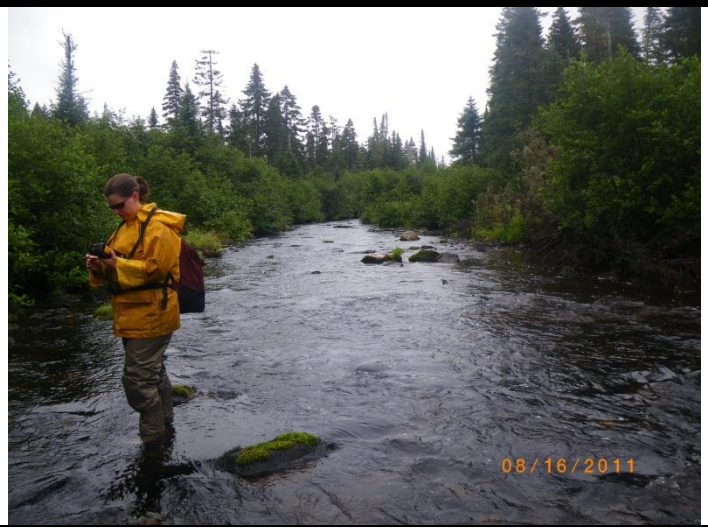


Photo 2 Reach 1 Looking upstream.

Photo 3 Reach 1 looking downstream.

Photo 4 Reach 2 looking upstream.

Lower Napadogan Habitat Survey Photographs	
Photo 5 Reach 2 looking downstream.	**Photo 6 Reach 3 looking upstream.**
Photo 7 Reach 3 looking downstream.	**Photo 8 Reach 4 looking upstream.**

Lower Napadogan Habitat Survey Photographs	

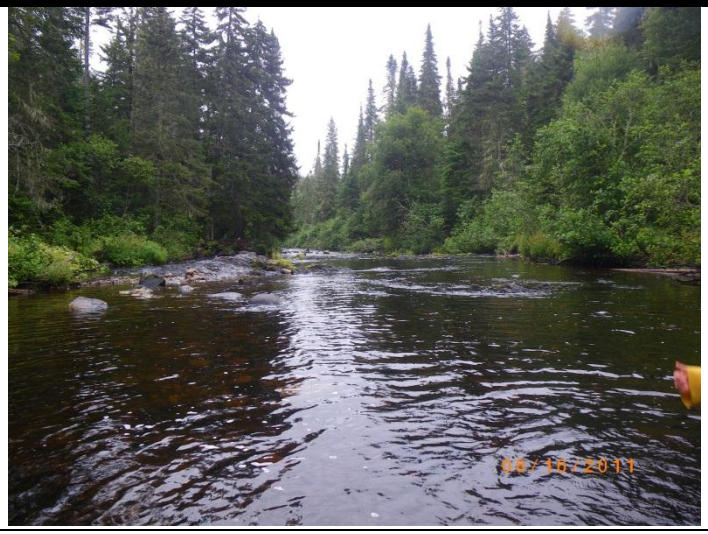
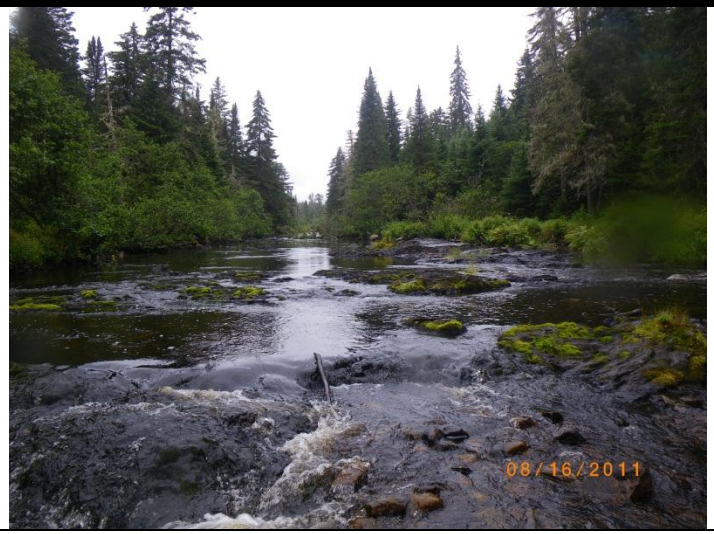
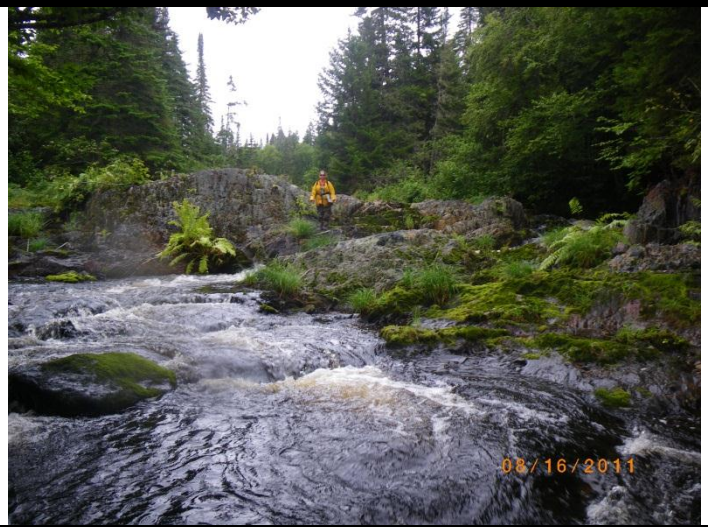
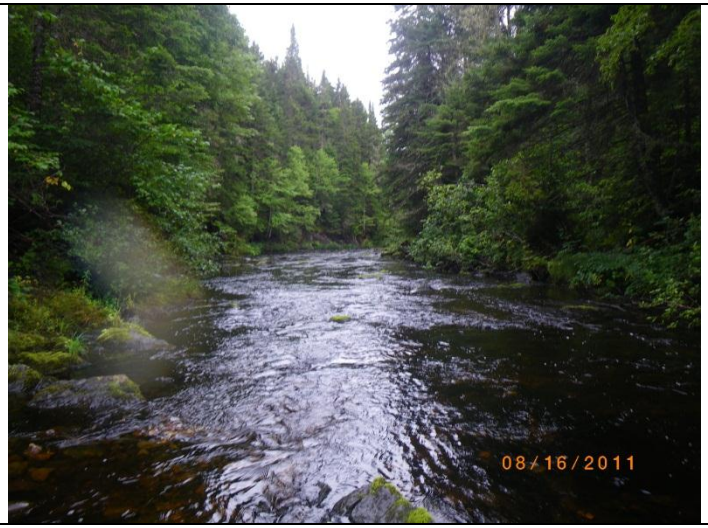
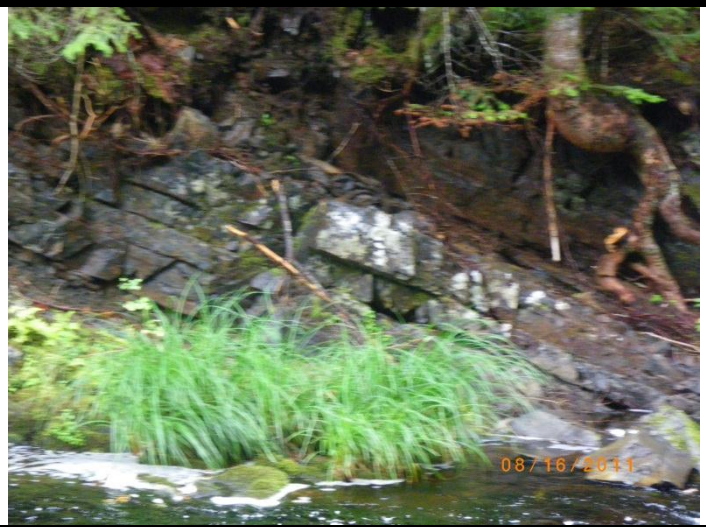
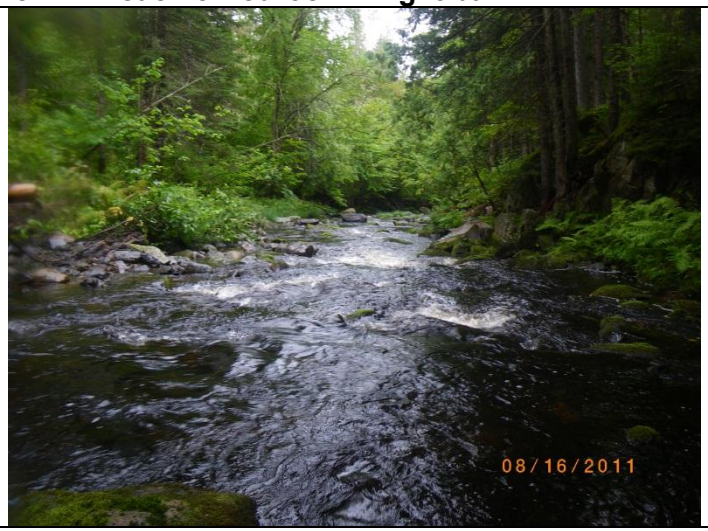

	

Photo 9 Reach 4 looking downstream.	**Photo 10** Reach 5 looking upstream.
Photo 11 Reach 5 looking downstream.	**Photo 12** Reach 6 looking upstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 13 Reach 6 looking downstream just before waterfall.	**Photo 14** Reach 7 looking upstream, person in photo is 155 cm.
	
Photo 15 Reach 8 looking upstream.	**Photo 16** Reach 8 looking downstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 17 Reach 8 Iron flock at a spring.	**Photo 18** Reach 8 Bedrock in right bank.
	
Photo 19 Reach 9 looking upstream.	**Photo 20** Reach 9 looking downstream.

Lower Napadogan Habitat Survey Photographs	

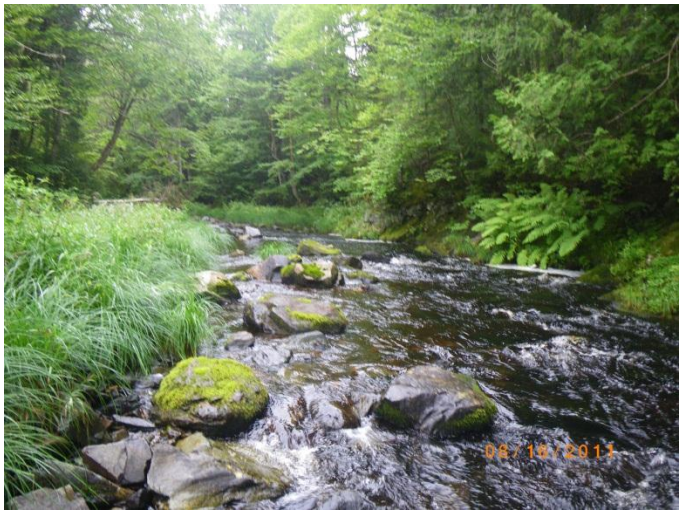
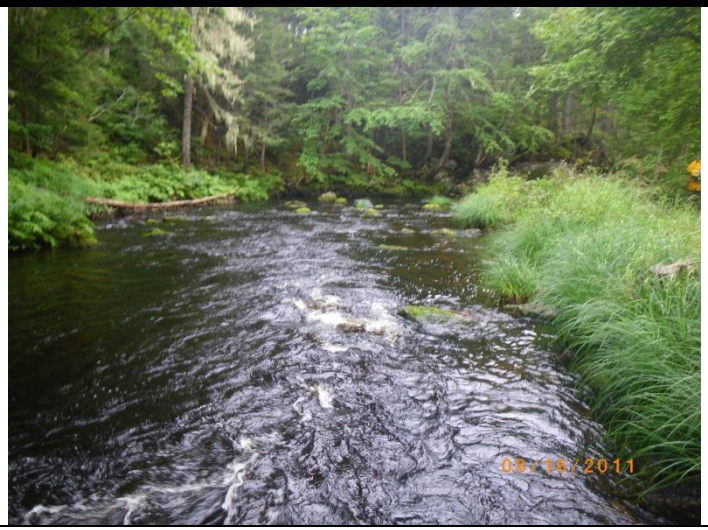
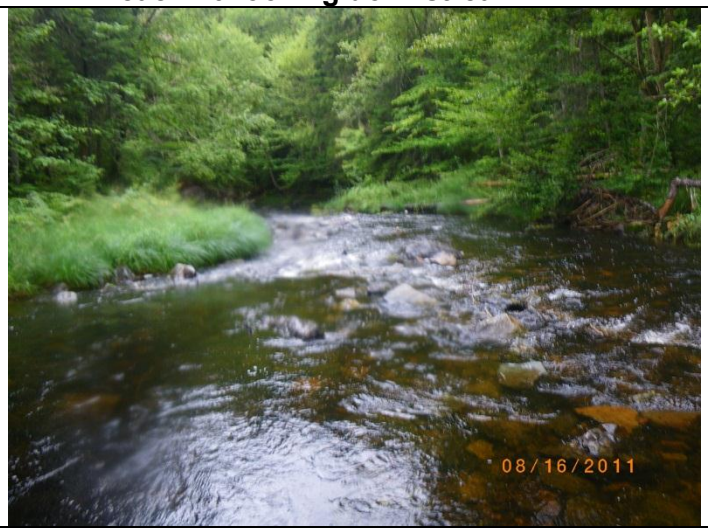

	

Photo 21 Reach 10 looking upstream.	**Photo 22 Reach 10 looking downstream.**
	
Photo 23 Reach 11 looking upstream.	**Photo 24 Reach 11 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

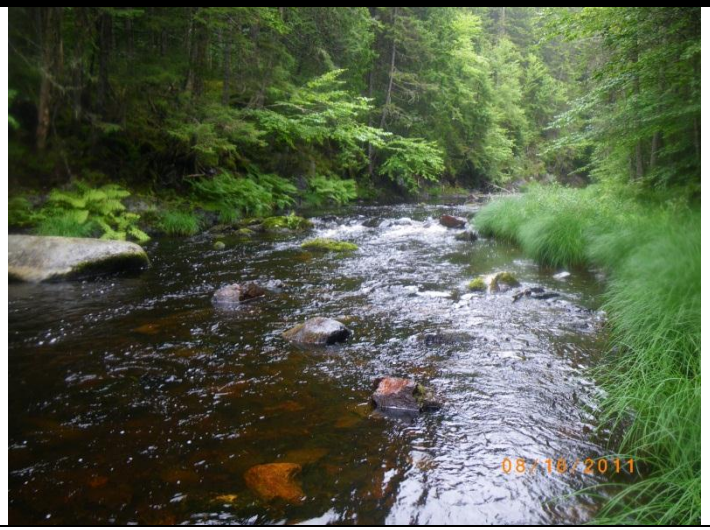
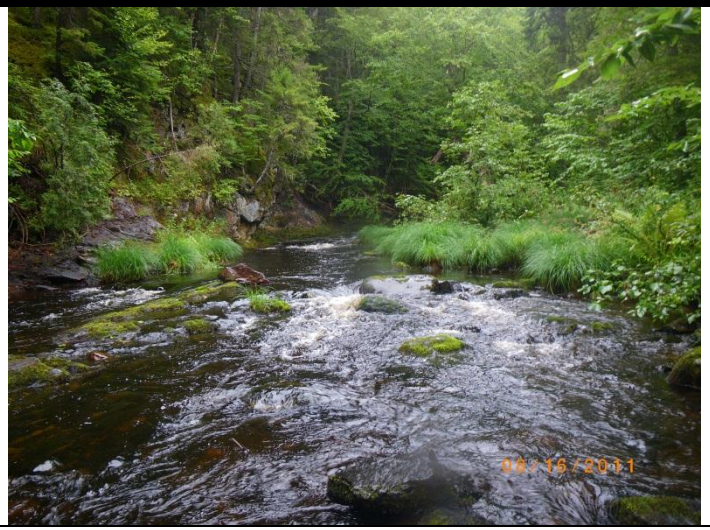

	

Photo 25 Reach 12 looking upstream.	**Photo 26** Reach 12 looking downstream.

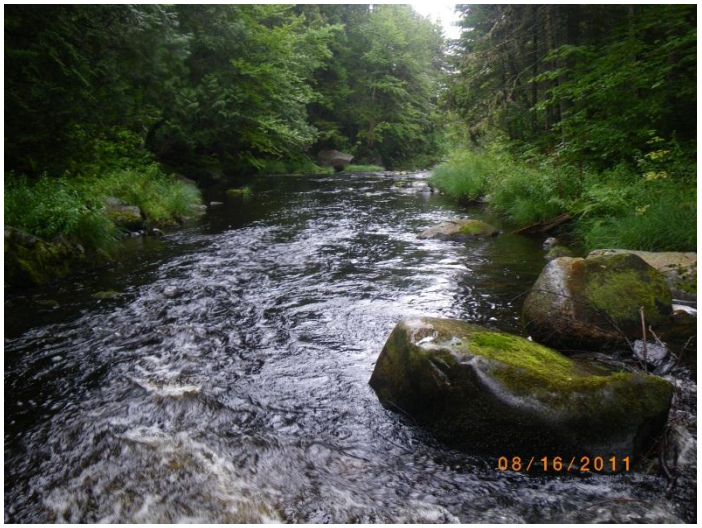
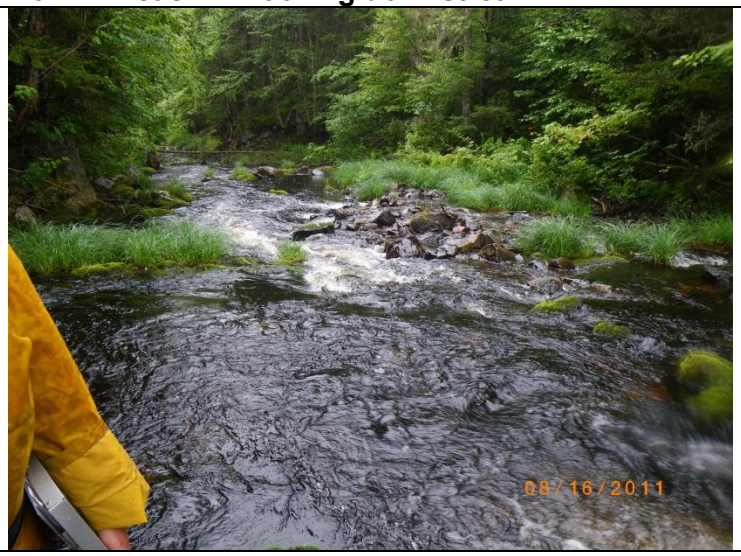

	

Photo 27 Reach 13 looking upstream.	**Photo 28** Reach 13 looking downstream.

Lower Napadogan Habitat Survey Photographs	

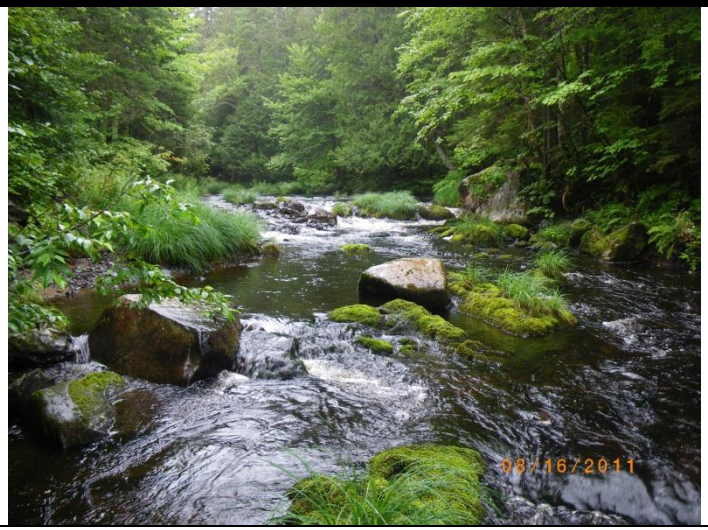



Photo 29 Reach 14 looking upstream.	**Photo 30** Reach 14 looking downstream.
Photo 31 Reach 15 Looking upstream.	**Photo 32** Reach 15 looking upstream at mouth of Sisson Brook.

Lower Napadogan Habitat Survey Photographs	

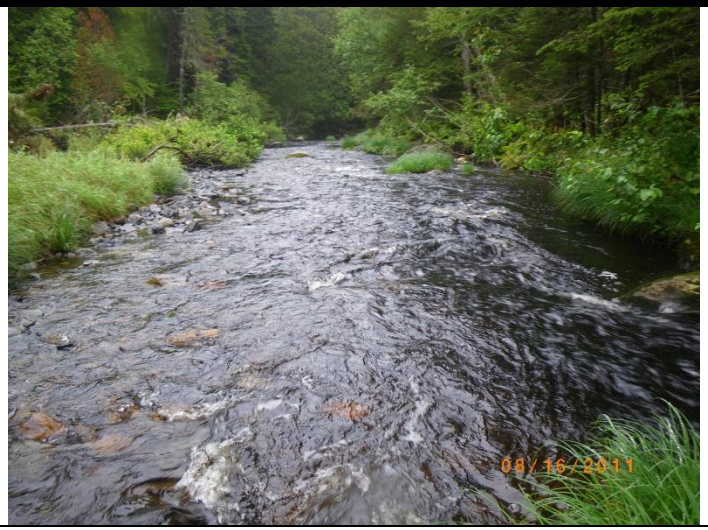
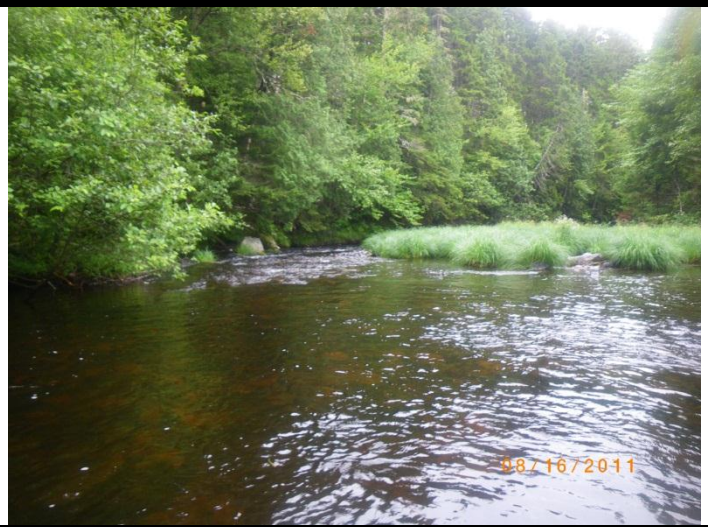
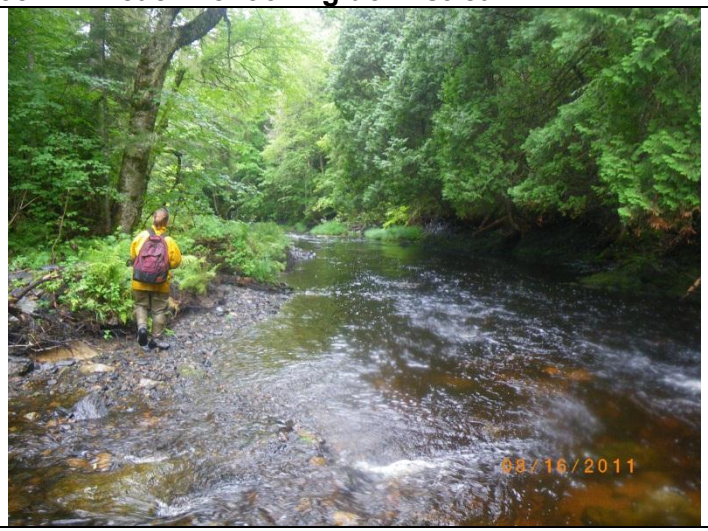
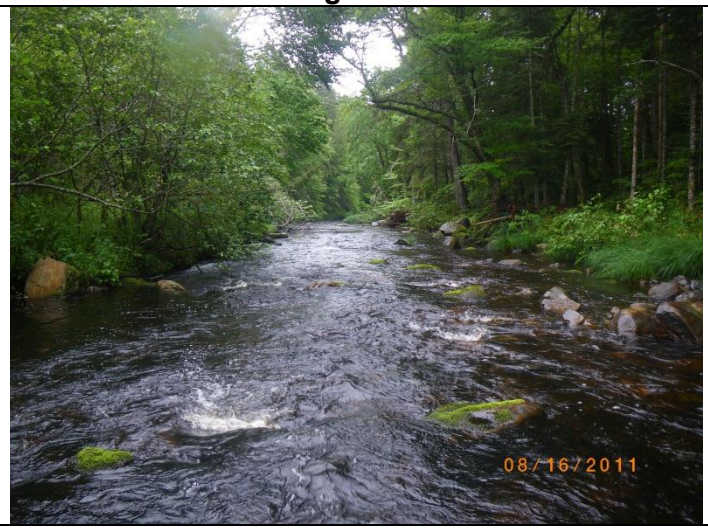



Photo 33 Reach 16 looking upstream.	**Photo 34** Reach 16 looking downstream.
Photo 35 Reach 17 looking upstream.	**Photo 36** Reach 17 looking upstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 37 Reach 18 looking upstream.	**Photo 38 Reach 18 looking downstream.**
	
Photo 39 Reach 19 looking upstream.	**Photo 40 Reach 19 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
Photo 41 Reach 20 looking upstream.	**Photo 42 Reach 20 looking downstream.**
	
Photo 43 Reach 21 looking upstream.	**Photo 44 Reach 21 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

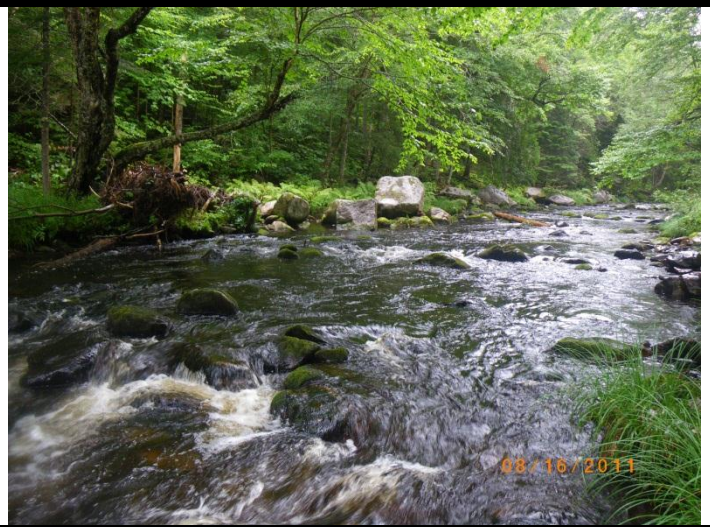
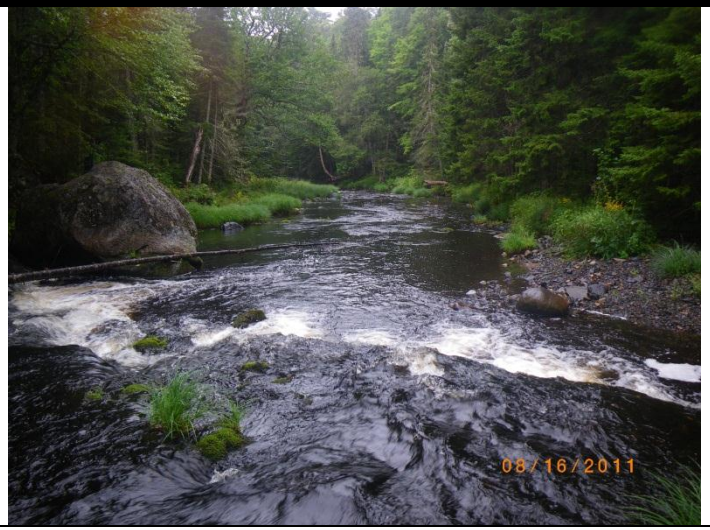

	

Photo 45 Reach 22 looking upstream.	**Photo 46** Reach 22 looking downstream.

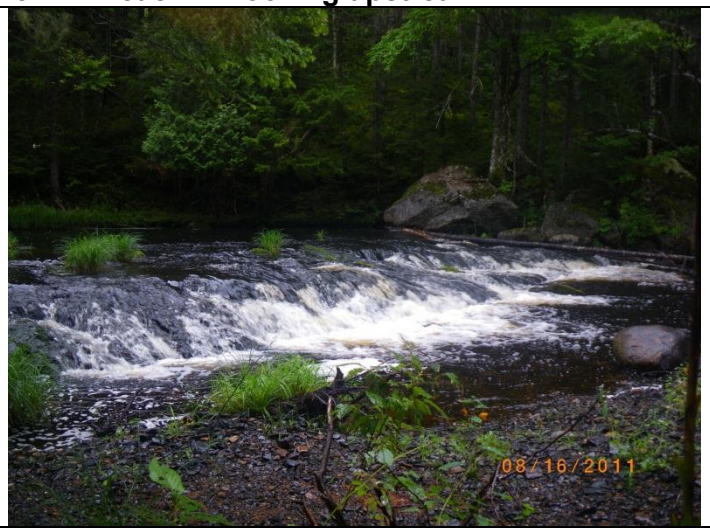



Photo 47 Reach 22 hydraulic jump approx. 60 cm high.	**Photo 48** Reach 23 looking upstream.

Lower Napadogan Habitat Survey Photographs	

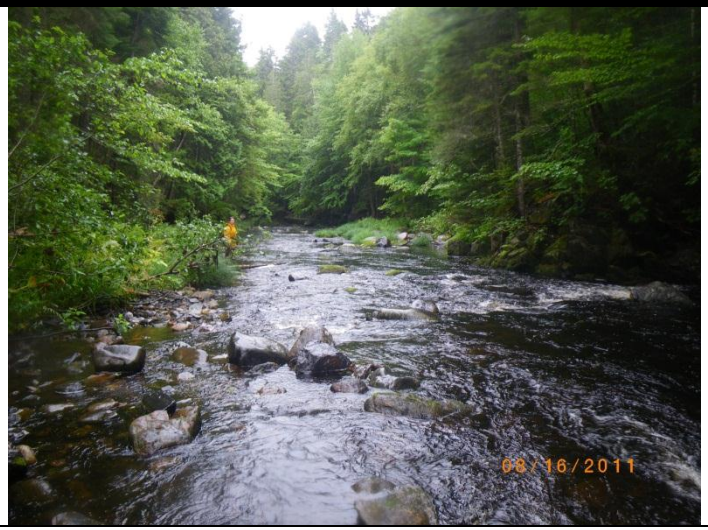
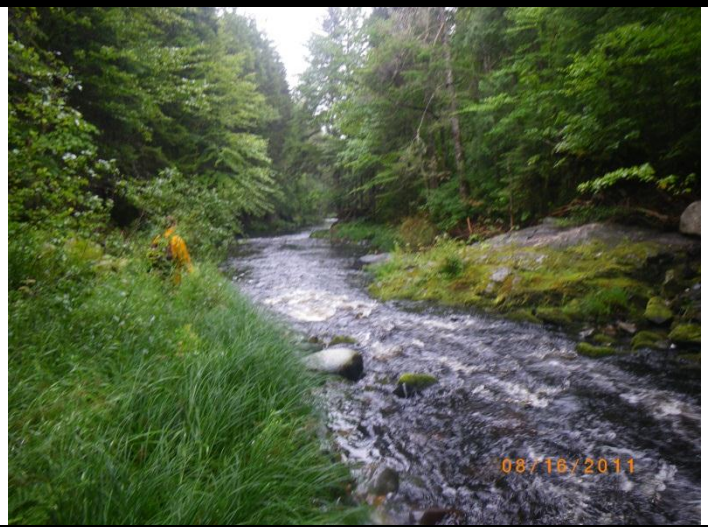

	

Photo 49 Reach 23 looking downstream.	**Photo 50** Reach 23 looking downstream at bedrock controlled narrowing of the watercourse.

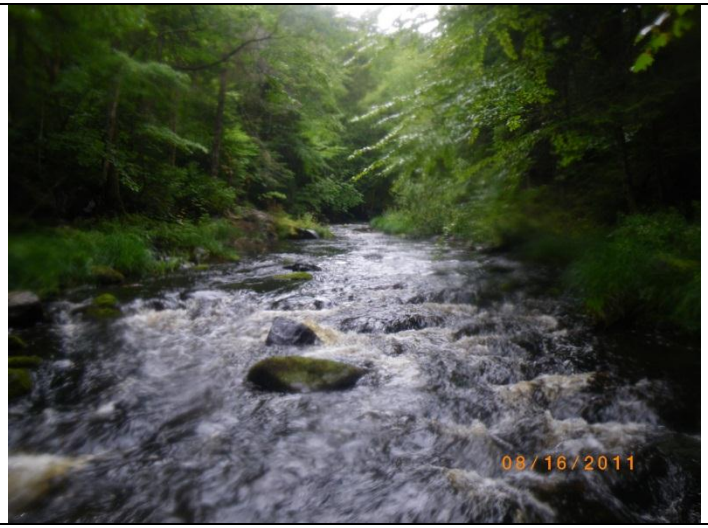
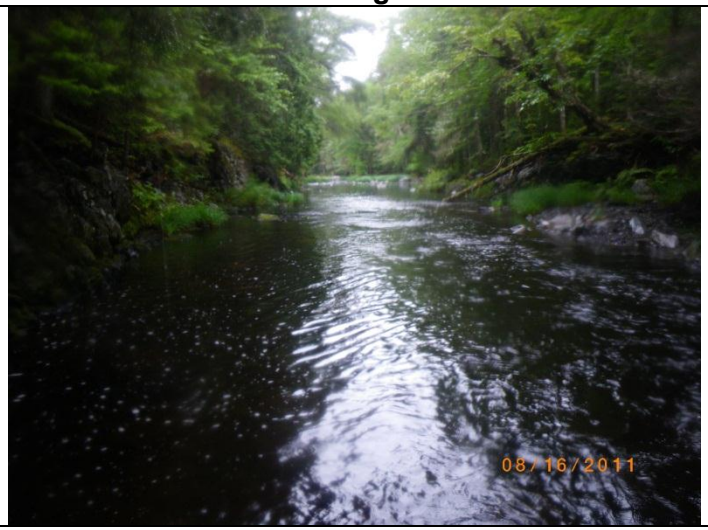
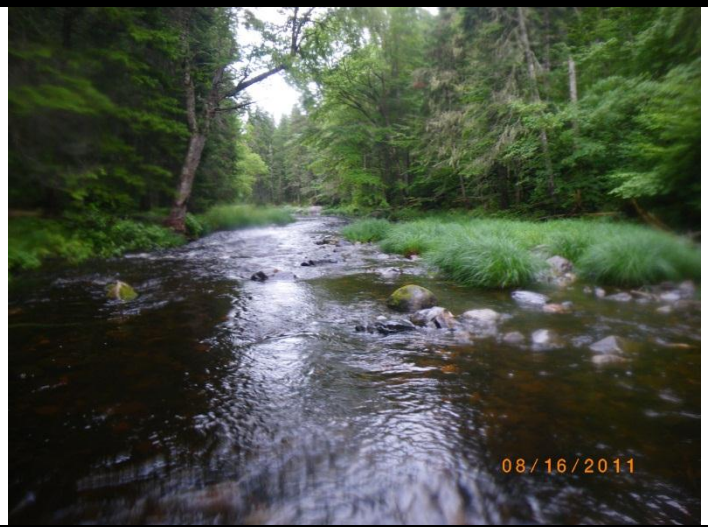

	

Photo 51 Reach 24 looking upstream.	**Photo 52** Reach 24 looking downstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 53 Reach 25 looking upstream.	**Photo 54 Reach 25 looking downstream.**

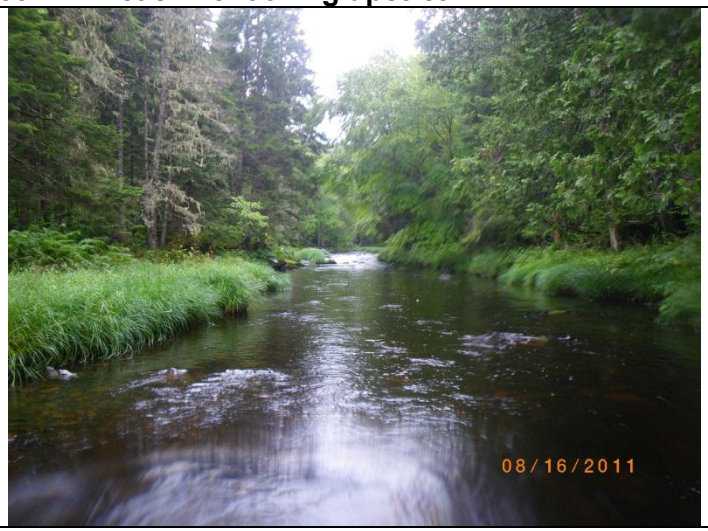
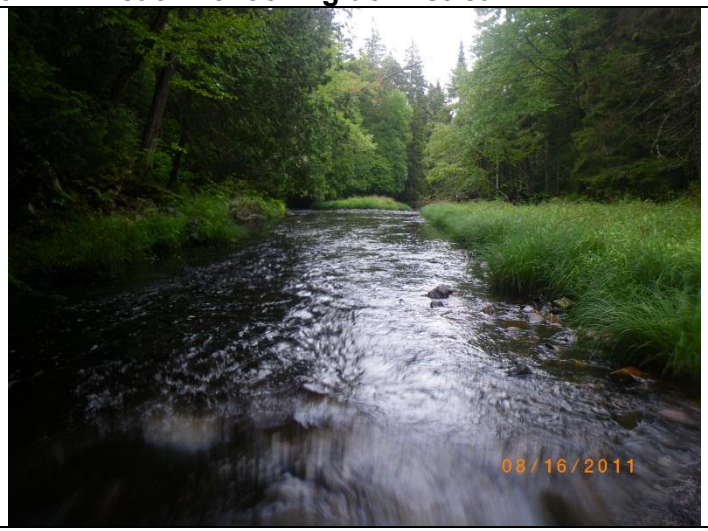

	

Photo 55 Reach 26 looking upstream.	**Photo 56 Reach 26 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

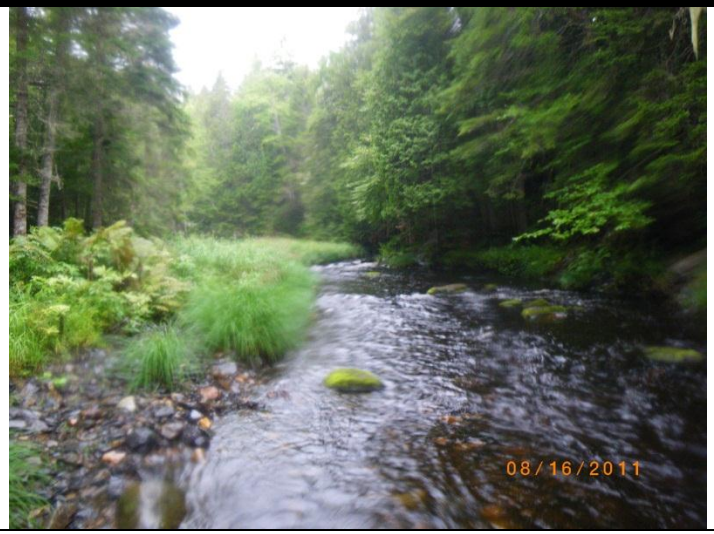
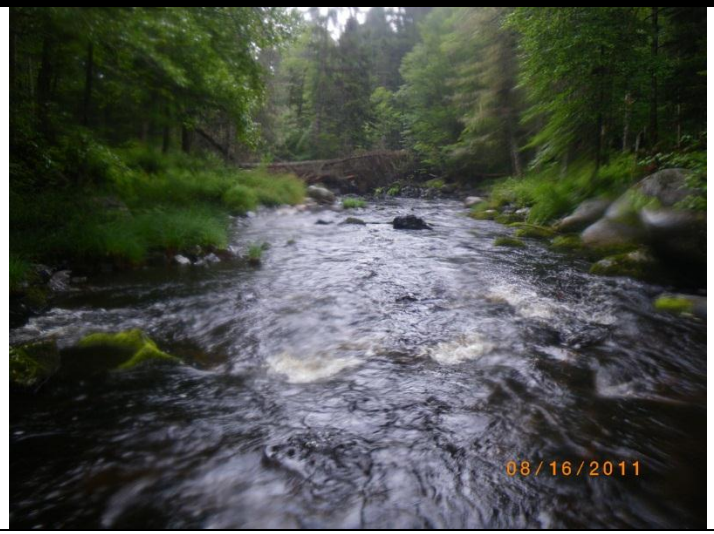

	

Photo 57 Reach 27 looking upstream.	**Photo 58 Reach 27 looking downstream.**

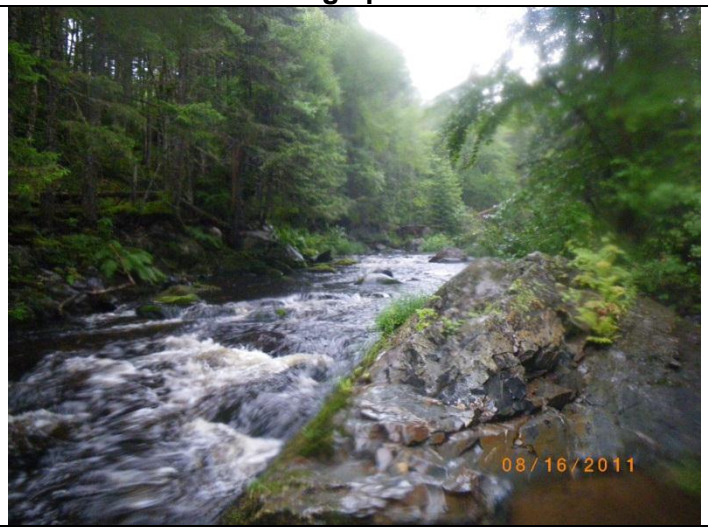
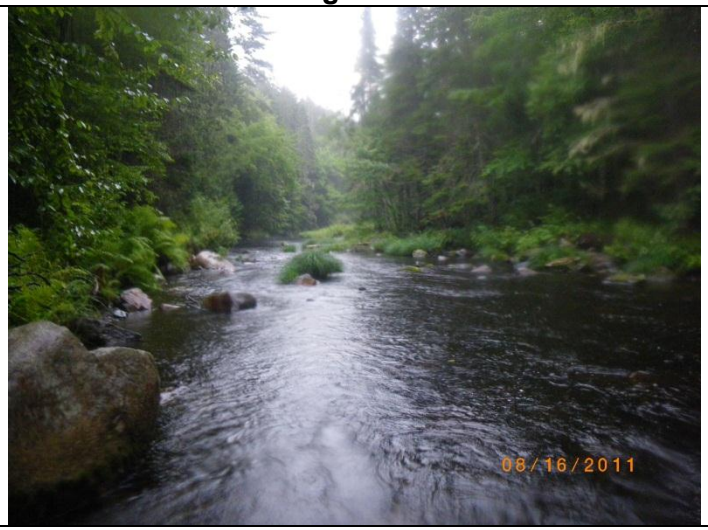

	

Photo 59 Reach 28 looking upstream.	**Photo 60 Reach 28 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

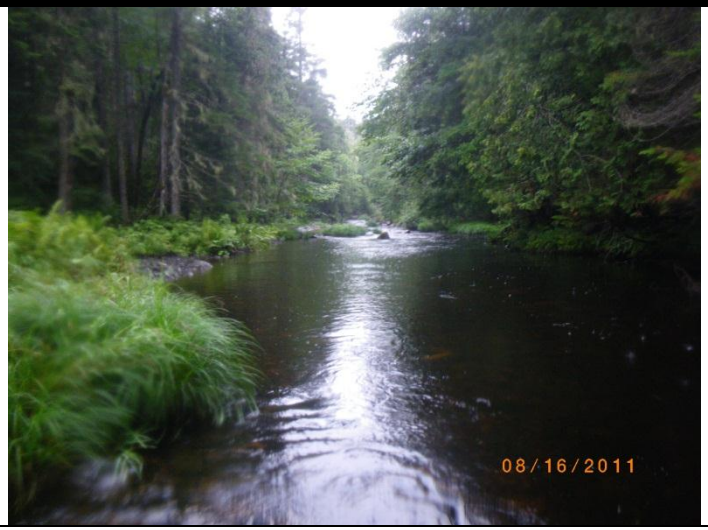
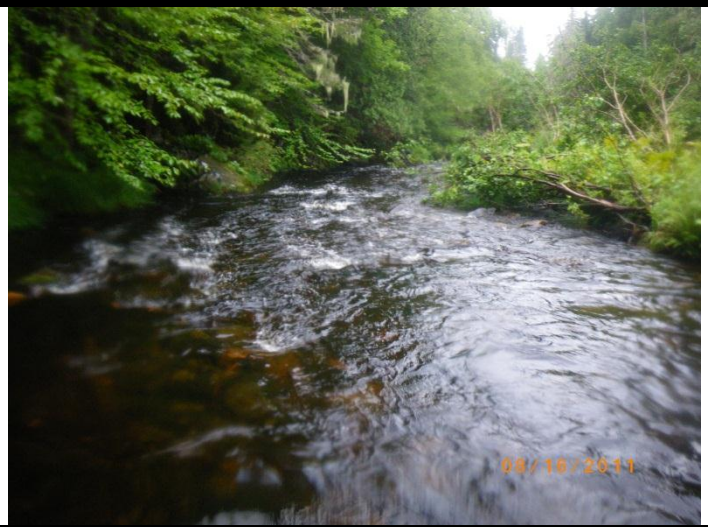
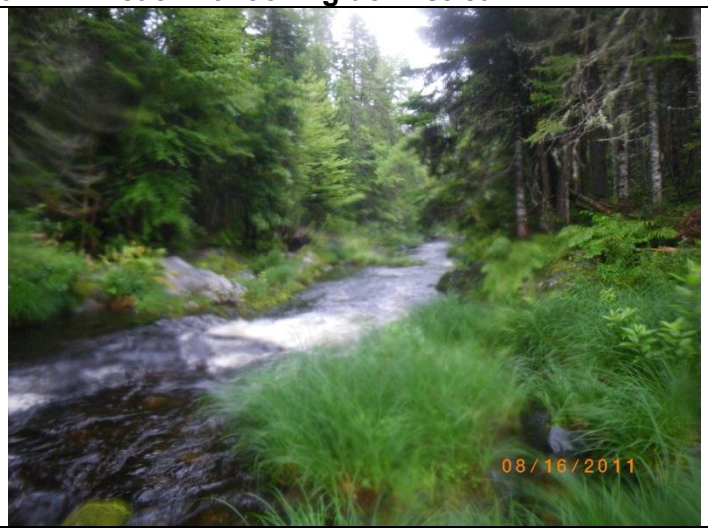

	

Photo 61 Reach 29 looking upstream.	**Photo 62 Reach 29 looking downstream.**
	
Photo 63 Reach 30 looking upstream.	**Photo 64 Reach 30 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

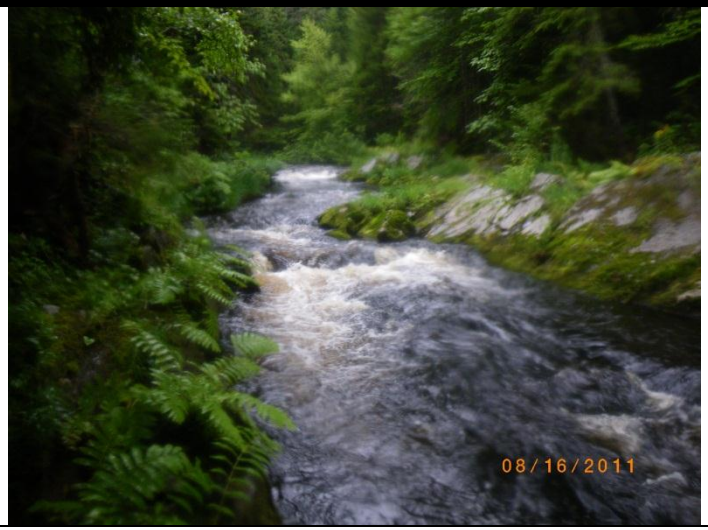
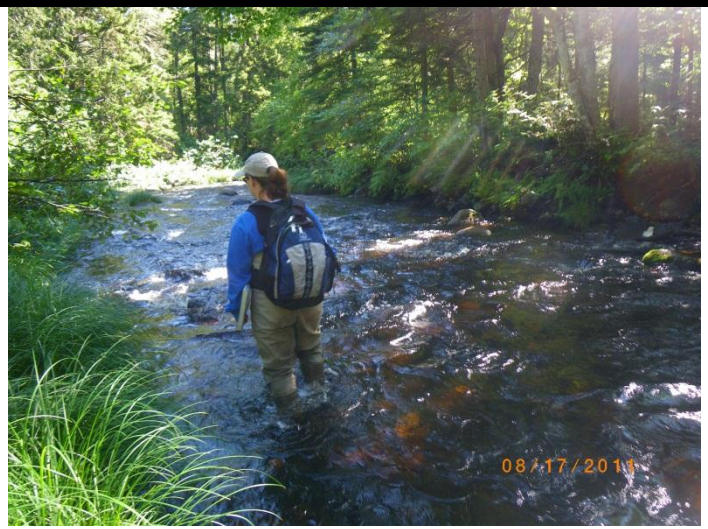
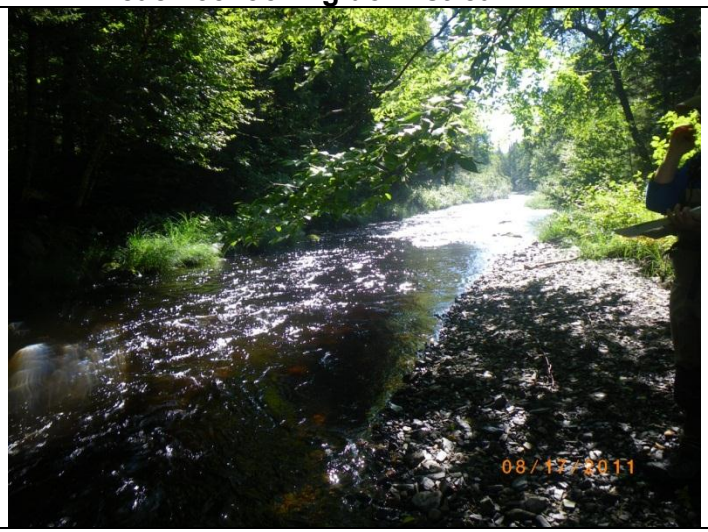
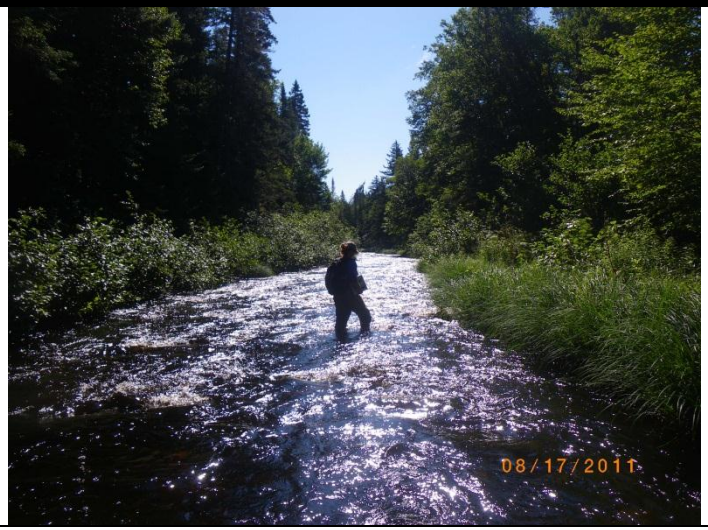



Photo 65 Reach 31 looking upstream.	**Photo 66** Reach 31 looking downstream.
Photo 67 Reach 32 looking upstream.	**Photo 68** Reach 32 looking downstream.

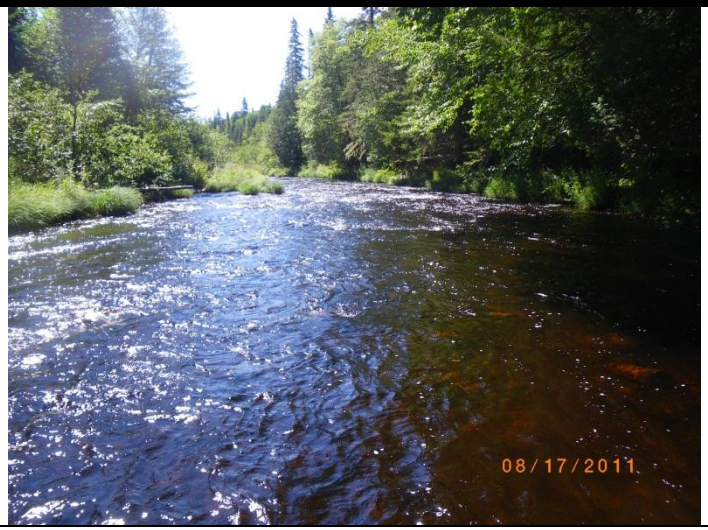
Lower Napadogan Habitat Survey Photographs	
Photo 69 Reach 33 looking upstream.	**Photo 70 Reach 33 looking downstream.**
Photo 71 Reach 34 looking upstream.	**Photo 72 Reach 34 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
	
Photo 73 Reach 35 looking upstream.	**Photo 74** Reach 35 looking downstream.
	
Photo 75 Reach 36 looking upstream.	**Photo 76** Reach 36 looking upstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 77 Reach 37 looking upstream.	**Photo 78 Reach 37 looking downstream.**
Photo 79 Reach 38 looking upstream.	**Photo 80 Reach 38 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
Photo 81 Reach 39 looking upstream.	**Photo 82** Reach 39 looking downstream.
Photo 83 Reach 40 looking upstream.	**Photo 84** Reach 40 looking downstream.

Lower Napadogan Habitat Survey Photographs	
Photo 85 Reach 41 looking upstream.	**Photo 86** Reach 41 looking downstream.
Photo 87 Reach 42 looking upstream.	**Photo 88** Reach 42 Looking downstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 89 Reach 43 looking upstream.	**Photo 90** Reach 43 looking downstream.

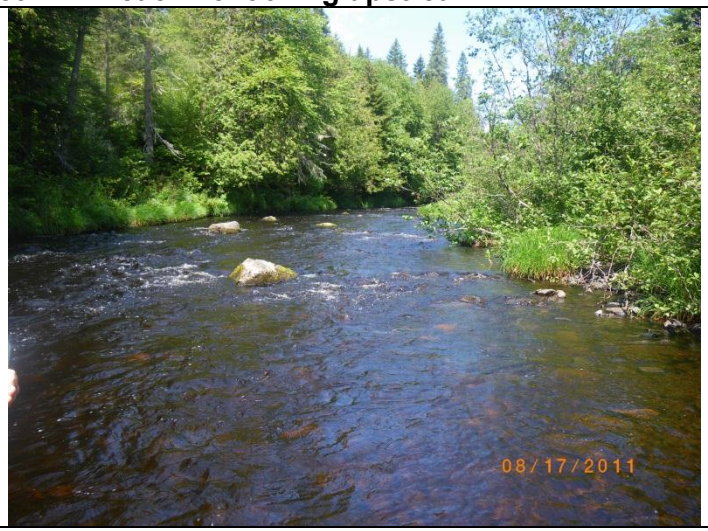
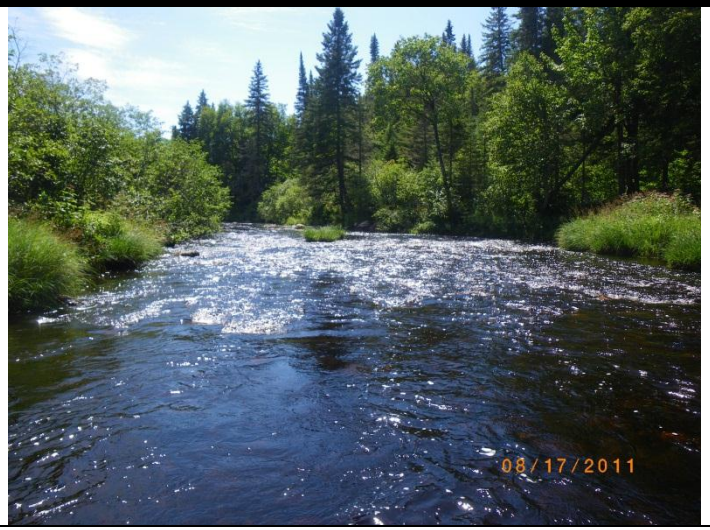
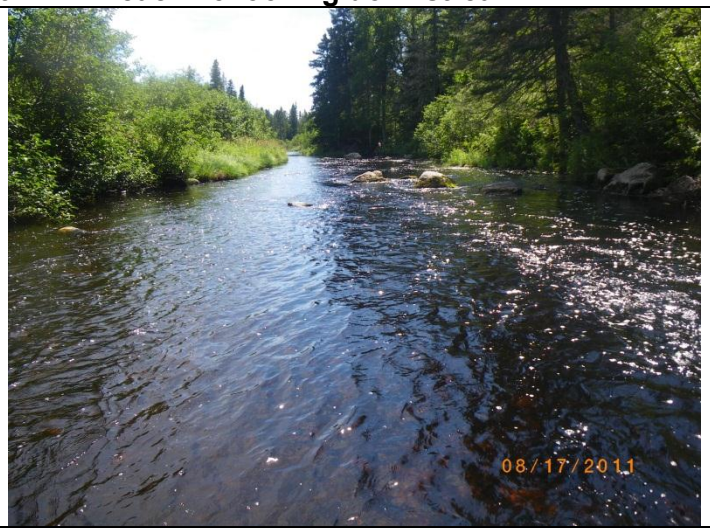



Photo 91 Reach 44 looking upstream.	**Photo 92** Reach 44 looking downstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 93 Reach 45 looking upstream.	**Photo 94** Reach 45 looking downstream.
	
Photo 95 Reach 46 looking upstream.	**Photo 96** Reach 46 looking downstream.

Lower Napadogan Habitat Survey Photographs	

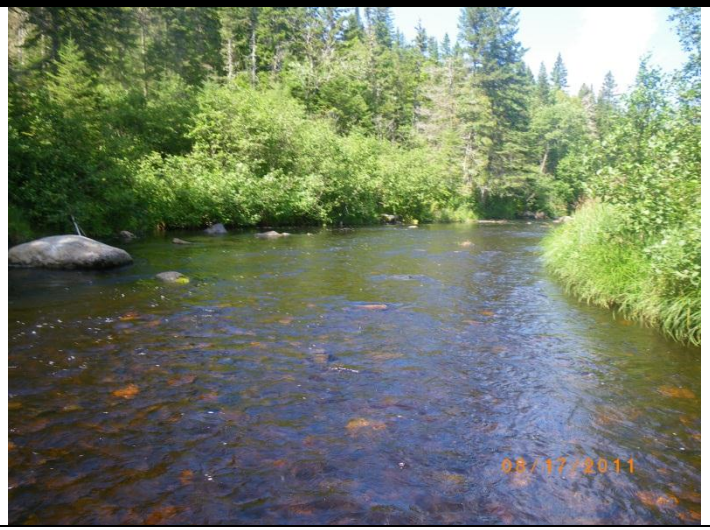



Photo 97 Reach 47 looking upstream.	**Photo 98** Reach 47 looking downstream.
Photo 99 Reach 48 looking upstream.	**Photo 100** Reach 48 looking downstream.

Lower Napadogan Habitat Survey Photographs	

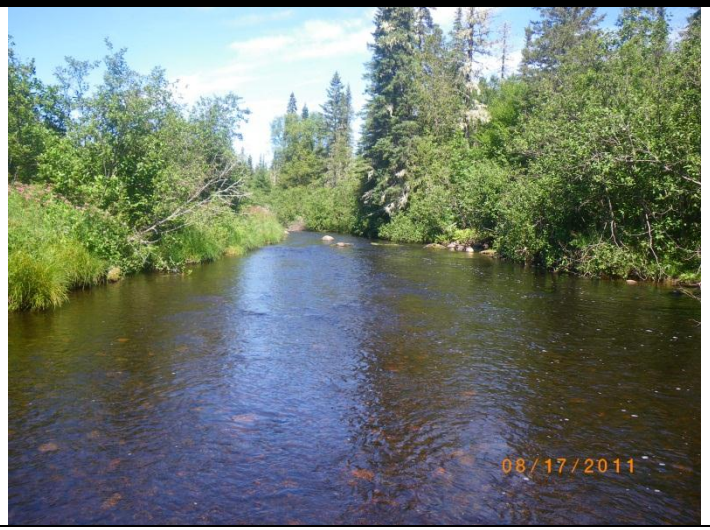
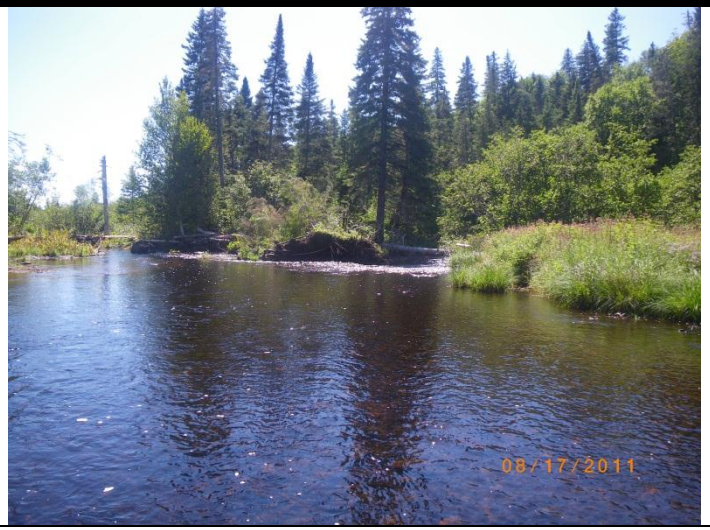
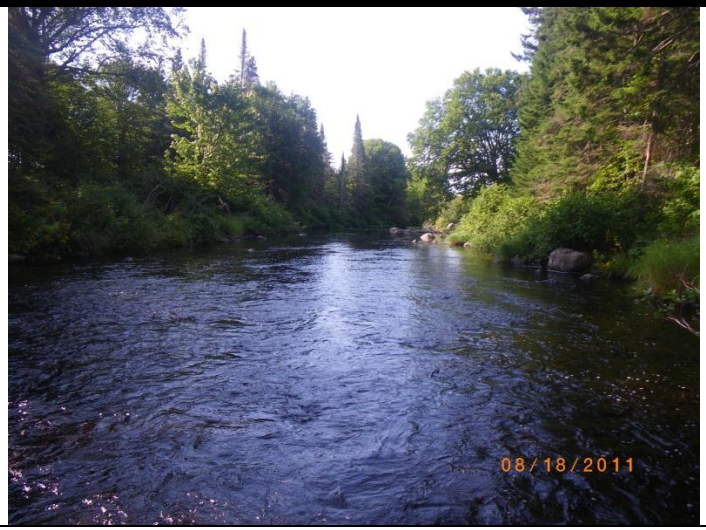

	

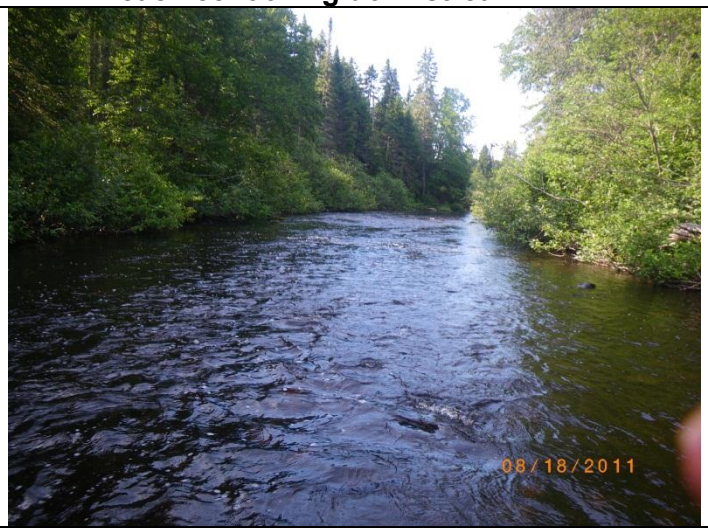
Photo 101 Reach 49 looking upstream.	**Photo 102 Reach 49 looking downstream.**
Photo 103 Reach 49 clay outcrop.	**Photo 104 Reach 49 backwater to wetland.**

Lower Napadogan Habitat Survey Photographs	
Photo 105 Reach 50 looking upstream.	**Photo 106** Reach 50 looking downstream.
Photo 107 Reach 51 looking upstream, note start of beaver dam	**Photo 108** Reach 51 looking downstream.

Lower Napadogan Habitat Survey Photographs	
Photo 109 Reach 52 looking upstream.	**Photo 110 Reach 52 looking downstream.**
Photo 111 Reach 53 looking upstream.	**Photo 112 Reach 53 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
Photo 113 Reach 54 looking upstream.	**Photo 114 Reach 54 looking downstream.**
Photo 115 Reach 55 looking up stream.	**Photo 116 Reach 55 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
	
Photo 117 Reach 56 looking upstream.	**Photo 118 Reach 56 looking downstream.**
Photo 119 Reach 57 looking upstream.	**Photo 120 reach 57 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
Photo 121 Reach 58 looking upstream.	**Photo 122 Reach 58 looking downstream.**
	
Photo 123 Reach 59 looking upstream.	**Photo 124 Reach 59 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

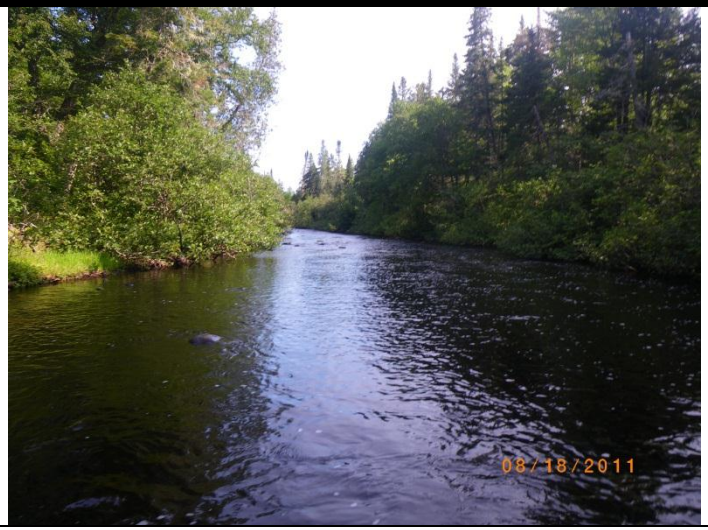
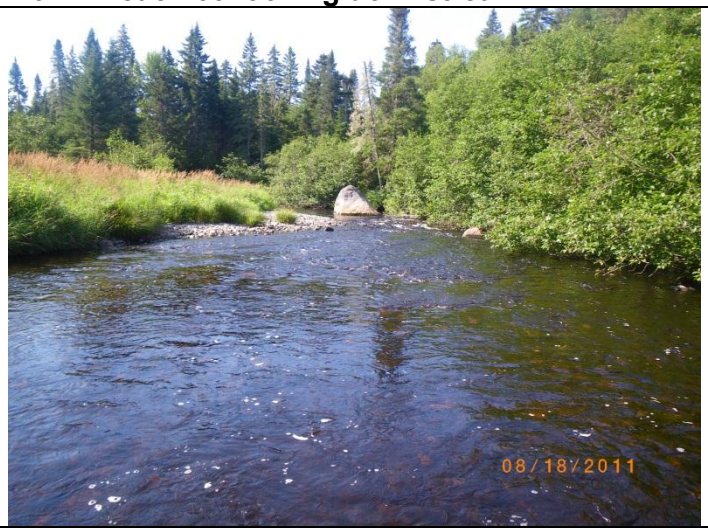
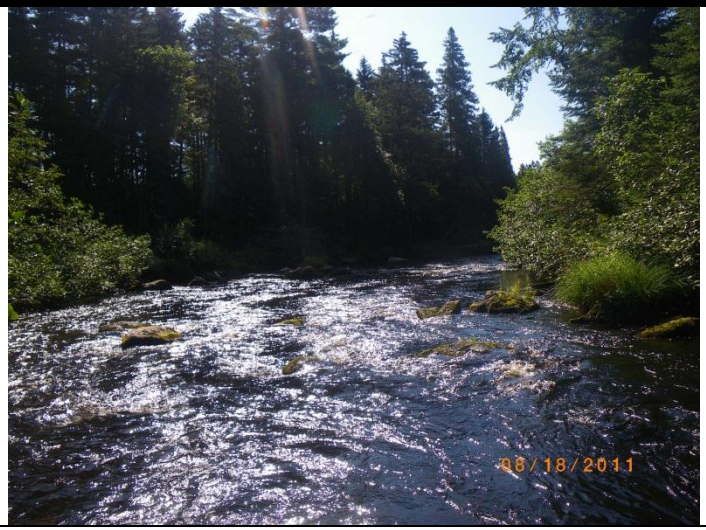



Photo 125 Reach 60 looking upstream.	**Photo 126 Reach 60 looking downstream.**
	
Photo 127 Reach 61 looking upstream.	**Photo 128 Reach 61 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
	
Photo 129 Reach 62 looking upstream.	**Photo 130 Reach 62 looking downstream.**
Photo 131 Reach 63 looking upstream.	**Photo 132 Reach 63 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
Photo 133 Reach 64 looking upstream.	**Photo 134 Reach 64 looking downstream.**
Photo 135 Reach 65 looking upstream.	**Photo 136 Reach 65 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

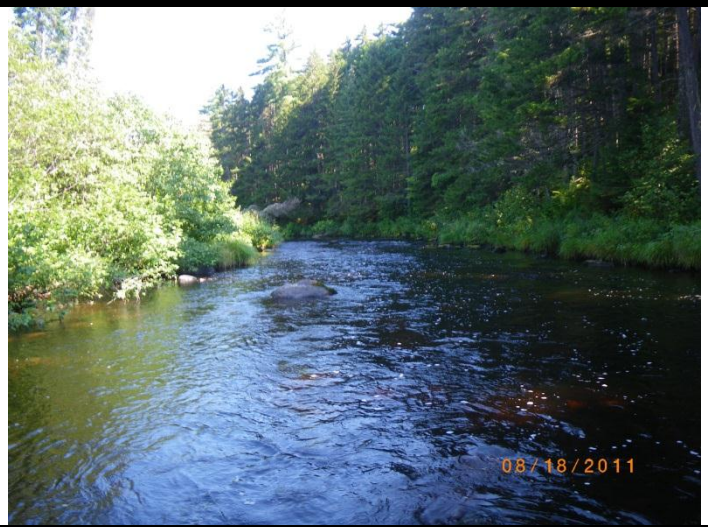
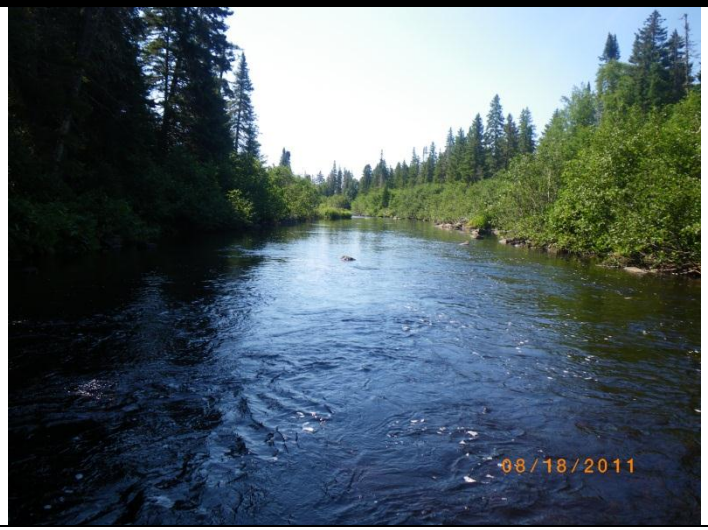
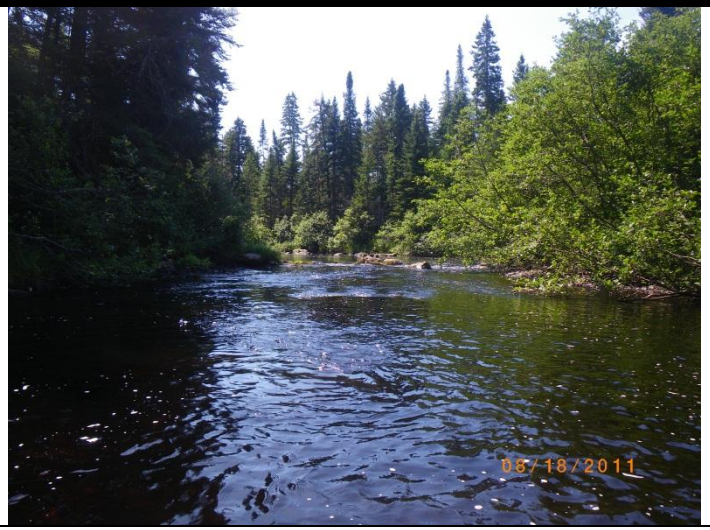

	

Photo 137 Reach 66 looking upstream.	**Photo 138 Reach 66 looking downstream.**
Photo 139 Reach 67 looking upstream.	**Photo 140 Reach 67 looking upstream.**

Lower Napadogan Habitat Survey Photographs	
Photo 141 Reach 68 looking upstream.	**Photo 142** Reach 68 looking downstream.
Photo 143 Reach 69 view looking upstream.	**Photo 144** Reach 69 view looking downstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 145 Reach 70 looking upstream.	**Photo 146** Reach 70 looking downstream.

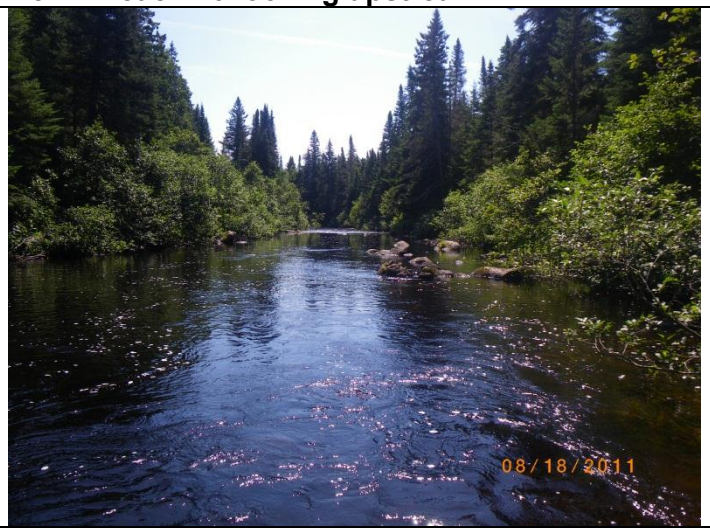
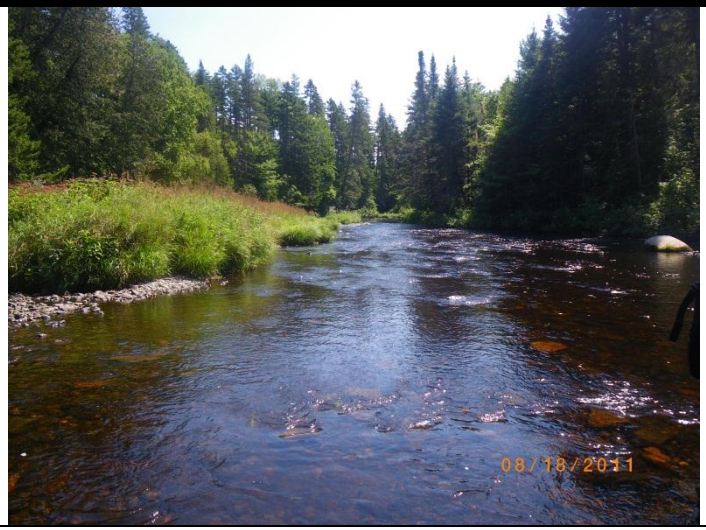



Photo 147 Reach 71 looking upstream.	**Photo 148** Reach 72 looking downstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 149 Reach 73 looking upstream.	**Photo 150 Reach 73 looing downstream.**
Photo 151 Reach 74 looking upstream.	**Photo 152 Reach 74 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

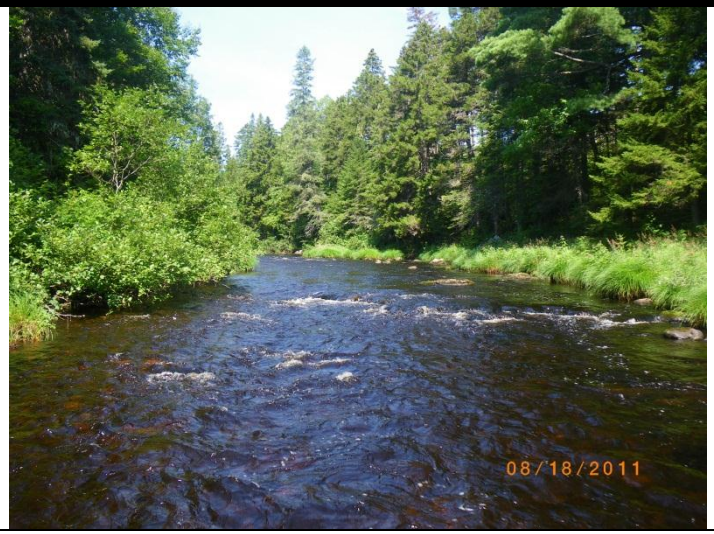
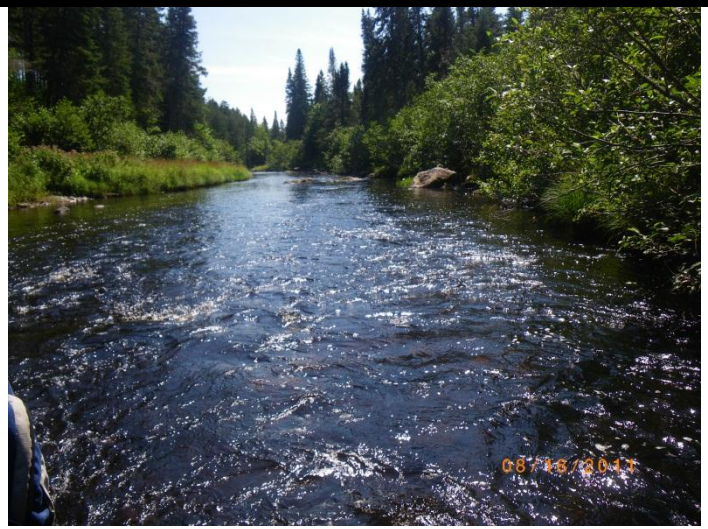

	

Photo 153 Reach 75 looking upstream.	**Photo 154** Reach 75 looking downstream.
Photo 155 Reach 76 looking upstream.	**Photo 156** Reach 76 looking downstream.

Lower Napadogan Habitat Survey Photographs	

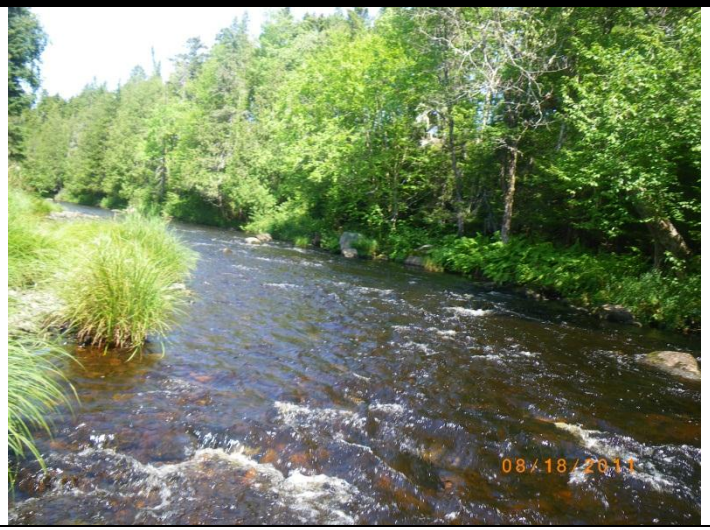
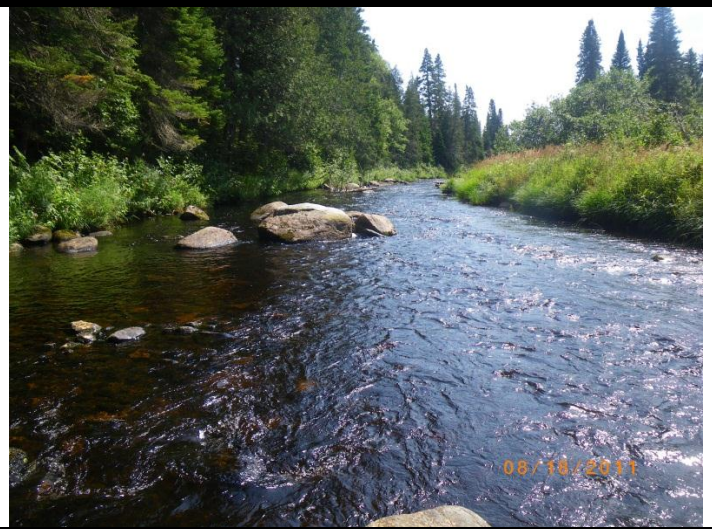
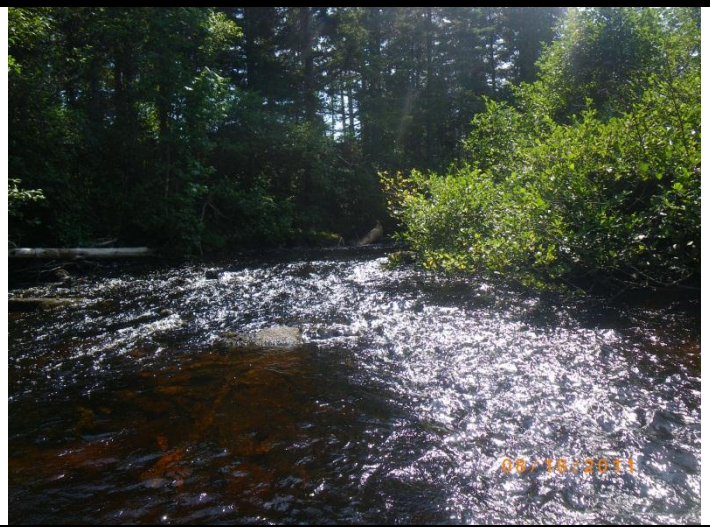
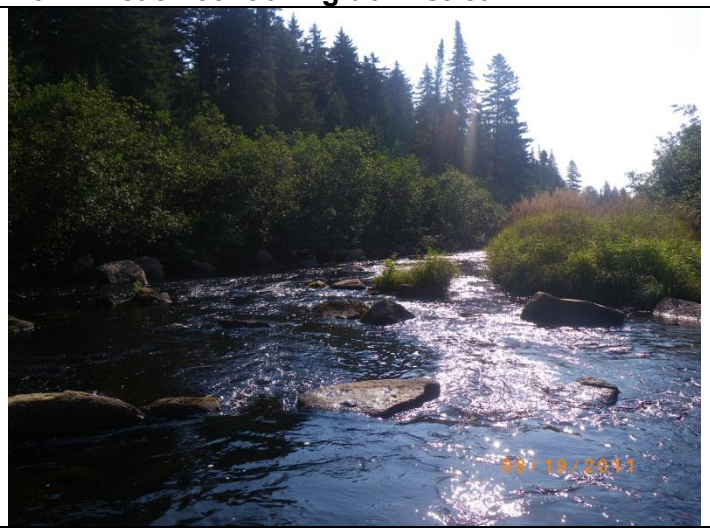



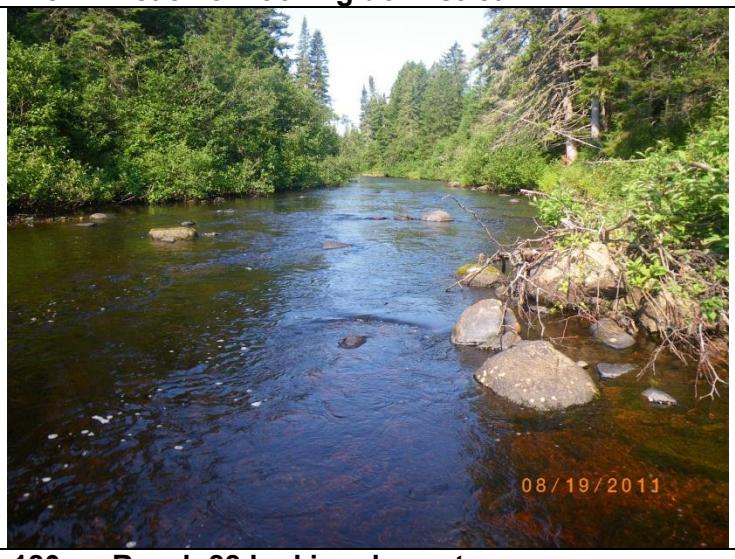
Photo 157 Reach 77 looking upstream.	**Photo 158 Reach 77 looking downstream.**
Photo 159 Reach 78 looking upstream.	**Photo 160 Reach 78 looking downstream.**

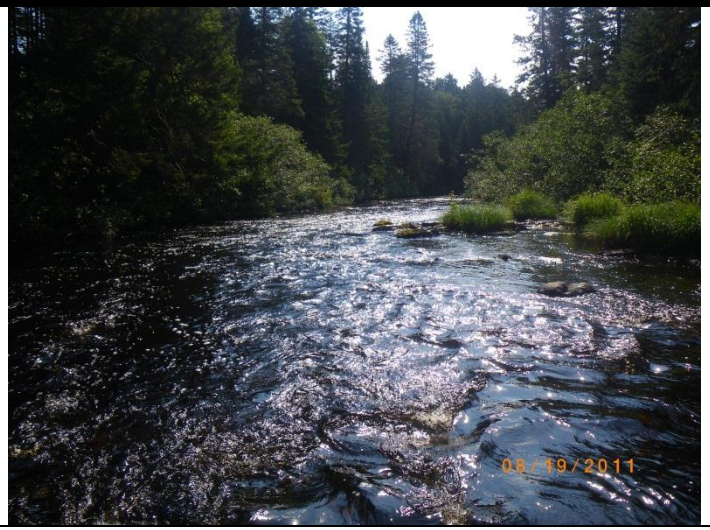
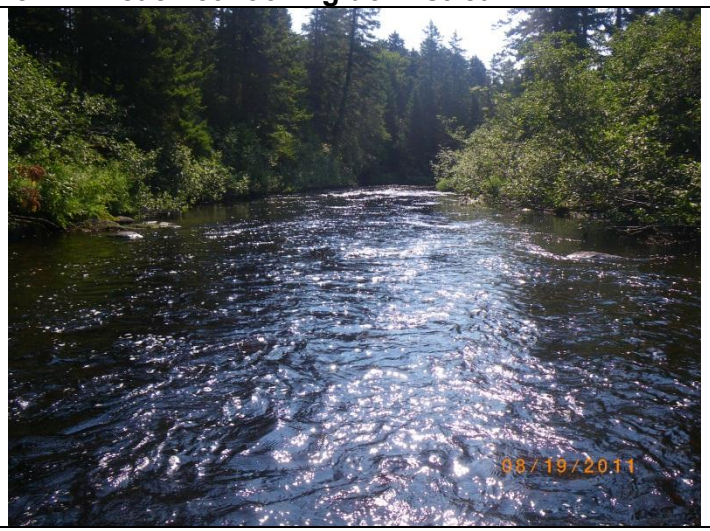
Lower Napadogan Habitat Survey Photographs	
	
Photo 161 Reach 79 looking upstream.	**Photo 162** Reach 79 looking downstream.
Photo 163 Reach 80 looking upstream.	**Photo 164** Reach 80 looking downstream.

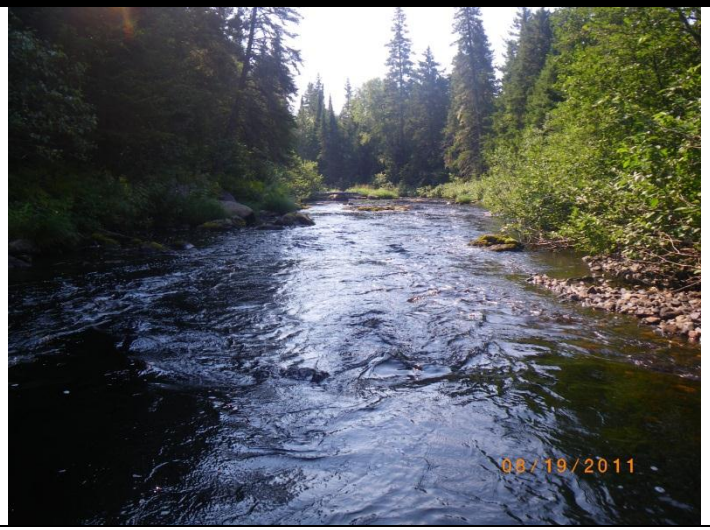
Lower Napadogan Habitat Survey Photographs	
Photo 165 Reach 81 looking upstream.	**Photo 166** Teach 81 looking downstream.
Photo 167 Reach 82 looking upstream.	**Photo 168** Reach 82 looking downstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 169 Reach 83 looking upstream.	**Photo 170** Reach 83 looking downstream.
	
Photo 171 Reach 84 looking downstream start of reach.	**Photo 172** Reach 84 looking downstream end of reach.

Lower Napadogan Habitat Survey Photographs	
Photo 173 Reach 85 looking upstream.	**Photo 174** Reach 85 looking downstream.
Photo 175 Reach 86 looking upstream.	**Photo 176** Reach 86 looking downstream.

Lower Napadogan Habitat Survey Photographs	
Photo 177 Reach 87 looking upstream.	**Photo 178 Reach 87 looking downstream**
	
Photo 179 Reach 88 looking upstream.	**Photo 180 Reach 88 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
	
Photo 181 Reach 89 looking upstream.	**Photo 182 Reach 89 looking downstream.**
	
Photo 183 Reach 90 looking upstream.	**Photo 184 Reach 90 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
	
Photo 185 Reach 91 looking upstream.	**Photo 186 Reach 91 looking downstream.**
Photo 187 Reach 92 looking upstream.	**Photo 188 Reach 92 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

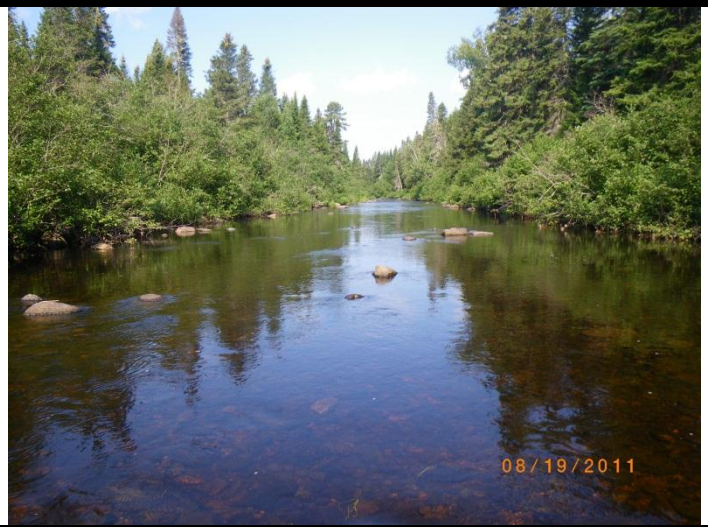
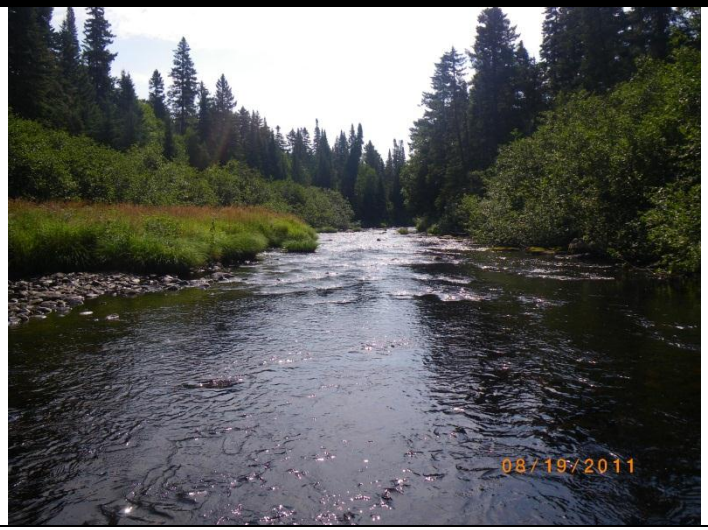
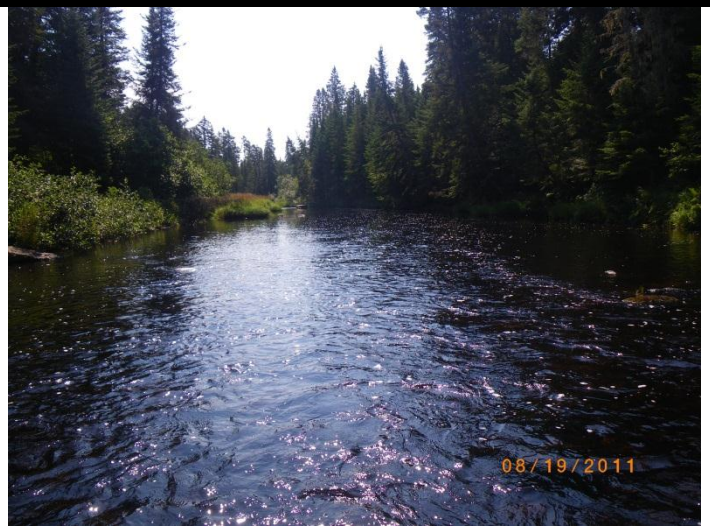
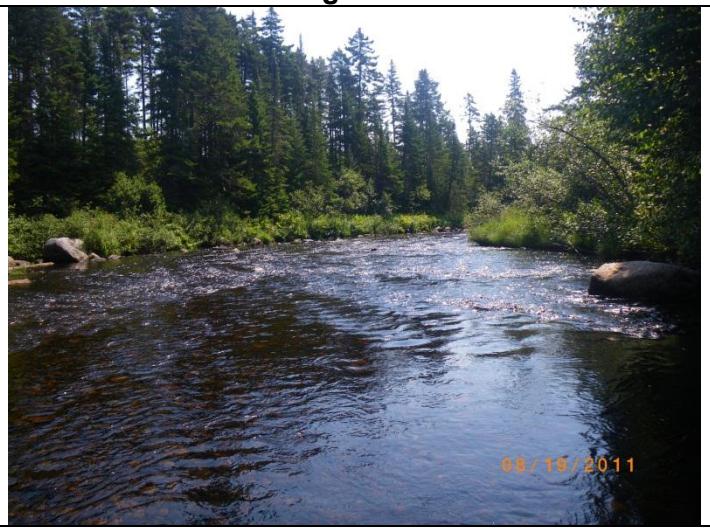
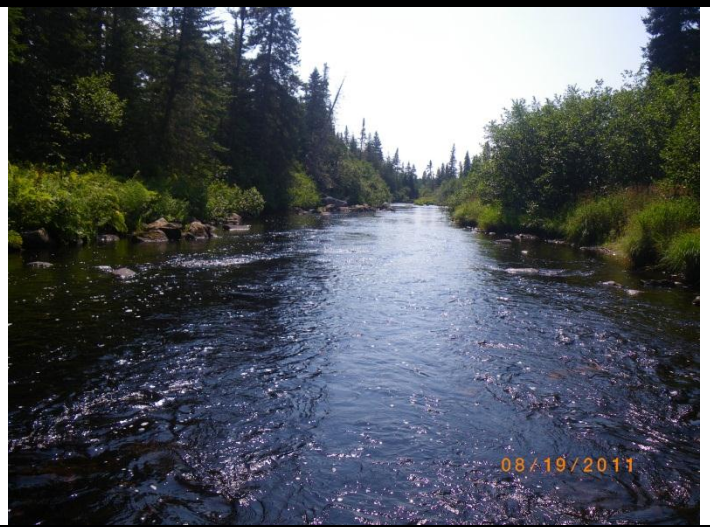
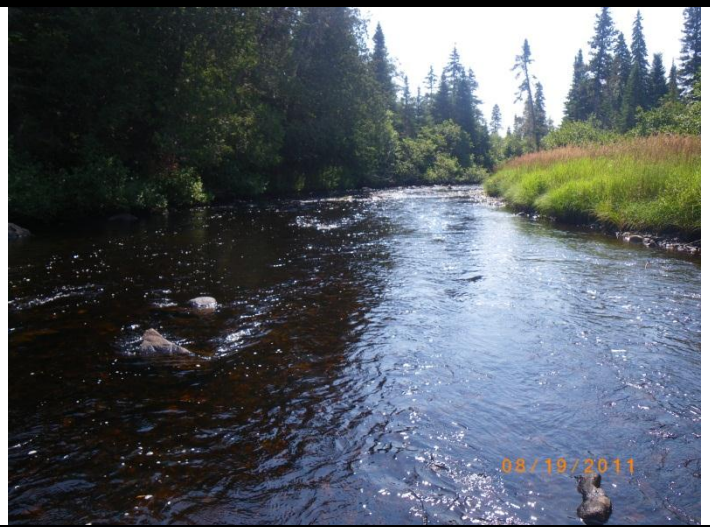

	

Photo 189 Reach 93 looking upstream.	**Photo 190 Reach 93 looking downstream.**
Photo 191 Reach 94 looking upstream.	**Photo 192 Reach 94 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
	
Photo 193 Reach 95 looking upstream.	**Photo 194 Reach 95 looking downstream.**
	
Photo 195 Reach 96 looking upstream.	**Photo 196 Reach 96 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
	
Photo 197 Reach 97 looking upstream.	**Photo 198 Reach 97 looking downstream.**
Photo 199 Reach 98 looking upstream.	**Photo 200 Reach 98 looking upstream.**

Lower Napadogan Habitat Survey Photographs	
	
Photo 201 Reach 99 looking upstream.	**Photo 202 Reach 99 looking downstream.**
Photo 203 Reach 100 looking upstream.	**Photo 204 Reach 100 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

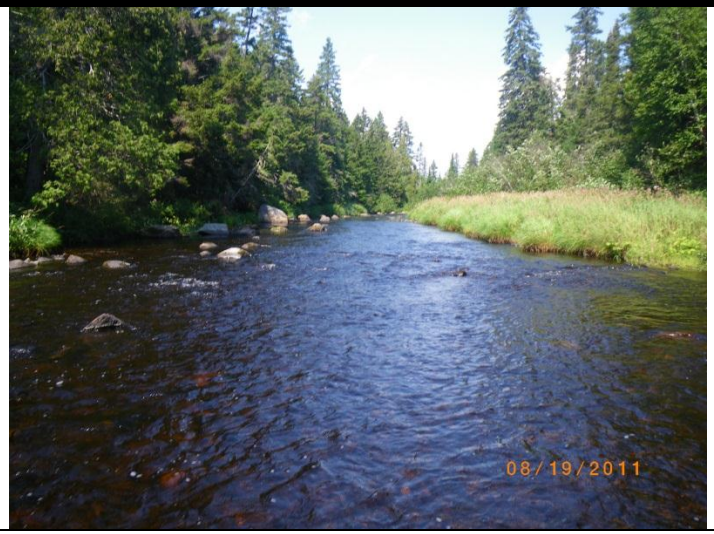
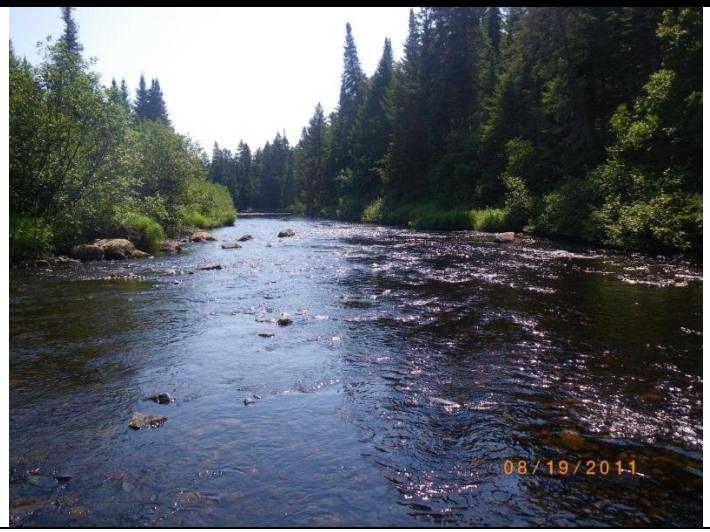
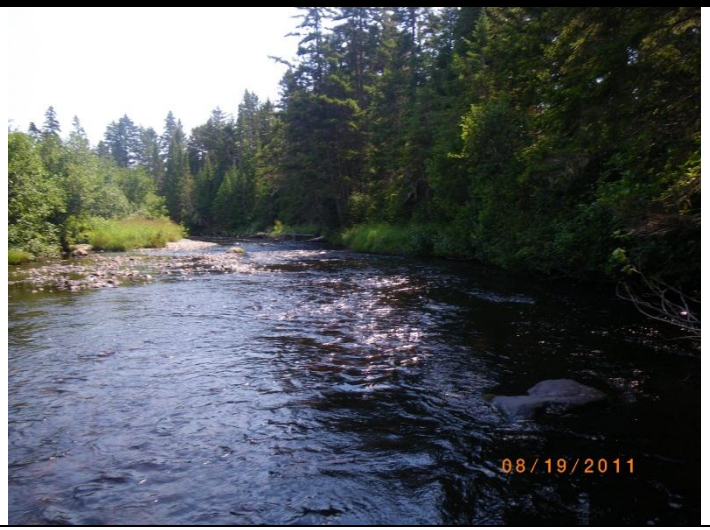



Photo 205 Reach 101 looking upstream.	**Photo 206 Reach 101 looking downstream.**
Photo 207 Reach 102 looking upstream.	**Photo 208 Reach 102 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
	
Photo 209 Reach 103 looking upstream.	**Photo 210 Reach 103 looking downstream.**
Photo 211 Reach 104 looking upstream.	**Photo 212 Reach 104 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
	
Photo 213 Reach 105 looking upstream.	**Photo 214 Reach 105 looing downstream.**
Photo 215 Reach 106 looking upstream.	**Photo 216 Reach 106 looking downstream.**

Lower Napadogan Habitat Survey Photographs	

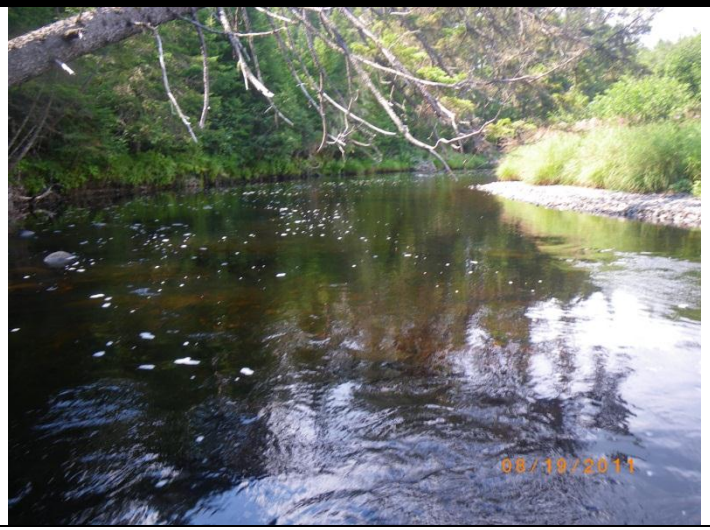
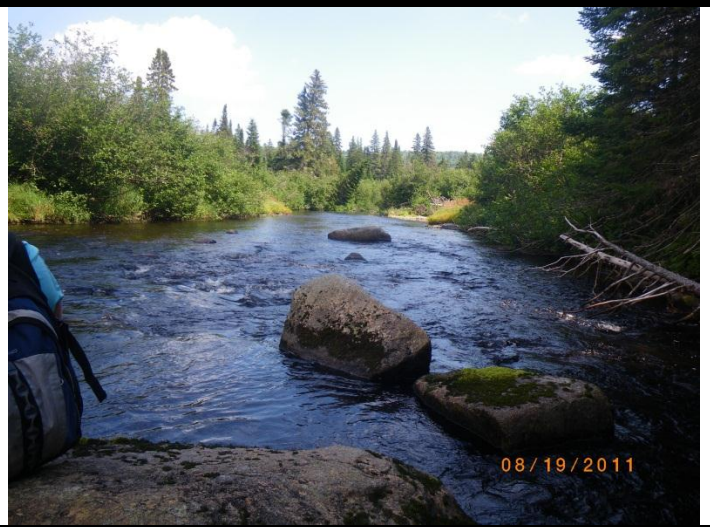

	

Photo 217 Reach 107 looking upstream.	**Photo 218** Reach 107 looking downstream.
Photo 219 Reach 108 looking upstream.	**Photo 220** Reach 108 looking downstream.

Lower Napadogan Habitat Survey Photographs	

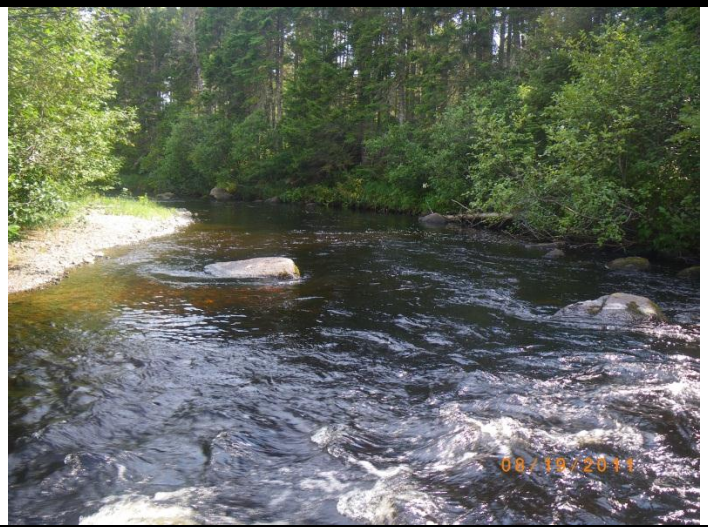
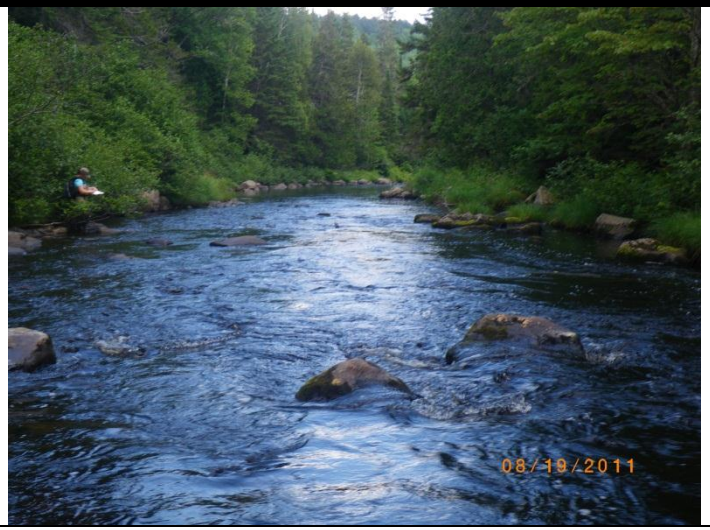



Photo 221 Reach 109 looking downstream.	**Photo 222** Reach 109 looking downstream.
Photo 223 Reach 110 looking upstream.	**Photo 224** Reach 110 looking downstream.

Lower Napadogan Habitat Survey Photographs	
	
Photo 225 Reach 111 looking upstream.	**Photo 226 Reach 111 looking downstream.**
Photo 227 Reach 112 looing upstream.	**Photo 228 Reach 112 looking downstream.**

Lower Napadogan Habitat Survey Photographs	
Photo 229 Reach 113 looking upstream.	**Photo 230** Reach 113 looking downstream.
Photo 231 Reach 114 looking downstream.	**Photo 232** Reach 114 mouth of the confluence of Nashwaak River.

Appendix G

Scientific Collection Permit

Fisheries and Oceans Canada | Pêches et Océans Canada

Document No: 11149077

REGISTRATION(S) AND/OR FISHING LICENCE(S)

This document authorizes the registration card holder and/or licence holder to engage in fishing and related activities on the Atlantic coast of Canada subject to the provisions of the Fisheries Act and Regulations made thereunder.

This licence and/or registration is issued under the authority of the Minister of Fisheries and Oceans Canada.

FIN 7-000140-06

_ STANTEC LIMITED
845 PROSPECT ST.
FREDERICTON, NB
E3B 2T7

CALENDAR YEAR 2011
ISSUANCE DATE: SEPTEMBER 16, 2011

HOMEPORT
25808 FREDERICTON

Licence(s) - 2011

Licence #	Species	Areas	Licence Type	Gear Permitted	Amt	VRN	LOA
321156	ITEMS UNSPECIFIED			UNKNOWN			

TO BE OPERATED BY EVA WALKER, (STANTEC CONSULTING LTD.) AND QUALIFIED PERSONS WORKING UNDER HER DIRECT SUPERVISION.

LOCATIONS: WATERBODIES IN NOVA SCOTIA AND NEW BRUNSWICK THAT ARE IN THE MARITIMES REGION.

GEARS PERMITTED TO USE: BACKPACK ELECTROFISHERS; SEINE NETS; HOOPNETS; AND/OR MINNOW TRAPS.

RETENTIONS: NO MORE THAN 40 FISH CAN BE LETHALLY SAMPLED FROM ANY ONE LOCATION (ELECTROFISHING SITE). REPORTS ON NUMBERS, SPECIES, LOCATIONS AND RETENTIONS MUST BE SUBMITTED TO THE PROVINCE OF NEW BRUNSWICK, DEPARTMENT OF NATURAL RESOURCES C/O CHRIS.CONNELL@GNB.CA

AMENDMENT:

SUBJECT TO CONDITIONS 7 AND 8 BELOW, ELECTROFISHING FOR PURPOSES OTHER THAN FISH RESCUES IS PERMITTED UNTIL OCTOBER 14, 2011.

DESIGNATED OPERATOR STATUS

SCIENTIFIC AND/OR EDUCATIONAL LICENCE OR PUBLIC DISPLAY

PURSUANT TO SECTION 52 OF THE FISHERY (GENERAL) REGULATIONS, THIS LICENCE IS HEREBY ISSUED TO FISH FOR MULTIPLE FISH SPECIES (FINFISH AND INVERTEBRATES) FOR PUBLIC DISPLAY, SCIENTIFIC AND/OR EDUCATIONAL PURPOSES, SUBJECT TO THE FOLLOWING CONDITIONS:

1. THAT THIS LICENCE DOES NOT AUTHORIZE COLLECTIONS OF SHELLFISH IN AREAS THAT HAVE BEEN CLOSED BY PROHIBITION ORDER;

2. THAT THIS LICENCE DOES NOT AUTHORIZE COLLECTIONS OF FISH IN ANY MARINE PROTECTED AREAS;

3. THAT ONLY THOSE LOCATIONS LISTED ABOVE ARE PERMITTED TO BE FISHED. THE GEAR AND ANY TAGS ISSUED UNDER THIS LICENCE, VESSELS AND THE SPECIES AND NUMBERS THAT ARE PERMITTED TO BE RETAINED ARE ALSO LISTED ABOVE; ALL OTHER FISH CAUGHT THAT ARE NOT LISTED WILL BE IMMEDIATELY RETURNED TO THE WATERS FROM WHICH THEY WERE TAKEN WITH THE LEAST AMOUNT OF HARM;

4. THAT THE AREA OF OPERATIONS IS LIMITED TO THOSE WATERS UNDER THE JURISDICTION OF THE DEPARTMENT OF FISHERIES AND OCEANS (DFO), MARITIMES REGION;

5. THAT ANY UNATTENDED GEAR MUST HAVE CLEAR MARKINGS ON IT IDENTIFYING THE LICENCE NUMBER AND CONTACT PERSON WITH AN EMERGENCY CONTACT NUMBER;

6. THAT ANY RECREATIONAL ANGLERS ANGLING IN INLAND WATERS OPERATING UNDER THE SUPERVISION OF THE LICENCE HOLDER AND UNDER THE AUTHORITY OF THIS LICENCE WHO ARE NOT EMPLOYED BY THE DEPARTMENT OF NATURAL RESOURCES OR EMPLOYED BY ANOTHER PROVINCIAL OR FEDERAL GOVERNMENT AGENCY, MUST BE IN POSSESSION OF A PROVINCIAL GENERAL ANGLING LICENCE AND MUST CARRY A COPY OF THIS LICENCE WITH THEM;

7. THAT ELECTROFISHING IS ONLY TO BE CONDUCTED FROM JUNE 1 TO SEPTEMBER 30 AND/OR WHEN WATER TEMPERATURES ARE BELOW 22 DEGREES CELSIUS.

It is a condition of this licence that the registration holder/licencee sign all pages of this document.

FISHER _____ DATE _____

AMENDMENT

Canada

REGISTRATION(S) AND/OR FISHING LICENCE(S)

This document authorizes the registration card holder and/or licence holder to engage in fishing and related activities on the Atlantic coast of Canada subject to the provisions of the Fisheries Act and Regulations made thereunder.

This licence and/or registration is issued under the authority of the Minister of Fisheries and Oceans Canada.

FIN 7-000140-06

_ STANTEC LIMITED
845 PROSPECT ST.
FREDERICTON, NB
E3B 2T7

CALENDAR YEAR 2011
ISSUANCE DATE: SEPTEMBER 16, 2011

HOMEPORT
25808 FREDERICTON

Licence #	Species	Areas	Licence Type	Gear Permitted	Amt	VRN	LOA

8. THAT ELECTROFISHING MAY BE CONDUCTED FROM JANUARY 1 TO DECEMBER 31 FOR FISH RESCUES ONLY;

9. THAT ANY PERSONS TRANSFERRING LIVE FISH OR INTRODUCING LIVE FISH INTO AQUATIC HABITAT MUST BE IN POSSESSION OF A SECTION 56 TRANSFER LICENCE ISSUED UNDER THE FISHERY GENERAL REGULATIONS WITH THE APPROVAL OF THE NOVA SCOTIA INTRODUCTIONS AND TRANSFERS COMMITTEES FOR TRANSFERS INTO OR WITHIN NOVA SCOTIA OR THE NEW BRUNSWICK INTRODUCTIONS AND TRANSFERS COMMITTEE FOR TRANSFERS INTO OR WITHIN NEW BRUNSWICK;

10. THAT, EXCEPT FOR THE TIME REQUIRED TO RECORD DATA, I.E., LENGTHS, WEIGHTS, SCALE OR FIN SAMPLES, ALL FISH MUST BE IMMEDIATELY RETURNED TO THE WATERS FROM WHICH THEY WERE TAKEN WITH THE LEAST POSSIBLE HARM;

11. THAT ANY FISH RETAINED AS PART OF, SCIENTIFIC ANALYSIS, REPRESENTATIVE SAMPLES AND/OR RESEARCH MUST BE PRESERVED AND RETAINED AT THE INSTITUTION CONDUCTING THE STUDIES OR DISPOSED OF IN A SANITARY MANNER AT THE END OF THE OPERATIONS;

12. THAT ANY FISH RETAINED FOR LIVE PUBLIC DISPLAY SPECIMENS MUST BE MAINTAINED IN AND PREVENTED ESCAPE FROM A CLOSED-CIRCULATION SYSTEM WITH STERILE DISPOSAL OF ALL EFFLUENT AND ALL DEAD SPECIMENS MUST BE DISPOSED OF IN A SANITARY MANNER;

13. THAT THIS LICENCE ALONE DOES NOT AUTHORIZE FISHING FOR SPECIES PROTECTED BY THE SPECIES AT RISK ACT (SARA) AND THAT ACTIVITIES TAKING PLACE IN LOCATIONS WHERE A SPECIES PROTECTED BY THE SARA IS KNOWN TO BE FOUND BE COMPLIANT WITH SARA, OR BE PERMITTED BY SECTION 73 OF SARA, OR BE EXEMPT THROUGH SECTION 83 OF SARA. AREAS THAT SPECIES PROTECTED BY SARA ARE KNOWN TO BE FOUND:
- THE WATERS OF MINAMKEAK LAKE, MILLIPSIGATE, HEBB LAKE, LUNENBURG CO., NS UPSTREAM FROM THE DAM AT ITS OUTLET, INCLUDING THE WATERS JOINING THESE LAKES KNOWN TO SUPPORT ATLANTIC WHITEFISH BUT NOT INCLUDING OTHER TRIBUTARIES TO THEM; AND
- LAKE UTOPIA, CHARLOTTE CO., NB AND TRIBUTARIES THEREOF KNOWN TO SUPPORT SPAWNING BY LAKE UTOPIA RAINBOW SMELT (SMALL-BODIED POPULATION); AND
- THE WATERS OF INNER BAY OF FUNDY RIVERS KNOWN TO SUPPORT ENDANGERED ATLANTIC SALMON AND TRIBUTARIES THEREOF;

14. THAT THE CONSERVATION AND PROTECTION OFFICE CLOSEST TO THE AREA OF OPERATIONS BE GIVEN AT LEAST 24 HOURS ADVANCE NOTIFICATION OF THE DETAILS AND LOCATIONS OF THE COLLECTIONS:

IN NEW BRUNSWICK:
" ST. GEORGE PH: 506-755-5000,
" SAINT JOHN PH: 506-636-5051
" FREDERICTON PH: 506-452-3018;

IN NOVA SCOTIA:
" SYDNEY PH: 902-564-2579
" TUSKET PH: 902-648-5000
" SHELBURNE PH: 902-875-2360
" BRIDGEWATER PH: 902-527-5574
" SHERBROOKE PH: 902-522-2832
" LIVERPOOL PH: 902-354-6030
" DARTMOUTH PH: 902-426-9010
" METEGHAN PH: 902-645-2045
" DIGBY PH: 902-245-2544
" BARRINGTON PH: 902-637-2851

15. THAT A COPY OF THIS LICENCE BE CARRIED DURING THE COLLECTIONS AND BE AVAILABLE FOR INSPECTION UPON REQUEST BY A FISHERY OFFICER;

16. THAT AN ANNUAL REPORT ON ACTIVITIES CONDUCTED UNDER AUTHORITY OF THIS LICENCE INCLUDING DATES, LOCATIONS, SPECIES CAUGHT, NUMBERS CAUGHT, WATER TEMPERATURES, MORTALITIES, CONCLUSIONS, ETC. MUST BE PROVIDED ELECTRONICALLY TO DR. ROSS CLAYTOR, POPULATION ECOLOGY DIVISION, DFO, E-MAIL: ROSS.CLAYTOR@DFO-MPO.GC.CA;

It is a condition of this licence that the registration holder/licencee sign all pages of this document.

FISHER _____ DATE _____

AMENDMENT

Canada

Fisheries and Oceans Canada | Pêches et Océans Canada

Document No: 11149077

REGISTRATION(S) AND/OR FISHING LICENCE(S)

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This licence and/or registration is issued under the authority of the Minister of Fisheries and Oceans Canada.

FIN 7-000140-06

_ STANTEC LIMITED
845 PROSPECT ST.
FREDERICTON, NB
E3B 2T7

CALENDAR YEAR 2011
ISSUANCE DATE: SEPTEMBER 16, 2011

HOMEPORT
25808 FREDERICTON

Licence #	Species	Areas	Licence Type	Gear Permitted	Amt	VRN	LOA

17. THAT THIS LICENCE IS VALID FROM DATE OF ISSUE UNTIL DECEMBER 31, 2011;

18. THAT ISSUANCE OF THIS LICENCE IMPLIES NO COMMITMENT BY THE MINISTER OR THE DEPARTMENT OF FISHERIES AND OCEANS TO REISSUE THE LICENCE IN SUBSEQUENT YEARS.

NOTE:
NOTHING IN THIS LICENCE SHALL BE CONSTRUED AS AUTHORITY UNDER THE SPECIES AT RISK ACT (SARA) TO KILL, HARM, HARASS, CAPTURE OR TAKE AN INDIVIDUAL OF A WILDLIFE SPECIES THAT IS LISTED AS "EXTIRPATED", "ENDANGERED" OR "THREATENED" AS IDENTIFIED IN SCHEDULE 1 OF SARA. IF THE ACTIVITY AUTHORIZED IN THIS LICENCE IS EXPECTED TO INTERACT WITH AN "EXTIRPATED", "ENDANGERED" OR "THREATENED" SPECIES, AN APPLICATION FOR A SECTION 73 SARA PERMIT CAN BE FOUND AT WWW.SARAREGISTRY.GC.CA AND SUBMITTED TO THE DFO SPECIES AT RISK MANAGEMENT DIVISION AT XMARSARA@DFO-MPO.GC.CA. FOR MORE INFORMATION ON SARA, INCLUDING A LIST OF PROTECTED SPECIES, PHONE 1-866-891-0771,VISIT WWW.SARAREGISTRY.GC.CA, OR CONTACT DFO SPECIES AT RISK MANAGEMENT DIVISION AT XMARSARA@DFO-MPO.GC.CA OR 902-426-4164.

The use of ALL of these licence(s) is subject to any conditions which are issued by D.F.O. The licence holder must ensure that they have received the licence conditions, and may NOT conduct any fishing activity with any of these licence(s) unless in receipt of the licence conditions.

It is a condition of this licence that the registration holder/licencee sign all pages of this document.

FISHER _____ DATE _____

AMENDMENT

Canada