

# 2014 Clinton Creek Surface Water Quality and Hydrological Monitoring Program Report

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 **HEMMERA**

**20**  
YEARS  
1994 – 2014

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## 1.0 INTRODUCTION

Hemmera and Ecological Logistics & Research Ltd. (Hemmera/ELR) were retained by the Yukon Government (YG), Assessment and Abandoned Mines (AAM) to conduct a water quality and hydrological monitoring program at the Clinton Creek Mine site in September 2014.

The Clinton Creek Mine Site (herein referred to as the Site) is an abandoned asbestos mine, formerly owned and operated by Cassiar Asbestos Corporation Limited from 1967 to 1978. Mining activities ceased in 1978 when the economic-value of the asbestos operations were exhausted (YG 2013). During operation, approximately 16 million tons of serpentinite rock containing 940,000 tonnes of white asbestos (known as chrysotile) were removed from three pits at the mine site. From 1978 to 1992, the company attempted to implement an abandonment plan and completed limited remedial activities at the Site. Since then, various weather events have destabilized creek channels and caused erosion on Site which has increased the potential for flooding. In 2002, the federal government implemented a stabilizing program at the Site under emergency provisions of the Yukon *Waters Act* (YG 2007) to mitigate further impacts. Upon devolution in 2003, AAM assumed responsibility and control of the care, maintenance and closure of the Site.

The purpose of this 2014 fall sampling program was to monitor the current status of water quality at the Site as part of the overall care, maintenance and closure program objectives for the Site.

### 1.1 SITE LOCATION AND HYDROLOGICAL SETTING

The Site is located approximately 75 kilometres (km) northwest of Dawson City (100 km by road), in the traditional territory of the Tr'ondëk Hwëch'in First Nation (**Figure 1.1**). The Site is within the Klondike Plateau Ecoregion of the Boreal Cordillera Ecozone (Smith et al. 1994), near the northern extent of the Klondike Plateau, at the edge of the Tintina Trench.

The Site falls within the drainage of the Forty Mile River, a tributary to the Yukon River. Clinton Creek flows through the Site from the west then continues southeast for approximately 8 km before flowing into the Forty Mile River. Tailings slumping into the valley have dammed Clinton Creek, forming Hudgeon Lake (**Figure 1.2**). The four tributaries of Clinton Creek at or near the Site are as follows:

- Easter Creek which flows into Hudgeon Lake;
- Porcupine Creek and Wolverine Creek which flow through the Site to Clinton Creek from the south and north, respectively; and,
- Eagle Creek which flows into Clinton Creek from the north, downstream from the Site.

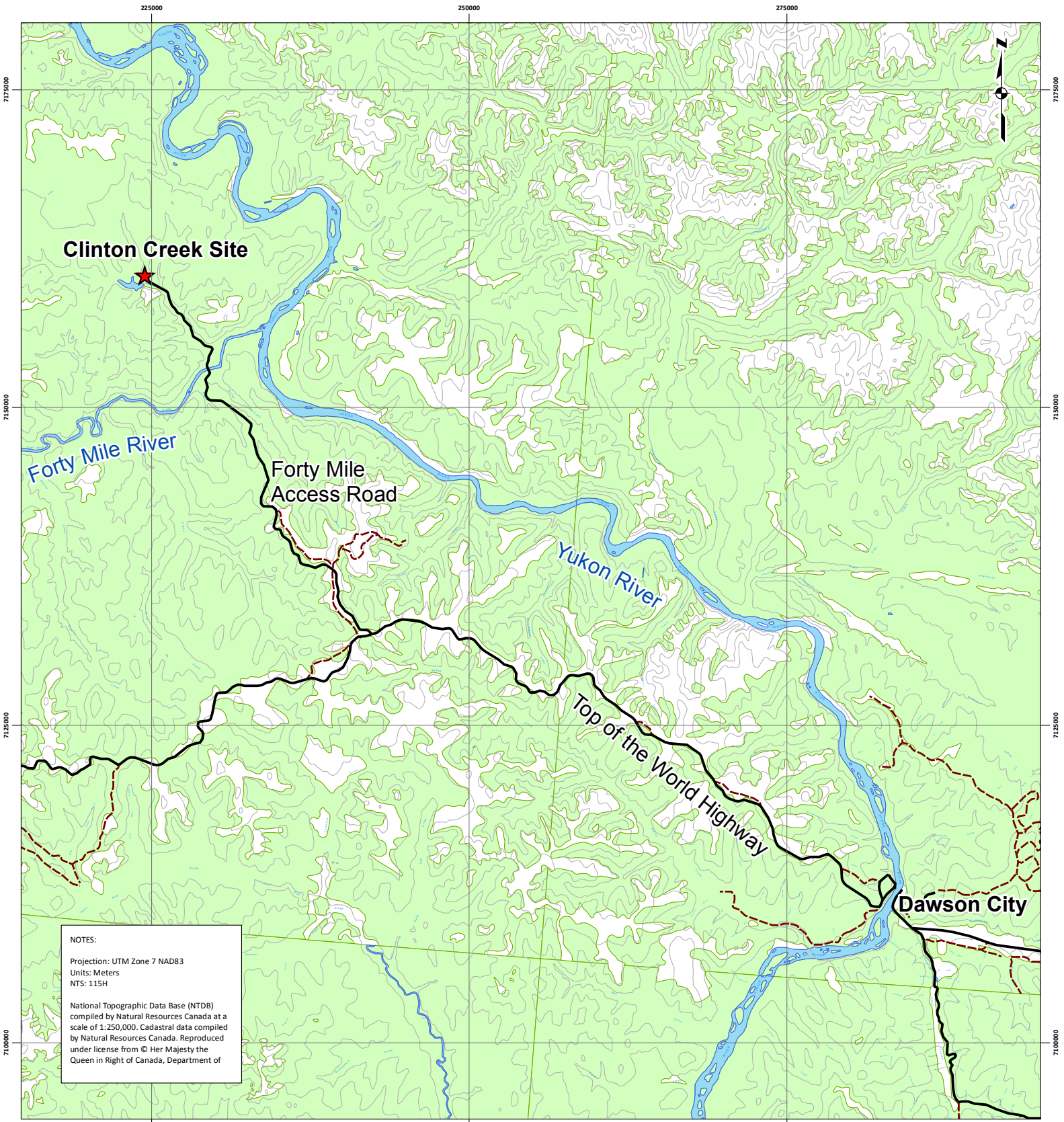
Slumping tailings have interrupted the flow of Wolverine Creek creating two ponds (**Figure 1.2**). Past mining activities have also formed two pit lakes: Porcupine Pit Lake and Snowshoe Pit Lake.

## 1.2 2014 MONITORING PROGRAM SCOPE

In accordance with the documented *Scope of Work: Clinton Creek Surface Water Quality and Hydrology Monitoring (September 2014)* provided to ELR by AAM, the 2014 monitoring program focused on recording current water quality and hydrological conditions at the Site during the fall of 2014. The scope of work included:

- Conducting surface water quality sampling at 18 designated sample sites and establishment of a new reference site. Field parameters and samples for laboratory analysis were collected at each sample site;
- Measuring stream discharge at sample sites where flowing water was present.
- Shipping samples to an accredited laboratory for analysis according to requirements established by AAM;
- Summarizing data from the field and laboratory program; and,
- Preparing a report that outlines the sampling program and presents the raw data.

This report summarizes the monitoring activities and the methods used to complete the field program, describes sample sites, summarizes data, including the quality assurance/quality control (QA/QC) program, and provides a summary of the overall success of the program.



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Client:

**Legend**

- Clinton Creek Site
- Road
- Limited-use road
- Wetlands
- Waterbodies
- Vegetation

Scale: 1:400,000

## 2014 Clinton Creek Monitoring Program

Figure 1.1  
Project Area Overview

Date: Dec.15, 2014	Drawn by: AN
ELR Project #: 14-183	Rev. #: 1
Hemmera Project #: 1343-005.04	

### 1.3 2014 PROGRAM SAMPLE SITES

A total of 18 sites were sampled during the sampling program, including six (6) reference surface water sites, seven (7) exposed surface water sites, and five (5) exposed groundwater seepage sites. Reference sites were located on watercourses upstream from the Site that were not considered to be influenced by Site infrastructure or activities. Exposed sites included watercourses and water bodies under the influence of Site infrastructure (e.g. waste rock or tailings), and sites downstream of the Site that were considered to be part of the receiving environment.

Due to on-Site safety concerns, sampling was not conducted in 2014 at the Porcupine Pit Lake (PL) site. Access to this site follows a roadway which begins in high ground on the northeast portion of the Site and descends along the southeast edge of the pit towards the sample site. There was evidence of numerous rock falls along the length of the roadway, including one directly at the sample site. No other access route was identified that would provide safe access. Photos of the Porcupine Pit Lake taken during the site assessment are provided in **Appendix 1**.

Also, due to safety concerns, the location of exposure Site E1 (Clinton Creek downstream of gabions) was moved approximately 400 metres (m) downstream of its original location. The original location of Site E1, provided in the Scope of Work, was upstream of the primary ford, which was in a hazardous area according to the document *Clinton Creek – Site Hazards* (AAM, 2014) provided to Hemmera/ELR by AAM. Following a discussion with and approval from AAM staff, the sample location was moved downstream of the primary ford crossing (**Figure 1.2**).

In addition to five (5) previously established reference sites in the program, Hemmera/ELR also established a new reference site on Porcupine Creek up-gradient of the Site. The new reference site was recommended in the 2013 sampling program report to assess the potential influence of the mining area on Clinton Creek, in particular in the area of numerous seeps (GWCC 1 through 5).

A summary of the sample sites including field-verified UTM locations, a description of the sites, and a summary of the sampling conducted at each sampling site is provided in **Table 1.1** below. The locations of sample sites are shown in **Figures 1.2** and **1.3**.



**Table 1.1 Sample Site Descriptions and Locations**

Site Type	Water Type	Site Code	Sampling Conducted	Site Description	Location (UTM, Zone 7N)	
					Easting	Northing
Reference	Surface Water	R1	Water Quality, Hydrology	Clinton Creek upstream of Hudgeon Lake	510718	7147525
		R2	Water Quality, Hydrology	Easter Creek upstream of Hudgeon Lake	512023	7148061
		R3	Water Quality, Hydrology	Wolverine Creek, upstream of tailings	513952	7148677
		R4	Water Quality, Hydrology	Eagle Creek, upstream of culvert	515981	7145344
		R6	Water Quality	Forty Mile River, upstream of Clinton Creek	519437	7141958
		R7	Water Quality, Hydrology	Porcupine Creek, upstream of waste rock	513026	7145669
		Exposed	PL	Not Sampled	Porcupine Pit Lake from shore	-
SL			Water Quality	Snowshoe Pit Lake from shore	513824	7146703
E1			Water Quality, Hydrology	Clinton Creek downstream of gabions	513645	7147111
E2			Water Quality, Hydrology	Clinton Creek, downstream of Porcupine Creek but upstream of Wolverine Creek	514149	7147076
E3			Water Quality, Hydrology	Wolverine Creek, upstream of culvert	514178	7147189
E4			Water Quality, Hydrology	Clinton Creek downstream of Wolverine Creek but upstream of Eagle Creek	515950	7145287
E7			Water Quality, Hydrology	Clinton Creek near mouth	519400	7142042
E8			Water Quality	Forty Mile River downstream of Clinton Creek	519457	7142788
Groundwater Seep	GWCC-1		Water Quality	Toe of the Waste Rock dump flowing into ponded area at Porcupine Creek	513902	7146960
	GWCC-2		Water Quality	Toe of the Waste Rock dump flowing into ponded area approx. 10 m northwest of GWCC-1	513899	7146968
	GWCC-3		Water Quality	Toe of the Waste Rock dump flowing into side channel, approx. 10 m northwest of GWCC-2	513882	7147038
	GWCC-4	Water Quality	Toe of the Waste Rock dump flowing into side channel, approx. 10 m northwest of GWCC-3	513868	7147052	
	GWCC-5	Water Quality, Hydrology	Groundwater flows in old Clinton Creek channel	513984	7147127	

# 2014 Clinton Creek Surface Water Quality and Hydrological Monitoring Program



Client:



## Legend

### Sampling Conducted

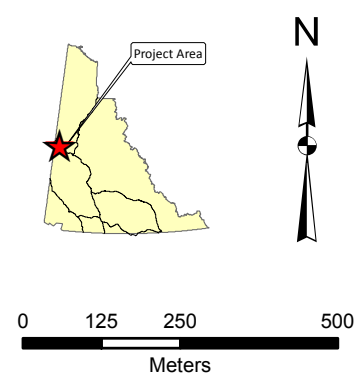
- ▲ Water Quality
- Water Quality & Hydrology

### Water Type

- Surface Water
- Ground Water Seepage

### Site Type

- Exposed
- Reference



**FIGURE 1.2**

Sampling Locations  
Site Area

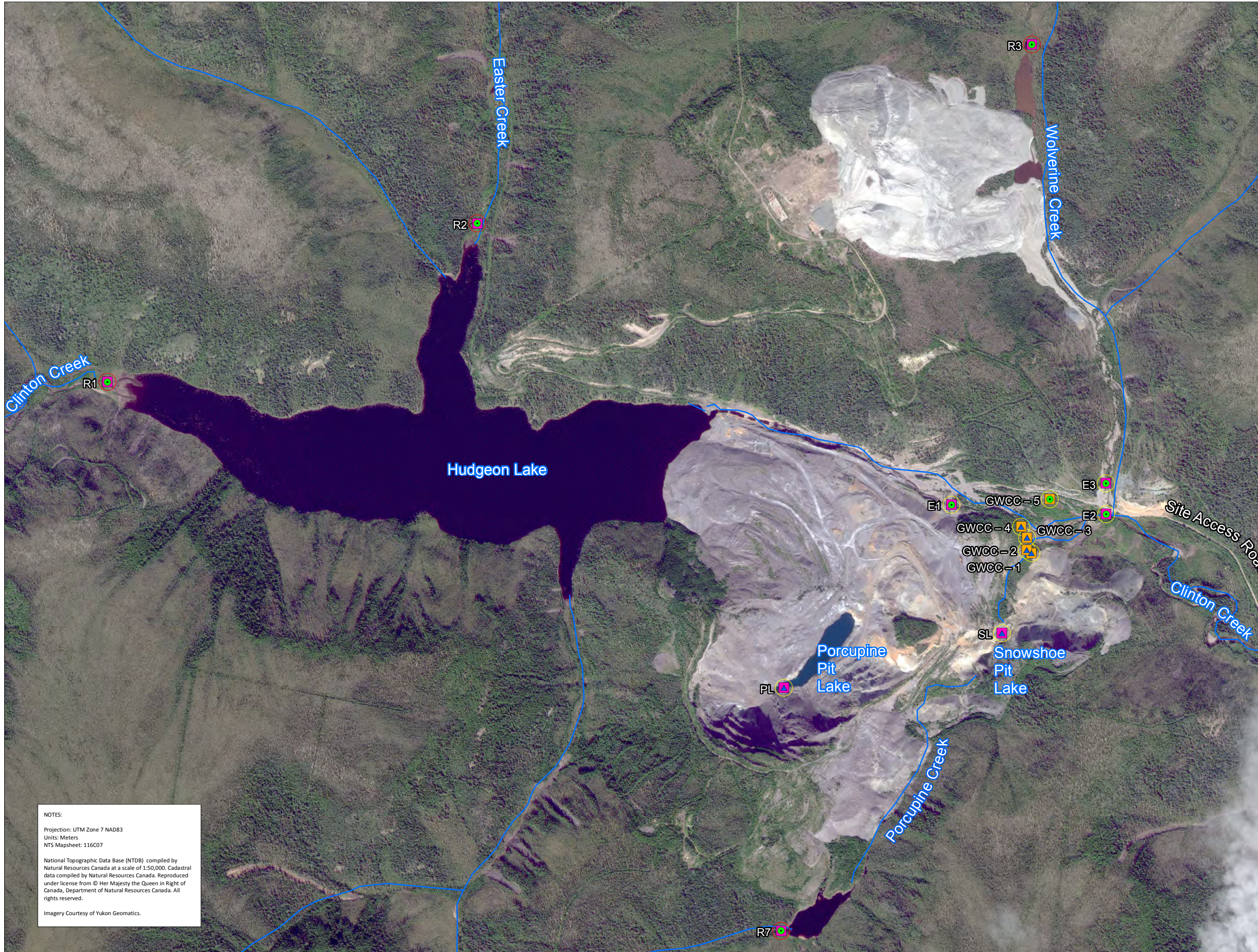
Date: Dec.15, 2014

Scale: 1:12,000

ELR Project #: 14-183

Rev. #: 2

Hemmera Project #: 1343-005.04



NOTES:  
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**2014 Clinton Creek  
Surface Water Quality  
and Hydrological  
Monitoring Program**



**Legend**

**Sampling Conducted**

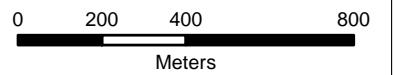
- ▲ Water Quality
- Water Quality & Hydrology

**Water Type**

- Surface Water
- Ground Water Seepage

**Site Type**

- Exposed
- Reference



NOTES:  
 Projection: UTM Zone 7 NAD83  
 Units: Meters  
 NTS Mapsheet: 116C07  
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**FIGURE 1.3**  
 Sampling Locations  
 Forty Mile River Area

Date: Dec. 15, 2014	Scale: 1:18,000
ELR Project #: 14-183 Hemmera Project #: 1343-005.04	Rev. #: 2

## 2.0 METHODS

Two Hemmera/ELR staff (Andrew Brown and Aaron Nicholson) completed the surface water quality and hydrological field program from September 19 to 23, 2014. Specific methods used in sampling are summarized in the following sections.

### 2.1 SURFACE WATER QUALITY SAMPLING

#### 2.1.1 Field Data Collection

Surface water quality sampling was conducted in accordance with *Standard Methods for the Examination of Water and Wastewater* (Rice et al., 2012). Field *in-situ* water quality parameters were measured and laboratory analytical samples were collected at each sample site, as described below.

Upon arriving at each sample site, the following field *in-situ* water quality data were collected and recorded using a YSI Professional Plus Water Quality Meter:

- Water temperature (°C);
- pH (pH units);
- Conductivity and Specific Conductivity ( $\mu\text{s}/\text{cm}$ ); and,
- Dissolved oxygen (mg/L and percent saturation).

Following the collection of field *in-situ* parameters at each site, samples for laboratory analysis were collected. Samples were collected directly into laboratory-supplied containers, and were field filtered and/or preserved according to laboratory instructions. The laboratory analytical bottle set for the 2014 monitoring program included seven bottles for each site, as detailed in **Table 2.1** (using Site R1 as an example), below. Nitric acid ( $\text{HNO}_3$ ) was used as a preservative for metals (dissolved and total), hydrochloric acid (HCl) was used to preserve samples for ultra-trace mercury testing, and sulphuric acid ( $\text{H}_2\text{SO}_4$ ) was used as a preservative for certain nutrient parameters and dissolved organic carbon (DOC).

**Table 2.1 Analytical Sampling Bottle Set Summary**

Site Name (Example)	Bottle Number	Bottle Size	Bottle Type	Parameter Analyzed	Sample Treatment	Preservative Added
R1	1 of 7	125 ml	Plastic	Low Level Dissolved Metals and Hardness	Field Filtered and Preserved	HNO <sub>3</sub>
R1	2 of 7	125 ml	Plastic	Low Level Total Metals and Hardness	Preserved	HNO <sub>3</sub>
R1	3 of 7	40 ml	Glass	Dissolved Mercury	Preserved	HCl
R1	4 of 7	40 ml	Glass	Total Mercury	Preserved	HCl
R1	5 of 7	250 ml	Glass	Nitrate, Nitrite, Ammonia-N and Total Phosphorous	Preserved	H <sub>2</sub> SO <sub>4</sub>
R1	6 of 7	1L	Plastic	Total Suspended Solids (TSS), Sulphate	-	None
R1	7 of 7	125 ml	Glass	Dissolved Organic Carbon (DOC)	Field Filtered and Preserved	H <sub>2</sub> SO <sub>4</sub>

At each sampling site, UTM coordinates were recorded using a Garmin Map 62s handheld GPS. The general condition and description of each site was recorded, including any identifiable features or conditions that may have influenced water quality results. Photos were taken at each site reference purposes and to record sampling conditions. Photos were taken facing upstream, facing downstream, and facing across the sample site at each location.

### 2.1.2 Sample Care and Shipping

Samples were placed into coolers immediately following water collection and were kept cool with ice. Samples were either transported by Hemmera/ELR or shipped via Air North under chain of custody and using custody seals to ALS Global laboratories in Whitehorse, Yukon for analysis.

### 2.1.3 Laboratory Analysis

All surface water quality samples collected during the program were received by the analytical laboratory within 72 hours of sampling, and all primary analyses were conducted within laboratory hold time limits.

Laboratory analyses for the surface water quality monitoring program employed a variety of laboratory methods to determine the various water quality parameters required under this monitoring program. Specific methods were selected to ensure that reportable detection limits (RDL) were less than the Canadian Council of Ministers on the Environment (CCME) *Water Quality Guidelines for Protection of Aquatic Life* (CCME-PAL), where applicable (CCME 2014).

## **2.1.4 QA/QC Program for Laboratory Analytical Sampling**

QA/QC methods were employed during the surface water quality monitoring program to confirm the precision of program with respect to sample contamination, sampling error or laboratory error.

### **2.1.4.1 Duplicate and Blank Samples**

As prescribed in the SOW, two blind duplicate samples, one field blank sample, and one travel blank sample were included in the program.

Blind duplicate samples were collected in the field at Sites E1 and GWCC-3. The results of these duplicates were compared with the results for corresponding sample sites to determine whether errors in laboratory analysis may have occurred or whether field or laboratory contamination may have been present.

One field blank was prepared at Site GWCC-3, which involved filling a program bottle set with deionized water. All handling, filtering, and preserving was conducted in the same manner as the sampling sites. The field blank was collected for the purpose of detecting contamination during the field sampling process.

One travel blank was prepared at the laboratory using deionized water. The travel blank was stored, handled, and transported in the same manner as the field samples in order to assess whether any contamination may have occurred during the transport or storage of samples.

Duplicate samples were compared with corresponding test samples to determine whether results varied significantly, thereby indicating potential contamination or errors in the field program. This analysis used the calculation of relative percent difference (RPD), where an RPD value exceeding 20% is considered to indicate significant differences between corresponding samples.

RPD is calculated according to the following formula:

$$RPD = \frac{Result\ 1 - Result\ 2}{[(Result\ 1 + Result\ 2)/2]} \times 100\%$$

### **2.1.4.2 Field Sampling QA/QC**

Hemmera/ELR employed the following methods during field sampling to help ensure the integrity of data:

- Samplers used new nitrile gloves at each sampling site;
- All sample bottle sets were pre-labeled prior to sampling with location, analyte, and sample preservation method information. Field site data was confirmed in the field and date/time was recorded on bottle labels at the time of sampling;

- Detailed field data sheets and checklists were used to track sample collection at each sample site;
- Disposable 60 mm syringes and disposable 40 µm luer-lock filters were used for field filtering of samples. New syringes and filters (from individually sealed packages) were used at each sample site;
- Samples were preserved immediately upon collection, where required by the laboratory;
- Samples were kept cool with ice during transportation to the laboratory; and
- The field water quality multimeter was calibrated prior to field sampling, and checked against established standards to ensure correct operation.

## **2.2 STREAM HYDROLOGICAL MONITORING**

### **2.2.1 Field Data Collection**

Hemmera/ELR used a velocity-area method to measure discharge at surface water bodies during the monitoring program. Total discharge was calculated using the area and velocity from a series of point measurements taken across the stream at each location.

During the monitoring program, Hemmera/ELR chose hydrological monitoring locations at each sample site that were well suited to flow and velocity measurements (i.e., a straight channel with relatively flat stream bed and little vegetation or rocks, and few back-eddies that could hinder flow meter measurements). At each site, a cross section was established, and the active stream channel width was determined using a tape measure fixed to the top of the bank on each side. The stream was then divided into a series of sections (referred to as panels), where individual velocity and depth measurements were recorded. Stream channel widths were divided by 20 to establish the location of flow gauging panels. The number of panels was further reduced in cases where the resulting panel widths were less than 6.0 cm. At each point across the stream cross section and water depth was measured and mean flow was measured (at 60% depth) using a Swoffer Model 2100 Series Current Velocity Meter.

### **2.2.2 QA/QC Program for Hydrology Field Measurements**

Two sets of measurements were collected at each stream crossing location. The first crossing was used to establish the station locations and data, and the second crossing was used to collect a duplicate set of data for QA/QC purposes (to ensure station readings were accurate and that no significant variance between the two measurements sets had occurred).

### **2.2.3 Data Analysis**

For each sampling point (panel) at a crossing location (sample site), stream discharge ( $Q$ ;  $\text{m}^3/\text{s}$ ) was calculated by multiplying the cross sectional area of the panel (width of panel x mean depth;  $A$ ;  $\text{m}^2$ ) by the measured velocity ( $V$ ;  $\text{m}/\text{s}$ ), according to the following formula:

$$Q = AV$$

The total discharge for a sample site was then calculated by summing the discharge of all panels for each stream crossing location.



### 3.0 RESULTS

#### 3.1 SURFACE WATER QUALITY SAMPLING

##### 3.1.1 Field *In-Situ* Water Quality Results

Field *in-situ* water quality monitoring results are presented below in **Table 3.1**, with CCME-PAL exceedances shown in bold italic text. Photographs of monitoring sites are provided in **Appendix 1**.

**Table 3.1 Water Quality Field Parameter Results.**

Site	Water Temperature (°C)	pH (pH units)	Conductivity (µs/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%Sat.)
<b>CCME-PAL Guideline Levels<sup>†</sup></b>					
		<b>6.5-9.0</b>	-	<b>5.5<sup>‡</sup></b>	-
<b>Reference Sites</b>					
R1	1.9	-	386.6	13.05	100.0
R2	1.8	-	353.6	13.10	100.4
R3	2.1	7.41	465.3	10.67	77.5
R4	3.4	7.47	448.6	13.08	104.6
R6	6.1	7.58	157.8	10.02	80.8
R7	1.8	<b>6.12</b>	113.3	10.15	72.8
<b>Exposed Sites</b>					
PL	-	-	-	-	-
SL	7.1	7.82	1014.0	13.06	114.2
E1	7.6	7.76	327.0	11.11	99.3
E2	8.3	7.39	504.0	<b>1.81</b>	16.6
E3	5.8	7.67	492.3	11.98	101.5
E4	8.2	7.26	547.0	11.25	101.6
E7	6.2	7.69	511.0	9.66	78.2
E8	5.8	7.71	153.9	10.16	81.2
GWCC-1	4.1	7.24	1434.0	<b>3.57</b>	27.3
GWCC-2	5.6	7.33	1156.0	5.71	45.7
GWCC-3	7.9	7.17	629.0	<b>4.45</b>	36.6
GWCC-4	9.3	7.27	502.0	<b>1.88</b>	16.3
GWCC-5	7.2	7.25	589.0	<b>3.36</b>	29.9

**Notes**

† Bold italic text indicates an exceedance of the CCME-PAL guideline level.

‡ Guideline level represents a minimum recommended value.

Surface water temperatures ranged from 1.9°C to 9.3°C. pH levels were relatively consistent and ranged from 6.12 to 7.82. pH levels measured at the reference site R7 were slightly acidic (6.12 pH) and below the CCME-PAL guideline range during the time of sampling. As discussed in previous communications with AAM, the field crew had calibration issues with the YSI pH sensor during sampling of two reference locations (R1 and R2). Due to the remoteness of the sites, AAM did not advise revisiting these sites to complete in-situ measurements. Field pH is therefore not provided for these two locations.

Surface water conductivity varied significantly between sites (**Table 3.1**). Reference site conductivity ranged between 113.3 µs/cm (R7) and 465.3 µs/cm (R3), with the lowest observed values found on the Forty Mile River (R6) and Porcupine Creek (R7).

Exposed stream sites ranged in conductivity from 327 µs/cm (E1) to 1434 µs/cm (GWCC-1). Exposed site conductivity was generally highest at the groundwater seepage sites GWCC-1 and GWCC-2 (1434 and 1156 µs/cm, respectively) as well as in Snowshoe Pit Lake (SL; 1014 µs/cm).

Measured concentrations of dissolved oxygen ranged from 1.81 mg/L (E2) to 13.1 mg/L (R2) at surface water sites (both reference and exposed), with only the lowest observed value being less than CCME-PAL guidelines (E2). The dissolved oxygen measured at four of five groundwater seepage sites was less than the CCME-PAL minimum of 5.5 mg/L, likely due to these sites being groundwater discharge locations. As such, dissolved oxygen levels are expected to increase downstream of the groundwater seeps. Recorded values at sites GWCC-1, GWCC-2, GWCC-3, GWCC-4 and GWCC-5 were 3.57 mg/L, 5.71 mg/L, 4.45 mg/L, 1.88 mg/L and 3.36 mg/L respectively.

### **3.1.2 Laboratory Analytical Water Quality Results**

Laboratory analytical results are summarized in **Tables 3.2** through **3.4**, below. General, physical, and nutrient (non-metal) results are summarized in **Table 3.2**, total metal results are summarized in **Table 3.3**, and dissolved metal results are summarized in **Table 3.4**. Exceedances for CCME-PAL guidelines are shaded within those tables. Laboratory analytical results are presented further below with comparison to CCME-PAL guidelines. For sample sites where pH values were not collected (Sites R1 and R2) the most stringent CCME-PAL pH dependent guideline was applied (i.e., ammonia and aluminum).

For sites where duplicate samples were collected, test and duplicate samples were compared relative to the lab QA/QC analysis threshold of 20% RPD. These QA/QC results are provided in **Tables 3.5 – 3.7** and are described below.

### **3.1.2.1 Reference Sites**

#### **Site R1**

The concentrations of total aluminum and dissolved aluminum at Site R1 were 0.129 mg/L and 0.0132 mg/L, respectively. pH was not measured at Site R1, and the CCME-PAL guideline for aluminum is pH dependent. The concentration of total aluminum exceeded the highest CCME-PAL guideline of 0.1 mg/L (regardless of pH level). The concentration of dissolved aluminum of 0.0132 mg/L exceeded the most conservative CCME-PAL guideline level of 0.005 mg/L (where pH is less than 6.5), but was less than the guideline of 0.1 mg/L (where pH is greater than 6.5). Considering pH levels observed during the 2013 Clinton Creek Monitoring Program at sample site R1 (8.04), an exceedance of dissolved aluminum in 2014 is considered to be unlikely.

The concentration of total iron and dissolved iron at Site R1 was 0.597 mg/L and 0.310 mg/L, respectively, both exceeding the CCME-PAL guideline of 0.3 mg/L.

The concentration of total selenium and dissolved selenium at Site R1 was 0.0033 mg/L and 0.00378 mg/L, both exceeded the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site R1.

#### **Site R2**

The concentration of total aluminum and dissolved aluminum at Site R2 was 0.0714 mg/L and 0.0181 mg/L. pH was not measured at Site R2, and the CCME-PAL guideline for aluminum is pH dependent. The concentrations of total and dissolved aluminum exceeded the most conservative CCME-PAL guideline of 0.005 mg/L (where pH is less than 6.5), but did not exceed the guideline of 0.1 mg/L where pH is greater than 6.5. Considering pH levels observed during the 2013 Clinton Creek Monitoring Program at sample site R2 (7.70), exceedances of total and dissolved aluminum in 2014 are considered unlikely.

The concentration of total iron at Site R2 was 0.316 mg/L, exceeding the CCME-PAL guideline of 0.3 mg/L.

No other non-metal or metal parameters exceeded CCME-PAL guidelines at Site R2.

#### **Site R3**

The concentration of total aluminum at Site R3 was 0.307 mg/L, exceeding the CCME-PAL guideline of 0.1 mg/L for pH greater than 6.5 (the pH measured at the site was 7.41).

The concentration of total iron at Site R3 was 1.05 mg/L, exceeding the CCME-PAL guideline of 0.3 mg/L.

The concentration of total chromium at Site R3 was 0.0012 mg/L, exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site R3.

#### **Site R4**

The concentration of total and dissolved selenium at Site R4 was 0.00291 mg/L and 0.00305 mg/L, respectively, both exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site R4.

#### **Site R6**

The concentration of total aluminum at Site R6 was 0.118 mg/L, exceeding the CCME-PAL guideline of 0.1 mg/L for pH is greater than 6.5 (the pH measured at the site was 7.58).

The concentration of total iron and dissolved iron at Site R6 was 0.44 mg/L and 0.363 mg/L, respectively, both exceeding the CCME-PAL guideline of 0.3 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site R6.

#### **Site R7**

The concentration of total aluminum and dissolved aluminum at Site R7 was 0.523 mg/L and 0.116 mg/L, respectively, both exceeding the CCME-PAL guideline of 0.005 mg/L for pH levels below 6.5 (the pH measured at the site was 6.12). pH levels at Site R7 were also below the CCME-PAL guideline range of 6.5-9.0.

The concentration of total and dissolved copper at Site R7 was 0.00533 mg/L and 0.00455 mg/L, respectively, both exceeding the hardness dependent CCME-PAL guideline of 0.00264 mg/L for a total hardness of 114 mg/L.

The concentration of total and dissolved chromium at Site R7 was 0.00232 mg/L and 0.00146 mg/L, respectively, both exceeding the CCME-PAL guideline of 0.001 mg/L.

The concentration of total iron and dissolved iron at Site R1 was 2.01 mg/L and 1.3 mg/L, respectively, both exceeding the CCME-PAL guideline of 0.3 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site R7.

### **3.1.2.2 Exposed Sites**

#### **Site E1**

The concentration of total and dissolved selenium at Site E1 was 0.00141 mg/L and 0.00148 mg/L, respectively, exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site E1.

#### **Site E2**

The concentration of total and dissolved iron at Site E2 was 0.374 mg/L and 0.303 mg/L, respectively, both exceeding the CCME-PAL guideline of 0.3 mg/L.

The concentration of total and dissolved selenium at Site E2 was 0.00144 mg/L and 0.00144 mg/L, respectively, exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site E2.

#### **Site E3**

The concentration of total iron at Site E3 was 0.341 mg/L, exceeding the CCME-PAL guideline of 0.3 mg/L.

The concentration of total chromium at Site E3 was 0.00104 mg/L, exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site E3.

#### **Site E4**

The concentration of total iron at Site E4 was 0.328 mg/L, exceeding the CCME-PAL guideline of 0.3 mg/L.

The concentration of total and dissolved selenium at Site E4 was 0.00123 mg/L and 0.00128 mg/L, respectively, exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site E4.

#### **Site E7**

The concentration of total iron at Site E7 was 0.308 mg/L, exceeding the CCME-PAL guideline of 0.3 mg/L.

The concentration of dissolved selenium at Site E7 was 0.00105 mg/L, exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site E7.

#### **Site E8**

The concentration of total aluminum at Site E8 was 0.134 mg/L, exceeding the CCME-PAL guideline of 0.1 mg/L for pH greater than 6.5 (the pH measured at the site was 7.71).

The concentration of total iron at Site E8 was 0.344 mg/L, exceeding the CCME-PAL guideline of 0.3 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site E8.

#### **Site SL**

The concentration of total and dissolved arsenic at Site SL was 0.0152 mg/L and 0.0148 mg/L respectively, both exceeding the CCME-PAL guideline of 0.005 mg/L.

The concentration of total chromium at Site SL was 0.00156 mg/L, exceeding the CCME-PAL guideline of 0.001 mg/L.

The concentration of total and dissolved selenium at Site SL was 0.0105 mg/L and 0.0103 mg/L respectively, both exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site SL.

#### **Site GWCC-1**

The concentration of total and dissolved chromium at Site R7 was 0.00247 mg/L and 0.00232 mg/L, respectively, both exceeding the CCME-PAL guideline of 0.001 mg/L.

The concentration of total and dissolved selenium at Site GWCC-1 was 0.00412 mg/L and 0.00422 mg/L respectively, both exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site GWCC-1.

#### **Site GWCC-2**

The concentration of total and dissolved chromium at Site R7 was 0.00173 mg/L and 0.00164 mg/L, respectively, both exceeding the CCME-PAL guideline of 0.001 mg/L.

The concentration of total and dissolved selenium at Site GWCC-2 was 0.00338 mg/L and 0.00363 mg/L respectively, both exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site GWCC-2.

#### **Site GWCC-3**

The concentration of total and dissolved selenium at Site GWCC-3 was 0.00143 mg/L and 0.00148 mg/L respectively, both exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site GWCC-3.

#### **Site GWCC-4**

No reported parameters exceeded CCME-PAL guidelines at Site GWCC-4.

#### **Site GWCC-5**

The concentration of total and dissolved selenium at Site GWCC-5 was 0.00475 mg/L and 0.00501 mg/L respectively, both exceeding the CCME-PAL guideline of 0.001 mg/L.

No other reported parameters exceeded CCME-PAL guidelines at Site GWCC-5.

**Table 3.2 Laboratory Analytical Results Summary for Non-Metal Parameters**

Parameter	Units	CCME-PAL	Surface Water – Reference Sites						Surface Water – Exposed Sites								Groundwater – Exposed Sites				
			R1	R2	R3	R4	R6	R7	E1	E2	E3	E4	E7	E8	PL	SL	GWCC-1	GCWW-2	GWCC-3	GWCC-4	GWCC-5
			20/09/2014	20/09/2014	22/09/2014	19/09/2014	21/09/2014	22/09/2014	19/09/2014	19/09/2014	19/09/2014	19/09/2014	21/09/2014	21/09/2014		20/09/2014	21/09/2014	21/09/2014	21/09/2014	21/09/2014	19/09/2014
Total Hardness (calculated as CaCO <sub>3</sub> )	mg/L	-	401	370	499	448	130	114	278	433	465	473	486	126	-	990	1660	1230	637	431	541
Total Suspended Solids (TSS)	mg/L	Varies <sup>†</sup>	6	<3.000	12.7	<3.000*	<3.000*	27.3	<3.000*	<3.000*	<3.000*	<3.000*	<3.000*	<3.000*	-	4	<3.000*	<3.000*	<3.000*	<3.000*	<3.000*
Nitrate	mg/L	13	0.162	0.0402	0.0633	0.113*	0.0859*	0.145	0.152*	0.138*	0.126*	0.103*	0.103*	0.0954*	-	<0.050	0.44*	0.396*	0.176*	0.0729*	<0.025*
Nitrite	mg/L	0.06	0.0011	<0.001	0.0015	<0.001*	<0.001*	<0.001	0.0016*	0.0011*	0.0013*	<0.001*	<0.001*	<0.001*	-	<0.010	<0.020*	<0.010*	<0.010*	<0.001*	<0.005*
Sulfate (SO <sub>4</sub> )	mg/L	-	220	172	304	235*	50.2*	45.3	139*	252*	261*	268*	271*	50.1*	-	721	1340*	929*	412*	231*	281*
Ammonia	mg/L	Varies <sup>‡</sup>	0.031	0.0082	0.0244	0.0175	0.0065	0.0306	0.0107	0.0128	0.0063	0.0054	0.0063	0.0067	-	<0.005	0.0077	<0.005	<0.005	<0.005	0.0062
Total Kjeldahl Nitrogen	mg/L	-	0.368	0.238	0.441	0.378	0.335	0.846	0.418	0.428	0.411	0.394	0.399	0.339	-	0.216	0.157	0.222	0.259	0.288	0.235
Dissolved Organic Carbon	mg/L	-	12.7	9.89	12.7	12.9	11.1	27.2	16.8	15	13.5	14.3	13.9	11.2	-	7.79	5.43	7.16	9.45	10.9	8.31
Total Phosphorus	mg/L	-	0.0064	0.0063	0.0165	0.0036	0.0033	0.0295	0.005	0.0043	0.0093	0.0055	0.004	0.0027	-	0.0034	<0.002	<0.002	<0.002	<0.002	0.0026

**Notes:**

CCME-PAL: Canadian Council of Ministers of the Environment, Water Quality Guidelines for the Protection of Aquatic Life (Freshwater), updated to November 2014.

- = No standard or not analyzed

Shaded text indicates results that exceeded the applicable CCME-PAL guideline level.

<sup>†</sup> CCME-PAL guideline for TSS exposure is a maximum increase of 25 mg/L above baseline for up to 24 hours, or a maximum increase of 5 mg/L above baseline lasting between 24 hours and 30 days.

<sup>‡</sup> Ammonia varies with pH and temperature for CCME PAL; see the CCME ammonia fact sheet for details regarding the applicable criteria, ammonia-NH<sub>3</sub> versus total ammonia-N. CCME values listed in the fact sheet table are expressed as ammonia (N). When field or lab pH are both not available, the most stringent guideline has been used.

\*Indicates the collection day/time varies in relation to other analysis at this site. Due to holding time constraints, general chemistry samples (including analysis of TSS, nitrate, nitrite, and sulfate) in some cases were collected the following day (e.g. the majority of R4 samples were collected on Sept.19, whereas general chemistry samples for R4 were collected on Sept.20). Detailed sampling times and dates are provided on the analytical laboratory reports.







### **3.1.3 Water Quality Monitoring QA/QC Review**

Duplicate laboratory analytical samples were collected at Sites E1 and GWCC-3, using the same methods for collection and treatment (application of preservative and/or filtration). Comparative results between duplicate and corresponding test samples are summarized in **Tables 3.5, 3.6, and 3.7**, below. Instances where the duplicate results and the test results exceeded the acceptable RPD limit of 20% are shaded within the tables, and discussed in the following sections. Field and travel blank sample results are provided for comparison.

#### **3.1.3.1 QA/QC for Non-Metal Parameters**

##### **Site E1 / Duplicate 1**

The RPD values for all corresponding pairs of results between Site E1 and DUP1 were less than the 20% QA/QC threshold, indicating that sampling error or laboratory error did not occur (**Table 3.5**).

##### **Site GWCC-3 / Duplicate 2**

The RPD values for all corresponding pairs of results between Site GWCC-3 and DUP2 were less than the 20% QA/QC threshold, indicating that sampling error or laboratory error did not occur (**Table 3.5**).

##### **Field Blank and Travel Blank**

A reported total Kjeldahl nitrogen (TKN) concentration of 1.59 mg/L for the field blank exceeded the RDL of 0.05 mg/L. Furthermore, a reported dissolved organic carbon concentration of 51.2 mg/L for the field blank exceeded the RDL of 2.5 mg/L (Discussed in **Section 4.1.1**).

The measured ammonia concentration in the travel blank was 0.0096 mg/L, slightly exceeded the RDL of 0.005 mg/L.

All other analytical results of the field blank and travel blank were less than or near RDL values for non-metal parameters (**Table 3.5**).

**Table 3.5 Comparison of Duplicate and Blank Results for Non-Metal Parameters**

Parameter	Units	Surface Water – Exposed			Seep – Exposed			Blanks <sup>3</sup>	
		Site E1	Duplicate (DUP1)	RPD <sup>1</sup>	GWCC -3	Duplicate (DUP2)	RPD <sup>1</sup>	Field Blank (GWCC-3)	Travel Blank
Hardness, Total (CaCO <sub>3</sub> )	mg/L	278	279	0.4	637	638	0.2	<0.500	<0.500
Total Suspended Solids	mg/L	<3.000	<3.000	-	<3.000	<3.000	-	<3.000	<3.000
Nitrate	mg/L	0.152	0.151	0.7	0.176	0.172	-	<0.005	<0.005
Nitrite	mg/L	0.0016	0.0021	-	<0.010	<0.010	-	<0.001	<0.001
Sulfate (SO <sub>4</sub> )	mg/L	139	139	0.0	412	413	0.2	<0.500	<0.500
Ammonia	mg/L	0.0107	0.011	-	<0.005	<0.005	-	<0.005	<b>0.0096</b>
Total Kjeldahl Nitrogen	mg/L	0.418	0.49	15.9	0.259	0.254	1.9	<b>1.59</b>	<0.050
Dissolved Organic Carbon	mg/L	16.8	17.1	1.8	9.45	9.67	2.3	<b>51.2</b>	
Total Organic Carbon	mg/L	-	-	-	-	-	-	-	<0.500 <sup>4</sup>

**Notes:**

<sup>1</sup>RPD was not calculated if either sample or duplicate were less than five times the RDL.

<sup>2</sup>Shaded cells indicate instances where duplicate and test sample results exceeded the 20% RPD threshold.

<sup>3</sup>Bold text indicates results in the field or travel blank above RDL level.

<sup>4</sup>Only total organic carbon was reported by the laboratory for the travel blank, and provides an indication of dissolved organic carbon.

**3.1.3.2 QA/QC for Total Metal Parameters**

**Site E1 and DUP1**

The RPDs for Site E1 and its duplicate (DUP1) were less than the 20% QA/QC threshold, indicating that sampling error or laboratory error was unlikely to have occurred (**Table 3.6**).

**Site GWCC-3 and DUP2**

The RPDs for Site GWCC-3 and its duplicate (DUP2) were less than the 20% QA/QC threshold, indicating that sampling error or laboratory error was unlikely to have occurred (**Table 3.6**).

**Field Blank and Travel Blank**

The analytical results of the travel blank were less than or near RDLs for all total metal parameters (**Table 3.6**).

The reported concentrations of total antimony, barium, boron, calcium, copper, lead, lithium, sodium, and strontium in the field blank all exceeded the laboratory RDLs (**Table 3.6**; Discussed in **Section 4.1.1**).

**Table 3.6 Comparison of Duplicate and Blank Results for Total Metals**

Metal	Units	Surface Water – Exposed			Seep – Exposed			Blanks <sup>3</sup>	
		Site E1	Duplicate (DUP1)	RPD % <sup>1</sup>	GWCC-3	Duplicate (DUP2)	RPD % <sup>1</sup>	Field Blank (Site GWCC-3)	Travel Blank
Aluminum	mg/L	0.042	0.0382	9.5	<0.003	<0.003	-	<0.003	<0.003
Antimony	mg/L	0.00034	0.00034	-	0.00081	0.00081	0.0	<b>0.00014</b>	<0.0001
Arsenic	mg/L	0.0008	0.00077	3.8	0.00082	0.00082	0.0	<0.0001	<0.0001
Barium	mg/L	0.0554	0.0551	0.5	0.0264	0.0258	2.3	<b>0.000226</b>	<0.00005
Beryllium	mg/L	0.0001	0.0001	-	0.0001	0.0001	-	<0.0001	<0.0001
Bismuth	mg/L	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005
Boron	mg/L	0.012	0.012	-	0.065	0.059	-	<b>0.022</b>	<0.01
Cadmium	mg/L	0.000036	0.00004	-	0.000091	0.000089	2.2	<0.00001	<0.00001
Calcium	mg/L	59.3	59.3	0.0	110	108	1.8	<b>0.139</b>	<0.05
Chromium	mg/L	0.00078	0.00069	12.2	0.00058	0.00059	1.7	<0.0001	<0.0001
Cobalt	mg/L	0.00032	0.00031	-	<0.0001	<0.0001	-	<0.0001	<0.0001
Copper	mg/L	0.00324	0.0033	1.8	0.00111	0.00109	-	<b>0.00077</b>	<0.0005
Iron	mg/L	0.235	0.233	0.9	<0.01	<0.01	-	<0.01	<0.01
Lead	mg/L	0.000083	0.000083	-	<0.00005	<0.00005	-	<b>0.000086</b>	<0.00005
Lithium	mg/L	0.003	0.00312	3.9	0.00631	0.00688	8.6	<b>0.00121</b>	<0.0005
Magnesium	mg/L	29.7	30	1.0	86.5	84.4	2.5	<0.1	<0.1
Manganese	mg/L	0.102	0.101	1.0	0.000186	0.000255	-	<0.00005	<0.00005
Mercury	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001
Molybdenum	mg/L	0.00138	0.00139	0.7	0.00254	0.00255	0.4	<0.00005	<0.00005
Nickel	mg/L	0.00537	0.00525	2.3	0.0297	0.0288	3.1	<0.0005	<0.0005
Phosphorus	mg/L	0.000005	0.0000059	-	<0.000002	<0.000002	-	<0.000002	<0.000002
Potassium	mg/L	0.57	0.56	1.8	1.16	1.14	1.7	<0.1	<0.1
Selenium	mg/L	0.00141	0.0014	0.7	0.00143	0.00137	4.3	<0.0001	<0.0001

Metal	Units	Surface Water – Exposed			Seep – Exposed			Blanks <sup>3</sup>	
		Site E1	Duplicate (DUP1)	RPD % <sup>1</sup>	GWCC-3	Duplicate (DUP2)	RPD % <sup>1</sup>	Field Blank (Site GWCC-3)	Travel Blank
Silicon	mg/L	4.4	4.46	1.4	4.65	4.61	0.9	<0.05	<0.05
Silver	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001
Sodium	mg/L	2.62	2.62	0.0	3.85	3.66	5.1	<b>1.43</b>	<0.05
Strontium	mg/L	0.29	0.303	4.4	0.54	0.533	1.3	<b>0.00105</b>	<0.0002
Sulfur	mg/L	46.7	47	0.6	139	136	2.2	<0.500	<0.500
Thallium	mg/L	<0.00001	<0.00001	-	0.000059	0.00006	1.7	<0.00001	<0.00001
Tin	mg/L	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001
Titanium	mg/L	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01
Uranium	mg/L	0.00192	0.00193	0.5	0.00145	0.00145	0.0	<0.00001	<0.00001
Vanadium	mg/L	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001
Zinc	mg/L	<0.003	<0.003	-	0.0036	0.0036	-	<0.003	<0.003

**Notes:**

<sup>1</sup>RPD was not calculated if either sample or duplicate were less than five times the RDL.

<sup>2</sup>Shaded cells indicate instances where duplicate and test sample results exceeded the 20% RPD threshold.

<sup>3</sup>Bold text indicates results in the field or travel blank above RDL level.

### **3.1.3.3 QA/QC for Dissolved Metal Parameters**

#### **Site E1 and DUP1**

The RPDs for Site E1 and its duplicate (DUP1) were less than the 20% QA/QC threshold for dissolved metals, indicating that sampling error or laboratory error was unlikely to have occurred (**Table 3.7**).

#### **GWCC-3 and DUP2**

The RPDs for GWCC-3 and its duplicate (DUP2) were less than the 20% QA/QC threshold, indicating that sampling error or laboratory error was unlikely to have occurred (**Table 3.7**).

#### **Field Blank and Travel Blank**

No results for dissolved metals were provided by the analytical laboratory for the travel blank, however all total metals concentrations for the travel blank were less than the RDLs (**Table 3.6**), and therefore dissolved metals concentration are assumed to be acceptable (**Table 3.7**).

The reported concentrations of dissolved barium, boron, calcium, copper, sodium, and strontium in the field blank all exceeded the laboratory RDL (**Table 3.7**; Discussed in **Section 4.1.1**).

**Table 3.7 Comparison of Duplicate and Blank Results for Dissolved Metals**

Parameter	Units	Surface Water – Exposed			Seep – Exposed			Blanks	
		Site E1	Duplicate (DUP1)	RPD %	GWCC-3	Duplicate (DUP2)	RPD %	Field Blank (Site GWCC-3)	Travel Blank
Aluminum	mg/L	0.0322	0.0293	9.4	0.0017	0.0016	-	<0.001	-
Antimony	mg/L	0.00033	0.00033	-	0.00083	0.00084	1.2	0.0001	-
Arsenic	mg/L	0.00076	0.00069	9.7	0.00082	0.00085	3.6	<0.0001	-
Barium	mg/L	0.0552	0.0518	6.4	0.0266	0.0262	1.5	<b>0.000206</b>	-
Beryllium	mg/L	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	-
Bismuth	mg/L	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	-
Boron	mg/L	<0.01	<0.01	-	0.058	0.055	5.3	<b>0.016</b>	-
Cadmium	mg/L	0.000037	0.000035	-	0.000089	0.000087	2.3	<0.00001	-
Calcium	mg/L	61.5	61.6	0.2	112	112	0.0	<b>0.142</b>	-
Chromium	mg/L	0.00054	0.00047	-	0.00048	0.00047	-	<0.0001	-
Cobalt	mg/L	0.00028	0.00024	-	<0.0001	<0.0001	-	<0.0001	-
Copper	mg/L	0.00314	0.00265	16.9	0.00104	0.00102	1.9	<b>0.00071</b>	-
Iron	mg/L	0.21	0.202	3.9	<0.01	<0.01	-	<0.01	-
Lead	mg/L	0.000055	<0.00005	-	<0.00005	<0.00005	-	<0.00005	-
Lithium	mg/L	0.00315	0.00298	5.5	0.00665	0.00718	7.7	<0.0005	-
Magnesium	mg/L	30.3	30.5	0.7	86.9	87	0.1	<0.1	-
Manganese	mg/L	0.0947	0.0831	13.0	0.000164	0.000167	-	<0.00005	-
Mercury	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	-
Molybdenum	mg/L	0.00123	0.00125	1.6	0.00249	0.00254	2.0	<0.00005	-
Nickel	mg/L	0.00514	0.00459	11.3	0.0284	0.0286	0.7	<0.0005	-
Phosphorus	mg/L	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	-
Potassium	mg/L	0.57	0.57	0.0	1.18	1.16	1.7	<0.1	-
Selenium	mg/L	0.00148	0.00158	6.5	0.00148	0.00148	0.0	<0.0001	-



Parameter	Units	Surface Water – Exposed			Seep – Exposed			Blanks	
		Site E1	Duplicate (DUP1)	RPD %	GWCC-3	Duplicate (DUP2)	RPD %	Field Blank (Site GWCC-3)	Travel Blank
Silicon	mg/L	4.51	4.5	0.2	4.66	4.72	1.3	<0.05	-
Silver	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	-
Sodium	mg/L	2.66	2.32	13.7	3.74	3.71	0.8	<b>1.47</b>	-
Strontium	mg/L	0.29	0.282	2.8	0.535	0.539	0.7	<b>0.00097</b>	-
Sulfur	mg/L	46.8	46.9	0.2	139	136	2.2	-	-
Thallium	mg/L	<0.00001	<0.00001	-	0.000058	0.000059	1.7	<0.00001	-
Tin	mg/L	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	-
Titanium	mg/L	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	-
Uranium	mg/L	0.00181	0.00182	0.6	0.00146	0.00145	0.7	<0.00001	-
Vanadium	mg/L	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-
Zinc	mg/L	0.0017	0.0011	-	0.0024	0.0025	-	<0.001	-

**Notes:**

RPD was not calculated if both sample and duplicate were below detectable limits.

Shaded cells indicate instances where duplicate and test sample results exceeded the 20% RPD threshold.

Bold text indicates results in the field or travel blank above RDL level.

### 3.2 STREAM HYDROLOGICAL MONITORING RESULTS

Stream hydrological monitoring was completed at 12 of the 19 sites visited during the monitoring program. Hydrological monitoring was not conducted at four (4) of the sampling sites due to a lack of defined channel and/or flows (Snowshoe Pit, GWCC-1, GWCC-2 and GWCC-4) and three (3) sites due to unsafe conditions (Porcupine Pit, R6, and E8).

Hydrological measurements collected during the monitoring program are summarized in **Table 3.8**, below, while detailed data, calculations, and crossing profiles are attached in **Appendix 3**.

**Table 3.8 Summary of Hydrological Data Collected During the Monitoring Program**

Site	Location (UTM – 7N)		Wetted Width (m)	Mean Channel Depth (m)	Mean Velocity (m/s)	Mean Calculated Discharge (m <sup>3</sup> /s)
	Easting	Northing				
R1	510718	7147525	3.90	0.140	0.365	0.2618
R2	512023	7148061	1.90	0.080	0.265	0.0578
R3	513952	7148677	1.85	0.050	0.310	0.0396
R4	515981	7145344	1.55	0.040	0.475	0.0346
R6*	519437	7141958	-	-	-	-
R7	513026	7145669	0.70	0.070	0.015	0.0014
E1	513645	7147111	8.85	0.120	0.195	0.2687
E2	514149	7147076	5.70	0.135	0.360	0.4155
E3	5141178	7147189	2.00	0.160	0.120	0.0513
E4	515950	7145287	5.95	0.145	0.455	0.4606
E7	519400	7142042	4.70	0.180	0.520	0.5505
E8†	519457	7142788	-	-	-	-
PL‡	-	-	-	-	-	-
SL‡	513824	7146703	-	-	-	-
GWCC-1§	513902	7146960	-	-	-	-
GWCC-2§	513899	7146968	-	-	-	-
GWCC-3**	513882	7147038	-	-	-	6.33 x10 <sup>-4</sup>
GWCC-4§	513868	7147052	-	-	-	-
GWCC-5	513984	7147127	0.65	0.040	0.050	0.0016

**Notes:**

\* Site R6 = Forty Mile River upstream of Clinton Creek; discharge data could not be safely collected.

† Site E8 = Forty Mile River, downstream of Clinton Creek; discharge data could not be safely collected.

‡ Sites PL and SL were pit lakes, therefore no discharge data was collected.

§ Groundwater seepage site without defined channel. No measureable discharge.

\*\* No defined channel present, but Hemmera/ELR were able to collect discharge data at Site GWCC-3 using a timed volume flow measurement

### **3.2.1 Site R1**

A total of 21 stations were sampled at Site R1 (Clinton Creek upstream of Hudgeon Lake). The channel had a wetted width of 3.90 m and a mean depth of 0.140 m. Stream velocity ranged from 0.21 m/s to 0.65 m/s, with a mean velocity of 0.365 m/s. The calculated discharge for two crossings was 0.2506 m<sup>3</sup>/s and 0.2730 m<sup>3</sup>/s, resulting in a mean calculated discharge at Site R1 of 0.2618 m<sup>3</sup>/s.

### **3.2.2 Site R2**

A total of 21 stations were sampled at Site R2 (Easter Creek upstream of Hudgeon Lake). The channel had a wetted width of 1.90 m and a mean depth of 0.080 m. Stream velocity ranged from 0.10 m/s to 0.57 m/s, with a mean velocity of 0.265 m/s. The calculated discharge at two crossings was 0.0608 m<sup>3</sup>/s and 0.0548 m<sup>3</sup>/s, resulting in a mean calculated discharge at Site R2 of 0.0578 m<sup>3</sup>/s.

### **3.2.3 Site R3**

A total of 21 stations were sampled at Site R3 (Wolverine Creek, upstream of the tailings area). The channel had a wetted width of 1.85 m, with a mean depth of 0.050 m. Stream velocity ranged from 0.09 m/s to 0.64 m/s, with a mean velocity of 0.310 m/s. The calculated discharge at two crossings was 0.0379 m<sup>3</sup>/s and 0.0414 m<sup>3</sup>/s, resulting in a mean calculated discharge at Site R3 of 0.0396 m<sup>3</sup>/s.

### **3.2.4 Site R4**

A total of 21 stations were sampled at Site R4 (Clinton Creek, upstream of Eagle Creek). The channel had a wetted width of 1.55 m, with a mean depth of 0.040 m. Stream velocity ranged from 0.17 m/s to 0.88 m/s, with a mean velocity of 0.475 m/s. The calculated discharge at two crossings was 0.0352 m<sup>3</sup>/s and 0.0341 m<sup>3</sup>/s, resulting in a mean calculated discharge at Site R4 of 0.0346 m<sup>3</sup>/s.

### **3.2.5 Site R6**

Site R6 is at the Forty Mile River upstream of Clinton Creek. Due to the size and velocity of the river, neither channel width nor flow data was collected.

### **3.2.6 Site R7**

A total of eleven (11) stations were sampled at Site R7 (Porcupine Creek, upstream of waste rock). The channel had a wetted width of 0.70 m, with a mean depth of 0.070 m. Stream velocity ranged from 0.01 m/s to 0.07 m/s, with a mean velocity of 0.015 m/s. The calculated discharge at two crossings was 0.0016 m<sup>3</sup>/s and 0.0012 m<sup>3</sup>/s, resulting in a mean calculated discharge at Site R4 of 0.0014 m<sup>3</sup>/s.

### **3.2.7 Site E1**

A total of 21 stations were sampled at Site E1 (Clinton Creek, upstream of Porcupine Creek but downstream of the Gabions). The channel had a wetted width of 8.85 m, with a mean depth of 0.120 m. Stream velocity ranged from 0.03 m/s to 0.65 m/s, with a mean velocity of 0.195 m/s. The calculated discharge at two crossings was 0.2760 m<sup>3</sup>/s and 0.2614 m<sup>3</sup>/s, resulting in a mean calculated discharge at Site E1 of 0.2687 m<sup>3</sup>/s.

### **3.2.8 Site E2**

A total of 21 stations were sampled at Site E2 (Clinton Creek, downstream of Porcupine Creek but downstream of Wolverine Creek). The channel had a wetted width of 5.70 m, with a mean depth of 0.135 m. Stream velocity ranged from 0.03 m/s to 0.81 m/s, with a mean velocity of 0.360 m/s. The calculated discharge at two crossings was 0.4102 m<sup>3</sup>/s and 0.4208 m<sup>3</sup>/s, resulting in a mean calculated discharge at Site E2 of 0.4155 m<sup>3</sup>/s.

### **3.2.9 Site E3**

A total of 21 stations were sampled at Site E3 (Wolverine Creek upstream from Clinton Creek). The channel had a wetted width of 2.00 m, with a mean depth of 0.160 m. Stream velocity ranged from 0.07 m/s to 0.26 m/s, with a mean velocity of 0.120 m/s. The calculated discharge at two crossings was 0.0495 m<sup>3</sup>/s and 0.0532 m<sup>3</sup>/s, resulting in a mean calculated discharge at Site E3 of 0.0513 m<sup>3</sup>/s.

### **3.2.10 Site E4**

A total of 21 stations were sampled at Site E4 (Clinton Creek upstream from Eagle Creek). The channel had a wetted width of 5.95 m, with a mean depth of 0.145 m. Stream velocity ranged from 0.06 m/s to 0.86 m/s, with a mean velocity of 0.455 m/s. The calculated discharge at two crossings was 0.4461 m<sup>3</sup>/s and 0.4751 m<sup>3</sup>/s, resulting in a mean calculated discharge at Site E4 of 0.4606 m<sup>3</sup>/s.

### **3.2.11 Site E7**

A total of 21 stations were sampled at Site E7 (Clinton Creek upstream from the Forty Mile River). The channel had a wetted width of 4.70 m, with a mean depth of 0.180 m. Stream velocity ranged from 0.13 m/s to 0.82 m/s, with a mean velocity of 0.520 m/s. The calculated discharge at two crossings was 0.5493 m<sup>3</sup>/s and 0.5518 m<sup>3</sup>/s, resulting in a mean calculated discharge at Site E7 of 0.5505 m<sup>3</sup>/s.

### **3.2.12 Site E8**

Site E8 is at the Forty Mile River downstream of Clinton Creek. Due to the size and velocity of the river, neither channel width nor flow data was collected.

### **3.2.13 Site PL**

Site PL is at the Porcupine Pit Lake; therefore, no channel or flow data was collected.

### **3.2.14 Site SL**

Site SL is at the Snowshoe Pit Lake; therefore, no channel or flow data was collected.

### **3.2.15 Site GWCC-1**

No defined channel was present at groundwater seepage Site GWCC-1 nor was flows sufficient to measure discharge.

### **3.2.16 Site GWCC-2**

No defined channel was present at groundwater seepage Site GWCC-2 nor was flows sufficient to measure discharge.

### **3.2.17 Site GWCC-3**

No defined channel was present at groundwater seepage Site GWCC-3; however, Hemmera/ELR was able to conduct a timed volume flow measurement at the seep. Five timed one-litre measurements were collected, ranging in time from 1.5 seconds to 2.0 seconds. The resulting calculated discharge ranged from  $5.0 \times 10^{-4} \text{ m}^3/\text{s}$  and  $6.67 \times 10^{-4} \text{ m}^3/\text{s}$ , resulting in a mean calculated discharge at Site GWCC-3 of  $6.33 \times 10^{-4} \text{ m}^3/\text{s}$ .

### **3.2.18 Site GWCC-4**

No defined channel was present at groundwater seepage Site GWCC-4 nor was flows sufficient to measure discharge.

### **3.2.19 Site GWCC-5**

A total of eight (8) stations were sampled at Site GWCC-5 (Groundwater flows in old Clinton Creek channel). Surface flows at seepage Site GWCC-5 were minimal, and there was no defined channel. In order to collect discharge data, ELR was forced to channelize existing flows. The resulting channel had a wetted width of 0.65 m, with a mean depth of 0.040 m. Stream velocity ranged from 0.01 m/s to 0.16 m/s, with a mean velocity of 0.050 m/s. The calculated discharge at two crossings was  $0.0018 \text{ m}^3/\text{s}$  and  $0.0015 \text{ m}^3/\text{s}$ , resulting in a mean calculated discharge at Site E7 of  $0.0016 \text{ m}^3/\text{s}$ .

## 4.0 SUMMARY AND DISCUSSION OF WATER QUALITY MONITORING RESULTS

### 4.1 SUMMARY OF WATER QUALITY EXCEEDANCES

A summary of the observed exceedances of CCME-PAL guideline levels are summarized according to parameter in **Table 4.1**, below.

**Table 4.1 Summary of Exceedances of CCME-PAL Guideline Levels Organized According to Parameter**

Parameter	Detected Level (Site)	CCME-PAL Guideline	Comments
pH	6.12 pH (R7)	6.5 – 9.0	Field pH levels at Site R7 were observed to be outside the CCME-PAL guidelines. No occurrences were identified in the field that may be impacting in-situ pH levels. Recorded pH values are assumed to be a component of the natural system.
Dissolved Oxygen	3.57 mg/L (GWCC-1) 4.45 mg/L (GWCC-3) 1.88 mg/L (GWCC-4) 3.36 mg/L (GWCC-5) 1.81 mg/L (E2)	Minimum of 5.5 mg/L	Low dissolved oxygen conditions were detected at groundwater seep sites, which can commonly have reduced dissolved oxygen. No implications for the site are assumed. Low dissolved oxygen levels were also measured at Site E2, no occurrences were identified in the field that may be impacting in-situ DO concentrations.
Total Aluminum	0.129 mg/L (R1) - pH not available, but exceeds least conservative limit regardless of pH. 0.0714 mg/L (R2). pH not available. Not likely to be an exceedance when considering 2013 pH value (7.70). 0.307 mg/L at pH 7.41 (R3) 0.118 mg/L at pH 7.58 (R6) 0.523 mg/L at pH 6.12 (R7) 0.134 mg/L at pH 7.71 (E8)	0.005 mg/L when pH <6.5, 0.1 mg/L when pH > 6.5	All exceedances of total aluminum appear to originate from off-site sources. At least four of the six sampled reference sites show total aluminum concentrations greater than CCME-PAL guidelines. The exceedance at Site E8 is considered to originate from the Forty Mile River, not Clinton Creek.
Dissolved Aluminum	0.0132 mg/L - pH not available (R1) 0.0181 mg/L - pH not available (R2) 0.116 mg/L at pH 6.12 (R7)	0.005 mg/L when pH <6.5, 0.1 mg/L when pH > 6.5	All exceedances of dissolved aluminum appear to originate from off-site sources. Dissolved aluminum did not exceed CCME-PAL guidelines in any of the sampled exposure sites.

Parameter	Detected Level (Site)	CCME-PAL Guideline	Comments
Total Arsenic	0.0152 mg/L (SL)	0.005 mg/L	Exceedances of total arsenic are limited to Snowshoe Pit lake (SL). Arsenic appears to be primarily in the dissolved form, as suggested by comparison of total and dissolved arsenic results. Total arsenic is not currently considered to be a concern for the receiving environment of the Site as exceedances are restricted to the pit area.
Dissolved Arsenic	0.0148 mg/L (SL)	0.005 mg/L	Exceedances of total arsenic are limited to Snowshoe Pit lake (SL). Total arsenic is not currently considered to be a concern for the receiving environment of the Site. Arsenic appears to be primarily in the dissolved form, as suggested by comparison of total and dissolved arsenic results.
Total Chromium	0.0012 mg/L (R3) 0.00232 mg/L (R7) 0.00104 mg/L (E3) 0.00156 mg/L (SL) 0.00247 mg/L (GWCC-1) 0.00173 mg/L (GWCC-2)	0.001 mg/L Note – standard is for hexavalent Chromium (CrVI) as noted in <b>Table 3.3.</b>	Exceedances for chromium are based on the CrVI standard, however speciated chromium was not specifically measured during the current study. Exceedances appear to be primarily in reference, pit, and seepage areas, and there are currently no exceedances downstream from the site in Clinton Creek.
Dissolved Chromium	0.00146 mg/L (R7) 0.00232 mg/L (GWCC-1) 0.00164 mg/L (GWCC-2)	0.001 mg/L Note – standard is for hexavalent Chromium (CrVI) as noted in <b>Table 3.4.</b>	Exceedances for chromium are based on the CrVI standard, however speciated chromium was not specifically measured during the current study. Exceedances appear to be primarily in reference and seepage areas, and there are currently no exceedances downstream from the site in Clinton Creek.
Total Copper	0.00533 mg/L at total hardness of 114 mg/L (R7)	0.00264 mg/L based on hardness	Total copper appears to be contributed primarily by an off-site source (R7). Total copper is therefore not considered to be a concern in relation to the Site at this time.
Dissolved Copper	0.00455 mg/L at total hardness of 114 mg/L (R7)	0.00264 mg/L based on hardness	Dissolved copper appears to be contributed primarily by an off-site source (R7). Dissolved copper is therefore not considered to be a concern in relation to the Site at this time.
Total Iron	0.597 mg/L (R1) 0.316 mg/L (R2) 1.050 mg/L (R3) 0.440 mg/L (R6) 2.010 mg/L (R7) 0.347 mg/L (E2) 0.341 mg/L (E3) 0.328 mg/L (E4) 0.308 mg/L (E7) 0.344 mg/L (E8)	0.3 mg/L	Total iron appears to be in nearly all cases originating off-site (R1, R2, R3, R6, and R7), thereby influencing exposed sites.
Dissolved Iron	0.310 mg/L (R1) 0.363 mg/L (R6) 1.300 mg/L (R7) 0.303 mg/L (E2)	0.3 mg/L	Dissolved iron appears to be originating off-site (R1, R6, and R7). Dissolved iron levels at exposure sites are close to CCME-PAL guideline. Therefore, dissolved iron is not considered to be a current concern in relation to the site.

Parameter	Detected Level (Site)	CCME-PAL Guideline	Comments
Total Selenium	0.0033 mg/L (R1) 0.00291 mg/L (R4) 0.00141 mg/L (E1) 0.00144 mg/L (E2) 0.00123 mg/L (E4) 0.0105 mg/L (SL) 0.00412 mg/L (GWCC-1) 0.00338 mg/L (GWCC-2) 0.00143 mg/L (GWCC-3) 0.00475 mg/L (GWCC-5)	0.001 mg/L	Total selenium is in some cases originating off-site (R1 and R4), but is also elevated in exposure sites (E1, E2, E4). Concentrations of total selenium are highest in seepage samples GWCC-1 and GWCC-5. Total selenium levels on upper Clinton Creek exposure sites exceed CCME-PAL guidelines but are below CCME lowest observed effects level (LOEL). Selenium appears to be primarily in the dissolved form, as suggested by comparison of total and dissolved selenium results. Future investigations of Selenium loading from on- vs. off-site sources is suggested.
Dissolved Selenium	0.00378 mg/L (R1) 0.00305 mg/L (R4) 0.0148 mg/L (E1) 0.00144 mg/L (E2) 0.00128 mg/L (E4) 0.00105 mg/L (E7) 0.0103 mg/L (SL) 0.00422 mg/L (GWCC-1) 0.00363 mg/L (GWCC-2) 0.00148 mg/L (GWCC-3) 0.0501 mg/L (GWCC-5)	0.001 mg/L	Dissolved selenium is in some cases originating off-site (R1 and R4), but is consistently elevated in exposure sites (E1, E2, E4, and E7). Concentrations of dissolved selenium are highest in seepage samples GWCC-1 and GWCC-5. Although dissolved selenium levels were elevated on all Clinton Creek exposure sites, concentrations are below CCME LOEL. Selenium appears to be primarily in the dissolved form, as suggested by comparison of total and dissolved selenium results. Future investigations of Selenium loading from on- vs. off-site sources is suggested.

#### 4.2 DISCUSSION OF QA/QC PROGRAM RESULTS

The two blind field duplicate samples demonstrated that there were no obvious sources of error in either field sampling program or laboratory analysis. No exceedances of the 20% RPD threshold were noted between sample and duplicates.

As noted in Section 3.1.3, concentrations of total Kjeldahl nitrogen, dissolved organic carbon, total antimony, dissolved and total barium, dissolved and total boron, dissolved and total calcium, dissolved and total copper, total lead, total lithium, dissolved and total sodium, and dissolved and total strontium were detected in the travel blank. For this particular sampling program, the analytical laboratory did not supply laboratory de-ionized water for preparing the field blank as is customary. This was not noted until Hemmera/ELR were at the Site, and the crew alternately prepared the field blank using a commercial de-ionized water. At the time the field blank was prepared, Hemmera/ELR was unaware that this specific brand of deionized water contained a bittering agent intended to discourage the product from being used for human consumption. A material safety data sheet (MSDS) for the bittering agent references benzenemethanaminium, N-[2-[(2,6-dimethylphenyl)amino]-2-oxoethyl]-N-diethyl-, and benzoate (1:1) as ingredients present which are classified as hazardous to health or the environment and therefore require reporting. These ingredients were listed as present in the deionized water in concentrations of less than 0.1 percent by weight. The presence of the bittering agent in the commercial de-ionized water is thought to be the reason for analytical results in the field blank greater than RDL values, as many of the compounds detected were not found to be elevated in any other sample collected from the Site.



To further investigate whether the source of field blank contamination may have been in the commercial deionized water, two additional samples were submitted to the laboratory for analysis: one using a sample of the same commercial brand of de-ionized water used to prepare the field blank, and the other containing laboratory certified de-ionized water provided by the laboratory. Additional blanks were prepared with both waters at the same time as per laboratory specifications (field filtered and preserved), and both were analysed for total Kjeldahl nitrogen, dissolved organic carbon, total metals and dissolved metals. A comparison of analytical results for the original field blank, commercial de-ionized water test blank, and laboratory certified de-ionized water test blank are provided in **Tables 4.2** and **Table 4.3**.

Results of the blank test samples show a similar chemical composition for metal and non-metal parameters between the field blank and the commercial deionized water. Of the 18 parameters where detectable levels were found in the field blank, 16 of the same parameters were detected in the commercial deionized water test (total Kjeldahl nitrogen and dissolved organic carbon, total antimony, total and dissolved barium, boron, calcium, and copper, total lead, and total and dissolved sodium and strontium). Slight variance between the field blank and commercial deionized water was observed for dissolved antimony, and total lithium (detected in the field blank but not in the commercial deionized test sample). Three other parameters (total manganese, total potassium, and dissolved lead) were detected in the deionized test sample but not in the field blank). The laboratory certified deionized water sample was below RDL values for all parameters except total iron and total manganese.

**Table 4.2 Comparison of Total Metals, Total Kjeldahl Nitrogen, and Dissolved Organic Carbon Results for Field Blank and Commercial and Laboratory Deionized Water**

Parameters	Units	Field Blank (Site GWCC-3)	Commercial Deionized Water Test	Laboratory Deionized Water Test
Total Kjeldahl Nitrogen	mg/L	<b>1.59</b>	<b>1.50</b>	<0.050
Dissolved Organic Carbon	mg/L	<b>51.2</b>	<b>49.5</b>	<0.50
<b>Total Metals</b>				
Aluminum	mg/L	<0.003	<0.0030	<0.0030
Antimony	mg/L	<b>0.00014</b>	<b>0.00015</b>	<0.00010
Arsenic	mg/L	<0.0001	<0.00010	<0.00010
Barium	mg/L	<b>0.000226</b>	<b>0.000450</b>	<0.000050
Beryllium	mg/L	<0.0001	<0.00010	<0.00010
Bismuth	mg/L	<0.0005	<0.00050	<0.00050
Boron	mg/L	<b>0.022</b>	<b>0.023</b>	<0.010
Cadmium	mg/L	<0.00001	<0.000010	<0.000010
Calcium	mg/L	<b>0.139</b>	<b>0.167</b>	<0.050
Chromium	mg/L	<0.0001	<0.00010	<0.00010
Cobalt	mg/L	<0.0001	<0.00010	<0.00010
Copper	mg/L	<b>0.00077</b>	<b>0.00069</b>	<0.00050
Iron	mg/L	<0.01	<0.010	<b>0.018</b>
Lead	mg/L	<b>0.000086</b>	<b>0.000082</b>	<0.000050

Parameters	Units	Field Blank (Site GWCC-3)	Commercial Deionized Water Test	Laboratory Deionized Water Test
Lithium	mg/L	<b>0.00121</b>	<0.00050	<0.00050
Magnesium	mg/L	<0.1	<0.10	<0.10
Manganese	mg/L	<0.00005	<b>0.000067</b>	<b>0.000303</b>
Mercury	mg/L	<0.00001	-	-
Molybdenum	mg/L	<0.00005	<0.000050	<0.000050
Nickel	mg/L	<0.0005	<0.00050	0.00055
Phosphorus	mg/L	<0.000002	<0.050	<0.050
Potassium	mg/L	<0.1	<b>0.12</b>	<0.10
Selenium	mg/L	<0.0001	<0.00010	<0.00010
Silicon	mg/L	<0.05	<0.050	<0.050
Silver	mg/L	<0.00001	<0.000010	<0.000010
Sodium	mg/L	<b>1.43</b>	<b>1.60</b>	<0.050
Strontium	mg/L	<b>0.00105</b>	<b>0.00105</b>	<0.00020
Sulfur	mg/L	<0.500	<0.50	<0.50
Thallium	mg/L	<0.00001	<0.000010	<0.000010
Tin	mg/L	<0.0001	<0.00010	<0.00010
Titanium	mg/L	<0.01	<0.010	<0.010
Uranium	mg/L	<0.00001	<0.000010	<0.000010
Vanadium	mg/L	<0.001	<0.0010	<0.0010
Zinc	mg/L	<0.003	<0.0030	<0.0030

**Notes:** Bold text indicates results above RDL level.

**Table 4.3 Comparison of Dissolved Metals Results between Field Blank, Commercial and Laboratory Deionized Water**

Metal	Units	Field Blank (Site GWCC-3)	Commercial Deionized Water Test	Laboratory Deionized Water Test
Aluminum	mg/L	<0.001	<0.0010	<0.0010
Antimony	mg/L	<b>0.0001</b>	<0.00010	<0.00010
Arsenic	mg/L	<0.0001	<0.00010	<0.00010
Barium	mg/L	<b>0.000206</b>	<b>0.000394</b>	<0.000050
Beryllium	mg/L	<0.0001	<0.00010	<0.00010
Bismuth	mg/L	<0.0005	<0.00050	<0.00050
Boron	mg/L	<b>0.016</b>	<b>0.019</b>	<0.010
Cadmium	mg/L	<0.00001	<0.000010	<0.000010
Calcium	mg/L	<b>0.142</b>	<b>0.168</b>	<0.050
Chromium	mg/L	<0.0001	<0.00010	<0.00010
Cobalt	mg/L	<0.0001	<0.00010	<0.00010
Copper	mg/L	<b>0.00071</b>	<b>0.00054</b>	<0.00020
Iron	mg/L	<0.01	<0.010	<0.010
Lead	mg/L	<0.00005	<b>0.000050</b>	<0.000050
Lithium	mg/L	<0.0005	<0.00050	<0.00050

Metal	Units	Field Blank (Site GWCC-3)	Commercial Deionized Water Test	Laboratory Deionized Water Test
Magnesium	mg/L	<0.1	<0.10	<0.10
Manganese	mg/L	<0.00005	<0.000050	<0.000050
Mercury	mg/L	<0.00001	-	-
Molybdenum	mg/L	<0.00005	<0.000050	<0.000050
Nickel	mg/L	<0.0005	<0.00050	<0.00050
Phosphorus	mg/L	<0.00005	<0.050	<0.050
Potassium	mg/L	<0.1	<0.10	<0.10
Selenium	mg/L	<0.0001	<0.00010	<0.00010
Silicon	mg/L	<0.05	<0.050	<0.050
Silver	mg/L	<0.00001	<0.000010	<0.000010
Sodium	mg/L	<b>1.47</b>	<b>1.51</b>	<0.050
Strontium	mg/L	<b>0.00097</b>	<b>0.00101</b>	<0.00020
Sulfur	mg/L	-	<0.50	<0.50
Thallium	mg/L	<0.00001	<0.000010	<0.000010
Tin	mg/L	<0.0001	<0.00010	<0.00010
Titanium	mg/L	<0.01	<0.010	<0.010
Uranium	mg/L	<0.00001	<0.000010	<0.000010
Vanadium	mg/L	<0.001	<0.0010	<0.0010
Zinc	mg/L	<0.001	<0.0010	<0.0010

**Notes:** Bold text indicates results above RDL level.

Hemmera/ELR consider the results of the follow-up analysis to show that the detected elements in the field blank most likely originated in the commercial deionized water rather than being from on-site sources of contamination. This is supported by the very close chemical match between the field blank and commercial deionized water test despite separate sample preparation events in separate locations. Further, many of the metals detected in both samples were not found to be elevated in other samples collected from the Clinton Creek Site (in water samples). The slight variation between the two samples is likely due to slight differences amongst batches of commercial deionized water (the two sources were the same brand, but not the same actual container).

Based on these results, Hemmera/ELR consider the field blank results to be isolated from the remainder of the program and has confidence in the program analytical results. The entire program was conducted using stringent QA/QC techniques, and the de-ionized water used in the field blank was not used for the cleaning of any field equipment or instruments. Further, the results from field duplicates and the travel blank indicate sound sampling and laboratory practices.

## 5.0 RECOMMENDATIONS

Hemmera/ELR has prepared several recommendations based on the results of the 2014 Clinton Creek water quality and hydrological monitoring program. These recommendations relate to the consistent collection of data on Site, and to better understanding the potential sources of contamination to the Site and its receiving waters.

- 1) The installation of signs at sample site locations to aid field crews with the location and identification of sites and to ensure consistency between sampling events (in particular groundwater seepage sites).
- 2) If flow data from the Forty Mile River is considered to be important to the overall monitoring program for the Site, a method for collecting hydrological data safely from this larger river site should be developed. This could potentially involve the installation of safety cables and the use of remote hydrometric data loggers (e.g., pressure transducer stations).
- 3) Hemmera/ELR recommend that sample Site E1 be permanently relocated to a safe area that can be consistently sampled in the future. During the 2014 program, samples were collected for Site E1 at a location downstream of the primary ford structure after discussion with AAM. The Clinton Creek – Site Hazards document (AAM, 2014) identified the area upstream of the primary ford as a potentially hazardous location, and therefore the site was relocated.

## 6.0 CLOSURE

Hemmera/ELR are pleased to provide the Yukon Government, Assessment and Abandoned Mines this report that summarizes the 2014 water quality and hydrological monitoring program at the Clinton Creek Site. Please do not hesitate to contact us should you have any questions regarding this report.

Sincerely,

Prepared by:  
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## 7.0 REFERENCES

Assessment and Abandoned Mines (AAM). 2014. Clinton Creek – Site Hazards. Government of Yukon, Clinton Creek – Health and Safety. September 4, 2014.

Canadian Council of Ministers of the Environment (CCME). 2014. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Accessed online at <http://st-ts.ccme.ca/>, March 2014.

Rice, E.W., Baird, R.B., Eaton, A.D., & Clesceri, L.S. 2012. Standard Methods for the Examination of Water and Wastewater, 22nd Edition. American Public Health Association.  
ISBN: 9780875530130

Smith, C.A.S., Meikle, J.C. and Roots, C.F. (editors). 2004. *Ecoregions of the Yukon Territory - Biophysical Properties of Yukon Landscapes*. Agriculture and Agri-Food Canada, PARC Technical Bulletin 04-01, Summerland, British Columbia.

Yukon government, Energy, Mines, and Resources (YG). 2013. Clinton Creek Site Description and Updates. Accessed online at: [http://www.emr.gov.yk.ca/aam/clinton\\_creek.html](http://www.emr.gov.yk.ca/aam/clinton_creek.html), October 2013.

Yukon Government (YG). 2007. Acts and Regulations: Waters Act O.I.C 2003/58. Accessed online at: [http://www.gov.yk.ca/legislation/acts/waters\\_c.pdf](http://www.gov.yk.ca/legislation/acts/waters_c.pdf) October 2013.

**APPENDIX 1**  
**Site Photos**



**Photo 1:** Downstream view of Site R1 (Clinton Creek upstream of Hudgeon Lake). Photo taken on September 20, 2014.



**Photo 2:** Downstream view of Site R2 (Easter Creek upstream of Hudgeon Lake). Photo taken on September 20, 2014.





**Photo 3:** Downstream view of Site R3 (Wolverine Creek, upstream of tailings). Photo taken on September 22, 2014.



**Photo 4:** Upstream view of Site R4 (Eagle Creek, upstream of culvert). Photo taken on September 19, 2014.



**Photo 5:** Downstream view of Site R6 (Forty Mile River, upstream of Clinton Creek). Photo taken on September 22, 2014.



**Photo 6:** Upstream view of Site R7 (Porcupine Creek, upstream of waste rock). Photo taken on September 22, 2014.



**Photo 7:** Upstream view of relocated Site E1 (Clinton Creek downstream of gabions). Photo taken on September 19, 2014.



**Photo 8:** Downstream view of Site E2 (Clinton Creek, downstream of Porcupine Creek but upstream of Wolverine Creek). Photo taken on September 19, 2014.



**Photo 9:** Upstream view of Site E3. Photo taken on September 19, 2014.



**Photo 10:** Upstream view of Site E4 (Clinton Creek downstream of Wolverine Creek but upstream of Eagle Creek). Photo taken on September 19, 2014.



**Photo 11:** Upstream view of Site E7 (Clinton Creek near mouth). Photo taken on September 21, 2014.



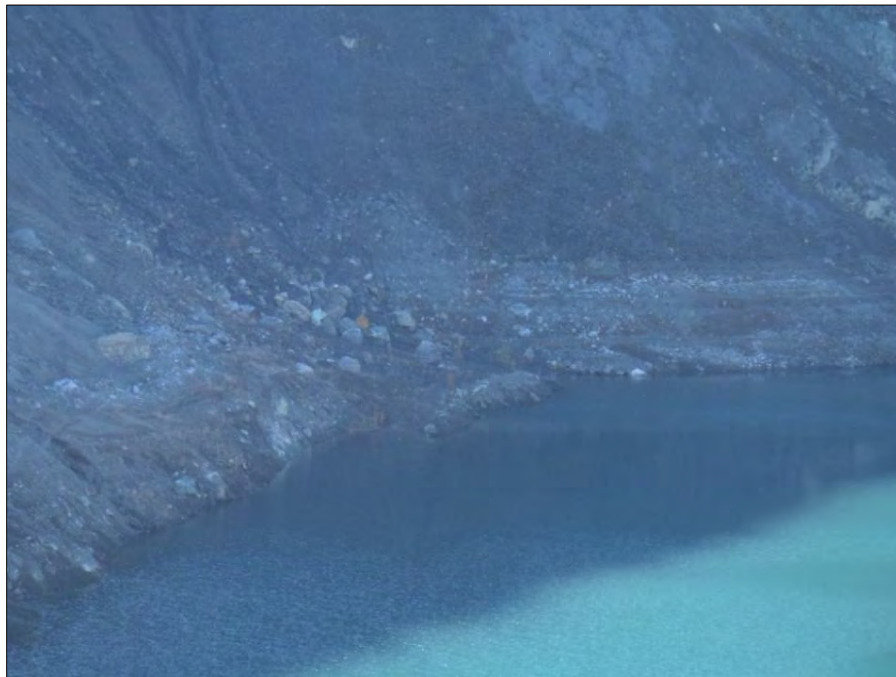
**Photo 12:** Downstream view of Site E8 (Forty Mile River downstream of Clinton Creek). Photo taken on September 21, 2014.



**Photo 13:** View of Porcupine Pit Lake (Site PL).Photo taken on September 20, 2014.



**Photo 14:** Access route to Porcupine Pit Lake (Site PL).Photo taken on September 20, 2014.



**Photo 15:** Rock falls at sampling location, Porcupine Pit Lake (Site PL). Photo taken on September 20, 2014.



**Photo 16:** View of Snowshoe Pit Lake (Site SL). Photo taken on September 20, 2014.



**Photo 17:** View of groundwater seepage Site GWCC-1. Photo taken on September 21, 2014.



**Photo 18:** View of groundwater seepage Site GWCC-2. Photo taken on September 21, 2014.





**Photo 19:** View of groundwater seepage Sites GWCC-1 and GWCC-2. Photo taken on September 21, 2014.



**Photo 20:** View of groundwater seepage Site GWCC-3. Photo taken on September 21, 2014.



**Photo 21:** View of groundwater seepage Site GWCC-4. Photo taken on September 21, 2014.



**Photo 22:** View of groundwater seepage GWCC-5. Photo taken on September 19, 2014.




**Photo 23:** View of unnamed groundwater seepage site. Photo taken on September 21, 2014.



**Photo 24:** View of channel formed from groundwater seepage sites. Photo taken on September 21, 2014.

**APPENDIX 2**  
**Water Quality Analytical Laboratory Reports**



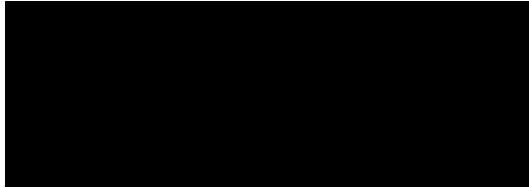
HEMMERA ENVIROCHEM INC.  
ATTN: Natasha Sandys  
230 - 2237 2nd Avenue  
Whitehorse YK Y1A 0K7

Date Received: 22-SEP-14  
Report Date: 01-OCT-14 17:25 (MT)  
Version: FINAL

Client Phone: 867-456-4865

## Certificate of Analysis

**Lab Work Order #:** L1521155  
**Project P.O. #:** NOT SUBMITTED  
**Job Reference:** HEMMERA 1343-005.04/ELR 14-183  
**C of C Numbers:** 10-152908, 10-152909  
**Legal Site Desc:**


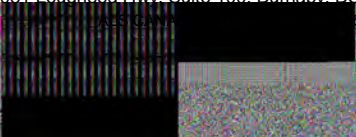



Brent Mack  
Account Manager

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

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ANALYST: [Redacted] | [Redacted] S Group - A Campbell Brothers Limited Company



## ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1521155-1 Surface Water 19-SEP-14 11:02 E1	L1521155-2 Surface Water 19-SEP-14 DUP 1	L1521155-3 Surface Water 20-SEP-14 15:10 E1	L1521155-4 Surface Water 20-SEP-14 DUP 1	L1521155-5 Surface Water 19-SEP-14 13:45 GWCC-5
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Hardness (as CaCO3) (mg/L)	278	279			541
	Total Suspended Solids (mg/L)			<3.0	<3.0	
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/L)	0.0107	0.0110			0.0062
	Nitrate (as N) (mg/L)			0.152	0.151	
	Nitrite (as N) (mg/L)			0.0016	0.0021	
	Total Kjeldahl Nitrogen (mg/L)	0.418	0.490			0.235
	Phosphorus (P)-Total (mg/L)	0.0050	0.0059			0.0026
	Sulfate (SO4) (mg/L)			139	139	
<b>Organic / Inorganic Carbon</b>	Dissolved Organic Carbon (mg/L)	16.8	17.1			8.31
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.0420	0.0382			<0.0030
	Antimony (Sb)-Total (mg/L)	0.00034	0.00034			0.00089
	Arsenic (As)-Total (mg/L)	0.00080	0.00077			0.00069
	Barium (Ba)-Total (mg/L)	0.0554	0.0551			0.0551
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010			<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050			<0.00050
	Boron (B)-Total (mg/L)	0.012	0.012			0.039
	Cadmium (Cd)-Total (mg/L)	0.000036	0.000040			0.000120
	Calcium (Ca)-Total (mg/L)	59.3	59.3			123
	Chromium (Cr)-Total (mg/L)	0.00078	0.00069			0.00080
	Cobalt (Co)-Total (mg/L)	0.00032	0.00031			<0.00010
	Copper (Cu)-Total (mg/L)	0.00324	0.00330			0.00122
	Iron (Fe)-Total (mg/L)	0.235	0.233			0.011
	Lead (Pb)-Total (mg/L)	0.000083	0.000083			<0.000050
	Lithium (Li)-Total (mg/L)	0.00300	0.00312			0.0103
	Magnesium (Mg)-Total (mg/L)	29.7	30.0			57.5
	Manganese (Mn)-Total (mg/L)	0.102	0.101			0.00230
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010			<0.000010
	Molybdenum (Mo)-Total (mg/L)	0.00138	0.00139			0.00197
	Nickel (Ni)-Total (mg/L)	0.00537	0.00525			0.0170
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			<0.050
	Potassium (K)-Total (mg/L)	0.57	0.56			0.96
	Selenium (Se)-Total (mg/L)	0.00141	0.00140			0.00475
	Silicon (Si)-Total (mg/L)	4.40	4.46			4.82
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			<0.000010
	Sodium (Na)-Total (mg/L)	2.62	2.62			3.98
	Strontium (Sr)-Total (mg/L)	0.290	0.303			0.771

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1521155-6 Surface Water 20-SEP-14 15:15 GWCC-5	L1521155-7 Surface Water 19-SEP-14 15:00 E2	L1521155-8 Surface Water 20-SEP-14 15:25 E2	L1521155-9 Surface Water 19-SEP-14 16:20 E3	L1521155-10 Surface Water 20-SEP-14 15:25 E3
Grouping	Analyte				
<b>WATER</b>					
<b>Physical Tests</b>	Hardness (as CaCO3) (mg/L)		433	465	
	Total Suspended Solids (mg/L)	<3.0		<3.0	<3.0
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/L)		0.0128	0.0063	
	Nitrate (as N) (mg/L)	<0.025 <sup>DLA</sup>		0.138	0.126
	Nitrite (as N) (mg/L)	<0.0050 <sup>DLA</sup>		0.0011	0.0013
	Total Kjeldahl Nitrogen (mg/L)		0.428	0.411	
	Phosphorus (P)-Total (mg/L)		0.0043	0.0093	
	Sulfate (SO4) (mg/L)	281		252	261
<b>Organic / Inorganic Carbon</b>	Dissolved Organic Carbon (mg/L)		15.0	13.5	
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)		0.0253	0.0681	
	Antimony (Sb)-Total (mg/L)		0.00046	0.00102	
	Arsenic (As)-Total (mg/L)		0.00120	0.00125	
	Barium (Ba)-Total (mg/L)		0.0517	0.0539	
	Beryllium (Be)-Total (mg/L)		<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)		<0.00050	<0.00050	
	Boron (B)-Total (mg/L)		0.045	0.089	
	Cadmium (Cd)-Total (mg/L)		0.000055	0.000019	
	Calcium (Ca)-Total (mg/L)		79.0	77.2	
	Chromium (Cr)-Total (mg/L)		0.00070	0.00104	
	Cobalt (Co)-Total (mg/L)		0.00070	0.00030	
	Copper (Cu)-Total (mg/L)		0.00267	0.00182	
	Iron (Fe)-Total (mg/L)		0.347	0.341	
	Lead (Pb)-Total (mg/L)		<0.000050	0.000057	
	Lithium (Li)-Total (mg/L)		0.00990	0.00502	
	Magnesium (Mg)-Total (mg/L)		55.4	62.3	
	Manganese (Mn)-Total (mg/L)		0.119	0.0901	
	Mercury (Hg)-Total (mg/L)		<0.000010	<0.000010	
	Molybdenum (Mo)-Total (mg/L)		0.00181	0.00146	
	Nickel (Ni)-Total (mg/L)		0.0162	0.0110	
	Phosphorus (P)-Total (mg/L)		<0.050	<0.050	
	Potassium (K)-Total (mg/L)		0.85	0.88	
	Selenium (Se)-Total (mg/L)		0.00144	0.00082	
	Silicon (Si)-Total (mg/L)		4.70	5.81	
	Silver (Ag)-Total (mg/L)		<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)		4.06	4.49	
	Strontium (Sr)-Total (mg/L)		0.497	0.410	

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1521155-11 Surface Water 19-SEP-14 18:38 E4	L1521155-12 Surface Water 20-SEP-14 15:35 E4	L1521155-13 Surface Water 19-SEP-14 17:35 R4	L1521155-14 Surface Water 20-SEP-14 15:40 R4	L1521155-15 Surface Water 20-SEP-14 10:10 R1
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Hardness (as CaCO3) (mg/L)	473		448		401
	Total Suspended Solids (mg/L)		<3.0		<3.0	6.0
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/L)	0.0054		0.0175		0.0310
	Nitrate (as N) (mg/L)		0.103		0.113	0.162
	Nitrite (as N) (mg/L)		<0.0010		<0.0010	0.0011
	Total Kjeldahl Nitrogen (mg/L)	0.394		0.378		0.368
	Phosphorus (P)-Total (mg/L)	0.0055		0.0036		0.0064
	Sulfate (SO4) (mg/L)		268		235	220
<b>Organic / Inorganic Carbon</b>	Dissolved Organic Carbon (mg/L)	14.3		12.9		12.7
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.0237		0.0304		0.129
	Antimony (Sb)-Total (mg/L)	0.00051		0.00047		0.00027
	Arsenic (As)-Total (mg/L)	0.00122		0.00230		0.00071
	Barium (Ba)-Total (mg/L)	0.0516		0.0627		0.0586
	Beryllium (Be)-Total (mg/L)	<0.00010		<0.00010		<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.00050		<0.00050		<0.00050
	Boron (B)-Total (mg/L)	0.065		<0.010		0.014
	Cadmium (Cd)-Total (mg/L)	0.000045		0.000094		0.000086
	Calcium (Ca)-Total (mg/L)	83.3		92.7		89.5
	Chromium (Cr)-Total (mg/L)	0.00079		0.00050		0.00070
	Cobalt (Co)-Total (mg/L)	0.00072		0.00182		0.00078
	Copper (Cu)-Total (mg/L)	0.00244		0.00288		0.00285
	Iron (Fe)-Total (mg/L)	0.328		0.268		0.597
	Lead (Pb)-Total (mg/L)	<0.000050		<0.000050		0.000263
	Lithium (Li)-Total (mg/L)	0.0142		0.00492		0.00399
	Magnesium (Mg)-Total (mg/L)	63.3		49.0		40.7
	Manganese (Mn)-Total (mg/L)	0.146		0.304		0.388
	Mercury (Hg)-Total (mg/L)	<0.000010		<0.000010		<0.000010
	Molybdenum (Mo)-Total (mg/L)	0.00183		0.00139		0.00169
	Nickel (Ni)-Total (mg/L)	0.0188		0.0148		0.00526
	Phosphorus (P)-Total (mg/L)	<0.050		<0.050		<0.050
	Potassium (K)-Total (mg/L)	0.97		0.59		0.62
	Selenium (Se)-Total (mg/L)	0.00123		0.00291		0.00330
	Silicon (Si)-Total (mg/L)	4.79		5.18		4.84
	Silver (Ag)-Total (mg/L)	<0.000010		<0.000010		0.000011
	Sodium (Na)-Total (mg/L)	5.24		5.00		3.51
	Strontium (Sr)-Total (mg/L)	0.565		0.538		0.460

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



# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1521155-16	L1521155-17		
Description	Surface Water	Surface Water	Surface Water		
Sampled Date	20-SEP-14	20-SEP-14	20-SEP-14		
Sampled Time	11:55	14:30	14:30		
Client ID	R2	SL	SL		
Grouping	Analyte				
<b>WATER</b>					
<b>Physical Tests</b>	Hardness (as CaCO3) (mg/L)	370	990		
	Total Suspended Solids (mg/L)	<3.0	4.0		
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/L)	0.0082	<0.0050		
	Nitrate (as N) (mg/L)	0.0402	<0.050 <sup>DLA</sup>		
	Nitrite (as N) (mg/L)	<0.0010	<0.010 <sup>DLA</sup>		
	Total Kjeldahl Nitrogen (mg/L)	0.238	0.216		
	Phosphorus (P)-Total (mg/L)	0.0063	0.0034		
	Sulfate (SO4) (mg/L)	172	721		
<b>Organic / Inorganic Carbon</b>	Dissolved Organic Carbon (mg/L)	9.89	7.79		
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.0714	0.0214		
	Antimony (Sb)-Total (mg/L)	0.00054	0.00354		
	Arsenic (As)-Total (mg/L)	0.00089	0.0152		
	Barium (Ba)-Total (mg/L)	0.0523	0.0199		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050		
	Boron (B)-Total (mg/L)	0.016	0.051		
	Cadmium (Cd)-Total (mg/L)	0.000029	0.000026		
	Calcium (Ca)-Total (mg/L)	65.8	226		
	Chromium (Cr)-Total (mg/L)	0.00072	0.00156		
	Cobalt (Co)-Total (mg/L)	0.00024	0.00012		
	Copper (Cu)-Total (mg/L)	0.00184	0.00133		
	Iron (Fe)-Total (mg/L)	0.316	0.035		
	Lead (Pb)-Total (mg/L)	0.000056	<0.000050		
	Lithium (Li)-Total (mg/L)	0.00622	0.0111		
	Magnesium (Mg)-Total (mg/L)	49.0	101		
	Manganese (Mn)-Total (mg/L)	0.122	0.00325		
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010		
	Molybdenum (Mo)-Total (mg/L)	0.000833	0.00196		
	Nickel (Ni)-Total (mg/L)	0.00320	0.0183		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	0.79	1.48		
	Selenium (Se)-Total (mg/L)	0.00068	0.0105		
	Silicon (Si)-Total (mg/L)	5.80	5.42		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	3.33	2.59		
Strontium (Sr)-Total (mg/L)	0.392	1.10			

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1521155-1	L1521155-2	L1521155-3	L1521155-4	L1521155-5
		Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
		Sampled Date	19-SEP-14	19-SEP-14	20-SEP-14	20-SEP-14	19-SEP-14
		Sampled Time	11:02		15:10		13:45
		Client ID	E1	DUP 1	E1	DUP 1	GWCC-5
Grouping	Analyte						
<b>WATER</b>							
<b>Total Metals</b>	Sulfur (S)-Total (mg/L)		46.7	47.0			98.6
	Thallium (Tl)-Total (mg/L)		<0.000010	<0.000010			0.000017
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010			<0.00010
	Titanium (Ti)-Total (mg/L)		<0.010	<0.010			<0.010
	Uranium (U)-Total (mg/L)		0.00192	0.00193			0.00220
	Vanadium (V)-Total (mg/L)		<0.0010	<0.0010			<0.0010
	Zinc (Zn)-Total (mg/L)		<0.0030	<0.0030			<0.0030
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location		FIELD	FIELD			FIELD
	Dissolved Metals Filtration Location		FIELD	FIELD			FIELD
	Aluminum (Al)-Dissolved (mg/L)		0.0322	0.0293			0.0018
	Antimony (Sb)-Dissolved (mg/L)		0.00033	0.00033			0.00091
	Arsenic (As)-Dissolved (mg/L)		0.00076	0.00069			0.00065
	Barium (Ba)-Dissolved (mg/L)		0.0552	0.0518			0.0545
	Beryllium (Be)-Dissolved (mg/L)		<0.00010	<0.00010			<0.00010
	Bismuth (Bi)-Dissolved (mg/L)		<0.00050	<0.00050			<0.00050
	Boron (B)-Dissolved (mg/L)		<0.010	<0.010			0.034
	Cadmium (Cd)-Dissolved (mg/L)		0.000037	0.000035			0.000089
	Calcium (Ca)-Dissolved (mg/L)		61.5	61.6			123
	Chromium (Cr)-Dissolved (mg/L)		0.00054	0.00047			0.00068
	Cobalt (Co)-Dissolved (mg/L)		0.00028	0.00024			<0.00010
	Copper (Cu)-Dissolved (mg/L)		0.00314	0.00265			0.00100
	Iron (Fe)-Dissolved (mg/L)		0.210	0.202			0.011
	Lead (Pb)-Dissolved (mg/L)		0.000055	<0.000050			<0.000050
	Lithium (Li)-Dissolved (mg/L)		0.00315	0.00298			0.00995
	Magnesium (Mg)-Dissolved (mg/L)		30.3	30.5			56.8
	Manganese (Mn)-Dissolved (mg/L)		0.0947	0.0831			0.00208
	Mercury (Hg)-Dissolved (mg/L)		<0.000010	<0.000010			<0.000010
	Molybdenum (Mo)-Dissolved (mg/L)		0.00123	0.00125			0.00181
	Nickel (Ni)-Dissolved (mg/L)		0.00514	0.00459			0.0165
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050			<0.050
	Potassium (K)-Dissolved (mg/L)		0.57	0.57			0.96
	Selenium (Se)-Dissolved (mg/L)		0.00148	0.00158			0.00501
	Silicon (Si)-Dissolved (mg/L)		4.51	4.50			4.75
	Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010			<0.000010
	Sodium (Na)-Dissolved (mg/L)		2.66	2.32			3.90
	Strontium (Sr)-Dissolved (mg/L)		0.290	0.282			0.745
	Sulfur (S)-Dissolved (mg/L)		46.8	46.9			95.3

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1521155-6 Surface Water 20-SEP-14 15:15 GWCC-5	L1521155-7 Surface Water 19-SEP-14 15:00 E2	L1521155-8 Surface Water 20-SEP-14 15:25 E2	L1521155-9 Surface Water 19-SEP-14 16:20 E3	L1521155-10 Surface Water 20-SEP-14 15:25 E3
Grouping	Analyte					
<b>WATER</b>						
<b>Total Metals</b>	Sulfur (S)-Total (mg/L)		86.1		88.2	
	Thallium (Tl)-Total (mg/L)		0.000022		<0.000010	
	Tin (Sn)-Total (mg/L)		<0.00010		<0.00010	
	Titanium (Ti)-Total (mg/L)		<0.010		<0.010	
	Uranium (U)-Total (mg/L)		0.00228		0.00435	
	Vanadium (V)-Total (mg/L)		<0.0010		<0.0010	
	Zinc (Zn)-Total (mg/L)		<0.0030		<0.0030	
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location		FIELD		FIELD	
	Dissolved Metals Filtration Location		FIELD		FIELD	
	Aluminum (Al)-Dissolved (mg/L)		0.0198		0.0188	
	Antimony (Sb)-Dissolved (mg/L)		0.00047		0.00094	
	Arsenic (As)-Dissolved (mg/L)		0.00107		0.00110	
	Barium (Ba)-Dissolved (mg/L)		0.0512		0.0541	
	Beryllium (Be)-Dissolved (mg/L)		<0.00010		<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)		<0.00050		<0.00050	
	Boron (B)-Dissolved (mg/L)		0.044		0.082	
	Cadmium (Cd)-Dissolved (mg/L)		0.000049		0.000013	
	Calcium (Ca)-Dissolved (mg/L)		80.8		80.8	
	Chromium (Cr)-Dissolved (mg/L)		0.00058		0.00075	
	Cobalt (Co)-Dissolved (mg/L)		0.00065		0.00026	
	Copper (Cu)-Dissolved (mg/L)		0.00223		0.00166	
	Iron (Fe)-Dissolved (mg/L)		0.303		0.093	
	Lead (Pb)-Dissolved (mg/L)		<0.000050		<0.000050	
	Lithium (Li)-Dissolved (mg/L)		0.00999		0.00513	
	Magnesium (Mg)-Dissolved (mg/L)		56.2		63.8	
	Manganese (Mn)-Dissolved (mg/L)		0.110		0.0876	
	Mercury (Hg)-Dissolved (mg/L)		<0.000010		<0.000010	
	Molybdenum (Mo)-Dissolved (mg/L)		0.00153		0.00123	
	Nickel (Ni)-Dissolved (mg/L)		0.0151		0.0106	
	Phosphorus (P)-Dissolved (mg/L)		<0.050		<0.050	
	Potassium (K)-Dissolved (mg/L)		0.87		0.88	
	Selenium (Se)-Dissolved (mg/L)		0.00144		0.00079	
	Silicon (Si)-Dissolved (mg/L)		4.68		5.83	
	Silver (Ag)-Dissolved (mg/L)		<0.000010		<0.000010	
	Sodium (Na)-Dissolved (mg/L)		3.73		4.46	
	Strontium (Sr)-Dissolved (mg/L)		0.422		0.356	
	Sulfur (S)-Dissolved (mg/L)		86.0		88.6	

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1521155-11 Surface Water 19-SEP-14 18:38 E4	L1521155-12 Surface Water 20-SEP-14 15:35 E4	L1521155-13 Surface Water 19-SEP-14 17:35 R4	L1521155-14 Surface Water 20-SEP-14 15:40 R4	L1521155-15 Surface Water 20-SEP-14 10:10 R1
Grouping	Analyte				
<b>WATER</b>					
<b>Total Metals</b>	Sulfur (S)-Total (mg/L)	93.0		78.1	74.8
	Thallium (Tl)-Total (mg/L)	0.000017		<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010		<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.010		<0.010	<0.010
	Uranium (U)-Total (mg/L)	0.00252		0.00641	0.00285
	Vanadium (V)-Total (mg/L)	<0.0010		<0.0010	<0.0010
	Zinc (Zn)-Total (mg/L)	<0.0030		0.0050	0.0043
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD		FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD		FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0146		0.0124	0.0132
	Antimony (Sb)-Dissolved (mg/L)	0.00051		0.00048	0.00022
	Arsenic (As)-Dissolved (mg/L)	0.00112		0.00226	0.00056
	Barium (Ba)-Dissolved (mg/L)	0.0500		0.0624	0.0535
	Beryllium (Be)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050		<0.00050	<0.00050
	Boron (B)-Dissolved (mg/L)	0.057		<0.010	0.011
	Cadmium (Cd)-Dissolved (mg/L)	0.000045		0.000084	0.000067
	Calcium (Ca)-Dissolved (mg/L)	84.6		96.8	93.3
	Chromium (Cr)-Dissolved (mg/L)	0.00062		0.00038	0.00026
	Cobalt (Co)-Dissolved (mg/L)	0.00068		0.00179	0.00065
	Copper (Cu)-Dissolved (mg/L)	0.00207		0.00205	0.00193
	Iron (Fe)-Dissolved (mg/L)	0.260		0.198	0.310
	Lead (Pb)-Dissolved (mg/L)	<0.000050		<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0138		0.00504	0.00339
	Magnesium (Mg)-Dissolved (mg/L)	63.6		50.1	40.9
	Manganese (Mn)-Dissolved (mg/L)	0.138		0.299	0.348
	Mercury (Hg)-Dissolved (mg/L)	<0.000010		<0.000010	<0.000010
	Molybdenum (Mo)-Dissolved (mg/L)	0.00166		0.00131	0.00156
	Nickel (Ni)-Dissolved (mg/L)	0.0181		0.0146	0.00451
	Phosphorus (P)-Dissolved (mg/L)	<0.050		<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	1.00		0.60	0.60
	Selenium (Se)-Dissolved (mg/L)	0.00128		0.00305	0.00378
	Silicon (Si)-Dissolved (mg/L)	4.75		5.24	4.71
	Silver (Ag)-Dissolved (mg/L)	<0.000010		<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	5.20		4.99	3.24
	Strontium (Sr)-Dissolved (mg/L)	0.533		0.549	0.426
	Sulfur (S)-Dissolved (mg/L)	91.1		78.7	73.7

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1521155-16 Surface Water 20-SEP-14 11:55 R2	L1521155-17 Surface Water 20-SEP-14 14:30 SL			
Grouping	Analyte				
<b>WATER</b>					
<b>Total Metals</b>	Sulfur (S)-Total (mg/L)	58.9	234		
	Thallium (Tl)-Total (mg/L)	<0.000010	0.000018		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010		
	Uranium (U)-Total (mg/L)	0.00474	0.00313		
	Vanadium (V)-Total (mg/L)	<0.0010	<0.0010		
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030		
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0181	0.0012		
	Antimony (Sb)-Dissolved (mg/L)	0.00051	0.00342		
	Arsenic (As)-Dissolved (mg/L)	0.00082	0.0148		
	Barium (Ba)-Dissolved (mg/L)	0.0503	0.0192		
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010		
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050	<0.00050		
	Boron (B)-Dissolved (mg/L)	0.013	0.048		
	Cadmium (Cd)-Dissolved (mg/L)	0.000025	0.000023		
	Calcium (Ca)-Dissolved (mg/L)	67.0	230		
	Chromium (Cr)-Dissolved (mg/L)	0.00047	0.00099		
	Cobalt (Co)-Dissolved (mg/L)	0.00020	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00163	0.00080		
	Iron (Fe)-Dissolved (mg/L)	0.212	<0.010		
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	0.00611	0.0105		
	Magnesium (Mg)-Dissolved (mg/L)	49.1	101		
	Manganese (Mn)-Dissolved (mg/L)	0.119	0.00240		
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010		
	Molybdenum (Mo)-Dissolved (mg/L)	0.000730	0.00173		
	Nickel (Ni)-Dissolved (mg/L)	0.00305	0.0168		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	0.80	1.46		
	Selenium (Se)-Dissolved (mg/L)	0.00070	0.0103		
	Silicon (Si)-Dissolved (mg/L)	5.70	5.35		
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	3.30	2.34		
	Strontium (Sr)-Dissolved (mg/L)	0.361	0.971		
	Sulfur (S)-Dissolved (mg/L)	57.9	230		

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1521155-1	L1521155-2	L1521155-3	L1521155-4	L1521155-5
		Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
		Sampled Date	19-SEP-14	19-SEP-14	20-SEP-14	20-SEP-14	19-SEP-14
		Sampled Time	11:02		15:10		13:45
		Client ID	E1	DUP 1	E1	DUP 1	GWCC-5
Grouping	Analyte						
<b>WATER</b>							
<b>Dissolved Metals</b>	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010				0.000017
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010				<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010				<0.010
	Uranium (U)-Dissolved (mg/L)	0.00181	0.00182				0.00208
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010				<0.0010
	Zinc (Zn)-Dissolved (mg/L)	0.0017	0.0011				<0.0010

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b>	<b>Description</b>	<b>Sampled Date</b>	<b>Sampled Time</b>	<b>Client ID</b>
	L1521155-6	Surface Water	20-SEP-14	15:15	GWCC-5
	L1521155-7	Surface Water	19-SEP-14	15:00	E2
	L1521155-8	Surface Water	20-SEP-14	15:25	E2
	L1521155-9	Surface Water	19-SEP-14	16:20	E3
	L1521155-10	Surface Water	20-SEP-14	15:25	E3
Grouping	Analyte				
<b>WATER</b>					
<b>Dissolved Metals</b>	Thallium (Tl)-Dissolved (mg/L)				
				0.000020	<0.000010
	Tin (Sn)-Dissolved (mg/L)				
				<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)				
				<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)				
				0.00202	0.00382
	Vanadium (V)-Dissolved (mg/L)				
				<0.0010	<0.0010
	Zinc (Zn)-Dissolved (mg/L)				
				0.0017	0.0028

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b>	<b>Description</b>	<b>Sampled Date</b>	<b>Sampled Time</b>	<b>Client ID</b>
	L1521155-11	Surface Water	19-SEP-14	18:38	E4
	L1521155-12	Surface Water	20-SEP-14	15:35	E4
	L1521155-13	Surface Water	19-SEP-14	17:35	R4
	L1521155-14	Surface Water	20-SEP-14	15:40	R4
	L1521155-15	Surface Water	20-SEP-14	10:10	R1
<b>Grouping</b>	<b>Analyte</b>				
<b>WATER</b>					
<b>Dissolved Metals</b>	Thallium (Tl)-Dissolved (mg/L)	0.000020		<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.010		<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00235		0.00678	0.00269
	Vanadium (V)-Dissolved (mg/L)	<0.0010		<0.0010	<0.0010
	Zinc (Zn)-Dissolved (mg/L)	0.0012		0.0038	0.0022

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



# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1521155-16	L1521155-17		
	<b>Description</b>	Surface Water	Surface Water		
	<b>Sampled Date</b>	20-SEP-14	20-SEP-14		
	<b>Sampled Time</b>	11:55	14:30		
	<b>Client ID</b>	R2	SL		
Grouping	Analyte				
<b>WATER</b>					
<b>Dissolved Metals</b>	Thallium (Tl)-Dissolved (mg/L)	<0.000010	0.000015		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010		
	Uranium (U)-Dissolved (mg/L)	0.00419	0.00284		
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010		
	Zinc (Zn)-Dissolved (mg/L)	0.0022	<0.0010		

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

## Reference Information

### Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1521155-7	E2	WSMT	Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

### QC Samples with Qualifiers & Comments:

QC Type	Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike		Sulfate (SO4)	MS-B	L1521155-10, -12, -14, -15, -16, -17, -3, -4, -6, -8
Matrix Spike		Sodium (Na)-Dissolved	MS-B	L1521155-1, -11, -13, -15, -16, -17, -2, -5, -7, -9
Matrix Spike		Strontium (Sr)-Dissolved	MS-B	L1521155-1, -11, -13, -15, -16, -17, -2, -5, -7, -9
Matrix Spike		Sulfur (S)-Dissolved	MS-B	L1521155-1, -11, -13, -15, -16, -17, -2, -5, -7, -9
Matrix Spike		Dissolved Organic Carbon	MS-B	L1521155-1, -2

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>ANIONS-NO2-IC-WR</b>	Water	Nitrite Nitrogen by Ion Chromatography	EPA 300.1
This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003. Nitrate is detected by UV absorbance.			
<b>ANIONS-NO3-IC-WR</b>	Water	Nitrate Nitrogen by Ion Chromatography	EPA 300.1
This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003. Nitrate is detected by UV absorbance.			
<b>ANIONS-SO4-IC-WR</b>	Water	Sulphate by Ion Chromatography	EPA 300.1
This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.			
<b>CARBONS-DOC-VA</b>	Water	Dissolved organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
<b>HARDNESS-CALC-VA</b>	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
<b>HG-DIS-LOW-CVAFS-VA</b>	Water	Dissolved Mercury in Water by CVAFS(Low)	EPA SW-846 3005A & EPA 245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).			
<b>HG-TOT-LOW-CVAFS-VA</b>	Water	Total Mercury in Water by CVAFS(Low)	EPA 245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).			
<b>MET-D-CCMS-VA</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
<b>MET-DIS-LOW-ICP-VA</b>	Water	Dissolved Metals in Water by ICPOES	EPA 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma -			

## Reference Information

optical emission spectrophotometry (EPA Method 6010B).

**MET-T-CCMS-VA**            Water            Total Metals in Water by CRC ICPMS            APHA 3030 B&E / EPA SW-846 6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

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

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

**NH3-F-VA**                    Water            Ammonia in Water by Fluorescence            J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

**P-T-PRES-COL-VA**            Water            Total P in Water by Colour            APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

**S-DIS-ICP-VA**                Water            Dissolved Sulfur in Water by ICPOES            EPA SW-846 3005A/6010B

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

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

**S-TOT-ICP-VA**                Water            Total Sulfur in Water by ICPOES            EPA SW-846 3005A/6010B

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

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

**TKN-F-VA**                    Water            TKN in Water by Fluorescence            APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

**TSS-MAN-WR**                Water            Total Suspended Solids by Gravimetric            APHA 2540 D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids are determined by filtering a sample through a glass fibre filter and drying the filter at 104 degrees celsius.

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

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

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

**Chain of Custody Numbers:**

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10-152908	10-152909
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## Reference Information

### GLOSSARY OF REPORT TERMS

*Surrogate* - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

*mg/kg* - milligrams per kilogram based on dry weight of sample.

*mg/kg wwt* - milligrams per kilogram based on wet weight of sample.

*mg/kg lwt* - milligrams per kilogram based on lipid-adjusted weight of sample.

*mg/L* - milligrams per litre.

*<* - Less than.

*D.L.* - The reported Detection Limit, also known as the Limit of Reporting (LOR).

*N/A* - Result not available. Refer to qualifier code and definition for explanation.

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*



<b>Report To</b>	<b>Report Format / Distribution</b>	<b>Service Request:</b> (Rush subject to availability - Contact ALS to confirm TAT)
Company: <u>Hemmera Environem Inc (HEI)</u>	Standard: <input checked="" type="checkbox"/> Other (specify):	<input checked="" type="checkbox"/> Regular (Standard Turnaround Times - Business Days)
Contact: <u>Natasha Sandys</u>	Select: PDF Excel Digital Fax	Priority (2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
Address: <u>Suite 203-2237 2nd Ave Whitehorse YT</u>	Email 1: <u>arnichot.garcon@clr.ca, chris@clr.ca</u>	Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
Phone: <u>867 456 4865</u> Fax: <u>ext 713</u>	Email 2: <u>abrown@hemmera.com, nsandys@hemmera.com</u>	Same Day or Weekend Emergency - Contact ALS to confirm TAT

<b>Invoice To</b> Same as Report? (circle) <input checked="" type="checkbox"/> Yes or No (if No, provide details)	<b>Client / Project Information</b>	<b>Analysis Request</b> (Indicate Filtered or Preserved, F/P)																		
Copy of Invoice with Report? (circle) <input checked="" type="checkbox"/> Yes or No	Job #: <u>Hemmera 1343-005.04</u>	F	P																	
Company:	PO/DATE: <u>ELR 14-183</u>	Low Level Dis. Metals	Low Level Total Metals	Nitrate Nitrite Sulphate	Total Phosphorus	Ammonia	TSS	DOC	Total Kjeldahl N	Total Hardness										
Contact: <u>SAME AS REPORT</u>	LSD:																			
Address:	Quote #: <u>Q46959 (attn: Natasha Sandys)</u>																			
Phone: Fax:	ALS Contact: <u>B Mack</u> Sampler: <u>A Nicholson A Brown</u>																			
<b>Lab Work Order # (lab use only)</b>																				

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Low Level Dis. Metals	Low Level Total Metals	Nitrate Nitrite Sulphate	Total Phosphorus	Ammonia	TSS	DOC	Total Kjeldahl N	Total Hardness	Number of Containers
1	E1	19-009-14	11:02	SW	✓	✓			✓	✓	✓			6
2	DUP 1	19-009-14			✓	✓			✓	✓	✓			6
3	E1	20-009-14	15:10				✓	✓	✓	✓	✓	✓	✓	1
4	DUP 1	20-009-14					✓	✓	✓	✓	✓	✓	✓	1
5	EWCC-5	19-009-14	13:45		✓	✓			✓	✓	✓			6
6	EWCC-5	20-009-14	15:15				✓	✓	✓	✓	✓	✓	✓	1
7	E2	19-009-14	15:00		✓	✓			✓	✓	✓	✓	✓	6
8	E2	20-009-14	15:25				✓	✓	✓	✓	✓	✓	✓	1
9	E3	19-009-14	16:20		✓	✓			✓	✓	✓	✓	✓	6
10	E3	20-009-14	15:25				✓	✓	✓	✓	✓	✓	✓	1
11	E4	19-009-14	18:38		✓	✓			✓	✓	✓	✓	✓	6
12	E4	20-009-14	15:35				✓	✓	✓	✓	✓	✓	✓	1

Short Holding Time  
Rush Processing

**Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details**

CCME Standards. Note some general chem parameters (anions) have 3 day hold time, require analysis asap on receipt as discussed in Whitehorse

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: <u>A. Nicholson via Air North Freight in Dawson City</u>	Date: <u>21 Sept 2014</u>	Time: <u>08:45</u>	Received by: <u>[Signature]</u>	Date: <u>22 Sept 14</u>	Time: <u>9:00</u>	Temperature: <u>2.13°C</u>	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

Rec'd by: Shayan      Sept. 23      14:45      3.5°C



Chain of Custody / Analytical Reque:  
 Canada Toll Free: 1 800 668 987  
 www.alsglobal.com



L1521155-COFC

19-152909

Page 2 of 2

<b>Report To</b>	<b>Report Format / Distribution</b>	<b>Service Request:</b> (Rush subject to availability - Contact ALS to confirm TAT)
Company: <u>Hemmera</u>	Standard: <input checked="" type="checkbox"/> Other (specify):	<input checked="" type="checkbox"/> Regular (Standard Turnaround Times - Business Days)
Contact: <u>Natasha Sandys</u>	Select: PDF Excel Digital Fax	Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
Address: <u># 203-7237 2nd Ave</u>	Email 1: <u>Aaron Nicholson (ELR) Chris Jozefowski (ELP)</u>	Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
<u>Whitehorse YT</u>	Email 2: <u>Natasha Sandys (Hemmera) Andrew Bram</u>	Same Day or Weekend Emergency - Contact ALS to confirm TAT
Phone: <u>8674564065</u> Fax:	<u>Hemmera Lab Data/Drucke</u> (Hemmera)	

<b>Invoice To</b> Same as Report? (circle) Yes or No (if No, provide details)	<b>Client / Project Information</b>	<b>Analysis Request</b> (Indicate Filtered or Preserved, F/P)																	
Copy of Invoice with Report? (circle) Yes or No	Job #: <u>Hemmera 1343-005.04</u>	F	P																
Company:	<u>POWAPL → ELR 14-183</u>																		
Contact: <u>SAME AS REPORT</u>	LSD:																		
Address:	Quote #: <u>Q46959 (Cattin' Natasha)</u>																		
Phone: Fax:	ALS Contact: <u>B Mack</u>																		
Lab Work Order # (lab use only)	Sampler: <u>A Nicholson</u>																		
	<u>A Bram</u>																		

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Dis Nitrites (Low Level)	Total Nitrites (Low Level)	Nitrate Nitrite Sulphate	Total P	Ammonia	TSS	DGC	Total K	N	Total Phosphorus	Number of Containers
13	R4	19-009-14	17:35	SW	✓	✓			✓		✓				6
14	R4	20-009-14	15:40	↓			✓	✓	✓			✓	✓		1
15	R2	20-009-14	10:10	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓		7
16	R2	20-009-14	11:55	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓		7
17	SL	20-009-14	14:30	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓		7

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

CCME Stds. Note hold time on anions require analysis in Whitehorse upon receipt

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: <u>A. Nicholson via Air North</u>	Date: <u>21 Sept 2014</u>	Time: <u>0845</u>	Received by: <u>Shayon</u>	Date: <u>Sept. 23</u>	Time: <u>14:45</u>	Temperature: <u>3.5 °C</u>	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF



ECOLOGICAL LOGISTICS & RESEARCH  
LTD.

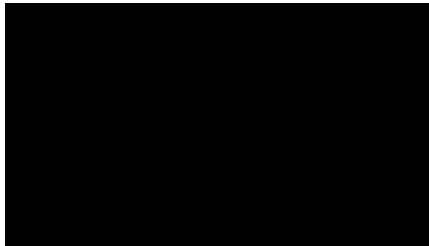
ATTN: Chris Jastrebski  
204 - 105 Titanium Way  
Whitehorse YT Y1A 0E7

Date Received: 06-NOV-14  
Report Date: 19-NOV-14 14:07 (MT)  
Version: FINAL

Client Phone: 867-668-6386

## Certificate of Analysis

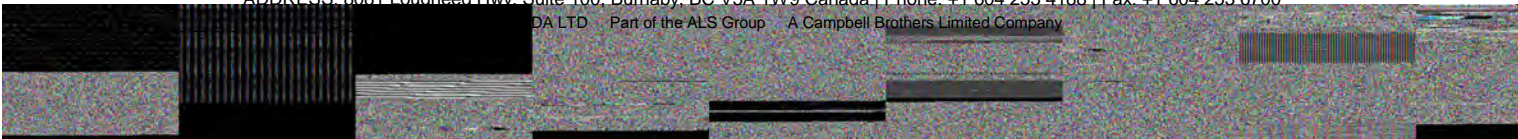
**Lab Work Order #:** L1543778  
**Project P.O. #:** ELR 14-183  
**Job Reference:** HEMMERA 1343-005.04  
**C of C Numbers:** 10-219289  
**Legal Site Desc:**



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## ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1543778-1 Water 06-NOV-14 12:10 DI TEST-COM	L1543778-2 Water 06-NOV-14 12:10 DI TEST-LAB		
Grouping	Analyte				
<b>WATER</b>					
<b>Physical Tests</b>	Hardness (as CaCO3) (mg/L)	<0.50	<0.50		
<b>Anions and Nutrients</b>	Total Kjeldahl Nitrogen (mg/L)	1.50	<0.050		
<b>Organic / Inorganic Carbon</b>	Dissolved Organic Carbon (mg/L)	49.5	<0.50		
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030		
	Antimony (Sb)-Total (mg/L)	0.00015	<0.00010		
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010		
	Barium (Ba)-Total (mg/L)	0.000450	<0.000050		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050		
	Boron (B)-Total (mg/L)	0.023	<0.010		
	Cadmium (Cd)-Total (mg/L)	<0.000010	<0.000010		
	Calcium (Ca)-Total (mg/L)	0.167	<0.050		
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010		
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010		
	Copper (Cu)-Total (mg/L)	0.00069	<0.00050		
	Iron (Fe)-Total (mg/L)	<0.010	0.018		
	Lead (Pb)-Total (mg/L)	0.000082	<0.000050		
	Lithium (Li)-Total (mg/L)	<0.00050	<0.00050		
	Magnesium (Mg)-Total (mg/L)	<0.10	<0.10		
	Manganese (Mn)-Total (mg/L)	0.000067	0.000303		
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050		
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00055		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	0.12	<0.10		
	Selenium (Se)-Total (mg/L)	<0.00010	<0.00010		
	Silicon (Si)-Total (mg/L)	<0.050	<0.050		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	1.60	<0.050		
	Strontium (Sr)-Total (mg/L)	0.00105	<0.00020		
	Sulfur (S)-Total (mg/L)	<0.50	<0.50		
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010		
	Uranium (U)-Total (mg/L)	<0.000010	<0.000010		
	Vanadium (V)-Total (mg/L)	<0.0010	<0.0010		
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030		

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



# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1543778-1 Water 06-NOV-14 12:10 DI TEST-COM	L1543778-2 Water 06-NOV-14 12:10 DI TEST-LAB			
Grouping	Analyte				
<b>WATER</b>					
<b>Dissolved Metals</b>	Dissolved Metals Filtration Location	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	<0.0010		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	<0.00010	<0.00010		
	Barium (Ba)-Dissolved (mg/L)	0.000394	<0.000050		
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010		
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050	<0.00050		
	Boron (B)-Dissolved (mg/L)	0.019	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	<0.000010	<0.000010		
	Calcium (Ca)-Dissolved (mg/L)	0.168	<0.050		
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00054	<0.00020		
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)	0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	<0.00050	<0.00050		
	Magnesium (Mg)-Dissolved (mg/L)	<0.10	<0.10		
	Manganese (Mn)-Dissolved (mg/L)	<0.000050	<0.000050		
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050		
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	<0.10	<0.10		
	Selenium (Se)-Dissolved (mg/L)	<0.00010	<0.00010		
	Silicon (Si)-Dissolved (mg/L)	<0.050	<0.050		
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	1.51	<0.050		
	Strontium (Sr)-Dissolved (mg/L)	0.00101	<0.00020		
	Sulfur (S)-Dissolved (mg/L)	<0.50	<0.50		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010		
	Uranium (U)-Dissolved (mg/L)	<0.000010	<0.000010		
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010		
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010		

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

## Reference Information

### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)-Dissolved	DLA	L1543778-1, -2
Duplicate	Arsenic (As)-Dissolved	DLA	L1543778-1, -2
Duplicate	Beryllium (Be)-Dissolved	DLA	L1543778-1, -2
Duplicate	Bismuth (Bi)-Dissolved	DLA	L1543778-1, -2
Duplicate	Lead (Pb)-Dissolved	DLA	L1543778-1, -2
Duplicate	Selenium (Se)-Dissolved	DLA	L1543778-1, -2
Duplicate	Silver (Ag)-Dissolved	DLA	L1543778-1, -2
Duplicate	Tin (Sn)-Dissolved	DLA	L1543778-1, -2
Duplicate	Titanium (Ti)-Dissolved	DLA	L1543778-1, -2
Duplicate	Vanadium (V)-Dissolved	DLA	L1543778-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1543778-1, -2
Matrix Spike	Dissolved Organic Carbon	MS-B	L1543778-2
Matrix Spike	Dissolved Organic Carbon	MS-B	L1543778-2
Matrix Spike	Dissolved Organic Carbon	MS-B	L1543778-2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1543778-1, -2
Matrix Spike	Cobalt (Co)-Dissolved	MS-B	L1543778-1, -2
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1543778-1, -2
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L1543778-1, -2
Matrix Spike	Selenium (Se)-Dissolved	MS-B	L1543778-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1543778-1, -2
Matrix Spike	Tin (Sn)-Dissolved	MS-B	L1543778-1, -2
Matrix Spike	Barium (Ba)-Total	MS-B	L1543778-1, -2
Matrix Spike	Strontium (Sr)-Total	MS-B	L1543778-1, -2

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>CARBONS-DOC-VA</b>	Water	Dissolved organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
<b>HARDNESS-CALC-VA</b>	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
<b>MET-D-CCMS-VA</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
<b>MET-DIS-LOW-ICP-VA</b>	Water	Dissolved Metals in Water by ICPOES	EPA 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
<b>MET-T-CCMS-VA</b>	Water	Total Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
<b>MET-TOT-LOW-ICP-VA</b>	Water	Total Metals in Water by ICPOES	EPA 3005A/6010B

## Reference Information

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

**S-DIS-ICP-VA**                      Water              Dissolved Sulfur in Water by ICPOES                      EPA SW-846 3005A/6010B

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

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

**S-TOT-ICP-VA**                      Water              Total Sulfur in Water by ICPOES                      EPA SW-846 3005A/6010B

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

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

**TKN-F-VA**                      Water              TKN in Water by Fluorescence                      APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

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

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

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Laboratory Definition Code	Laboratory Location
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VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
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### Chain of Custody Numbers:

10-219289

### GLOSSARY OF REPORT TERMS

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*



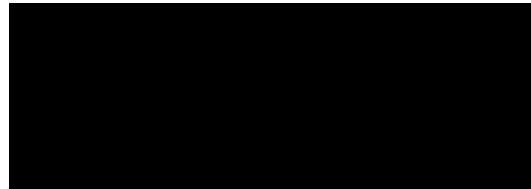
HEMMERA ENVIROCHEM INC.  
ATTN: Natasha Sandys  
230 - 2237 2nd Avenue  
Whitehorse YK Y1A 0K7

Date Received: 23-SEP-14  
Report Date: 07-OCT-14 10:49 (MT)  
Version: FINAL

Client Phone: 867-456-4865

## Certificate of Analysis

**Lab Work Order #:** L1522214  
**Project P.O. #:** NOT SUBMITTED  
**Job Reference:** HEMMERA 1343-005-04. ELR 14-183  
**C of C Numbers:** 10-152910, 10-152911  
**Legal Site Desc:**



Brent Mack  
Account Manager

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

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ALS CANADA LTD Part of the AL



## ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1522214-1 SW 21-SEP-14 18:50 E7	L1522214-2 SW 22-SEP-14 15:40 E7	L1522214-3 SW 21-SEP-14 18:00 E8	L1522214-4 SW 22-SEP-14 15:20 E8	L1522214-5 SW 21-SEP-14 15:30 GWCC-1
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Hardness (as CaCO3) (mg/L)	486		126		1660
	Total Suspended Solids (mg/L)		<3.0		<3.0	
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/L)	0.0063		0.0067		0.0077
	Nitrate (as N) (mg/L)		0.103		0.0954	
	Nitrite (as N) (mg/L)		<0.0010		<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.399		0.339		0.157
	Phosphorus (P)-Total (mg/L)	0.0040		0.0027		<0.0020
	Sulfate (SO4) (mg/L)			271		50.1
<b>Organic / Inorganic Carbon</b>	Dissolved Organic Carbon (mg/L)	13.9		11.2		5.43
	Total Organic Carbon (mg/L)					
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.0325		0.134		<0.0030
	Antimony (Sb)-Total (mg/L)	0.00038		0.00012		0.00136
	Arsenic (As)-Total (mg/L)	0.00093		0.00052		0.00217
	Barium (Ba)-Total (mg/L)	0.0527		0.0418		0.0190
	Beryllium (Be)-Total (mg/L)	<0.00010		<0.00010		<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.00050		<0.00050		<0.00050
	Boron (B)-Total (mg/L)	0.053		<0.010		0.288
	Cadmium (Cd)-Total (mg/L)	0.000057		0.000023		0.000203
	Calcium (Ca)-Total (mg/L)	82.0		32.3		205
	Chromium (Cr)-Total (mg/L)	0.00079		0.00051		0.00247
	Cobalt (Co)-Total (mg/L)	0.00077		0.00044		<0.00010
	Copper (Cu)-Total (mg/L)	0.00196		0.00246		0.00093
	Iron (Fe)-Total (mg/L)	0.308		0.344		<0.010
	Lead (Pb)-Total (mg/L)	0.000054		<0.000050		<0.000050
	Lithium (Li)-Total (mg/L)	0.0123		0.00397		0.0714
	Magnesium (Mg)-Total (mg/L)	59.9		10.9		279
	Manganese (Mn)-Total (mg/L)	0.261		0.0275		0.000298
	Mercury (Hg)-Total (mg/L)	<0.000010		<0.000010		<0.000010
	Molybdenum (Mo)-Total (mg/L)	0.00152		0.000498		0.00253
	Nickel (Ni)-Total (mg/L)	0.0166		0.00286		0.0757
	Phosphorus (P)-Total (mg/L)	<0.050		<0.050		<0.050
	Potassium (K)-Total (mg/L)	0.99		1.01		3.14
	Selenium (Se)-Total (mg/L)	0.00097		0.00022		0.00412
	Silicon (Si)-Total (mg/L)	4.54		5.12		6.33
Silver (Ag)-Total (mg/L)	<0.000010		<0.000010		<0.000010	
Sodium (Na)-Total (mg/L)	4.54		4.16		17.4	

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1522214-6 SW 22-SEP-14 14:30 GWCC-1	L1522214-7 SW 21-SEP-14 15:00 GWCC-2	L1522214-8 SW 22-SEP-14 14:35 GWCC-2	L1522214-9 SW 21-SEP-14 13:35 GWCC-3	L1522214-10 SW 22-SEP-14 14:40 GWCC-3
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Hardness (as CaCO3) (mg/L)		1230		637	
	Total Suspended Solids (mg/L)	<3.0		<3.0		<3.0
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/L)		<0.0050		<0.0050	
	Nitrate (as N) (mg/L)	0.44		0.396 <sup>DLA</sup>		0.176 <sup>DLA</sup>
	Nitrite (as N) (mg/L)	<0.020 <sup>DLA</sup>		<0.010 <sup>DLA</sup>		<0.010 <sup>DLA</sup>
	Total Kjeldahl Nitrogen (mg/L)		0.222		0.259	
	Phosphorus (P)-Total (mg/L)		<0.0020		<0.0020	
	Sulfate (SO4) (mg/L)	1340		929		412
<b>Organic / Inorganic Carbon</b>	Dissolved Organic Carbon (mg/L)		7.16		9.45	
	Total Organic Carbon (mg/L)					
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)		<0.0030		<0.0030	
	Antimony (Sb)-Total (mg/L)		0.00123		0.00081	
	Arsenic (As)-Total (mg/L)		0.00140		0.00082	
	Barium (Ba)-Total (mg/L)		0.0176		0.0264	
	Beryllium (Be)-Total (mg/L)		<0.00010		<0.00010	
	Bismuth (Bi)-Total (mg/L)		<0.00050		<0.00050	
	Boron (B)-Total (mg/L)		0.144		0.065	
	Cadmium (Cd)-Total (mg/L)		0.000178		0.000091	
	Calcium (Ca)-Total (mg/L)		172		110	
	Chromium (Cr)-Total (mg/L)		0.00173		0.00058	
	Cobalt (Co)-Total (mg/L)		<0.00010		<0.00010	
	Copper (Cu)-Total (mg/L)		0.00112		0.00111	
	Iron (Fe)-Total (mg/L)		<0.010		<0.010	
	Lead (Pb)-Total (mg/L)		0.000090		<0.000050	
	Lithium (Li)-Total (mg/L)		0.0161		0.00631	
	Magnesium (Mg)-Total (mg/L)		193		86.5	
	Manganese (Mn)-Total (mg/L)		0.000207		0.000186	
	Mercury (Hg)-Total (mg/L)		<0.000010		<0.000010	
	Molybdenum (Mo)-Total (mg/L)		0.00288		0.00254	
	Nickel (Ni)-Total (mg/L)		0.0428		0.0297	
	Phosphorus (P)-Total (mg/L)		<0.050		<0.050	
	Potassium (K)-Total (mg/L)		1.93		1.16	
	Selenium (Se)-Total (mg/L)		0.00338		0.00143	
	Silicon (Si)-Total (mg/L)		5.04		4.65	
Silver (Ag)-Total (mg/L)		<0.000010		<0.000010		
Sodium (Na)-Total (mg/L)		6.56		3.85		

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1522214-11 SW 21-SEP-14 14:25 GWCC-4	L1522214-12 SW 22-SEP-14 14:30 GWCC-4	L1522214-13 SW 22-SEP-14 09:25 R3	L1522214-14 SW 21-SEP-14 19:55 R6	L1522214-15 SW 22-SEP-14 15:45 R6
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Hardness (as CaCO3) (mg/L)	431		499	130	
	Total Suspended Solids (mg/L)		<3.0	12.7		<3.0
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/L)	<0.0050		0.0244	0.0065	
	Nitrate (as N) (mg/L)		0.0729	0.0633		0.0859
	Nitrite (as N) (mg/L)		<0.0010	0.0015		<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.288		0.441	0.335	
	Phosphorus (P)-Total (mg/L)	<0.0020		0.0165	0.0033	
	Sulfate (SO4) (mg/L)		231	304		50.2
<b>Organic / Inorganic Carbon</b>	Dissolved Organic Carbon (mg/L)	10.9		12.7	11.1	
	Total Organic Carbon (mg/L)					
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.0032		0.307	0.118	
	Antimony (Sb)-Total (mg/L)	0.00080		0.00018	0.00011	
	Arsenic (As)-Total (mg/L)	0.00118		0.00086	0.00062	
	Barium (Ba)-Total (mg/L)	0.0297		0.0560	0.0400	
	Beryllium (Be)-Total (mg/L)	<0.00010		<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.00050		<0.00050	<0.00050	
	Boron (B)-Total (mg/L)	0.040		<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	0.000050		0.000030	0.000021	
	Calcium (Ca)-Total (mg/L)	77.0		91.3	31.6	
	Chromium (Cr)-Total (mg/L)	0.00047		0.00120	0.00047	
	Cobalt (Co)-Total (mg/L)	<0.00010		0.00065	0.00047	
	Copper (Cu)-Total (mg/L)	0.00109		0.00226	0.00246	
	Iron (Fe)-Total (mg/L)	<0.010		1.05	0.440	
	Lead (Pb)-Total (mg/L)	<0.000050		0.000270	<0.000050	
	Lithium (Li)-Total (mg/L)	0.00540		0.00419	0.00397	
	Magnesium (Mg)-Total (mg/L)	50.4		57.9	11.3	
	Manganese (Mn)-Total (mg/L)	0.000537		0.177	0.0441	
	Mercury (Hg)-Total (mg/L)	<0.000010		<0.000010	<0.000010	
	Molybdenum (Mo)-Total (mg/L)	0.00240		0.00127	0.000476	
	Nickel (Ni)-Total (mg/L)	0.0289		0.00423	0.00271	
	Phosphorus (P)-Total (mg/L)	<0.050		<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.92		0.90	1.02	
	Selenium (Se)-Total (mg/L)	0.00071		0.00054	0.00021	
	Silicon (Si)-Total (mg/L)	4.98		6.14	4.93	
	Silver (Ag)-Total (mg/L)	<0.000010		<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	2.77		4.11	4.22	

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



# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1522214-16 SW 22-SEP-14 12:15 R7	L1522214-17 SW 21-SEP-14  DUP2	L1522214-18 SW 22-SEP-14  DUP2	L1522214-19 SW 21-SEP-14  FB1	L1522214-20 SW 22-SEP-14  FB1 GC
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Hardness (as CaCO3) (mg/L)	114	638		<0.50	
	Total Suspended Solids (mg/L)	27.3		<3.0		<3.0
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/L)	0.0306	<0.0050		<0.0050	
	Nitrate (as N) (mg/L)	0.145		0.172 <sup>DLA</sup>		<0.0050
	Nitrite (as N) (mg/L)	<0.0010		<0.010 <sup>DLA</sup>		<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.846	0.254		1.59 <sup>RRV</sup>	
	Phosphorus (P)-Total (mg/L)	0.0295	<0.0020		<0.0020	
	Sulfate (SO4) (mg/L)	45.3		413		<0.50
<b>Organic / Inorganic Carbon</b>	Dissolved Organic Carbon (mg/L)	27.2	9.67		51.2	
	Total Organic Carbon (mg/L)					
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.523	<0.0030		<0.0030	
	Antimony (Sb)-Total (mg/L)	0.00022	0.00081		0.00014	
	Arsenic (As)-Total (mg/L)	0.00147	0.00082		<0.00010	
	Barium (Ba)-Total (mg/L)	0.0842	0.0258		0.000226	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010		<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050		<0.00050	
	Boron (B)-Total (mg/L)	<0.010	0.059		0.022	
	Cadmium (Cd)-Total (mg/L)	0.000033	0.000089		<0.000010	
	Calcium (Ca)-Total (mg/L)	23.9	108		0.139	
	Chromium (Cr)-Total (mg/L)	0.00232	0.00059		<0.00010	
	Cobalt (Co)-Total (mg/L)	0.00102	<0.00010		<0.00010	
	Copper (Cu)-Total (mg/L)	0.00533	0.00109		0.00077	
	Iron (Fe)-Total (mg/L)	2.01	<0.010		<0.010	
	Lead (Pb)-Total (mg/L)	0.000303	<0.000050		0.000086	
	Lithium (Li)-Total (mg/L)	0.00096	0.00688		0.00121	
	Magnesium (Mg)-Total (mg/L)	11.6	84.4		<0.10	
	Manganese (Mn)-Total (mg/L)	0.274	0.000255		<0.000050	
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010		<0.000010	
	Molybdenum (Mo)-Total (mg/L)	0.000532	0.00255		<0.000050	
	Nickel (Ni)-Total (mg/L)	0.00445	0.0288		<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050		<0.050	
	Potassium (K)-Total (mg/L)	0.22	1.14		<0.10	
	Selenium (Se)-Total (mg/L)	0.00034	0.00137		<0.00010	
	Silicon (Si)-Total (mg/L)	5.85	4.61		<0.050	
Silver (Ag)-Total (mg/L)	<0.000010	<0.000010		<0.000010		
Sodium (Na)-Total (mg/L)	1.33	3.66		1.43		

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID				
	L1522214-21 SW 23-SEP-14 16:20 TRAVEL BLANK				
Grouping	Analyte				
<b>WATER</b>					
<b>Physical Tests</b>	Hardness (as CaCO3) (mg/L)	<0.50			
	Total Suspended Solids (mg/L)	<3.0			
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/L)	0.0096			
	Nitrate (as N) (mg/L)	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	<0.050			
	Phosphorus (P)-Total (mg/L)	<0.0020			
	Sulfate (SO4) (mg/L)	<0.50			
<b>Organic / Inorganic Carbon</b>	Dissolved Organic Carbon (mg/L)				
	Total Organic Carbon (mg/L)	<0.50			
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	<0.0030			
	Antimony (Sb)-Total (mg/L)	<0.00010			
	Arsenic (As)-Total (mg/L)	<0.00010			
	Barium (Ba)-Total (mg/L)	<0.000050			
	Beryllium (Be)-Total (mg/L)	<0.00010			
	Bismuth (Bi)-Total (mg/L)	<0.00050			
	Boron (B)-Total (mg/L)	<0.010			
	Cadmium (Cd)-Total (mg/L)	<0.000010			
	Calcium (Ca)-Total (mg/L)	<0.050			
	Chromium (Cr)-Total (mg/L)	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050			
	Iron (Fe)-Total (mg/L)	<0.010			
	Lead (Pb)-Total (mg/L)	<0.000050			
	Lithium (Li)-Total (mg/L)	<0.00050			
	Magnesium (Mg)-Total (mg/L)	<0.10			
	Manganese (Mn)-Total (mg/L)	<0.000050			
	Mercury (Hg)-Total (mg/L)	<0.000010			
	Molybdenum (Mo)-Total (mg/L)	<0.000050			
	Nickel (Ni)-Total (mg/L)	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050			
	Potassium (K)-Total (mg/L)	<0.10			
	Selenium (Se)-Total (mg/L)	<0.00010			
	Silicon (Si)-Total (mg/L)	<0.050			
Silver (Ag)-Total (mg/L)	<0.000010				
Sodium (Na)-Total (mg/L)	<0.050				

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1522214-1 SW 21-SEP-14 18:50 E7	L1522214-2 SW 22-SEP-14 15:40 E7	L1522214-3 SW 21-SEP-14 18:00 E8	L1522214-4 SW 22-SEP-14 15:20 E8	L1522214-5 SW 21-SEP-14 15:30 GWCC-1
Grouping	Analyte					
<b>WATER</b>						
<b>Total Metals</b>	Strontium (Sr)-Total (mg/L)	0.510		0.170		2.02
	Sulfur (S)-Total (mg/L)	88.8		16.9		442
	Thallium (Tl)-Total (mg/L)	<0.000010		<0.000010		0.000091
	Tin (Sn)-Total (mg/L)	<0.00010		<0.00010		<0.00010
	Titanium (Ti)-Total (mg/L)	<0.010		<0.010		<0.010
	Uranium (U)-Total (mg/L)	0.00241		0.00106		0.00694
	Vanadium (V)-Total (mg/L)	<0.0010		<0.0010		<0.0010
	Zinc (Zn)-Total (mg/L)	0.0048		0.0045		0.0083
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD		FIELD		FIELD
	Dissolved Metals Filtration Location	FIELD		FIELD		FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0120		0.0711		0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00039		0.00013		0.00133
	Arsenic (As)-Dissolved (mg/L)	0.00091		0.00045		0.00216
	Barium (Ba)-Dissolved (mg/L)	0.0547		0.0410		0.0191
	Beryllium (Be)-Dissolved (mg/L)	<0.00010		<0.00010		<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050		<0.00050		<0.00050
	Boron (B)-Dissolved (mg/L)	0.049		<0.010		0.264
	Cadmium (Cd)-Dissolved (mg/L)	0.000053		0.000019		0.000205
	Calcium (Ca)-Dissolved (mg/L)	88.8		32.5		207
	Chromium (Cr)-Dissolved (mg/L)	0.00057		0.00033		0.00232
	Cobalt (Co)-Dissolved (mg/L)	0.00076		0.00040		<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00194		0.00233		0.00088
	Iron (Fe)-Dissolved (mg/L)	0.246		0.244		<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050		<0.000050		<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0130		0.00415		0.0682
	Magnesium (Mg)-Dissolved (mg/L)	64.1		10.8		277
	Manganese (Mn)-Dissolved (mg/L)	0.274		0.0257		0.000212
	Mercury (Hg)-Dissolved (mg/L)	<0.000010		<0.000010		<0.000010
	Molybdenum (Mo)-Dissolved (mg/L)	0.00155		0.000457		0.00248
	Nickel (Ni)-Dissolved (mg/L)	0.0172		0.00276		0.0739
	Phosphorus (P)-Dissolved (mg/L)	<0.050		<0.050		<0.050
	Potassium (K)-Dissolved (mg/L)	1.07		0.98		3.11
	Selenium (Se)-Dissolved (mg/L)	0.00105		0.00023		0.00422
	Silicon (Si)-Dissolved (mg/L)	4.82		4.96		6.33
	Silver (Ag)-Dissolved (mg/L)	<0.000010		<0.000010		<0.000010
	Sodium (Na)-Dissolved (mg/L)	4.82		4.19		17.4
	Strontium (Sr)-Dissolved (mg/L)	0.525		0.166		2.01

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1522214-6 SW 22-SEP-14 14:30 GWCC-1	L1522214-7 SW 21-SEP-14 15:00 GWCC-2	L1522214-8 SW 22-SEP-14 14:35 GWCC-2	L1522214-9 SW 21-SEP-14 13:35 GWCC-3	L1522214-10 SW 22-SEP-14 14:40 GWCC-3
Grouping	Analyte					
<b>WATER</b>						
<b>Total Metals</b>	Strontium (Sr)-Total (mg/L)		1.01		0.540	
	Sulfur (S)-Total (mg/L)		313		139	
	Thallium (Tl)-Total (mg/L)		0.000072		0.000059	
	Tin (Sn)-Total (mg/L)		<0.00010		<0.00010	
	Titanium (Ti)-Total (mg/L)		<0.010		<0.010	
	Uranium (U)-Total (mg/L)		0.00328		0.00145	
	Vanadium (V)-Total (mg/L)		<0.0010		<0.0010	
	Zinc (Zn)-Total (mg/L)		0.0060		0.0036	
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location		FIELD		FIELD	
	Dissolved Metals Filtration Location		FIELD		FIELD	
	Aluminum (Al)-Dissolved (mg/L)		0.0019		0.0017	
	Antimony (Sb)-Dissolved (mg/L)		0.00113		0.00083	
	Arsenic (As)-Dissolved (mg/L)		0.00135		0.00082	
	Barium (Ba)-Dissolved (mg/L)		0.0178		0.0266	
	Beryllium (Be)-Dissolved (mg/L)		<0.00010		<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)		<0.00050		<0.00050	
	Boron (B)-Dissolved (mg/L)		0.110		0.058	
	Cadmium (Cd)-Dissolved (mg/L)		0.000179		0.000089	
	Calcium (Ca)-Dissolved (mg/L)		175		112	
	Chromium (Cr)-Dissolved (mg/L)		0.00164		0.00048	
	Cobalt (Co)-Dissolved (mg/L)		<0.00010		<0.00010	
	Copper (Cu)-Dissolved (mg/L)		0.00121		0.00104	
	Iron (Fe)-Dissolved (mg/L)		<0.010		<0.010	
	Lead (Pb)-Dissolved (mg/L)		<0.000050		<0.000050	
	Lithium (Li)-Dissolved (mg/L)		0.0133		0.00665	
	Magnesium (Mg)-Dissolved (mg/L)		194		86.9	
	Manganese (Mn)-Dissolved (mg/L)		0.000246		0.000164	
	Mercury (Hg)-Dissolved (mg/L)		<0.000010		<0.000010	
	Molybdenum (Mo)-Dissolved (mg/L)		0.00264		0.00249	
	Nickel (Ni)-Dissolved (mg/L)		0.0446		0.0284	
	Phosphorus (P)-Dissolved (mg/L)		<0.050		<0.050	
	Potassium (K)-Dissolved (mg/L)		1.92		1.18	
	Selenium (Se)-Dissolved (mg/L)		0.00363		0.00148	
	Silicon (Si)-Dissolved (mg/L)		5.05		4.66	
	Silver (Ag)-Dissolved (mg/L)		<0.000010		<0.000010	
	Sodium (Na)-Dissolved (mg/L)		6.76		3.74	
	Strontium (Sr)-Dissolved (mg/L)		0.963		0.535	

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1522214-11	L1522214-12	L1522214-13	L1522214-14	L1522214-15
	Description	SW	SW	SW	SW	SW
	Sampled Date	21-SEP-14	22-SEP-14	22-SEP-14	21-SEP-14	22-SEP-14
	Sampled Time	14:25	14:30	09:25	19:55	15:45
	Client ID	GWCC-4	GWCC-4	R3	R6	R6
Grouping	Analyte					
<b>WATER</b>						
<b>Total Metals</b>	Strontium (Sr)-Total (mg/L)	0.383		0.430	0.167	
	Sulfur (S)-Total (mg/L)	76.3		99.9	17.0	
	Thallium (Tl)-Total (mg/L)	0.000061		<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010		<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.010		<0.010	<0.010	
	Uranium (U)-Total (mg/L)	0.000904		0.00612	0.00108	
	Vanadium (V)-Total (mg/L)	<0.0010		0.0014	<0.0010	
	Zinc (Zn)-Total (mg/L)	<0.0030		0.0048	0.0041	
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD		FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD		FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0020		0.0215	0.0678	
	Antimony (Sb)-Dissolved (mg/L)	0.00082		0.00017	0.00011	
	Arsenic (As)-Dissolved (mg/L)	0.00123		0.00055	0.00058	
	Barium (Ba)-Dissolved (mg/L)	0.0310		0.0462	0.0403	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010		<0.00010	<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050		<0.00050	<0.00050	
	Boron (B)-Dissolved (mg/L)	0.037		<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	0.000048		0.000012	0.000022	
	Calcium (Ca)-Dissolved (mg/L)	83.8		97.8	32.9	
	Chromium (Cr)-Dissolved (mg/L)	0.00041		0.00049	0.00032	
	Cobalt (Co)-Dissolved (mg/L)	<0.00010		0.00044	0.00045	
	Copper (Cu)-Dissolved (mg/L)	0.00106		0.00160	0.00223	
	Iron (Fe)-Dissolved (mg/L)	<0.010		0.184	0.363	
	Lead (Pb)-Dissolved (mg/L)	<0.000050		<0.000050	<0.000050	
	Lithium (Li)-Dissolved (mg/L)	0.00554		0.00434	0.00420	
	Magnesium (Mg)-Dissolved (mg/L)	53.8		61.8	11.5	
	Manganese (Mn)-Dissolved (mg/L)	0.000393		0.172	0.0433	
	Mercury (Hg)-Dissolved (mg/L)	<0.000010		<0.000010	<0.000010	
	Molybdenum (Mo)-Dissolved (mg/L)	0.00240		0.00126	0.000456	
	Nickel (Ni)-Dissolved (mg/L)	0.0299		0.00345	0.00265	
	Phosphorus (P)-Dissolved (mg/L)	<0.050		<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	0.99		0.87	1.03	
	Selenium (Se)-Dissolved (mg/L)	0.00072		0.00052	0.00023	
	Silicon (Si)-Dissolved (mg/L)	5.32		5.98	4.98	
	Silver (Ag)-Dissolved (mg/L)	<0.000010		<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	2.88		4.28	4.22	
	Strontium (Sr)-Dissolved (mg/L)	0.393		0.448	0.168	

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1522214-16 SW 22-SEP-14 12:15 R7	L1522214-17 SW 21-SEP-14  DUP2	L1522214-18 SW 22-SEP-14  DUP2	L1522214-19 SW 21-SEP-14  FB1	L1522214-20 SW 22-SEP-14  FB1 GC
Grouping	Analyte					
<b>WATER</b>						
<b>Total Metals</b>	Strontium (Sr)-Total (mg/L)	0.0743	0.533		0.00105	
	Sulfur (S)-Total (mg/L)	14.9	136		<0.50	
	Thallium (Tl)-Total (mg/L)	<0.000010	0.000060		<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010		<0.00010	
	Titanium (Ti)-Total (mg/L)	0.020	<0.010		<0.010	
	Uranium (U)-Total (mg/L)	0.000128	0.00145		<0.000010	
	Vanadium (V)-Total (mg/L)	0.0025	<0.0010		<0.0010	
	Zinc (Zn)-Total (mg/L)	0.0042	0.0036		<0.0030	
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD	FIELD		FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD		FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.116	0.0016		<0.0010	
	Antimony (Sb)-Dissolved (mg/L)	0.00022	0.00084		0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00128	0.00085		<0.00010	
	Barium (Ba)-Dissolved (mg/L)	0.0772	0.0262		0.000206	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010		<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050	<0.00050		<0.00050	
	Boron (B)-Dissolved (mg/L)	<0.010	0.055		0.016	
	Cadmium (Cd)-Dissolved (mg/L)	0.000025	0.000087		<0.000010	
	Calcium (Ca)-Dissolved (mg/L)	25.5	112		0.142	
	Chromium (Cr)-Dissolved (mg/L)	0.00146	0.00047		<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	0.00080	<0.00010		<0.00010	
	Copper (Cu)-Dissolved (mg/L)	0.00455	0.00102		0.00071	
	Iron (Fe)-Dissolved (mg/L)	1.30	<0.010		<0.010	
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050		<0.000050	
	Lithium (Li)-Dissolved (mg/L)	0.00072	0.00718		<0.00050	
	Magnesium (Mg)-Dissolved (mg/L)	12.3	87.0		<0.10	
	Manganese (Mn)-Dissolved (mg/L)	0.277	0.000167		<0.000050	
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010		<0.000010	
	Molybdenum (Mo)-Dissolved (mg/L)	0.000517	0.00254		<0.000050	
	Nickel (Ni)-Dissolved (mg/L)	0.00399	0.0286		<0.00050	
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050		<0.050	
	Potassium (K)-Dissolved (mg/L)	0.20	1.16		<0.10	
	Selenium (Se)-Dissolved (mg/L)	0.00036	0.00148		<0.00010	
	Silicon (Si)-Dissolved (mg/L)	5.55	4.72		<0.050	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010		<0.000010	
	Sodium (Na)-Dissolved (mg/L)	1.39	3.71		1.47	
	Strontium (Sr)-Dissolved (mg/L)	0.0743	0.539		0.00097	

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>				
	L1522214-21 SW 23-SEP-14 16:20 TRAVEL BLANK				
Grouping	Analyte				
<b>WATER</b>					
<b>Total Metals</b>	Strontium (Sr)-Total (mg/L)	<0.00020			
	Sulfur (S)-Total (mg/L)	<0.50			
	Thallium (Tl)-Total (mg/L)	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.010			
	Uranium (U)-Total (mg/L)	<0.000010			
	Vanadium (V)-Total (mg/L)	<0.0010			
	Zinc (Zn)-Total (mg/L)	<0.0030			
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location				
	Dissolved Metals Filtration Location				
	Aluminum (Al)-Dissolved (mg/L)				
	Antimony (Sb)-Dissolved (mg/L)				
	Arsenic (As)-Dissolved (mg/L)				
	Barium (Ba)-Dissolved (mg/L)				
	Beryllium (Be)-Dissolved (mg/L)				
	Bismuth (Bi)-Dissolved (mg/L)				
	Boron (B)-Dissolved (mg/L)				
	Cadmium (Cd)-Dissolved (mg/L)				
	Calcium (Ca)-Dissolved (mg/L)				
	Chromium (Cr)-Dissolved (mg/L)				
	Cobalt (Co)-Dissolved (mg/L)				
	Copper (Cu)-Dissolved (mg/L)				
	Iron (Fe)-Dissolved (mg/L)				
	Lead (Pb)-Dissolved (mg/L)				
	Lithium (Li)-Dissolved (mg/L)				
	Magnesium (Mg)-Dissolved (mg/L)				
	Manganese (Mn)-Dissolved (mg/L)				
	Mercury (Hg)-Dissolved (mg/L)				
	Molybdenum (Mo)-Dissolved (mg/L)				
	Nickel (Ni)-Dissolved (mg/L)				
	Phosphorus (P)-Dissolved (mg/L)				
	Potassium (K)-Dissolved (mg/L)				
	Selenium (Se)-Dissolved (mg/L)				
	Silicon (Si)-Dissolved (mg/L)				
	Silver (Ag)-Dissolved (mg/L)				
	Sodium (Na)-Dissolved (mg/L)				
	Strontium (Sr)-Dissolved (mg/L)				

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1522214-1	L1522214-2	L1522214-3	L1522214-4	L1522214-5
		Description	SW	SW	SW	SW	SW
		Sampled Date	21-SEP-14	22-SEP-14	21-SEP-14	22-SEP-14	21-SEP-14
		Sampled Time	18:50	15:40	18:00	15:20	15:30
		Client ID	E7	E7	E8	E8	GWCC-1
Grouping	Analyte						
<b>WATER</b>							
<b>Dissolved Metals</b>	Sulfur (S)-Dissolved (mg/L)	94.3			16.7		435
	Thallium (Tl)-Dissolved (mg/L)	<0.000010			<0.000010		0.000092
	Tin (Sn)-Dissolved (mg/L)	<0.00010			<0.00010		<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.010			<0.010		<0.010
	Uranium (U)-Dissolved (mg/L)	0.00251			0.00102		0.00684
	Vanadium (V)-Dissolved (mg/L)	<0.0010			<0.0010		<0.0010
	Zinc (Zn)-Dissolved (mg/L)	0.0024			0.0034		0.0073

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



# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	Description	Sampled Date	Sampled Time	Client ID	L1522214-6	L1522214-7	L1522214-8	L1522214-9	L1522214-10
					SW	SW	SW	SW	SW
		22-SEP-14	14:30	GWCC-1	22-SEP-14	21-SEP-14	22-SEP-14	21-SEP-14	22-SEP-14
					14:30	15:00	14:35	13:35	14:40
					GWCC-1	GWCC-2	GWCC-2	GWCC-3	GWCC-3
Grouping	Analyte								
<b>WATER</b>									
<b>Dissolved Metals</b>	Sulfur (S)-Dissolved (mg/L)					314		139	
	Thallium (Tl)-Dissolved (mg/L)					0.000065		0.000058	
	Tin (Sn)-Dissolved (mg/L)					<0.00010		<0.00010	
	Titanium (Ti)-Dissolved (mg/L)					<0.010		<0.010	
	Uranium (U)-Dissolved (mg/L)					0.00311		0.00146	
	Vanadium (V)-Dissolved (mg/L)					<0.0010		<0.0010	
	Zinc (Zn)-Dissolved (mg/L)					0.0053		0.0024	

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	Description	Sampled Date	Sampled Time	Client ID	L1522214-11	L1522214-12	L1522214-13	L1522214-14	L1522214-15
					SW	SW	SW	SW	SW
					21-SEP-14	22-SEP-14	22-SEP-14	21-SEP-14	22-SEP-14
					14:25	14:30	09:25	19:55	15:45
					GWCC-4	GWCC-4	R3	R6	R6
Grouping	Analyte								
<b>WATER</b>									
<b>Dissolved Metals</b>	Sulfur (S)-Dissolved (mg/L)				79.2		105	17.3	
	Thallium (Tl)-Dissolved (mg/L)				0.000062		<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)				<0.00010		<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)				<0.010		<0.010	<0.010	
	Uranium (U)-Dissolved (mg/L)				0.000937		0.00621	0.00105	
	Vanadium (V)-Dissolved (mg/L)				<0.0010		<0.0010	<0.0010	
	Zinc (Zn)-Dissolved (mg/L)				0.0012		0.0013	0.0026	

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1522214-16	L1522214-17	L1522214-18	L1522214-19	L1522214-20
		Description	SW	SW	SW	SW	SW
		Sampled Date	22-SEP-14	21-SEP-14	22-SEP-14	21-SEP-14	22-SEP-14
		Sampled Time	12:15				
		Client ID	R7	DUP2	DUP2	FB1	FB1 GC
Grouping	Analyte						
<b>WATER</b>							
<b>Dissolved Metals</b>	Sulfur (S)-Dissolved (mg/L)		15.6	136		<0.50	
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	0.000059		<0.000010	
	Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010		<0.00010	
	Titanium (Ti)-Dissolved (mg/L)		<0.010	<0.010		<0.010	
	Uranium (U)-Dissolved (mg/L)		0.000099	0.00145		<0.000010	
	Vanadium (V)-Dissolved (mg/L)		0.0011	<0.0010		<0.0010	
	Zinc (Zn)-Dissolved (mg/L)		0.0022	0.0025		<0.0010	

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L1522214-21 SW 23-SEP-14 16:20 TRAVEL BLANK			
<b>Grouping</b>	<b>Analyte</b>				
<b>WATER</b>					
<b>Dissolved Metals</b>	Sulfur (S)-Dissolved (mg/L) Thallium (Tl)-Dissolved (mg/L) Tin (Sn)-Dissolved (mg/L) Titanium (Ti)-Dissolved (mg/L) Uranium (U)-Dissolved (mg/L) Vanadium (V)-Dissolved (mg/L) Zinc (Zn)-Dissolved (mg/L)				

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

## Reference Information

### Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comment:
L1522214-19	Water	Note: Results confirmed by repeat analysis	

### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1522214-1, -11, -13, -14, -17, -3, -5, -7, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1522214-1, -11, -13, -14, -16, -17, -19, -3, -5, -7, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1522214-1, -11, -13, -14, -16, -17, -19, -3, -5, -7, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1522214-1, -11, -13, -14, -16, -17, -19, -3, -5, -7, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1522214-16
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1522214-1, -11, -13, -14, -16, -17, -19, -3, -5, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1522214-1, -11, -13, -14, -16, -17, -19, -3, -5, -7, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L1522214-16, -17, -19
Matrix Spike	Manganese (Mn)-Total	MS-B	L1522214-16, -17, -19
Matrix Spike	Sodium (Na)-Total	MS-B	L1522214-16, -17, -19
Matrix Spike	Strontium (Sr)-Total	MS-B	L1522214-16, -17, -19

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>ANIONS-NO2-IC-WR</b>	Water	Nitrite Nitrogen by Ion Chromatography	EPA 300.1
This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003. Nitrate is detected by UV absorbance.			
<b>ANIONS-NO3-IC-WR</b>	Water	Nitrate Nitrogen by Ion Chromatography	EPA 300.1
This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003. Nitrate is detected by UV absorbance.			
<b>ANIONS-SO4-IC-WR</b>	Water	Sulphate by Ion Chromatography	EPA 300.1
This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.			
<b>CARBONS-DOC-VA</b>	Water	Dissolved organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
<b>CARBONS-TOC-VA</b>	Water	Total organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
<b>HARDNESS-CALC-VA</b>	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
<b>HG-DIS-LOW-CVAFS-VA</b>	Water	Dissolved Mercury in Water by CVAFS(Low)	EPA SW-846 3005A & EPA 245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).			
<b>HG-TOT-LOW-CVAFS-VA</b>	Water	Total Mercury in Water by CVAFS(Low)	EPA 245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).			

## Reference Information

<b>MET-D-CCMS-VA</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
<b>MET-DIS-LOW-ICP-VA</b>	Water	Dissolved Metals in Water by ICPOES	EPA 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
<b>MET-T-CCMS-VA</b>	Water	Total Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
<b>MET-TOT-LOW-ICP-VA</b>	Water	Total Metals in Water by ICPOES	EPA 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
<b>NH3-F-VA</b>	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
<b>P-T-PRES-COL-VA</b>	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
<b>S-DIS-ICP-VA</b>	Water	Dissolved Sulfur in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.			
<b>S-TOT-ICP-VA</b>	Water	Total Sulfur in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.			
<b>TKN-F-VA</b>	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
<b>TSS-MAN-WR</b>	Water	Total Suspended Solids by Gravimetric	APHA 2540 D
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids are determined by filtering a sample through a glass fibre filter and drying the filter at 104 degrees celsius.			

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

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

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA

## Reference Information

WR VA

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

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### Chain of Custody Numbers:

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10-152910 10-152911

### GLOSSARY OF REPORT TERMS

*Surrogate* - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

*mg/kg* - milligrams per kilogram based on dry weight of sample.

*mg/kg wwt* - milligrams per kilogram based on wet weight of sample.

*mg/kg lwt* - milligrams per kilogram based on lipid-adjusted weight of sample.

*mg/L* - milligrams per litre.

*<* - Less than.

*D.L.* - The reported Detection Limit, also known as the Limit of Reporting (LOR).

*N/A* - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

# Short Holding Time



Rush Processing

Chain of Custody / Analytical Request Form  
 Canada Toll Free: 1 800 668 9878  
 www.alsglobal.com



L1522214-COFC

152910

Page 1 of 2

ALS to confirm TAT

<b>Report To</b>	<b>Report Format / Distribution</b>	
Company: <u>Hemera Environmental Inc</u>	Standard: <input checked="" type="checkbox"/> Other (specify): <input checked="" type="checkbox"/>	Regular (Standard Turnaround Times - Business Days)
Contact: <u>Natasha Saunders</u>	Select: PDF Excel Digital Fax	Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
Address: <u>#203-2237 2<sup>nd</sup> Ave</u>	Email 1: <u>gwen@elr.ca, chris@elr.ca</u>	Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
<u>Whitcomb VT</u>	Email 2: <u>abra@hemera.com, nsaunders@hemera.com</u>	Same Day or Weekend Emergency - Contact ALS to confirm TAT
Phone: <u>867 456 4865 (x713)</u> Fax:	<u>Daistie/Lach Data</u>	

<b>Invoice To</b>	<b>Client / Project Information</b>	<b>Analysis Request</b>	
Same as Report? (circle) <input checked="" type="checkbox"/> Yes or No (if No, provide details)	Job #: <u>Hemera 1343-005-04</u>	(Indicate Filtered or Preserved, F/P)	
Copy of Invoice with Report? (circle) <input checked="" type="checkbox"/> Yes or No	LSD: <u>ELR 14-183</u>	<input checked="" type="checkbox"/> Low Level Dis Metals	<input checked="" type="checkbox"/> Low Level Totals Metals
Company:	Quote #: <u>Q46959 (attn: Natasha)</u>	<input checked="" type="checkbox"/> Nitrate Nitrite Sulphate	<input checked="" type="checkbox"/> Total Phosphorus
Contact: <u>SAME AS REPORT</u>	ALS Contact: <u>B Mack</u> Sampler: <u>A Brown</u>	<input checked="" type="checkbox"/> Ammonia	<input checked="" type="checkbox"/> TSS
Address:		<input checked="" type="checkbox"/> DOE	<input checked="" type="checkbox"/> Total K Nitrogen
Phone:		<input checked="" type="checkbox"/> Total Hardness	
Fax:			

<b>Lab Work Order # (lab use only)</b>	<b>ALS Contact:</b> <u>B Mack</u>	<b>Sampler:</b> <u>A Brown</u> <u>A Nicholson</u>
--	-----------------------------------	--

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Low Level Dis Metals	Low Level Totals Metals	Nitrate Nitrite Sulphate	Total Phosphorus	Ammonia	TSS	DOE	Total K Nitrogen	Total Hardness	Number of Containers
E7		21-009-14	18:50	SW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			6
E7		22-009-14	15:40				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		1
E8		21-009-14	18:00		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			6
E8		22-009-14	15:20				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		1
GWCC-1		21-009-14	15:30		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			6
GWCC-1		22-009-14	14:30				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		1
GWCC-2		21-009-14	15:00		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			6
GWCC-2		22-009-14	14:35				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		1
GWCC-3		21-009-14	13:35		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			6
GWCC-3		22-009-14	14:40				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		1
<del>GWCC-4</del> GWCC-4		21-009-14	14:25		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			6
<del>GWCC-4</del> GWCC-4		22-009-14	14:30				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		1

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

CCME Standards.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: <u>Aaron Nicholson</u>	Date: <u>23 Sept 2014</u>	Time:	Received by: <u>[Signature]</u>	Date: <u>23-SEP-14</u>	Time: <u>9:20</u>	Temperature: <u>-0.8, 1.00C</u>	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY

YELLOW - CLIENT COPY

GENF 16.01 Front

PAUL

SEP 26

14:30

4°C





<b>Report To</b> Hemmer Environ	<b>Report Format / Distribution</b>	<b>Service requirements</b> (ability - Contact ALS to confirm TAT)
<b>Company:</b>	Standard: <input checked="" type="checkbox"/> Other (specify):	<input checked="" type="checkbox"/> Regular (Standard Turnaround Times - Business Days)
<b>Contact:</b> Natasha Sardys	Select: PDF Excel Digital Fax	Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
<b>Address:</b> #203-2237 2 <sup>nd</sup> Ave Whitby Ont	Email 1: Email 2: SAME AS COC X of 2	Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
<b>Phone:</b> 667 456 4965 (713) Fax:		Same Day or Weekend Emergency - Contact ALS to confirm TAT

<b>Invoice To</b> Same as Report? (circle) <input checked="" type="checkbox"/> Yes or No (If No, provide details)	<b>Client / Project Information</b>	<b>Analysis Request</b> (Indicate Filtered or Preserved, F/P)	
Copy of Invoice with Report? (circle) <input checked="" type="checkbox"/> Yes or No	Job #: 1343-005.04	<input checked="" type="checkbox"/> P	<input checked="" type="checkbox"/> P
<b>Company:</b>	PO / A/E:	Low Level Dis Metals	Low Level Total Metals
<b>Contact:</b> SAME AS REPORT	LSD:	Nitrate, Nitrite, Sulphate	Total Phosphorus
<b>Address:</b>	Quote #: Q46959 (attn: Natasha)	Ammonia	TSS
<b>Phone:</b> Fax:	ALS Contact: B Mack	DOC	Total K Nitrogen
<b>Lab Work Order # (lab use only)</b>	Sampler: A Brown A Nicholson	Total Hardness	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	Low Level Dis Metals	Low Level Total Metals	Nitrate, Nitrite, Sulphate	Total Phosphorus	Ammonia	TSS	DOC	Total K Nitrogen	Total Hardness	Number of Containers
R3		22-009-14	09:25	SW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7
R6		21-009-14	19:55		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	6
R6		22-009-14	15:45		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1
R7		22-009-14	12:15		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7
DUP2		21-009-14			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	6
DUP2		22-009-14			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1
FB1		21-009-14			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	6
FB1 GC		22-009-14			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1
Travel Blank		23-009-14	16:20		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	6

**Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details**

CCME standards . Travel blank not filtered/preserved. Travel Blank as supplied by lab. Lab did not supply DI water for field blank, used sealed jugs of "Turbo Power" DI water

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Aaron Nicholson	Date: 23 Sept 2014	Time:	Received by:	Date:	Time:	Temperature: °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

**APPENDIX 3**  
**Hydrological Monitoring Data Summaries**

### Stream Flow & Discharge Calculation

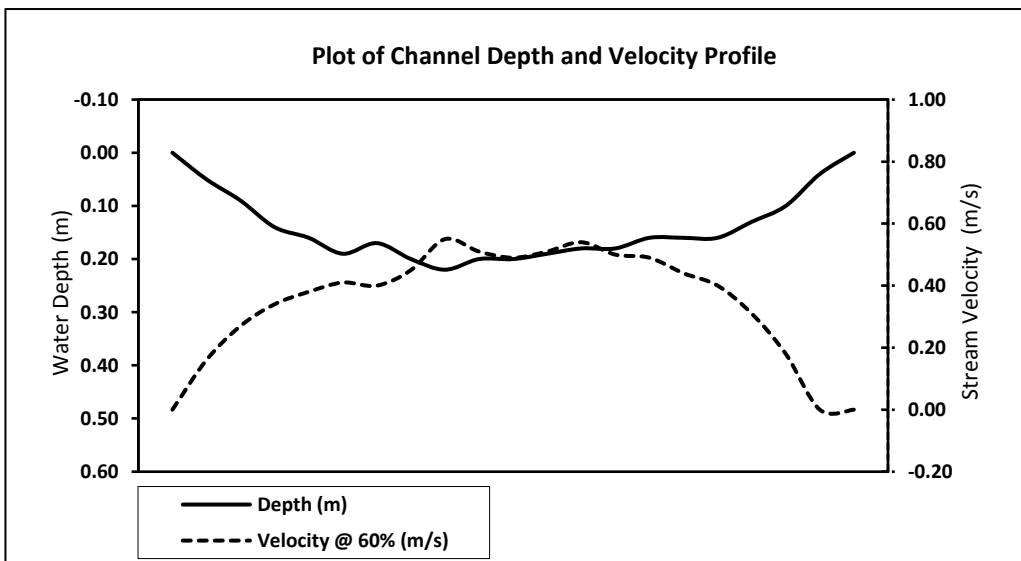
ELR Project No.	14-183		
Site / Location:	R1		
Stream Name:	Clinton Creek		
Station Name:	R1		
Date and Time:	20 Sep. 2014 @ 10:00		
Staff:	AN + AB		
UTM Coordinates:	07W 0510718 7147525		
Technique:	Swoffer Meter	Left Bank	4.3
Temp., Water/Air (°C)	NC / 3	Right Bank	0.4
Crossing Number	1	Wet.Width	3.9



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	4.30	0.100	0.00	0.00	0.000	0.0000
1	4.10	0.200	0.05	0.16	0.010	0.0016
2	3.90	0.200	0.09	0.27	0.018	0.0049
3	3.70	0.200	0.14	0.34	0.028	0.0095
4	3.50	0.200	0.16	0.38	0.032	0.0122
5	3.30	0.200	0.19	0.41	0.038	0.0156
6	3.10	0.200	0.17	0.40	0.034	0.0136
7	2.90	0.200	0.20	0.45	0.040	0.0180
8	2.70	0.200	0.22	0.55	0.044	0.0242
9	2.50	0.200	0.20	0.51	0.040	0.0204
10	2.30	0.200	0.20	0.49	0.040	0.0196
11	2.10	0.200	0.19	0.51	0.038	0.0194
12	1.90	0.200	0.18	0.54	0.036	0.0194
13	1.70	0.200	0.18	0.50	0.036	0.0180
14	1.50	0.200	0.16	0.49	0.032	0.0157
15	1.30	0.200	0.16	0.44	0.032	0.0141
16	1.10	0.200	0.16	0.40	0.032	0.0128
17	0.90	0.200	0.13	0.31	0.026	0.0081
18	0.70	0.200	0.10	0.18	0.020	0.0036
19	0.50	0.200	0.04	0.00	0.008	0.0000
20	0.30	0.100	0.00	0.00	0.000	0.0000
21	0.30					

Mean Depth (m)	0.14
Mean Velocity (m/s)	0.35

Discharge (m <sup>3</sup> /s)	0.2506
-------------------------------	--------



## Stream Flow & Discharge Calculation

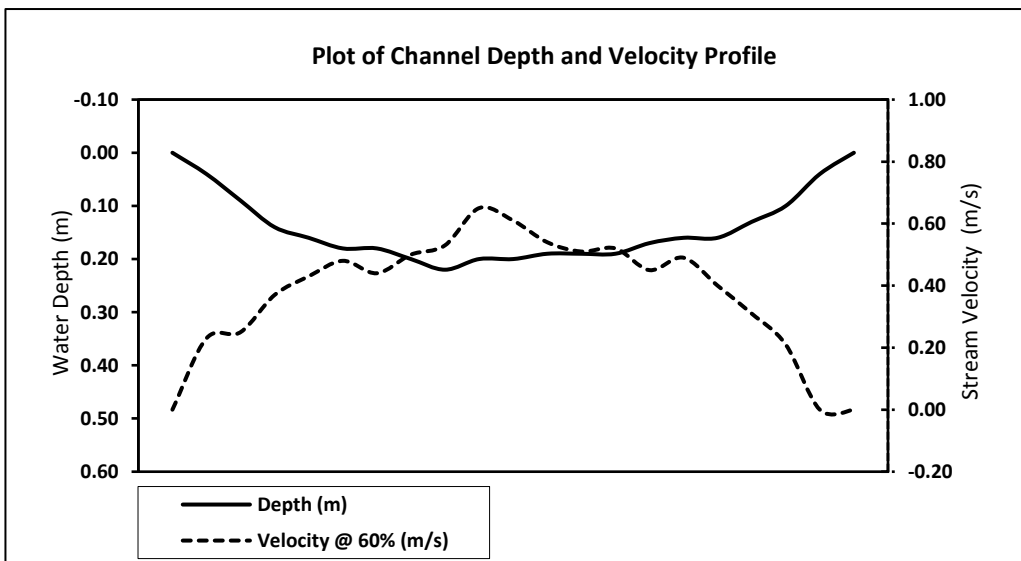
ELR Project No.	14-183		
Site / Location:	R1		
Stream Name:	Clinton Creek		
Station Name:	R1		
Date and Time:	20 Sep. 2014 @ 10:00		
Staff:	AN + AB		
UTM Coordinates:	07W 0510718 7147525		
Technique:	Swoffer Meter	Left Bank	4.3
Temp., Water/Air (°C)	NC / 3	Right Bank	0.4
Crossing Number	2	Wet.Width	3.9



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	4.30	0.100	0.00	0.00	0.000	0.0000
1	4.10	0.200	0.04	0.23	0.008	0.0018
2	3.90	0.200	0.09	0.25	0.018	0.0045
3	3.70	0.200	0.14	0.37	0.028	0.0104
4	3.50	0.200	0.16	0.43	0.032	0.0138
5	3.30	0.200	0.18	0.48	0.036	0.0173
6	3.10	0.200	0.18	0.44	0.036	0.0158
7	2.90	0.200	0.20	0.50	0.040	0.0200
8	2.70	0.200	0.22	0.53	0.044	0.0233
9	2.50	0.200	0.20	0.65	0.040	0.0260
10	2.30	0.200	0.20	0.61	0.040	0.0244
11	2.10	0.200	0.19	0.54	0.038	0.0205
12	1.90	0.200	0.19	0.51	0.038	0.0194
13	1.70	0.200	0.19	0.52	0.038	0.0198
14	1.50	0.200	0.17	0.45	0.034	0.0153
15	1.30	0.200	0.16	0.49	0.032	0.0157
16	1.10	0.200	0.16	0.40	0.032	0.0128
17	0.90	0.200	0.13	0.31	0.026	0.0081
18	0.70	0.200	0.10	0.21	0.020	0.0042
19	0.50	0.200	0.04	0.00	0.008	0.0000
20	0.30	0.100	0.00	0.00	0.000	0.0000
21	0.30					

Mean Depth (m)	0.14
Mean Velocity (m/s)	0.38

Discharge (m <sup>3</sup> /s)	0.2730
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### Stream Flow & Discharge Calculation

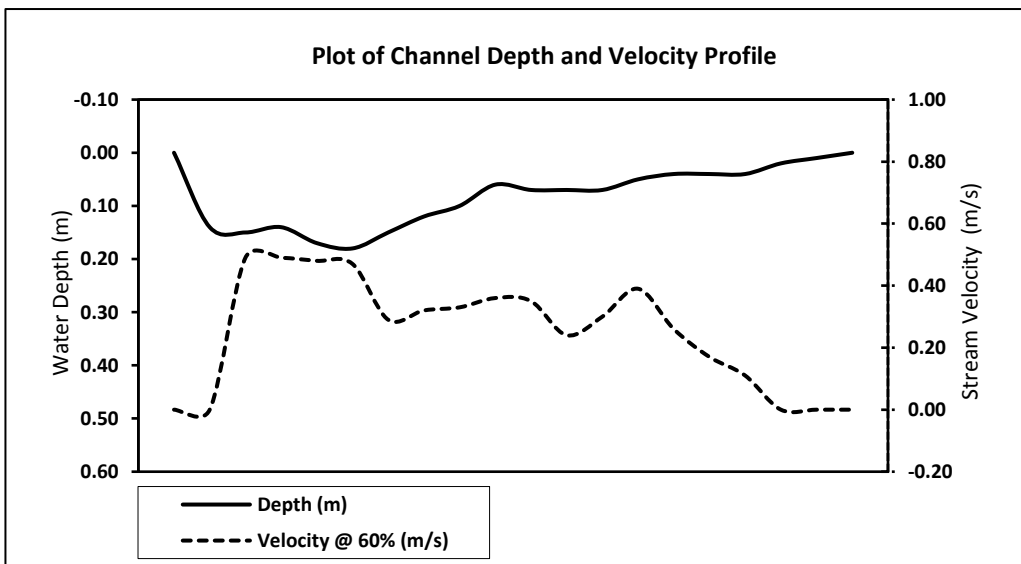
ELR Project No.	14-183		
Site / Location:	R2		
Stream Name:	Easter Creek		
Station Name:	R2		
Date and Time:	20 Sep. 2014 @ 11:45		
Staff:	AN + AB		
UTM Coordinates:	07W 0512023 7148061		
Technique:	Swoffer Meter	Left Bank	0.75
Temp., Water/Air (°C)	NC / 8	Right Bank	2.65
Crossing Number	1	Wet.Width	1.9



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.75	0.050	0.00	0.00	0.000	0.0000
1	0.85	0.100	0.14	0.00	0.014	0.0000
2	0.95	0.100	0.15	0.49	0.015	0.0074
3	1.05	0.100	0.14	0.49	0.014	0.0069
4	1.15	0.100	0.17	0.48	0.017	0.0082
5	1.25	0.100	0.18	0.47	0.018	0.0085
6	1.35	0.100	0.15	0.29	0.015	0.0044
7	1.45	0.100	0.12	0.32	0.012	0.0038
8	1.55	0.100	0.10	0.33	0.010	0.0033
9	1.65	0.100	0.06	0.36	0.006	0.0022
10	1.75	0.100	0.07	0.35	0.007	0.0025
11	1.85	0.100	0.07	0.24	0.007	0.0017
12	1.95	0.100	0.07	0.30	0.007	0.0021
13	2.05	0.100	0.05	0.39	0.005	0.0020
14	2.15	0.100	0.04	0.26	0.004	0.0010
15	2.25	0.100	0.04	0.17	0.004	0.0007
16	2.35	0.100	0.04	0.11	0.004	0.0004
17	2.45	0.100	0.02	0.00	0.002	0.0000
18	2.55	0.100	0.01	0.00	0.001	0.0000
19	2.65	0.050	0.00	0.00	0.000	0.0000
20	2.65					

Mean Depth (m)	0.08
Mean Velocity (m/s)	0.25

Discharge (m <sup>3</sup> /s)	0.0548
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### Stream Flow & Discharge Calculation

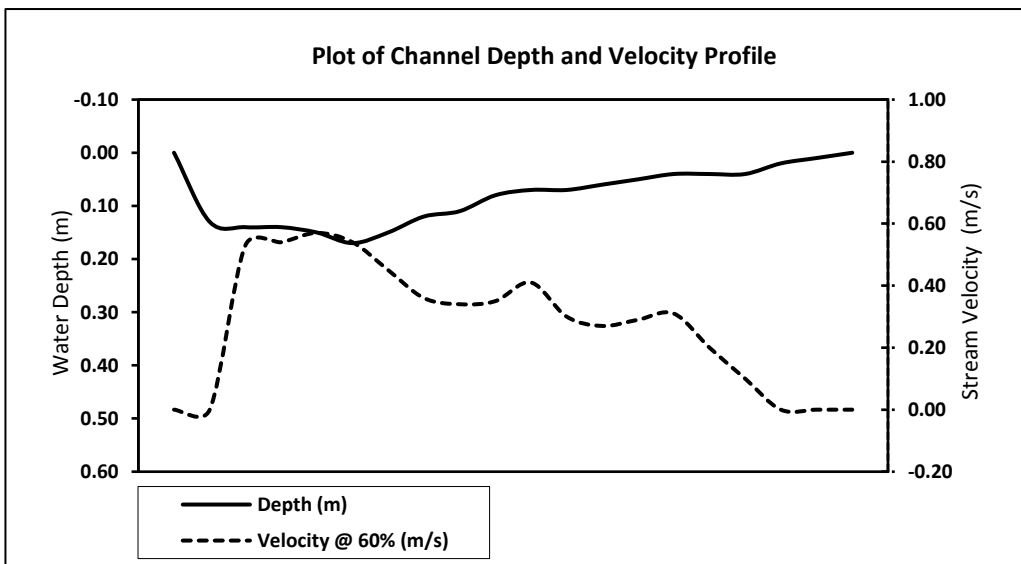
ELR Project No.	14-183		
Site / Location:	R2		
Stream Name:	Easter Creek		
Station Name:	R2		
Date and Time:	20 Sep. 2014 @ 11:45		
Staff:	AN + AB		
UTM Coordinates:	07W 0512023 7148061		
Technique:	Swoffer Meter	Left Bank	0.75
Temp., Water/Air (°C)	NC / 8	Right Bank	2.65
Crossing Number	2	Wet.Width	1.9



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.75	0.050	0.00	0.00	0.000	0.0000
1	0.85	0.100	0.13	0.00	0.013	0.0000
2	0.95	0.100	0.14	0.53	0.014	0.0074
3	1.05	0.100	0.14	0.54	0.014	0.0076
4	1.15	0.100	0.15	0.57	0.015	0.0086
5	1.25	0.100	0.17	0.54	0.017	0.0092
6	1.35	0.100	0.15	0.45	0.015	0.0068
7	1.45	0.100	0.12	0.36	0.012	0.0043
8	1.55	0.100	0.11	0.34	0.011	0.0037
9	1.65	0.100	0.08	0.35	0.008	0.0028
10	1.75	0.100	0.07	0.41	0.007	0.0029
11	1.85	0.100	0.07	0.30	0.007	0.0021
12	1.95	0.100	0.06	0.27	0.006	0.0016
13	2.05	0.100	0.05	0.29	0.005	0.0015
14	2.15	0.100	0.04	0.31	0.004	0.0012
15	2.25	0.100	0.04	0.20	0.004	0.0008
16	2.35	0.100	0.04	0.10	0.004	0.0004
17	2.45	0.100	0.02	0.00	0.002	0.0000
18	2.55	0.100	0.01	0.00	0.001	0.0000
19	2.65	0.050	0.00	0.00	0.000	0.0000
20	2.65					

Mean Depth (m)	0.08
Mean Velocity (m/s)	0.28

Discharge (m <sup>3</sup> /s)	0.0608
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## Stream Flow & Discharge Calculation

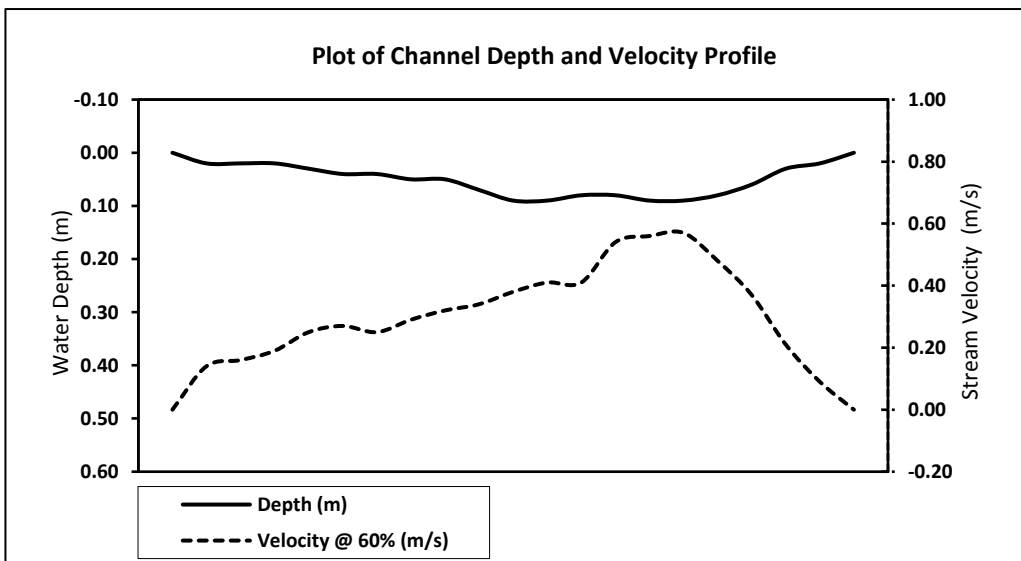
ELR Project No.	14-183		
Site / Location:	R3		
Stream Name:	Wolverine Creek		
Station Name:	R3		
Date and Time:	22 Sep. 2014		
Staff:	AN + AB		
UTM Coordinates:	07W 0513952 7148677		
Technique:	Swoffer Meter	Left Bank	0.2
Temp., Water/Air (°C)	NC / 2	Right Bank	2.05
Crossing Number	1	Wet.Width	1.85



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.20	0.045	0.00	0.00	0.000	0.0000
1	0.29	0.085	0.02	0.14	0.002	0.0002
2	0.37	0.095	0.02	0.16	0.002	0.0003
3	0.48	0.100	0.02	0.19	0.002	0.0004
4	0.57	0.091	0.03	0.25	0.003	0.0007
5	0.66	0.095	0.04	0.27	0.004	0.0010
6	0.76	0.095	0.04	0.25	0.004	0.0009
7	0.85	0.090	0.05	0.29	0.005	0.0013
8	0.94	0.090	0.05	0.32	0.005	0.0014
9	1.03	0.095	0.07	0.34	0.007	0.0023
10	1.13	0.095	0.09	0.38	0.009	0.0032
11	1.22	0.090	0.09	0.41	0.008	0.0033
12	1.31	0.090	0.08	0.41	0.007	0.0030
13	1.40	0.095	0.08	0.54	0.008	0.0041
14	1.50	0.095	0.09	0.56	0.009	0.0048
15	1.59	0.090	0.09	0.57	0.008	0.0046
16	1.68	0.090	0.08	0.48	0.007	0.0035
17	1.77	0.095	0.06	0.37	0.006	0.0021
18	1.87	0.095	0.03	0.21	0.003	0.0006
19	1.96	0.090	0.02	0.09	0.002	0.0002
20	2.05	0.045	0.00	0.00	0.000	0.0000
21	2.05					

Mean Depth (m)	0.05
Mean Velocity (m/s)	0.30

Discharge (m <sup>3</sup> /s)	0.0379
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## Stream Flow & Discharge Calculation

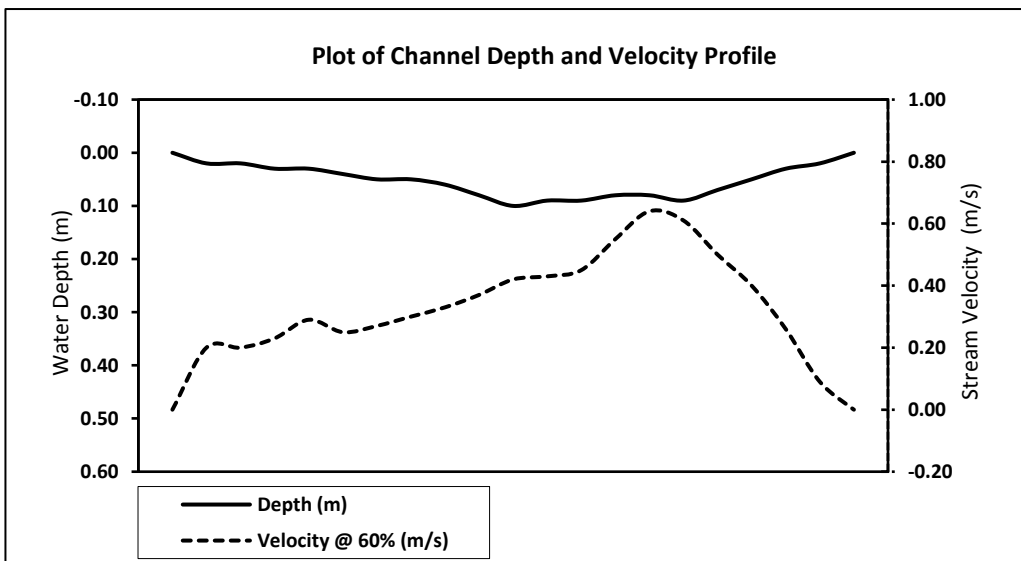
ELR Project No.	14-183		
Site / Location:	R3		
Stream Name:	Wolverine Creek		
Station Name:	R3		
Date and Time:	22 Sep. 2014		
Staff:	AN + AB		
UTM Coordinates:	07W 0513952 7148677		
Technique:	Swoffer Meter	Left Bank	0.2
Temp., Water/Air (°C)	NC / 2	Right Bank	2.05
Crossing Number	2	Wet.Width	1.85



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.20	0.045	0.00	0.00	0.000	0.0000
1	0.29	0.085	0.02	0.20	0.002	0.0003
2	0.37	0.095	0.02	0.20	0.002	0.0004
3	0.48	0.100	0.03	0.23	0.003	0.0007
4	0.57	0.091	0.03	0.29	0.003	0.0008
5	0.66	0.095	0.04	0.25	0.004	0.0010
6	0.76	0.095	0.05	0.27	0.005	0.0013
7	0.85	0.090	0.05	0.30	0.005	0.0014
8	0.94	0.090	0.06	0.33	0.005	0.0018
9	1.03	0.095	0.08	0.37	0.008	0.0028
10	1.13	0.095	0.10	0.42	0.010	0.0040
11	1.22	0.090	0.09	0.43	0.008	0.0035
12	1.31	0.090	0.09	0.45	0.008	0.0036
13	1.40	0.095	0.08	0.55	0.008	0.0042
14	1.50	0.095	0.08	0.64	0.008	0.0049
15	1.59	0.090	0.09	0.61	0.008	0.0049
16	1.68	0.090	0.07	0.50	0.006	0.0032
17	1.77	0.095	0.05	0.40	0.005	0.0019
18	1.87	0.095	0.03	0.26	0.003	0.0007
19	1.96	0.090	0.02	0.09	0.002	0.0002
20	2.05	0.045	0.00	0.00	0.000	0.0000
21	2.05					

Mean Depth (m)	0.05
Mean Velocity (m/s)	0.32

Discharge (m <sup>3</sup> /s)	0.0414
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## Stream Flow & Discharge Calculation

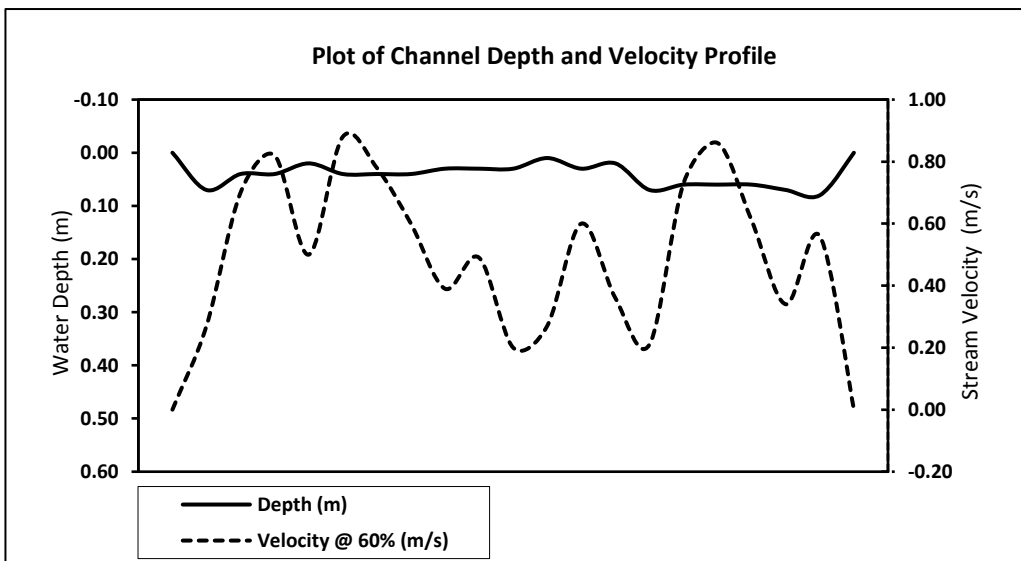
ELR Project No.	14-183		
Site / Location:	R4		
Stream Name:	Eagle Creek		
Station Name:	R4		
Date and Time:	19 Sep. 2014 @ 17:55		
Staff:	AB + AN		
UTM Coordinates:	07W 0515981 7415344		
Technique:	Swoffer Meter	Left Bank	0.35
Temp., Water/Air (°C)	NC / 8	Right Bank	1.9
Crossing Number	1	Wet.Width	1.55



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.35	0.040	0.00	0.00	0.000	0.0000
1	0.43	0.080	0.07	0.27	0.006	0.0015
2	0.51	0.075	0.04	0.70	0.003	0.0021
3	0.58	0.075	0.04	0.82	0.003	0.0025
4	0.66	0.080	0.02	0.50	0.002	0.0008
5	0.74	0.078	0.04	0.88	0.003	0.0027
6	0.82	0.075	0.04	0.78	0.003	0.0023
7	0.89	0.078	0.04	0.60	0.003	0.0019
8	0.97	0.080	0.03	0.39	0.002	0.0009
9	1.05	0.080	0.03	0.49	0.002	0.0012
10	1.13	0.075	0.03	0.20	0.002	0.0005
11	1.20	0.075	0.01	0.27	0.001	0.0002
12	1.28	0.080	0.03	0.60	0.002	0.0014
13	1.36	0.080	0.02	0.36	0.002	0.0006
14	1.44	0.075	0.07	0.21	0.005	0.0011
15	1.51	0.075	0.06	0.73	0.005	0.0033
16	1.59	0.080	0.06	0.86	0.005	0.0041
17	1.67	0.080	0.06	0.61	0.005	0.0029
18	1.75	0.075	0.07	0.34	0.005	0.0018
19	1.82	0.075	0.08	0.56	0.006	0.0034
20	1.90	0.040	0.00	0.00	0.000	0.0000
21	1.90					

Mean Depth (m)	0.04
Mean Velocity (m/s)	0.48

Discharge (m <sup>3</sup> /s)	0.0352
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### Stream Flow & Discharge Calculation

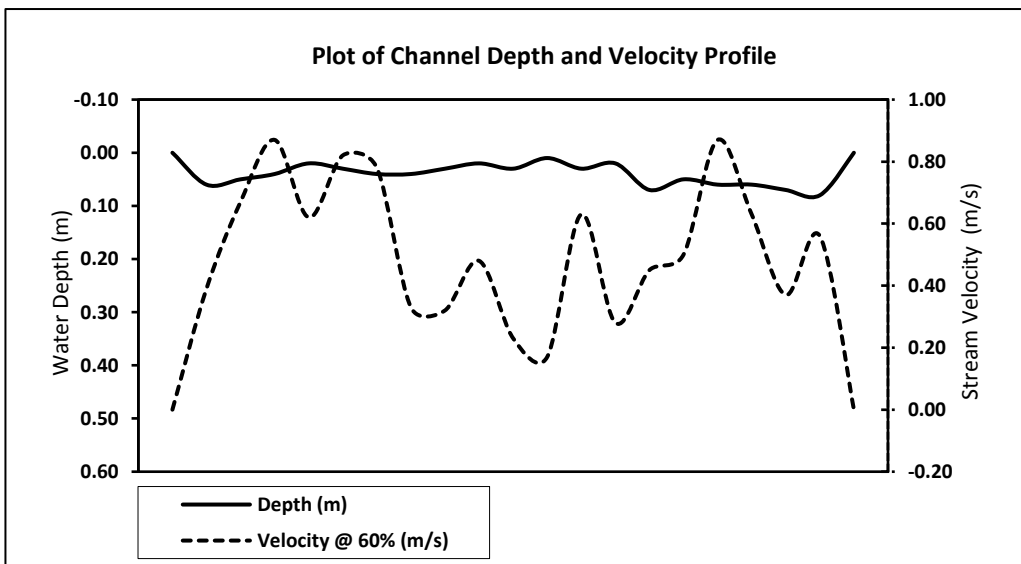
ELR Project No.	14-183		
Site / Location:	R4		
Stream Name:	Eagle Creek		
Station Name:	R4		
Date and Time:	19 Sep. 2014 @ 17:55		
Staff:	AB + AN		
UTM Coordinates:	07W 0515981 7415344		
Technique:	Swoffer Meter	Left Bank	0.35
Temp., Water/Air (°C)	NC / 8	Right Bank	1.9
Crossing Number	2	Wet.Width	1.55



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.35	0.040	0.00	0.00	0.000	0.0000
1	0.43	0.080	0.06	0.39	0.005	0.0019
2	0.51	0.075	0.05	0.67	0.004	0.0025
3	0.58	0.075	0.04	0.87	0.003	0.0026
4	0.66	0.080	0.02	0.62	0.002	0.0010
5	0.74	0.078	0.03	0.82	0.002	0.0019
6	0.82	0.075	0.04	0.78	0.003	0.0023
7	0.89	0.078	0.04	0.33	0.003	0.0010
8	0.97	0.080	0.03	0.32	0.002	0.0008
9	1.05	0.080	0.02	0.48	0.002	0.0008
10	1.13	0.075	0.03	0.23	0.002	0.0005
11	1.20	0.075	0.01	0.17	0.001	0.0001
12	1.28	0.080	0.03	0.63	0.002	0.0015
13	1.36	0.080	0.02	0.28	0.002	0.0004
14	1.44	0.075	0.07	0.45	0.005	0.0024
15	1.51	0.075	0.05	0.50	0.004	0.0019
16	1.59	0.080	0.06	0.87	0.005	0.0042
17	1.67	0.080	0.06	0.63	0.005	0.0030
18	1.75	0.075	0.07	0.37	0.005	0.0019
19	1.82	0.075	0.08	0.56	0.006	0.0034
20	1.90	0.040	0.00	0.00	0.000	0.0000
21	1.90					

Mean Depth (m)	0.04
Mean Velocity (m/s)	0.47

Discharge (m <sup>3</sup> /s)	0.0341
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### Stream Flow & Discharge Calculation

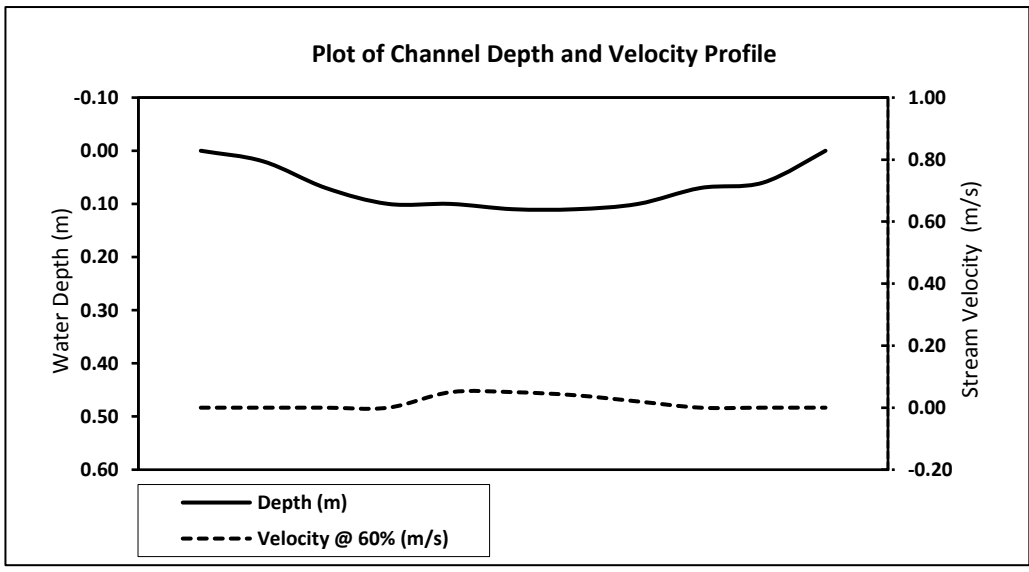
ELR Project No.	14-183		
Site / Location:	R7		
Stream Name:	Porcupine Creek		
Station Name:	R7		
Date and Time:	22 Sep. 2014 @ 12:10		
Staff:	AN + AB		
UTM Coordinates:	07W 0513026 7145669		
Technique:	Swoffer Meter	Left Bank	0.3
Temp., Water/Air (°C)	NC / 3	Right Bank	1
Crossing Number	1	Wet.Width	0.7



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.30	0.035	0.00	0.00	0.000	0.0000
1	0.37	0.070	0.02	0.00	0.001	0.0000
2	0.44	0.070	0.07	0.00	0.005	0.0000
3	0.51	0.070	0.10	0.00	0.007	0.0000
4	0.58	0.070	0.10	0.05	0.007	0.0004
5	0.65	0.070	0.11	0.05	0.008	0.0004
6	0.72	0.070	0.11	0.04	0.008	0.0003
7	0.79	0.070	0.10	0.02	0.007	0.0001
8	0.86	0.070	0.07	0.00	0.005	0.0000
9	0.93	0.070	0.06	0.00	0.004	0.0000
10	1.00	0.035	0.00	0.00	0.000	0.0000
11	1.00					

Mean Depth (m)	0.07
Mean Velocity (m/s)	0.01

Discharge (m <sup>3</sup> /s)	0.0012
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## Stream Flow & Discharge Calculation

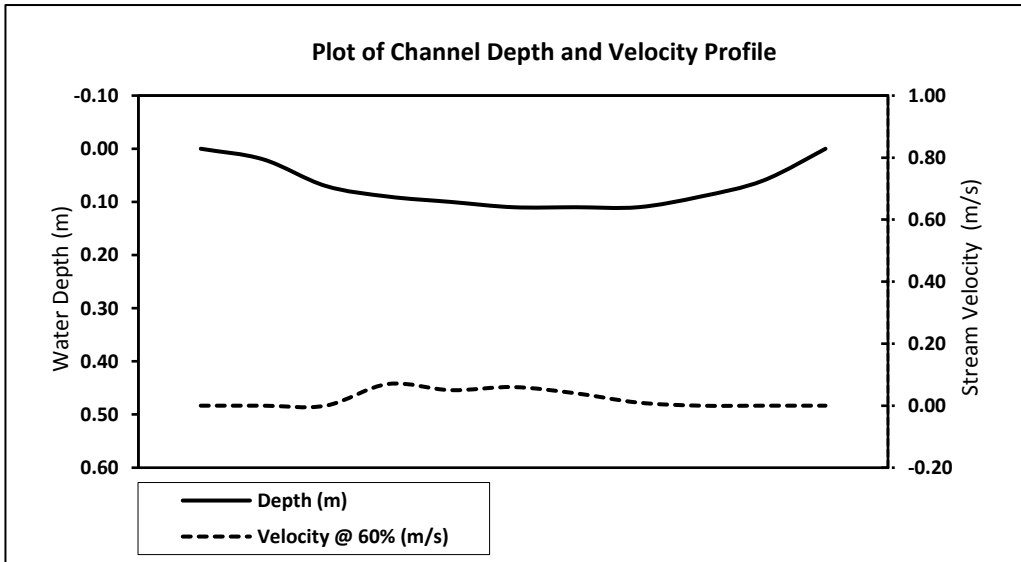
ELR Project No.	14-183		
Site / Location:	R7		
Stream Name:	Porcupine Creek		
Station Name:	R7		
Date and Time:	22 Sep. 2014 @ 12:10		
Staff:	AN + AB		
UTM Coordinates:	07W 0513026 7145669		
Technique:	Swoffer Meter	Left Bank	0.3
Temp., Water/Air (°C)	NC / 3	Right Bank	1
Crossing Number	2	Wet.Width	0.7



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.30	0.035	0.00	0.00	0.000	0.0000
1	0.37	0.070	0.02	0.00	0.001	0.0000
2	0.44	0.070	0.07	0.00	0.005	0.0000
3	0.51	0.070	0.09	0.07	0.006	0.0004
4	0.58	0.070	0.10	0.05	0.007	0.0004
5	0.65	0.070	0.11	0.06	0.008	0.0005
6	0.72	0.070	0.11	0.04	0.008	0.0003
7	0.79	0.070	0.11	0.01	0.008	0.0001
8	0.86	0.070	0.09	0.00	0.006	0.0000
9	0.93	0.070	0.06	0.00	0.004	0.0000
10	1.00	0.035	0.00	0.00	0.000	0.0000
11	1.00					

Mean Depth (m)	0.07
Mean Velocity (m/s)	0.02

Discharge (m <sup>3</sup> /s)	0.0016
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### Stream Flow & Discharge Calculation

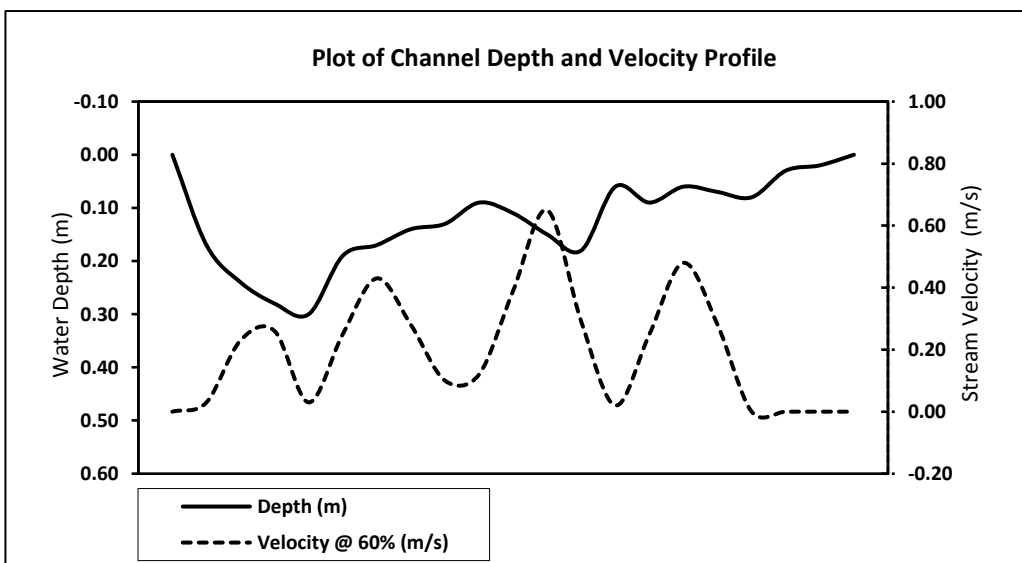
ELR Project No.	14-183		
Site / Location:	E1		
Stream Name:	Clinton Creek		
Station Name:	E1		
Date and Time:	19 Sep. 2014 @ 11:35		
Staff:	AN + AB		
UTM Coordinates:	07W 0513645 7147111		
Technique:	Swoffer Meter	Left Bank	0.65
Temp., Water/Air (°C)	NC / 3 no sun, 8 with sun	Right Bank	9.5
Crossing Number	1	Wet.Width	8.85



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.65	0.220	0.00	0.00	0.000	0.0000
1	1.09	0.440	0.17	0.03	0.075	0.0022
2	1.53	0.445	0.24	0.23	0.107	0.0246
3	1.98	0.445	0.28	0.26	0.125	0.0324
4	2.42	0.440	0.30	0.03	0.132	0.0040
5	2.86	0.445	0.19	0.25	0.085	0.0211
6	3.31	0.445	0.17	0.43	0.076	0.0325
7	3.75	0.440	0.14	0.28	0.062	0.0172
8	4.19	0.440	0.13	0.10	0.057	0.0057
9	4.63	0.445	0.09	0.12	0.040	0.0048
10	5.08	0.445	0.11	0.39	0.049	0.0191
11	5.52	0.440	0.15	0.65	0.066	0.0429
12	5.96	0.440	0.18	0.29	0.079	0.0230
13	6.40	0.445	0.06	0.02	0.027	0.0005
14	6.85	0.445	0.09	0.25	0.040	0.0100
15	7.29	0.440	0.06	0.48	0.026	0.0127
16	7.73	0.440	0.07	0.28	0.031	0.0086
17	8.17	0.445	0.08	0.00	0.036	0.0000
18	8.62	0.445	0.03	0.00	0.013	0.0000
19	9.06	0.440	0.02	0.00	0.009	0.0000
20	9.50	0.220	0.00	0.00	0.000	0.0000
21	9.50					

Mean Depth (m)	0.12
Mean Velocity (m/s)	0.19

Discharge (m <sup>3</sup> /s)	0.2614
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### Stream Flow & Discharge Calculation

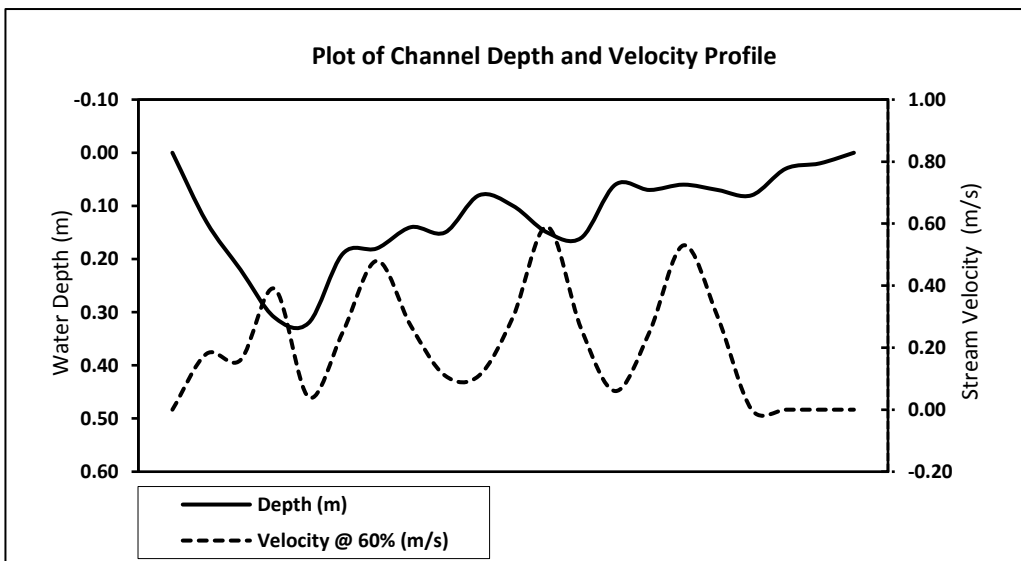
ELR Project No.	14-183		
Site / Location:	E1		
Stream Name:	Clinton Creek		
Station Name:	E1		
Date and Time:	19 Sep. 2014 @ 11:35		
Staff:	AN + AB		
UTM Coordinates:	07W 0513645 7147111		
Technique:	Swoffer Meter	Left Bank	0.65
Temp., Water/Air (°C)	NC / 3 no sun, 8 with sun	Right Bank	9.5
Crossing Number	2	Wet.Width	8.85



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.65	0.220	0.00	0.00	0.000	0.0000
1	1.09	0.440	0.13	0.18	0.057	0.0103
2	1.53	0.445	0.22	0.16	0.098	0.0157
3	1.98	0.445	0.31	0.39	0.138	0.0538
4	2.42	0.440	0.32	0.04	0.141	0.0056
5	2.86	0.445	0.19	0.25	0.085	0.0211
6	3.31	0.445	0.18	0.48	0.080	0.0384
7	3.75	0.440	0.14	0.27	0.062	0.0166
8	4.19	0.440	0.15	0.11	0.066	0.0073
9	4.63	0.445	0.08	0.11	0.036	0.0039
10	5.08	0.445	0.10	0.30	0.045	0.0134
11	5.52	0.440	0.15	0.59	0.066	0.0389
12	5.96	0.440	0.16	0.26	0.070	0.0183
13	6.40	0.445	0.06	0.06	0.027	0.0016
14	6.85	0.445	0.07	0.25	0.031	0.0078
15	7.29	0.440	0.06	0.53	0.026	0.0140
16	7.73	0.440	0.07	0.30	0.031	0.0092
17	8.17	0.445	0.08	0.00	0.036	0.0000
18	8.62	0.445	0.03	0.00	0.013	0.0000
19	9.06	0.440	0.02	0.00	0.009	0.0000
20	9.50	0.220	0.00	0.00	0.000	0.0000
21	9.50					

Mean Depth (m)	0.12
Mean Velocity (m/s)	0.20

Discharge (m <sup>3</sup> /s)	0.2760
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### Stream Flow & Discharge Calculation

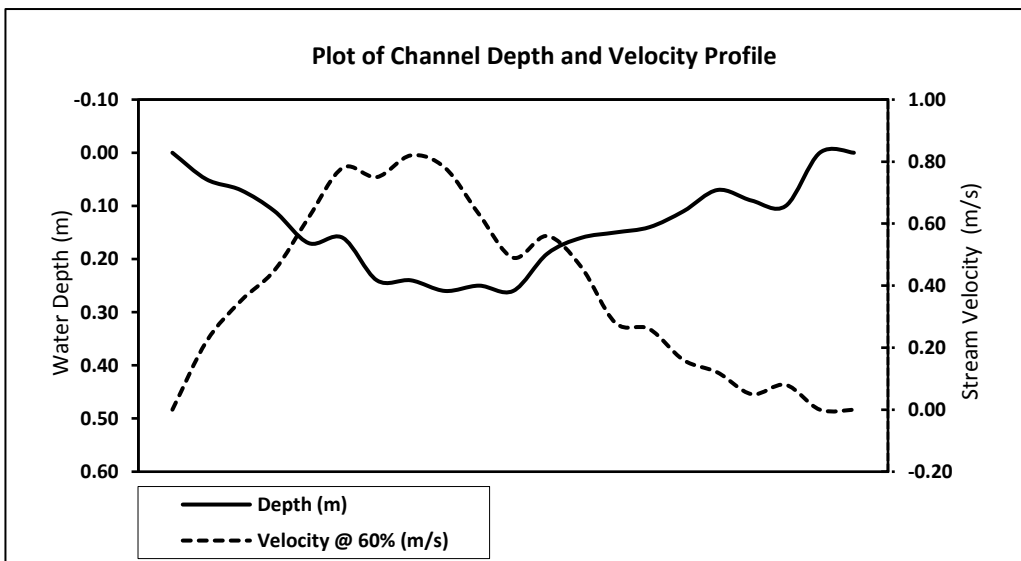
ELR Project No.	14-183		
Site / Location:	E2		
Stream Name:	Clinton Creek		
Station Name:	E2		
Date and Time:	19 Sep. 2014 @ 15:10		
Staff:	AN + AB		
UTM Coordinates:	07W 0514149 7147076		
Technique:	Swoffer Meter	Left Bank	1.5
Temp., Water/Air (°C)	NC / 6	Right Bank	7.2
Crossing Number	1	Wet.Width	5.7



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	1.50	0.145	0.00	0.00	0.000	0.0000
1	1.79	0.285	0.05	0.22	0.014	0.0031
2	2.07	0.285	0.07	0.35	0.020	0.0070
3	2.36	0.285	0.11	0.45	0.031	0.0141
4	2.64	0.285	0.17	0.62	0.048	0.0300
5	2.93	0.285	0.16	0.78	0.046	0.0356
6	3.21	0.285	0.24	0.75	0.068	0.0513
7	3.50	0.285	0.24	0.82	0.068	0.0561
8	3.78	0.285	0.26	0.78	0.074	0.0578
9	4.07	0.285	0.25	0.63	0.071	0.0449
10	4.35	0.285	0.26	0.49	0.074	0.0363
11	4.64	0.285	0.19	0.56	0.054	0.0303
12	4.92	0.285	0.16	0.46	0.046	0.0210
13	5.21	0.285	0.15	0.28	0.043	0.0120
14	5.49	0.285	0.14	0.26	0.040	0.0104
15	5.78	0.285	0.11	0.16	0.031	0.0050
16	6.06	0.285	0.07	0.12	0.020	0.0024
17	6.35	0.285	0.09	0.05	0.026	0.0013
18	6.63	0.285	0.10	0.08	0.029	0.0023
19	6.92	0.285	0.00	0.00	0.000	0.0000
20	7.20	0.140	0.00	0.00	0.000	0.0000
21	7.20					

Mean Depth (m)	0.13
Mean Velocity (m/s)	0.37

Discharge (m <sup>3</sup> /s)	0.4208
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## Stream Flow & Discharge Calculation

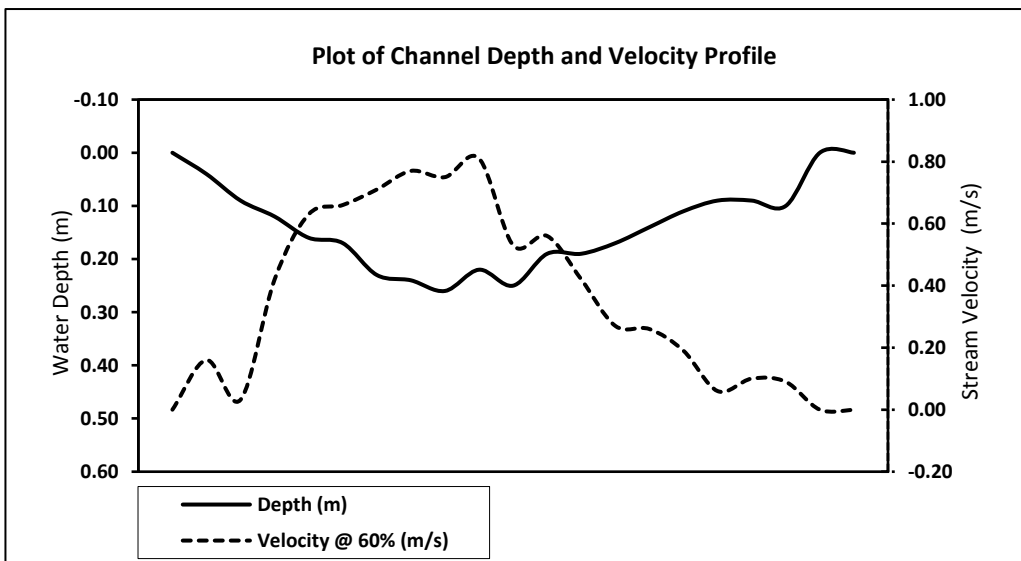
ELR Project No.	14-183		
Site / Location:	E2		
Stream Name:	Clinton Creek		
Station Name:	E2		
Date and Time:	19 Sep. 2014 @ 15:10		
Staff:	AN + AB		
UTM Coordinates:	07W 0514149 7147076		
Technique:	Swoffer Meter	Left Bank	1.5
Temp., Water/Air (°C)	NC / 6	Right Bank	7.2
Crossing Number	2	Wet.Width	5.7



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	1.50	0.145	0.00	0.00	0.000	0.0000
1	1.79	0.285	0.04	0.16	0.011	0.0018
2	2.07	0.285	0.09	0.03	0.026	0.0008
3	2.36	0.285	0.12	0.42	0.034	0.0144
4	2.64	0.285	0.16	0.63	0.046	0.0287
5	2.93	0.285	0.17	0.66	0.048	0.0320
6	3.21	0.285	0.23	0.71	0.066	0.0465
7	3.50	0.285	0.24	0.77	0.068	0.0527
8	3.78	0.285	0.26	0.75	0.074	0.0556
9	4.07	0.285	0.22	0.81	0.063	0.0508
10	4.35	0.285	0.25	0.53	0.071	0.0378
11	4.64	0.285	0.19	0.56	0.054	0.0303
12	4.92	0.285	0.19	0.42	0.054	0.0227
13	5.21	0.285	0.17	0.27	0.048	0.0131
14	5.49	0.285	0.14	0.26	0.040	0.0104
15	5.78	0.285	0.11	0.19	0.031	0.0060
16	6.06	0.285	0.09	0.06	0.026	0.0015
17	6.35	0.285	0.09	0.10	0.026	0.0026
18	6.63	0.285	0.10	0.09	0.029	0.0026
19	6.92	0.285	0.00	0.00	0.000	0.0000
20	7.20	0.140	0.00	0.00	0.000	0.0000
21	7.20					

Mean Depth (m)	0.14
Mean Velocity (m/s)	0.35

Discharge (m <sup>3</sup> /s)	0.4102
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### Stream Flow & Discharge Calculation

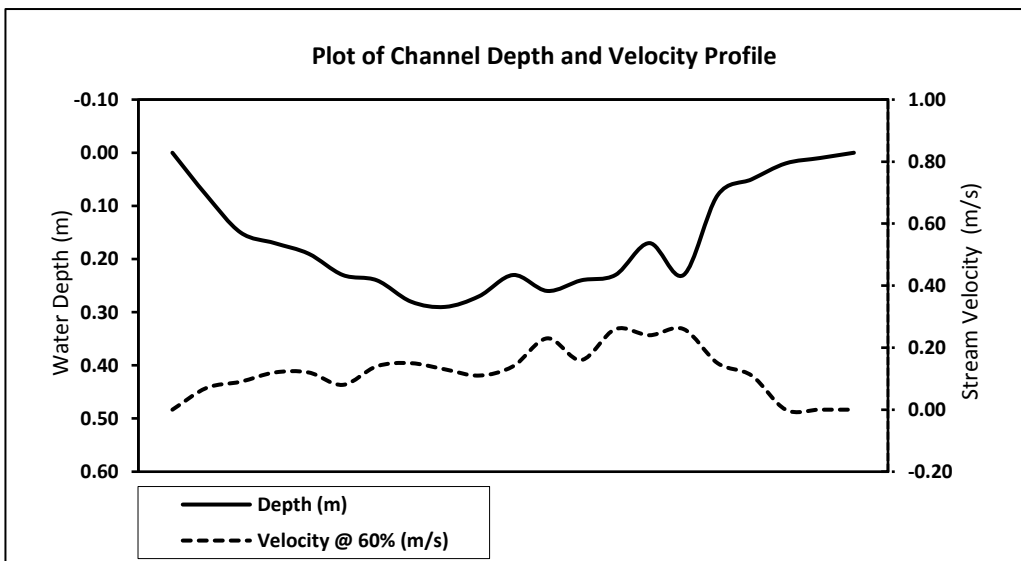
ELR Project No.	14-183		
Site / Location:	E3		
Stream Name:	Wolverine Creek		
Station Name:	E3		
Date and Time:	19 Sep. 2014 @ 16:30		
Staff:	AB + AN		
UTM Coordinates:	07W 0514178 7147189		
Technique:	Swoffer Meter	Left Bank	3.3
Temp., Water/Air (°C)	NC / 8	Right Bank	1.3
Crossing Number	1	Wet.Width	2



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	3.30	0.050	0.00	0.00	0.000	0.0000
1	3.20	0.100	0.08	0.07	0.008	0.0006
2	3.10	0.100	0.15	0.09	0.015	0.0014
3	3.00	0.100	0.17	0.12	0.017	0.0020
4	2.90	0.100	0.19	0.12	0.019	0.0023
5	2.80	0.100	0.23	0.08	0.023	0.0018
6	2.70	0.100	0.24	0.14	0.024	0.0034
7	2.60	0.100	0.28	0.15	0.028	0.0042
8	2.50	0.100	0.29	0.13	0.029	0.0038
9	2.40	0.100	0.27	0.11	0.027	0.0030
10	2.30	0.100	0.23	0.14	0.023	0.0032
11	2.20	0.100	0.26	0.23	0.026	0.0060
12	2.10	0.100	0.24	0.16	0.024	0.0038
13	2.00	0.100	0.23	0.26	0.023	0.0060
14	1.90	0.100	0.17	0.24	0.017	0.0041
15	1.80	0.100	0.23	0.26	0.023	0.0060
16	1.70	0.100	0.08	0.15	0.008	0.0012
17	1.60	0.100	0.05	0.11	0.005	0.0006
18	1.50	0.100	0.02	0.00	0.002	0.0000
19	1.40	0.100	0.01	0.00	0.001	0.0000
20	1.30	0.050	0.00	0.00	0.000	0.0000
21	1.30					

Mean Depth (m)	0.16
Mean Velocity (m/s)	0.12

Discharge (m <sup>3</sup> /s)	0.0532
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## Stream Flow & Discharge Calculation

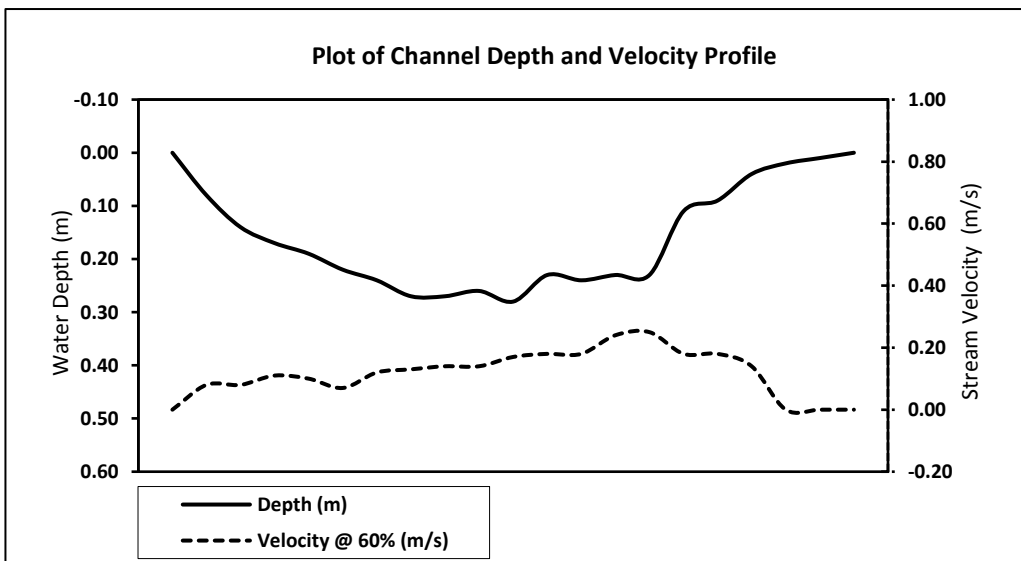
ELR Project No.	14-183		
Site / Location:	E3		
Stream Name:	Wolverine Creek		
Station Name:	E3		
Date and Time:	19 Sep. 2014 @ 16:30		
Staff:	AB + AN		
UTM Coordinates:	07W 0514178 7147189		
Technique:	Swoffer Meter	Left Bank	3.3
Temp., Water/Air (°C)	NC / 8	Right Bank	1.3
Crossing Number	2	Wet.Width	2



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	3.30	0.050	0.00	0.00	0.000	0.0000
1	3.20	0.100	0.08	0.08	0.008	0.0006
2	3.10	0.100	0.14	0.08	0.014	0.0011
3	3.00	0.100	0.17	0.11	0.017	0.0019
4	2.90	0.100	0.19	0.10	0.019	0.0019
5	2.80	0.100	0.22	0.07	0.022	0.0015
6	2.70	0.100	0.24	0.12	0.024	0.0029
7	2.60	0.100	0.27	0.13	0.027	0.0035
8	2.50	0.100	0.27	0.14	0.027	0.0038
9	2.40	0.100	0.26	0.14	0.026	0.0036
10	2.30	0.100	0.28	0.17	0.028	0.0048
11	2.20	0.100	0.23	0.18	0.023	0.0041
12	2.10	0.100	0.24	0.18	0.024	0.0043
13	2.00	0.100	0.23	0.24	0.023	0.0055
14	1.90	0.100	0.23	0.25	0.023	0.0057
15	1.80	0.100	0.11	0.18	0.011	0.0020
16	1.70	0.100	0.09	0.18	0.009	0.0016
17	1.60	0.100	0.04	0.14	0.004	0.0006
18	1.50	0.100	0.02	0.00	0.002	0.0000
19	1.40	0.100	0.01	0.00	0.001	0.0000
20	1.30	0.050	0.00	0.00	0.000	0.0000
21	1.30					

Mean Depth (m)	0.16
Mean Velocity (m/s)	0.12

Discharge (m <sup>3</sup> /s)	0.0495
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## Stream Flow & Discharge Calculation

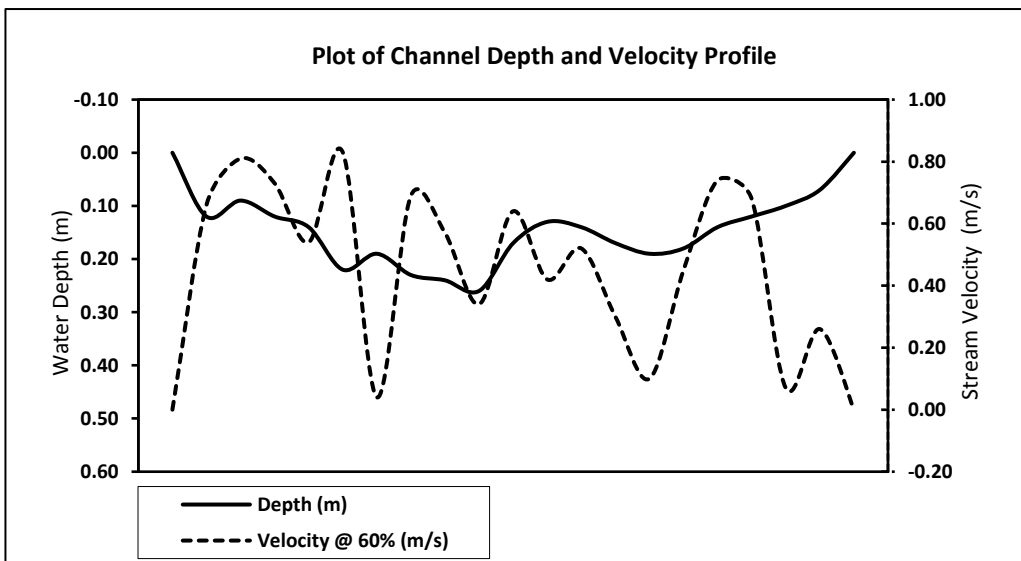
ELR Project No.	14-183		
Site / Location:	E4		
Stream Name:	Clinton Creek		
Station Name:	E4		
Date and Time:	19 Sep. 2014 @ 18:35		
Staff:	AB + AN		
UTM Coordinates:	07W 0515950 7145287		
Technique:	Swoffer Meter	Left Bank	0.2
Temp., Water/Air (°C)	NC / 8	Right Bank	6.15
Crossing Number	1	Wet.Width	5.95



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.20	0.150	0.00	0.00	0.000	0.0000
1	0.50	0.300	0.12	0.66	0.036	0.0238
2	0.80	0.300	0.09	0.81	0.027	0.0219
3	1.10	0.300	0.12	0.73	0.036	0.0263
4	1.40	0.300	0.14	0.54	0.042	0.0227
5	1.70	0.300	0.22	0.83	0.066	0.0548
6	2.00	0.300	0.19	0.04	0.057	0.0023
7	2.30	0.300	0.23	0.69	0.069	0.0476
8	2.60	0.300	0.24	0.57	0.072	0.0410
9	2.90	0.300	0.26	0.34	0.078	0.0265
10	3.20	0.300	0.17	0.64	0.051	0.0326
11	3.50	0.300	0.13	0.42	0.039	0.0164
12	3.80	0.300	0.14	0.52	0.042	0.0218
13	4.10	0.300	0.17	0.30	0.051	0.0153
14	4.40	0.300	0.19	0.10	0.057	0.0057
15	4.70	0.300	0.18	0.45	0.054	0.0243
16	5.00	0.300	0.14	0.74	0.042	0.0311
17	5.30	0.300	0.12	0.68	0.036	0.0245
18	5.60	0.300	0.10	0.07	0.030	0.0021
19	5.90	0.300	0.07	0.26	0.021	0.0055
20	6.20	0.150	0.00	0.00	0.000	0.0000
21	6.20					

Mean Depth (m)	0.14
Mean Velocity (m/s)	0.45

Discharge (m <sup>3</sup> /s)	0.4461
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## Stream Flow & Discharge Calculation

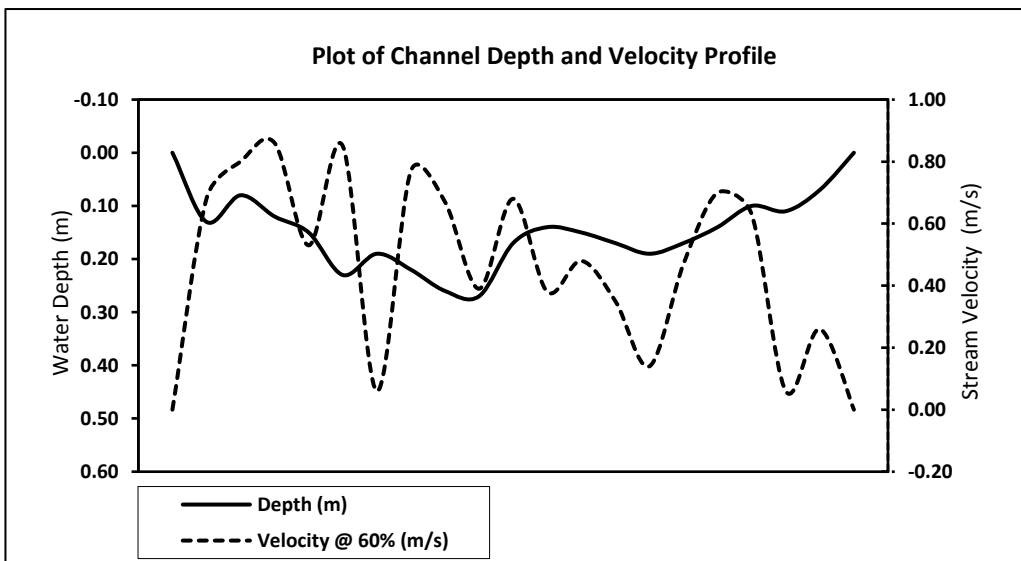
ELR Project No.	14-183		
Site / Location:	E4		
Stream Name:	Clinton Creek		
Station Name:	E4		
Date and Time:	19 Sep. 2014 @ 18:35		
Staff:	AB + AN		
UTM Coordinates:	07W 0515950 7145287		
Technique:	Swoffer Meter	Left Bank	0.2
Temp., Water/Air (°C)	NC / 8	Right Bank	6.15
Crossing Number	2	Wet.Width	5.95



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.20	0.150	0.00	0.00	0.000	0.0000
1	0.50	0.300	0.13	0.68	0.039	0.0265
2	0.80	0.300	0.08	0.80	0.024	0.0192
3	1.10	0.300	0.12	0.86	0.036	0.0310
4	1.40	0.300	0.15	0.53	0.045	0.0239
5	1.70	0.300	0.23	0.85	0.069	0.0587
6	2.00	0.300	0.19	0.06	0.057	0.0034
7	2.30	0.300	0.22	0.77	0.066	0.0508
8	2.60	0.300	0.26	0.67	0.078	0.0523
9	2.90	0.300	0.27	0.39	0.081	0.0316
10	3.20	0.300	0.17	0.68	0.051	0.0347
11	3.50	0.300	0.14	0.38	0.042	0.0160
12	3.80	0.300	0.15	0.48	0.045	0.0216
13	4.10	0.300	0.17	0.35	0.051	0.0179
14	4.40	0.300	0.19	0.14	0.057	0.0080
15	4.70	0.300	0.17	0.47	0.051	0.0240
16	5.00	0.300	0.14	0.70	0.042	0.0294
17	5.30	0.300	0.10	0.63	0.030	0.0189
18	5.60	0.300	0.11	0.06	0.033	0.0020
19	5.90	0.300	0.07	0.26	0.021	0.0055
20	6.20	0.150	0.00	0.00	0.000	0.0000
21	6.20					

Mean Depth (m)	0.15
Mean Velocity (m/s)	0.46

Discharge (m <sup>3</sup> /s)	0.4751
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## Stream Flow & Discharge Calculation

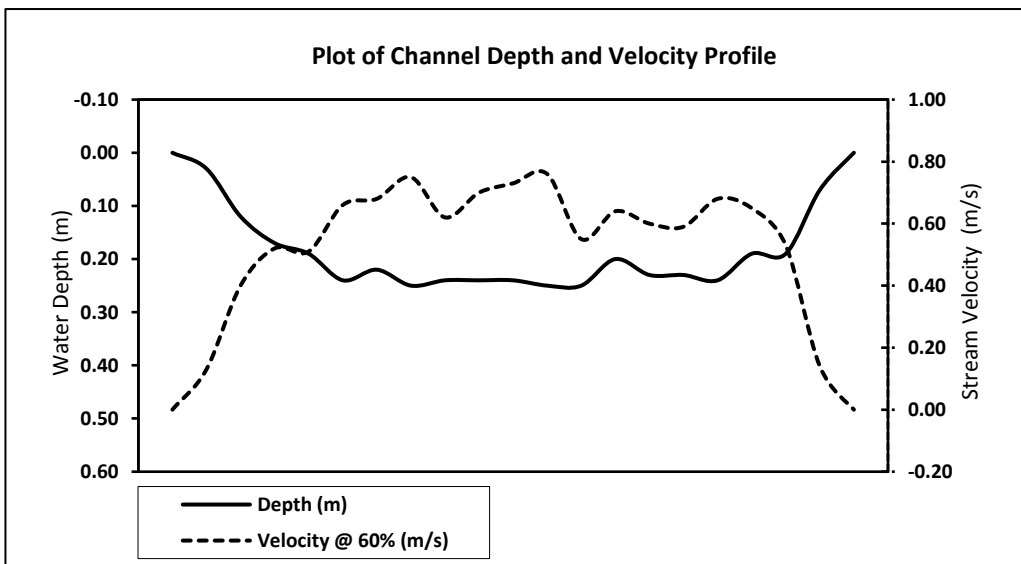
ELR Project No.	14-183		
Site / Location:	E7		
Stream Name:	Clinton Creek		
Station Name:	E7		
Date and Time:	21 Sep. 2014 @ 18:40		
Staff:	AN + AB		
UTM Coordinates:	07W 0519400 7142042		
Technique:	Swoffer Meter	Left Bank	5.35
Temp., Water/Air (°C)	NC / 6	Right Bank	0.65
Crossing Number	1	Wet.Width	4.7



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	5.35	0.120	0.00	0.00	0.000	0.0000
1	5.11	0.235	0.03	0.13	0.007	0.0009
2	4.88	0.235	0.12	0.40	0.028	0.0113
3	4.64	0.238	0.17	0.52	0.040	0.0210
4	4.41	0.230	0.19	0.51	0.044	0.0223
5	4.18	0.233	0.24	0.66	0.056	0.0368
6	3.94	0.235	0.22	0.68	0.052	0.0352
7	3.71	0.235	0.25	0.75	0.059	0.0441
8	3.47	0.235	0.24	0.62	0.056	0.0350
9	3.24	0.235	0.24	0.70	0.056	0.0395
10	3.00	0.235	0.24	0.73	0.056	0.0412
11	2.77	0.235	0.25	0.76	0.059	0.0447
12	2.53	0.235	0.25	0.55	0.059	0.0323
13	2.30	0.235	0.20	0.64	0.047	0.0301
14	2.06	0.235	0.23	0.60	0.054	0.0324
15	1.83	0.235	0.23	0.59	0.054	0.0319
16	1.59	0.235	0.24	0.68	0.056	0.0384
17	1.36	0.235	0.19	0.65	0.045	0.0290
18	1.12	0.235	0.19	0.53	0.045	0.0237
19	0.89	0.235	0.07	0.14	0.016	0.0023
20	0.65	0.120	0.00	0.00	0.000	0.0000
21	0.65					

Mean Depth (m)	0.18
Mean Velocity (m/s)	0.52

Discharge (m <sup>3</sup> /s)	0.5518
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## Stream Flow & Discharge Calculation

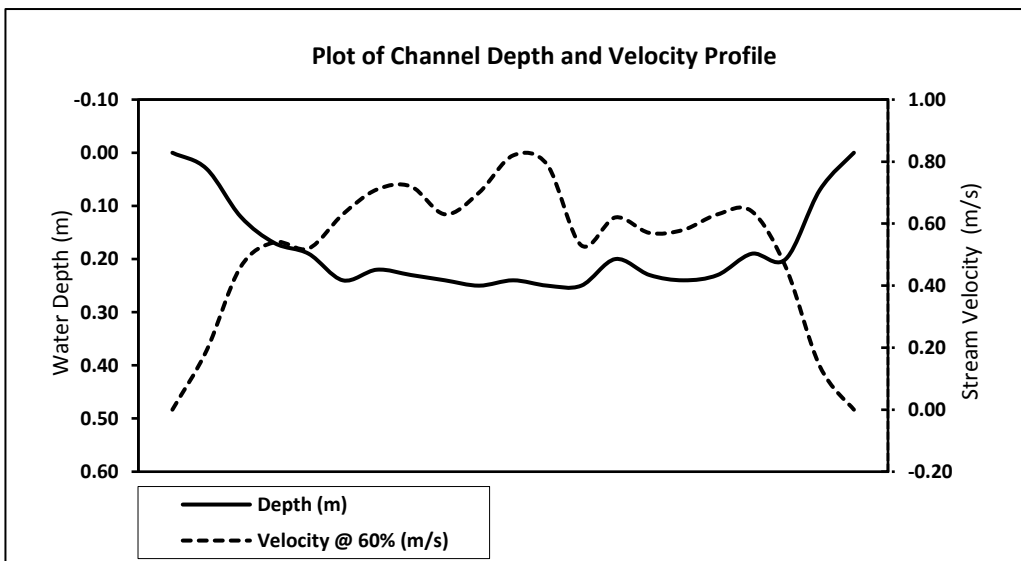
ELR Project No.	14-183		
Site / Location:	E7		
Stream Name:	Clinton Creek		
Station Name:	E7		
Date and Time:	21 Sep. 2014 @ 18:40		
Staff:	AN + AB		
UTM Coordinates:	07W 0519400 7142042		
Technique:	Swoffer Meter	Left Bank	5.35
Temp., Water/Air (°C)	NC / 6	Right Bank	0.65
Crossing Number	2	Wet.Width	4.7



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	5.35	0.120	0.00	0.00	0.000	0.0000
1	5.11	0.235	0.03	0.19	0.007	0.0013
2	4.88	0.235	0.12	0.46	0.028	0.0130
3	4.64	0.238	0.17	0.54	0.040	0.0218
4	4.41	0.230	0.19	0.52	0.044	0.0227
5	4.18	0.233	0.24	0.63	0.056	0.0352
6	3.94	0.235	0.22	0.71	0.052	0.0367
7	3.71	0.235	0.23	0.72	0.054	0.0389
8	3.47	0.235	0.24	0.63	0.056	0.0355
9	3.24	0.235	0.25	0.70	0.059	0.0411
10	3.00	0.235	0.24	0.82	0.056	0.0462
11	2.77	0.235	0.25	0.79	0.059	0.0464
12	2.53	0.235	0.25	0.53	0.059	0.0311
13	2.30	0.235	0.20	0.62	0.047	0.0291
14	2.06	0.235	0.23	0.57	0.054	0.0308
15	1.83	0.235	0.24	0.58	0.056	0.0327
16	1.59	0.235	0.23	0.63	0.054	0.0341
17	1.36	0.235	0.19	0.64	0.045	0.0286
18	1.12	0.235	0.20	0.46	0.047	0.0216
19	0.89	0.235	0.07	0.14	0.016	0.0023
20	0.65	0.120	0.00	0.00	0.000	0.0000
21	0.65					

Mean Depth (m)	0.18
Mean Velocity (m/s)	0.52

Discharge (m <sup>3</sup> /s)	0.5493
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## Stream Flow & Discharge Calculation



ELR Project No.	14-183		
Site / Location:	GWCC - 3		
Stream Name:	NA		
Station Name:	GWCC - 3		
Date and Time:	21 Sep. 2014 @ 13:35		
Staff:	AN + AB		
UTM Coordinates:	07W 0513882 7147038		
Technique:	Volumetric Flow Rate	Left Bank	N/A
Temp., Water/Air (°C)	NC / NC	Right Bank	N/A
Crossing Number	N/A	Wet.Width	N/A

Measureme nt No.	Volume (L)	Time (s)	Velocity (L/s)	Discharge (m <sup>3</sup> /s)
0	1.000	2.00	0.5000	0.000500
1	1.000	1.50	0.6667	0.000667
2	1.000	1.50	0.6667	0.000667
3	1.000	1.50	0.6667	0.000667
4	1.000	1.50	0.6667	0.000667

Mean Depth (m)	N/A
Mean Velocity (m/s)	N/A

Average Discharge (m <sup>3</sup> /s)	0.000633
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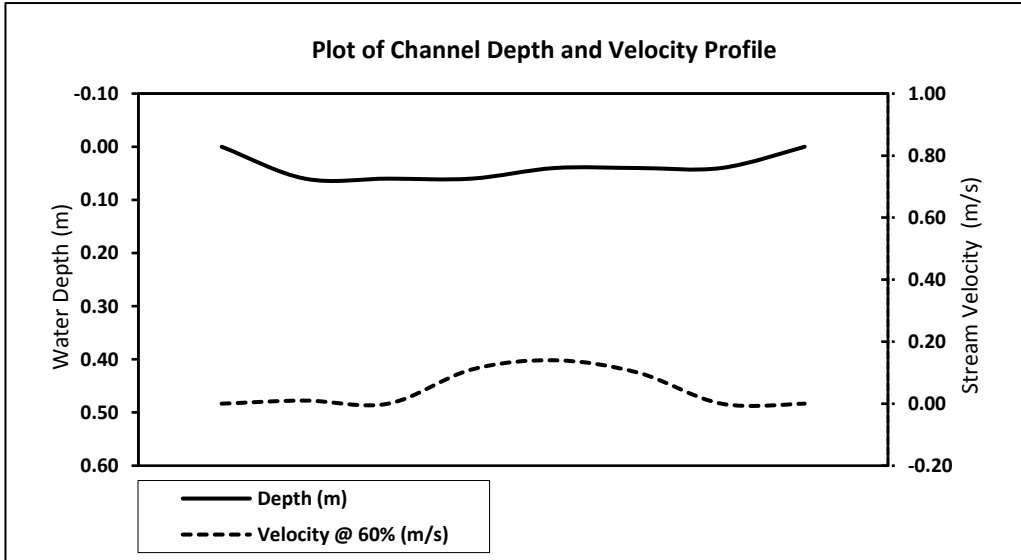
### Stream Flow & Discharge Calculation

ELR Project No.	14-183		
Site / Location:	GWCC - 5		
Stream Name:	NA		
Station Name:	GWCC - 5		
Date and Time:	19 Sep. 2014 @ 14:00		
Staff:	AN + AB		
UTM Coordinates:	07W 0513984 7147127		
Technique:	Swoffer Meter	Left Bank	0.65
Temp., Water/Air (°C)	NC / NC	Right Bank	1.3
Crossing Number	1	Wet.Width	0.65



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.65	0.045	0.00	0.00	0.000	0.0000
1	0.74	0.090	0.06	0.01	0.005	0.0001
2	0.83	0.095	0.06	0.00	0.006	0.0000
3	0.93	0.095	0.06	0.11	0.006	0.0006
4	1.02	0.090	0.04	0.14	0.004	0.0005
5	1.11	0.090	0.04	0.10	0.004	0.0004
6	1.20	0.090	0.04	0.00	0.004	0.0000
7	1.29	0.045	0.00	0.00	0.000	0.0000
8	1.29					

Mean Depth (m)	0.04	Discharge (m <sup>3</sup> /s)	0.0015
Mean Velocity (m/s)	0.05		





### Stream Flow & Discharge Calculation

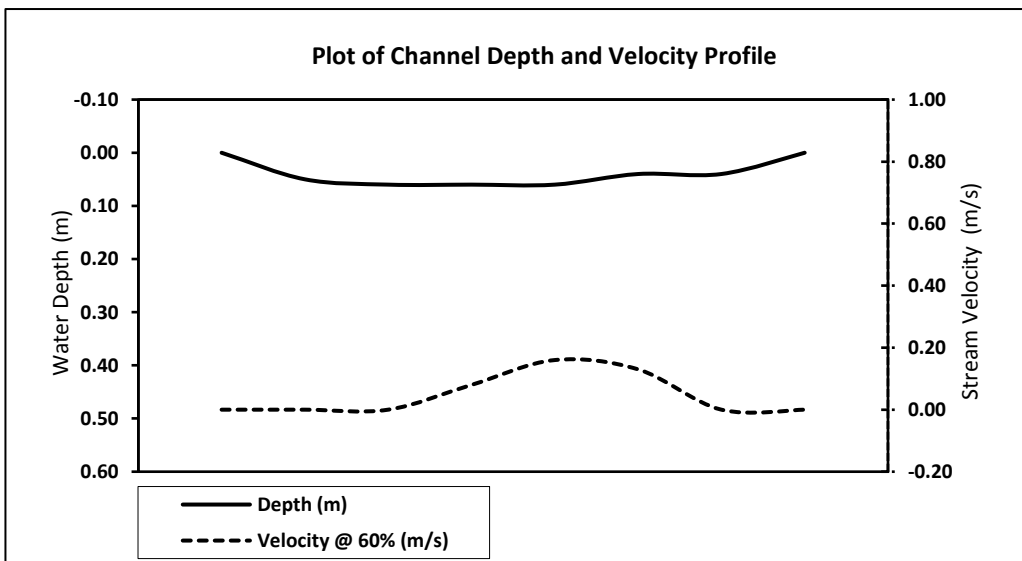
ELR Project No.	14-183		
Site / Location:	GWCC - 5		
Stream Name:	NA		
Station Name:	GWCC - 5		
Date and Time:	19 Sep. 2014 @ 14:00		
Staff:	AN + AB		
UTM Coordinates:	07W 0513984 7147127		
Technique:	Swoffer Meter	Left Bank	0.65
Temp., Water/Air (°C)	NC / NC	Right Bank	1.3
Crossing Number	2	Wet.Width	0.65



Station No.	Distance (m)	Station Width (m)	Depth (m)	Velocity @ 60% (m/s)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)
0	0.65	0.045	0.00	0.00	0.000	0.0000
1	0.74	0.090	0.05	0.00	0.005	0.0000
2	0.83	0.095	0.06	0.00	0.006	0.0000
3	0.93	0.095	0.06	0.08	0.006	0.0005
4	1.02	0.090	0.06	0.16	0.005	0.0009
5	1.11	0.090	0.04	0.13	0.004	0.0005
6	1.20	0.090	0.04	0.00	0.004	0.0000
7	1.29	0.045	0.00	0.00	0.000	0.0000
8	1.29					

Mean Depth (m)	0.04
Mean Velocity (m/s)	0.05

Discharge (m <sup>3</sup> /s)	0.0018
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**APPENDIX 4**  
**Sampling Field Notes**





AND Gen Chemistry 20 Sept 2014 15:10 (EI + DUP 1)

Surface Water Sample Sheet

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

(1343-005.04 Hemmera)

Date and Time (24hr) 19 Sept 2014 11:02

Samples: AN

Sample ID EI (and DUP 1)

Notes: AB

Sampling Method: Grab Other? \_\_\_\_\_

Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals (and mercury)	Y	2	Y	N	Metals plastic, Hg vial
Dissolved Metals (and mercury)	Y	2	Y	Y	
Total Suspended Solids (TSS)					
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	amber glass
Nitrate/Nitrite/Sulphate					
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	amber glass
		6	N	N	1 L plastic
General Chemistry collected 20 Sept 2014 @ 15:10					
		7	Total		

Duplicates and Field Blank

Duplicate Name ID, e.g. Dup 1 (do not use the station name)	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)
DUP 1	Y	6 + 1	see comments	
Field Blank ID (e.g. FBI)	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)
	N/A			

Field Parameters

Water Temp. (°C)	7.6
pH	not recorded, pH probe won't calibrate UPDATE pH = 7.76 w/ Hemmera YSI, 21 Sept 12:45
Conductivity (µS/cm)	327.0 Specific Conductivity (µS/cm): 490.2
ORP (mV)	NOT RECORDED
Turbidity (NTU)	NOT RECORDED
Dissolved O <sub>2</sub> (mg/L)	11.11 (AS)
Dissolved O <sub>2</sub> (% Sat.)	99.3 (AS) % L

Miscellaneous Information

ELR YSI, calibrated 19 Sept 2014 except pH probe

Photo Numbers 168 - 171, AW camera  
 UTM Coordinates AN GPS Zone: 07 W E: 0513645 N: 7147111  
 Waypoint name EI Sept 2014 Datum: NAD 83

Observations → Moved EI location from scope of work coordinates in order to avoid hazard areas described in AAM Safety Manual re: Deep Structure 4 and waste rock slope instabilities. This location is ~ 10m downstream of primary ford structure  
 → Sample/assess BEFORE crossing 2<sup>o</sup> ford structure to avoid downstream disturbance

all field parameters w/ ELR YSI (19 Sept) except 21 Sept pH w/ Hemmera YSI

$$\begin{array}{r} \phantom{0} \\ -885 \\ \phantom{0} \\ \hline 1.770 \end{array}$$

$$\begin{array}{r} 885 \\ 885 \\ \hline 1770 \end{array}$$



and Gen Chem collected 20 Sept 2014 @ 15:15

### Surface Water Sample Sheet

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring  
Hemmera 1343-005.04

Sample: AN  
Notes: AB

Date and Time (24hr) 19 Sept 2014 13:45

Sample ID GWCC-5

Sampling Method: **Grab** Other? \_\_\_\_\_

#### Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals (and mercury)	Y	2	Y	N	1 plastic + 1 vial
Dissolved Metals (and mercury)	Y	2	Y	Y	" "
Total Suspended Solids (TSS)					
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	amber glass
Nitrate/Nitrite/Sulphate					
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	1 amber glass
		6			
General Chemistry collected 20 Sept 2014 @ 15:15	Y	1	N	N	1 IL plastic
↳ relatively shallow flow in creek so only able to fill gen chem bottle 3/4 full w/ undisturbed / clear / free flowing water	Total	7			

#### Duplicates and Field Blank

No	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g., Dup 1 (do not use the station name)
Duplicate	N/A				
No	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g., FBI)
Field Blank	N/A				

#### Field Parameters

all field parameters w/ ELR YSI (19 Sept) except 21 Sept pH w/ Hemmera YSI

Water Temp. (°C) 7.2

pH @ pH probe on YSI wasn't calibrate, reading not recorded UPDATE pH = 7.25 w/ Hemmera YSI, 21 Sept 2014 @ 12:35

Conductivity (µS/cm) 589 Specific Conductivity (µS/cm): 892

ORP (mV) not recorded

Turbidity (NTU) not recorded

Dissolved O<sub>2</sub> (mg/L) 3.36 (AS)

Dissolved O<sub>2</sub> (% Sat.) 29.9 (AS) %L

#### Miscellaneous Information

Photo Numbers 172-180 (AN Camera)

UTM Coordinates GWCC 5 2014 Zone: 07 W E: 0513984 N: 7147127

Waypoint name (on AN GPS) Datum: NAD 83

Observations AN selected location based on best ability to collect hydrology sample. Sample collected @ outlet of pool. Four arctic grayling (~15cm length) observed in pool + channel (see photo)

↳ lots algae in channel, in pool above



AWD Gen Chem 20 Sept 2014 15:25

**Surface Water Sample Sheet**

Hemmer 1843-005.04

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

Date and Time (24hr) 19 Sept 2014, 15:00

Sample ID E2

Sampling Method: Grab Other? \_\_\_\_\_

Sampler: AN  
Notes: AB

**Surface Water Samples**

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals + mercury	Y	1+1	Y	N	1 plastic + 1 vial
Dissolved Metals + mercury	Y	1+1	Y	Y	1 plastic + 1 vial
Total Suspended Solids (TSS)					
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	1 amber glass
Nitrate/Nitrite/Sulphate					
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	1 amber glass
		6			
→ General Chemistry collected 20 Sept 2014 @ 15:25	Y	1	N	N	1 1L plastic
		7			

**Duplicates and Field Blank**

	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g., Dup 1 (do not use the station name)
NO					
Duplicate	N/A				
	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g., FB1)
NO					
Field Blank	N/A				

**Field Parameters**

Water Temp. (°C) 8.3

pH not recorded, pH probe on YSI won't calibrate → UPDATE pH = 7.39 21 Sept 2014 12:20 ✓ Hemmer YSI

Conductivity (µS/cm) 504 Specific Conductivity (µS/cm): 741

ORP (mV) NOT RECORDED

Turbidity (NTU) NOT RECORDED

Dissolved O<sub>2</sub> (mg/L) 1.81 (AS)

Dissolved O<sub>2</sub> (% Sat.) 16.6 (AS) % L

**Miscellaneous Information**

Photo Numbers 181 - 184 (AN camera)

UTM Coordinates AWGPS Zone: 07 W E: 0514149 N: 7147076

Waypoint name E2 SEPT 2014 Datum: NAD 83

Observations ~ 25 m upstream of confluence w/ Wolverine, on Clinton Creek  
Hydrology station established, see Hydrology field sheet

All field parameters ✓ ELR YSI 19 Sept except pH on 21 Sept ✓ Hemmer YSI



AND Gen Chem collected 20 Sept 2014 @ 15:25

### Surface Water Sample Sheet

Hannem 1343-005.04

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

Date and Time (24hr) 19 Sept 2014; 16:20

Sampler: AN

Notes: AB

Sample ID E3

Sampling Method: Grab

Other?

Wx - overcast, no wind ~ 8°C

#### Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals + mercury	Y	1 + 1	Y	N	1 plastic + 1 vial
Dissolved Metals - mercury	Y	1 + 1	Y	Y	
Total Suspended Solids (TSS)					
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	1 amber
Nitrate/Nitrite/Sulphate					
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	1 amber
		6			
→ General Chemistry, collected 20 Sept 2014 @ 15:25	Y	1	N	N	1 LL plastic
		7			

#### Duplicates and Field Blank

	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g. Dup 1 (do not use the station name)
No					
Duplicate	N/A				
	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g. FBI)
No					
Field Blank	N/A				

#### Field Parameters

all field parameters ✓ ELR YSI on 19 Sept except pH with Hannem YSI on 21 Sept

Water Temp. (°C) 5.8

pH pH probe on YSI won't calibrate properly, not recorded. UPDATE pH = 7.67 on Hannem YSI, 21 Sept 2014 12:25

Conductivity (µS/cm) 492.3 Specific Conductivity (µS/cm): 778.8

ORP (mV) NOT RECORDED

Turbidity (NTU) NOT RECORDED

Dissolved O<sub>2</sub> (mg/L) 11.98 (As)

Dissolved O<sub>2</sub> (% Sat.) 101.5 (As) % L

#### Miscellaneous Information

Photo Numbers 185-188 (AN camera)

UTM Coordinates E3 SEPT 2014 Zone: 07 W E: 0514178 N: 7147189

Waypoint name AN AN GPS Datum: NAD 83

Observations ~ 40 m upgradient of confluence w/ Clinton Creek, on Wolverine Creek  
 Also site of hydrology measurements, see ELR Hydrology field sheet





AND Gen Chem collected 20 Sept 2014 @ 15:40

Surface Water Sample Sheet

Hemmer 1343-005.04

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

Sampler: AN

Notes: AB

Date and Time (24hr) 19 Sept 2014; 17:35

Sample ID R4

Sampling Method: Grab Other?

WX - overcast, no wind, 18°C

Surface Water Samples

Table with 6 columns: Parameters, Collected (Y/N), No. of bottles, Preserved (Y/N), Field filtered (Y/N), Comments. Rows include Total Metals, Dissolved Metals, TSS, DOC, Nitrate/Nitrite/Sulphate, Total Nitrogen/Ammonia/Total Phosphorus, and General Chemistry.

Duplicates and Field Blank

Table for Duplicates and Field Blank with columns for Duplicate Collected?, No. of bottles, Preserved?, Field filtered?, and Duplicate Name ID.

Field Parameters

all field parameters @ time of sample on 19 Sept ✓ ELR VSI except pH ✓ Hemmer VSI on 21 Sept. Water Temp. (°C) 3.4, pH not recorded, Conductivity (µS/cm) 448.6, Specific Conductivity (µS/cm): 763.4, ORP (mV) not recorded, Turbidity (NTU) not recorded, Dissolved O2 (mg/L) 13.08 (AS), Dissolved O2 (% Sat.) 104.6 (AS) % L.

Miscellaneous Information

Photo Numbers 189-192 (AN Camera), UTM Coordinates (AN GPS) Zone: 07 W E: 0515981 N: 7145344, Waypoint name R4 SEPT 2014 Datum: NAD 83, Observations Located ~ 40m upstream of confluence of Clinton Creek, on Taylor Creek. Located ~ 15m upstream of log stringers from old creek crossing structure. Also a hydrology assessment site, see ECR Field Hydrology Form.



AND Gen Chem 20 Sept 2014 @ 15:35

Surface Water Sample Sheet

Hemmera 1343-005.04  
 ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

AN: Sampler  
 AR: Notes

Date and Time (24hr) 19 Sept 2014 18:38  
 Sample ID E4  
 Sampling Method: Grab Other? \_\_\_\_\_

wx: overcast, no wind, -8°C

Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals	Y	1+1	Y	N	1 plastic, 1 vial
Dissolved Metals	Y	1+1	Y	Y	1 plastic, 1 vial
Total Suspended Solids (TSS)					
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	amber glass
Nitrate/Nitrite/Sulphate					
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	amber glass
		6			
General Chemistry collected 20 Sept 2014 @ 15:35	Y	1	N	N	1 IL plastic
					TOTAL

Duplicates and Field Blank

No	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g. Dup 1 (do not use the station name)
Duplicate	N/A				
No	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g. FBI)
Field Blank	N/A				

Field Parameters

Water Temp. (°C) 8.2  
 pH not recorded, pH probe on YSI won't calibrate - UPDATE pH = 7.26 w/ Hemmera YSI  
 Conductivity (µS/cm) 547 Specific Conductivity (µS/cm): 805  
 ORP (mV) NOT RECORDED, NOT REQUIRED  
 Turbidity (NTU) NOT RECORDED, NOT REQUIRED  
 Dissolved O<sub>2</sub> (mg/L) 11.25 (A)  
 Dissolved O<sub>2</sub> (% Sat.) 101.6 (A) % L

12:10, 21 Sept

all field parameters ✓ ELR YSI @ time sample on Sept 19, except pH w/ Hemmera YSI on 21 Sept

Miscellaneous Information

Photo Numbers 193-196 (AN camera)  
 UTM Coordinates (AN GPS) Zone: 07W E: 0515950 N: 7145287  
 Waypoint name E4 SEPT 2014 Datum: NAD 83  
 Observations Located ~ 20m upstream (on Clinton Creek) from confluence w/ Eagle Creek  
Also a hydrology assessment location, see ELR Hydrology Field Sheet  
Creosote treated hydroprobe butt ~ 5m inland from left bank (fallen on ground)



# Surface Water Sample Sheet

Hemmera 1343-005.04

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

AB: notes  
AN: Sample

Date and Time (24hr) 20 Sept 2014 10:10

Sample ID R1

Sampling Method: Grab Other? \_\_\_\_\_

WX - mix sun + cloud, no wind, ~30°C

## Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals (inc mercury)	Y	1+1	Y	N	1 plastic + 1 vial
Dissolved Metals (inc mercury)	Y	1+1	Y	Y	" "
Total Suspended Solids (TSS)	Y	Gen Chem			see Gen Chem
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	amber glass
Nitrate/Nitrite/Sulphate	Y	Gen Chem			see Gen Chem
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	amber glass
↳ via General Chemistry bottle	Y	1	N	N	see Gen Chem, 2 JL plastic
		7 TOTAL			

## Duplicates and Field Blank

	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g., Dup 1 (do not use the station name)
No					
Duplicate	N/A				
	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g., FB1)
No					
Field Blank	N/A				

## Field Parameters

all field parameters ✓ ELR YSI @ time of sample

Water Temp. (°C)	1.9
pH	not recorded, pH probe on YSI won't calibrate properly
Conductivity (µS/cm)	386.6
Specific Conductivity (µS/cm):	692.0
ORP (mV)	not recorded, not required
Turbidity (NTU)	not recorded, not required
Dissolved O <sub>2</sub> (mg/L)	13.05 (A)
Dissolved O <sub>2</sub> (% Sat.)	100.0 (A) %L

## Miscellaneous Information

Photo Numbers	197-206 (AN camera)		
UTM Coordinates	Zone: 07 W	E: 0510718	N: 7147525
Waypoint name	R1 SEPT 2014 (AN EPS)		Datum: NAD 83
Observations	~40 m upstream of Clinton Creek outflow to Hudgeon Lake Also hydrology measure site, see ELR Hydrology Field Sheet		



Surface Water Sample Sheet

ELR PROJECT NUMBER AND NAME: Hemmera 1343-005.04 14-183 Clinton Creek Monitoring

AB: Auster  
AN: Sample

Date and Time (24hr) 20 Sept 2014 11:55

Sample ID R2

Sampling Method: Grab Other?

WX - mix sun + cloud, no wind, ~8°C

Surface Water Samples

Table with 6 columns: Parameters, Collected (Y/N), No. of bottles, Preserved (Y/N), Field filtered (Y/N), Comments. Rows include Total Metals, Dissolved Metals, Total Suspended Solids (TSS), Dissolved Organic Carbon (DOC), Nitrate/Nitrite/Sulphate, Total Nitrogen/Ammonia/Total Phosphorus, and General Chemistry.

Duplicates and Field Blank

Table with 6 columns: Duplicate Collected? (Y/N), No. of bottles, Preserved? (Y/N), Field filtered (Required) (Y/N), Duplicate Name ID, Field Blanks Made up? (Y/N), Field filtered? (Y/N), Field Blank ID. Includes handwritten 'No' for duplicate and 'N/A' for field blank.

Field Parameters

Table with 2 columns: Parameter, Value. Includes Water Temp. (1.8), Conductivity (353.6), Specific Conductivity (634.9), Dissolved O2 (13.10), and Dissolved O2 (% Sat.) (100.4).

Miscellaneous Information

Table with 2 columns: Information, Value. Includes Photo Numbers (201-204), UTM Coordinates (AN EPS), Waypoint name (R2 SEPT 2014), and Observations (Located ~50m upstream of Foster Creek outflow into Hudson Lake).

all field parameters ✓ ELR VSI @ time of sample



# Surface Water Sample Sheet

Hemlock 13413-005.04

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

AW: Sampler  
AR: notes

Date and Time (24hr) 20 Sept 2014 14:30

Sample ID SL

Sampling Method: Grab Other: \_\_\_\_\_

Wx - mostly clear, sunny, no wind ~ 12°C

## Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals	Y	1+1	Y	N	1 plastic + 1 vial
Dissolved Metals	Y	1+1	Y	Y	"
Total Suspended Solids (TSS)	VIA	GEN CHEM			
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	1 amber glass
Nitrate/Nitrite/Sulphate	VIA	GEN CHEM			
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	1 amber glass
General Chemistry	Y	1	N	N	1 LC plastic
		7 TOTAL			

## Duplicates and Field Blank

No	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g. Dup 1 (do not use the station name)
Duplicate	N/A				
No	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g. FBI)
Field Blank	N/A				

## Field Parameters

Water Temp. (°C)	7.1
pH	not recorded, pH probe on YSI won't calibrate properly UPDATE, pH = 7.82 on Hemlock YSI
Conductivity (µS/cm)	1014 Specific Conductivity (µS/cm): 1539
ORP (mV)	NOT RECORDED, NOT REQUIRED
Turbidity (NTU)	NOT RECORDED, NOT REQUIRED
Dissolved O <sub>2</sub> (mg/L)	13.06 (A <sub>3</sub> )
Dissolved O <sub>2</sub> (% Sat.)	114.2 (A <sub>3</sub> ) % L

beaver dam appears to block lake out-flow, only trickle water flowing out of lake to the east, can hear water flowing in to the west

## Miscellaneous Information

Photo Numbers	Approach: 215 - 221 Site: 222-227
UTM Coordinates	(AN GPS) Zone: 07 W E: 0513824 N: 7146703
Waypoint name	SL SEPT 2014 Datum: NAD 83

Observations YSI @ ~ 0.6m depth, ~ 0.6m from "shore", lake appears stagnant, lots algae, very noticeable "swampy" odour in mud on shore. Sample from YSI location

⊗ Approach only from waste rock pile, do not approach from south, pit walls subject to rock fall

Variable depths along "shore", from < 1m deep extending > 2m from shore, to unknown depth (=> 2m, too murky to see) > 2m from "shore"

If found, please call ELR: 867.668.6386

all field parameters w/ ELR YSI & time of sample, except pH w/ Hemlock YSI on 21 Sept



AND Gen Chem collected 22 Sept 2014 @ 14:40

Lab GC for DUP2 and FB1GC (new Turbo Power)

Surface Water Sample Sheet

DI jug

P1/2

OVER →

Hemmen 1343-005.04

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

Date and Time (24hr) 21 Sept 2014, 13:35-14:00 (inc DUP + FB)

FB: holes  
AN: sampler

Sample ID GWCC-3

Sampling Method: Grab Other?

WX - mix sun/cloudy, mostly cloudy, nonwindy ~7°C

Surface Water Samples

Table with 6 columns: Parameters, Collected (Y/N), No. of bottles, Preserved (Y/N), Field filtered (Y/N), Comments. Rows include Total Metals, Dissolved Metals, TSS, DOC, Nitrate/Nitrite/Sulphate, Total Nitrogen/Ammonia/Total Phosphorus, and General Chemistry.

Duplicates and Field Blank

Table with 6 columns: Duplicate Name, Duplicate Collected? (Y/N), No. of bottles, Preserved? (Y/N), Field filtered (Required) (Y/N), Duplicate Name ID. Rows include DUP 2 and FB1 / FB1 GC.

no lab supplied DI, used sealed Turbo Power DI

Field Parameters

Table with 2 columns: Parameter, Value. Parameters include Water Temp, pH, Conductivity, Specific Conductivity, ORP, Turbidity, Dissolved O2.

Miscellaneous Information

Table with 4 columns: Field Number, UTM Coordinates, Waypoint name, Observations. Observations include flow estimation and sample collection details.

If found, please call ELR: 867.668.6386

← OVER

# Surface Water Sample Sheet

GWCC-3

21 Sept 2014

AB/ AW

p<sup>2</sup>/<sub>2</sub>

Flow Rate estimations,

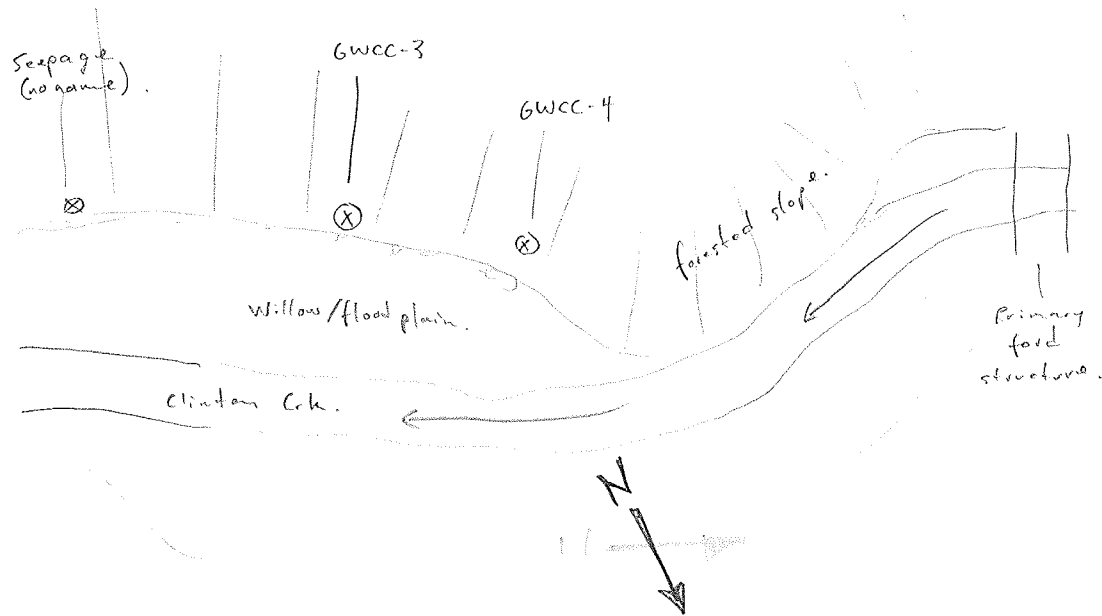
AW modified seep/flow channel to direct all flow into 1 L plastic bottle w/ top cut off.

Time to fill 1 L (5 trials),

- 1) 2 seconds
- 2) 1.5 seconds
- 3) 1.5 "
- 4) 1.5 "
- 5) 1.5 "

\* 5th seepage site observed along toe of waste rock dump. Seepage contributes to inflow of beaver pond. (see site diagrams - GWCC-3 + GWCC-2). Underground flow seeps into pre-existing channel (no measurable volume).

## Site Diagram





AND Gen Chem collected 22 Sept 2014 @ 14:30

p/2 OVER →

### Surface Water Sample Sheet

Hemlock 1343-005.04

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

AW: Sampler

AB: Notes

Date and Time (24hr) 21 Sept 2014; 14:25 - 14:35

Sample ID EWCC-4

Sampling Method: Grab Other? \_\_\_\_\_

WX - mix sun + cloud, no wind ~ 7°C

### Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals (and mercury)	Y	1+1	Y	N	1 plastic, 1 vial
Dissolved Metals (and mercury)	Y	1+1	Y	Y	1 plastic, 1 vial
Total Suspended Solids (TSS)	VIA GEN CHEM →				
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	1 amber glass
Nitrate/Nitrite/Sulphate	VIA GEN CHEM →				
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	1 amber glass
		6			
Gen. Chem collected 22 Sept 2014 @ 14:30	Y	1	N	N	
		7 TOTAL			

### Duplicates and Field Blank

No	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g., Dup 1 (do not use the station name)
	N/A				
No	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g., FBI)
	N/A				

### Field Parameters

all field parameters w/ Hemlock 4:57 @ time of 21 Sept sample

Water Temp. (°C)	9.3°C
pH	7.27
Conductivity (µS/cm)	502
Specific Conductivity (µS/cm):	718
ORP (mV)	NOT RECORDED, NOT REQUIRED
Turbidity (NTU)	NOT RECORDED, NOT REQUIRED
Dissolved O <sub>2</sub> (mg/L)	1.88 (1/2)
Dissolved O <sub>2</sub> (% Sat.)	16.3 (1/3) %

### Miscellaneous Information

Photo Numbers 232-235 (AN camera)

UTM Coordinates Zone: 07 W E: 0513868 N: 7147052

Waypoint name EWCC 4 SEPT 2014 (AN EPS) Datum: NAD 83 ~ 25 m up stream from EWCC-3

Observations Location marked w/ existing + faded orange flag w/ ID. Very miniscule flow rate, unconfined, derived (under) boulders and talus above. See photos. No way to confine and estimate flow rate. Sample collected from small "pool" (~8cm deep, 20cm x 20cm) at base of seep w/ almost stagnant water. Don't have sniffer, but from experience it would record no measurable velocity.

If found, please call ELR: 867.668.6386

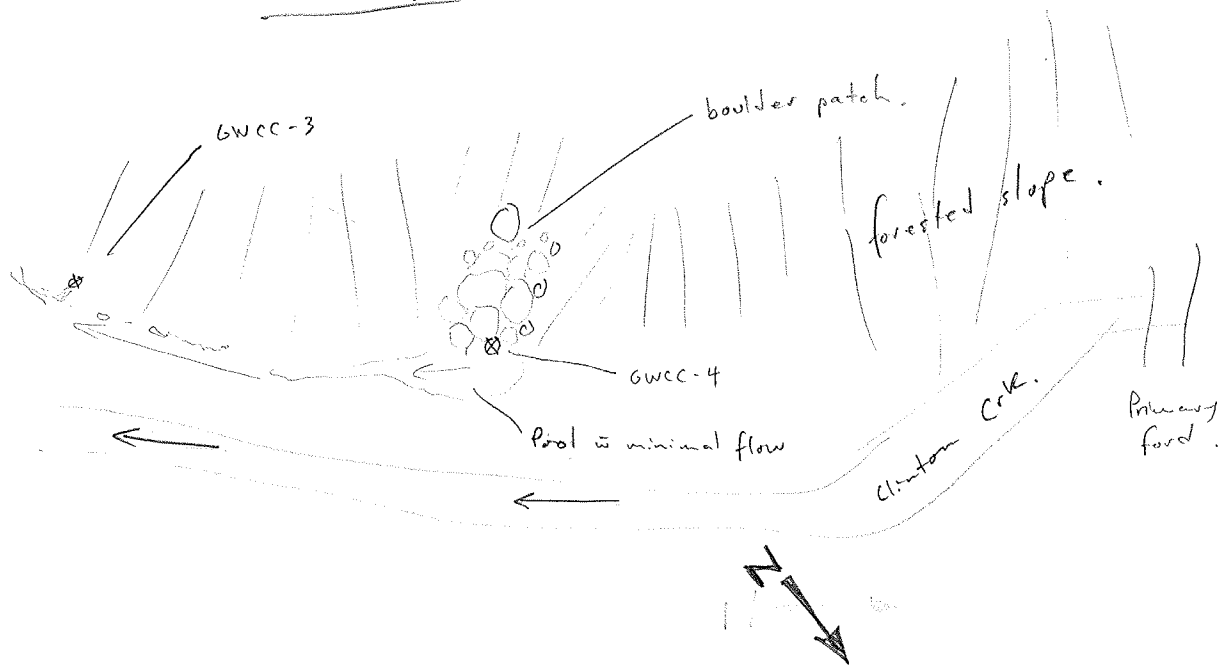
OVER →



# Surface Water Sample Sheet

GWCC-4 21 Sept 2014 AB/AN p2/2

## Site Diagram





AND Gen Chem collected 22 Sept 2014 @ 14:35

### Surface Water Sample Sheet

AW: Sampler  
AB: Notes

P/2 OVER →

Hemmera 1343-005.04  
ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

Date and Time (24hr) 21 Sept 2014; 15:00

Sample ID GWCC-2

Sampling Method: Grab Other? \_\_\_\_\_

WX - mix sun + cloud, no wind ~ 90°

#### Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals (and mercury)	Y	1+1	Y	N	1 plastic, 1 vial
Dissolved Metals (and mercury)	Y	1+1	Y	Y	1 plastic, 1 vial
Total Suspended Solids (TSS)	VIA	GEN CHEM			
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	1 amber glass
Nitrate/Nitrite/Sulphate	VIA	GEN CHEM			
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	1 amber glass
		6			
		1			1/2 plastic
		7 TOTAL			
↳ seep to shallow to allow full onion bottle (2L Gen Chem), collected 1/5 bottle only					

#### Duplicates and Field Blank

No	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g., Dup 1 (do not use the station name)
	N/A				
No	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g., FB1)
	N/A				

#### Field Parameters

Water Temp. (°C)	5.6
pH	7.33
Conductivity (µS/cm)	1156
Specific Conductivity (µS/cm):	1834
ORP (mV)	NOT RECORDED, NOT REQUIRED
Turbidity (NTU)	NOT RECORDED, NOT REQUIRED
Dissolved O <sub>2</sub> (mg/L)	5.71 (A <sub>3</sub> )
Dissolved O <sub>2</sub> (% Sat.)	45.7 (A <sub>3</sub> ) %

#### Miscellaneous Information

Photo Numbers \_\_\_\_\_  
 UTM Coordinates AN GPS Zone: 07 W E: 0513899 N: 7146968  
 Waypoint name GWCC 2 SEPT 2014 Datum: NAD 83

Observations On shore of beaver pond, @ toe slope w/ talus/boulders above. Old faded orange flag w/ site ID marked. Slow, small trickle under boulders, but can't access for grab sample + field parameters, collected from outlet of seep in pond @ shore (~6cm deep)

↳ Based on experience, swifter would be no measurable flow to no more than 0.05 m/s velocity

↳ Another similar seep through boulders + talus ~ 10m closer to Clinton Creek

all field parameters w/ Hemmera 1/5 I, collected @ time of sample on 21 Sept

Surface Water Sample Sheet

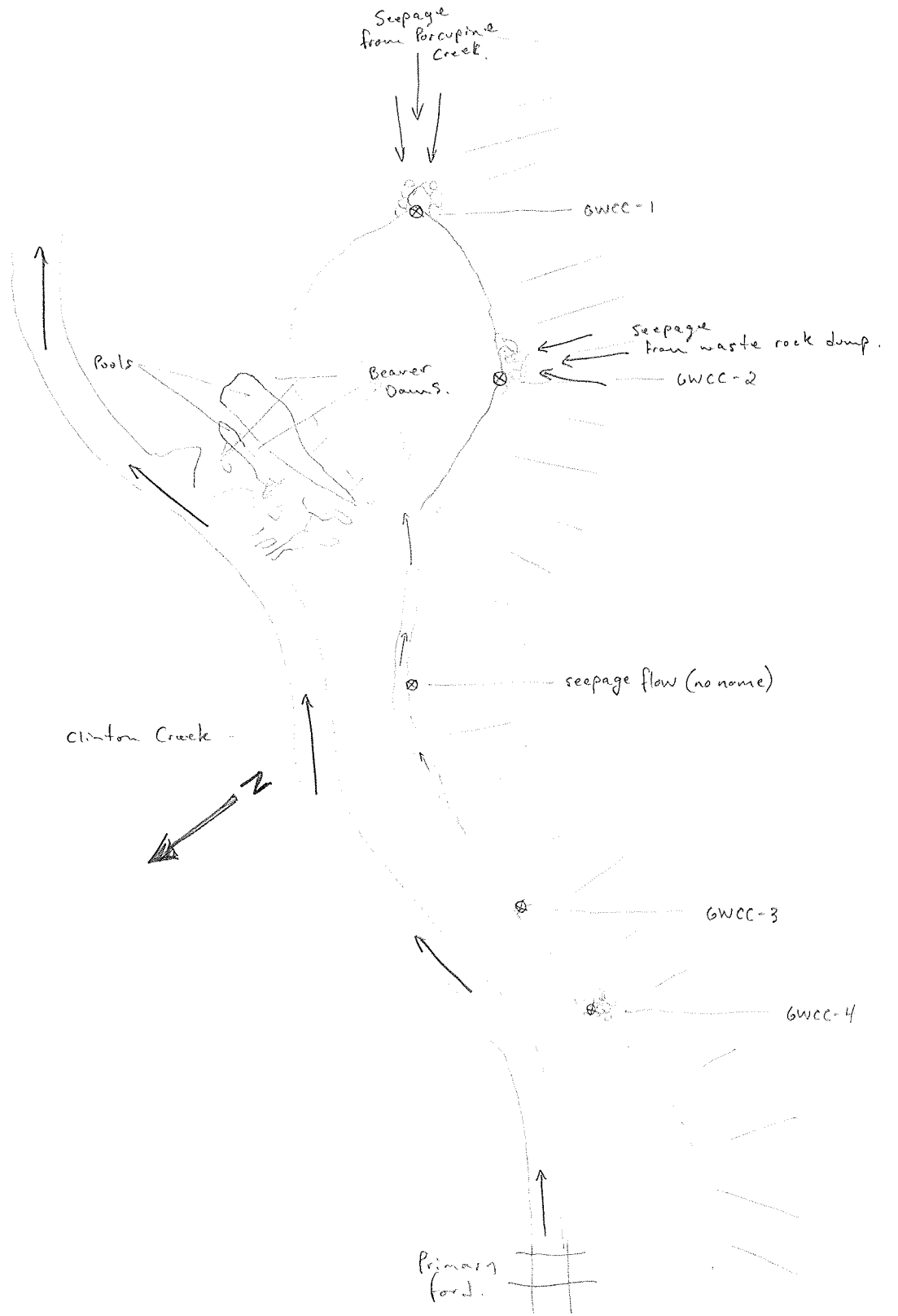
GWCC-2

21 Sept 2014

AB/AW

p2/2

Site Diagram





Surface Water Sample Sheet

→ AND G. Chem collected 22 Sept. 2014 @ 14:30

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring, Hemmer 1343-005.04

Date and Time (24hr) 21 Sept 2014, 15:30 - 15:40

Sample ID GWCC-1

AN: Notes

Sampling Method: Grab Other? \_\_\_\_\_

Surface Water Samples

Table with 6 columns: Parameters, Collected (Y/N), No. of bottles, Preserved (Y/N), Field filtered (Y/N), Comments. Includes rows for Total Metals, Dissolved Metals, TSS, DOC, Nitrate/Nitrite/Sulphate, and Total Nitrogen/Ammonia/Total Phosphorus.

Duplicates and Field Blank

Table for Duplicates and Field Blank with columns for Duplicate Collected?, No. of bottles, Preserved?, Field filtered?, Duplicate Name ID, and Field Blank ID.

Field Parameters

Table for Field Parameters with rows for Water Temp. (°C), pH, Conductivity (µS/cm), Specific Conductivity (µS/cm), ORP (mV), Turbidity (NTU), Dissolved O2 (mg/L), and Dissolved O2 (% Sat.).

Miscellaneous Information

Photo Numbers, UTM Coordinates (Zone: 07 W, E: 0513902, N: 7146960), Waypoint name: AN GPS, Datum: NAD 83

Observations: On shore of beaver pond, toe of waste rock dump. Seepage emerging into pond from large boulder patch. Source is presumed to be Porcupine Creek. ~4m of shoreline = observed seepage ~0.1-0.2 m/sec. Sample collect in seepage directly below flagging. Pre-existing flagging was absent. UTM's and photos match previous report (2013). Site was flagged @ the time of sample.

If found, please call ELR: 867.668.6386

all field parameters recorded to Hemmer 751 collected @ time of sample on 21 Sept.

Site Diagram.

\* refer to site diagram on field form GWCC-2.



AWD General Chem collected 22 Sept 2014 @ 15:20

Surface Water Sample Sheet

Hummer 1343-005.04  
ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

AN: Sampler  
AB: Notes

Date and Time (24hr) 21 Sept 2014, 18:00 - 18:10  
Sample ID E8  
Sampling Method: Grab Other? \_\_\_\_\_

WX - MIX sun/cloud, becoming overcast + dusk, light wind @ river ~ 50c  
Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals (and mercury)	Y	1+1	Y	N	1 plastic, 1 vial
Dissolved Metals (and mercury)	Y	1+1	Y	Y	1 plastic, 1 vial
Total Suspended Solids (TSS)	VIA GEN CHEM				
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	amber glass
Nitrate/Nitrite/Sulphate	VIA GEN CHEM				
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	amber glass
		6			
		1	N	N	1L plastic
		7 TOTAL			

Duplicates and Field Blank

No	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g. Dup 1 (do not use the station name)
Duplicate	N/A				
No	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g. FBI)
Field Blank	N/A				

Field Parameters

Water Temp. (°C) 5.8  
 pH 7.71  
 Conductivity (µS/cm) 153.9 Specific Conductivity (µS/cm): 243.3  
 ORP (mV) NOT RECORDED, NOT REQUIRED  
 Turbidity (NTU) NOT RECORDED, NOT REQUIRED  
 Dissolved O<sub>2</sub> (mg/L) 10.16  
 Dissolved O<sub>2</sub> (% Sat.) 81.2 %

Miscellaneous Information

Photo Numbers 254 - 256 (AN camera)  
 UTM Coordinates AN Gps Zone: 07 W E: 0519457 N: 7142788  
 Waypoint name E8 SEPT 2014 Datum: NAD 83  
 Observations West bank of Forty Mile River, @ saddle between 2 rock bluffs  
 YSI ~ 0.7m from bank ~ 30cm deep

all field parameters w/ Hummer YSI collected during 21 Sept sample



AWD Gen Chem collected Sept 22 2014 @ 15:40

### Surface Water Sample Sheet

Hemmera 1343-005.04

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

Date and Time (24hr) 21 Sept 2014, 18:50-19:00

AN: Sampler  
AB: Notes

Sample ID E7

Sampling Method: Grab Other? \_\_\_\_\_

WX - mix sun + cloud, sun setting, light wind on river, ~6°C

### Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals (and mercury)	Y	1+1	Y	N	1 plastic 1 vial
Dissolved Metals (and mercury)	Y	1+1	Y	Y	1 plastic 1 vial
Total Suspended Solids (TSS)	VIA	GEN CHEM			
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	1 amber glass
Nitrate/Nitrite/Sulphate	VIA	GEN CHEM			
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	1 amber glass
		6			
Gen Chem collected 22 Sept 2014 @ 15:40	Y	1	N	N	1 plastic
		7 TOTAL			

### Duplicates and Field Blank

	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g., Dup 1 (do not use the station name)
NO					
Duplicate	N/A				
	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g., FB1)
NO					
Field Blank	N/A				

### Field Parameters

Water Temp. (°C)	6.2
pH	7.69
Conductivity (µS/cm)	511
Specific Conductivity (µS/cm):	797
ORP (mV)	NOT RECORDED, NOT REQUIRED
Turbidity (NTU)	NOT RECORDED, NOT REQUIRED
Dissolved O <sub>2</sub> (mg/L)	9.66
Dissolved O <sub>2</sub> (% Sat.)	78.2 %

### Miscellaneous Information

Photo Numbers	257-260 (AN Camera)		
UTM Coordinates	AN GPS	Zone: 07 W	E: 0519400 N: 7142042
Waypoint name	E7 SEPT 2014	Datum: NAD 83	
Observations	Location ~ 15 m upstream of confluence w/ Forty-mile River on Clinton Creek Also a hydrology measurement site, see ELR Hydrology Field Form Sample + YSI in middle of channel, ~ 25 cm deep		

all field parameters of Hemmera YSI @ time of 21 Sept sample collect



AND General Chem collected 22 Sept @ 15:45  
**Surface Water Sample Sheet**

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

Date and Time (24hr) 21 Sept. 2014 19:55 - 20:05

Sample ID R6

Sampling Method: Grab Other? \_\_\_\_\_

Conditions: Mix sun/cloud, sun setting ~6°C.

**Surface Water Samples**

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals (and more)	Y	1+1	Y	N	1 plastic vial
Dissolved Metals (11 " )	Y	1+1	Y	Y	1 plastic vial
Total Suspended Solids (TSS)	N/A	G. CHEM			
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	1 amber glass
Nitrate/Nitrite/Sulphate	Y	1	Y	N	1 amber glass
Total Nitrogen/Ammonia/Total Phosphorus					
Gen. Chem. collected 22 Sept 2014 @ 15:45	Y	1	N	N	1 L plastic
		7 bottles total			

**Duplicates and Field Blank**

	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g. Dup 1 (do not use the station name)
No					
Duplicate	N/A				
	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g. FBI)
No					
Field Blank	N/A				

**Field Parameters**

Water Temp. (°C) 6.1  
 pH 7.58  
 Conductivity (µS/cm) 157.8 Specific Conductivity (µS/cm): 246.6  
 ORP (mV) NOT RECORDED.  
 Turbidity (NTU) NOT RECORDED.  
 Dissolved O<sub>2</sub> (mg/L) 10.02 \* YSI located ~1m from shore, 20cm deep.  
 Dissolved O<sub>2</sub> (% Sat.) 80.8

**Miscellaneous Information**

Photo Numbers 261 -  
 UTM Coordinates AN 6PS Zone: 07W E: 0919437 N: 7141958  
 Waypoint name R6 SEPT 2014 Datum: NAD 83  
 Observations Sample site located on Forty Mile River. Upstream of Clinton Creek mouth. Sample collected in channel between gravel bar and main shoreline. (refer to site diagram on E7 field form).  
 hydrology.





# Surface Water Sample Sheet

Hennery 1343-005.04

ELR PROJECT NUMBER AND NAME: 14-183 Clinton Creek Monitoring

Date and Time (24hr) 22 SEPT 2014 09:25

AN: Sampler  
AB: Notes

Sample ID R3

Sampling Method:

Grab

Other? \_\_\_\_\_

WX - overcast, no wind, mix rain + snow, ~20C

## Surface Water Samples

Parameters	Collected (Y/N)	No. of bottles	Preserved (Y/N)	Field filtered (Y/N)	Comments
Total Metals (4 mercury)	Y	1+1	Y	N	1 plastic, 1 vial
Dissolved Metals (4 mercury)	Y	1+1	Y	Y	
Total Suspended Solids (TSS)	N/A	GEN. CHEM			
Dissolved Organic Carbon (DOC)	Y	1	Y	Y	1 amber glass
Nitrate/Nitrite/Sulphate	VIA	6. Chem			
Total Nitrogen/Ammonia/Total Phosphorus	Y	1	Y	N	1 Amber glass
6. Chem.	Y	1	N	N	1 L plastic.
7 bottles total.					

## Duplicates and Field Blank

	Duplicate Collected? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered (Required) (Y/N)	Duplicate Name ID, e.g., Dup 1 (do not use the station name)
No					
Duplicate	N/A				
	Field Blanks Made up? (Y/N)	No. of bottles	Preserved? (Y/N)	Field filtered? (Y/N)	Field Blank ID (e.g., FB1)
No					
Field Blank	N/A				

## Field Parameters

Water Temp. (°C) 2.1

pH 7.41

Conductivity (µS/cm) 465.3 Specific Conductivity (µS/cm): 827.2

ORP (mV) -827.2

Turbidity (NTU) NOT RECORDED, NOT REQUIRED

Dissolved O<sub>2</sub> (mg/L) NOT RECORDED, NOT REQUIRED 10.67 mg/L

Dissolved O<sub>2</sub> (% Sat.) 77.5 %

\*YSI + Sample in middle channel

## Miscellaneous Information

Photo Numbers \_\_\_\_\_ (GR Contain)

UTM Coordinates (AN EPS) \_\_\_\_\_ Zone: 07 W E: \_\_\_\_\_ N: \_\_\_\_\_

Waypoint name R3 SEPT 2014 → access hike = R3 Access Datum: NAD-83 Sept 2014

Observations ~100m upstream of upper tailings slung on Wolvaine Creek in confined channel near of swampy/grass marsh. ~40m downstream to flooded lake pond  
See AN EPS for walking access which avoids tailings except only here  
safe (and impassable on other side of creek)

If found, please call ELR: 867.668.6386

Also a hydrology assessment station - see ELR hydrology field form

**APPENDIX 5**  
**Comment Log**

**Response to Comments from Draft Report Version (as Received November 25, 2014).**

Comment No.	Page	Comment	Response
1	Cover	Please provide excel spreadsheets used when conducting analysis.	All supporting files provided with final document.
2	1	Additional tributaries flowing into Hudgeon Lake, this should be mentioned, and if in the future, should they be sampled.	There are several additional tributaries that have not been assessed by Hemmera/ELR as they were not included in the scope of work. Their inclusion in future programs may be advisable, but we believe this has been addressed through the potential re-scoping of the Clinton Creek program.
3	1	Please identify Porcupine Pit and Snowshoe Pit on the Map	The map has been edited accordingly.
4	5	Why is there no R5?	In response to your comments on page 5 concerning sample site ID, reference site R5 and exposure sites E5 and E6 were not included in the scope of work. We assume that these may be some previously sampled sites that were decommissioned, however we don't have any project history available to confirm.
5	5	Why is there no E5 and E6?	In response to your comments on page 5 concerning sample site ID, reference site R5 and exposure sites E5 and E6 were not included in the scope of work. We assume that these may be some previously sampled sites that were decommissioned, however we don't have any project history available to confirm.
6	6	As mentioned earlier, is there a name to this creek/tributary? Should we sample it in the future?	See response to comment no. 2.
7	7	As mentioned earlier, is there a name to this creek/tributary? Should we sample it in the future?	See response to comment no. 2.
8	10	May want to include a paragraph explaining that proper deionized water was not used for blanks and steps were taken to reassure validity of results.	Issue has been addressed in this section and in discussion.
9	14	Review this sentence..... 5 results, yet only 4 sites provided.....	Report has been revised accordingly.
10	15	Isn't pH a standard test performed within the lab analysis? Why is it not included for all sites?	As per our recent discussions, unfortunately field pH could not be measured at several sites, and lab pH was not requested. Although not in the scope of work, it should have been requested in this particular case. This again would fall under the scope of a review of the sampling program, and I believe that parameters such as pH and conductivity should be included in future events.

Comment No.	Page	Comment	Response
11	19	Why was pH not provided? As well as other typical lab parameters...? (e.g. conductivity)	See response to comment no. 10.
12	19	What are the ranges when dependent on pH and water temp?	Table footnotes have been revised to indicate that parameter varies, and ranges have been removed to avoid confusion.
13	20	Interesting to note that most cases where metal levels super-seed CCME levels are those flows feeding into the foot printed area..... (R1, R2, R3, R6, R7)	Yes. There is evidence of external influence on the site, which indicates the importance of proper reference site documentation.
14	20	For Copper at E8 - May want to re-check... After looking at hardness, the value still falls within the given range.. Does this depend on a range or is it the given calculation below that determines whether it is at an elevated level or not.... which is dependent on hardness?	In response to your comment concerning a CCME-PAL total copper exceedance for site E8. Concentrations of total copper at this site were 0.00246 mg/l. Total copper concentrations did not exceed the CCME-PAL guideline of 0.00288 mg/l (based on a hardness 126 mg/l). We have changed the ranges provided in the tables to "Varies" to denote the site-specific conditions for each parameter, so hopefully this will provide more clear information.
15	23	Please provide an explanation for this....	Field blank results are discussed in the context of additional confirmatory testing in the report.
16	27	and Porcupine Pit Lake	Report has been changed accordingly.
17	27	According to the table, there were 7 not sampled....	Report has been changed accordingly.
18	28	Not what it says in the table.... says 0.365 m/s	Report has been changed accordingly.
19	31	Several comments regarding field vs lab pH results.....  As mentioned earlier, we were just wondering why pH (among other parameters) wasn't measured in the lab? Wouldn't it be more accurate to relate to lab results?  As well, in some instances, field pH was not measured (as a result of instrumentation problems). And in this case, worst case pH situations were used... This should also be discussed here.	In respect to using field pH to calculate CCME exceedances, where available, field pH was used to calculate CCME-PAL guidelines for aluminum. Field pH provides the most accurate representation of in-situ conditions and is therefore preferred over laboratory pH for calculating CCME exceedances. For sites where pH data was not available (R1 and R2), CCME-PAL exceedances of aluminum were calculated based on the lowest pH observed during the field program (6.12 pH), resulting in an aluminum guideline of 0.005 mg/l. Field pH during the 2013 Clinton Creek Monitoring program at sample sites R1 and R2 was 8.04 and 7.70, resulting in a CCME-FAL aluminum guideline of 0.1 mg/l.
20	31	Dissolved vs total metals for arsenic are essentially the same.... 0.0152 vs 0.0148?	These two are essentially the same. The comment that arsenic is primarily in the dissolved form still stands, and the text has been revised to that this reads more clearly.

Comment No.	Page	Comment	Response
21	32	Is selenium a concern? Should we be worried? What are potential impacts if so?	<p>In response to your questions concerning impacts from selenium (Se) contamination, Se is known to be toxic to plants, animals, and humans at higher concentrations. The concentration of total selenium in natural waters is typically less than 0.001 mg/l. The concentration of Se in the study area ranged from 0.00022 mg/l (E8) and 0.00412 mg/l (GWCC-1), with CCME exceedances at both reference and exposure sites.</p> <p>The lowest observed effects level (LOEL) for selenium in water is 0.01 mg/l. CCME-PAL guideline for Se is 0.001 mg/l, using a safety factor of 10. The BC MOE use a slightly higher guideline (0.002 mg/l), using a safety factor of 5. The higher guideline is apparently based on the fact that selenium is an essential element for animal health, and food (not water) is the major source of selenium in the food chain.</p> <p>It's also important to note that we did find concentrations of total selenium above CCME-PAL values at reference sites R1 and R2, indicating elevated concentrations may also be sourced from off-site. This is consistent with data collected in the fall of 2013. Further data would be required to investigate the potential impacts of selenium contamination and whether or not accumulation in the receiving environment is a serious threat to aquatic life. This is something that could be investigated in greater detail through an expanded program.</p>
22	33	<p>May want to include a paragraph explaining that proper deionized water was not used for blanks and steps were taken to reassure validity of results..... I discussed this with Chris on the phone and he said he would include a section when the results came through.... (i.e. how the issue was resolved)</p> <p>- As well, could you please provide the new results for the two water samples and a discussion comparing them and confirm that results from the program were good.</p>	<p>The discussion has been updated to include the results of the additional confirmatory testing.</p>

Comment No.	Page	Comment	Response
23	34	I noticed in one of the photos (#23) that there was an "unknown/unnamed" ground seep... Should this be monitored in the future? Where is this located? I don't recall this presented in the report.	An additional groundwater seepage site was identified in the field at the toe of the waste rock dump (photo 23), similar to GWCC-3 and GWCC-4. The unnamed seep was entering the seepage creek (photo 24) below the surface of the water and therefore it would be difficult to collect samples or conduct flows measurements. Flow measurements and samples could however be collected from the resulting seepage creek. Sample sites GWCC-3 and GWCC-4 also flow into this creek which flows into the beaver pond (photo 19). This is another point that should be considered for the next year's program, and could be taken into account separately or as part of a larger program review.
24	34	Not too clear on this recommendation..	We have simplified this recommendation to relate only to signs at sample sites.
25	34	I am not sure what this means.... should this not have been developed as part of the work plan for this year?	This recommendation has been removed.
26	34	We should chose a location and stick with it... Was the new location safe? Would this continue to be a representative location to replace the old? If so, stick with it.....	Agreed about permanently establishing a new Site E1. If possible, this should be part of the overall program review to ensure that this site will be accessible in the long term, and that it is the best appropriate location.
27	34	- Should Hudgeon Lake be sampled? And if so, at what depth? (multiple depths?)  - As mentioned earlier, should we capture all tributaries entering Clinton Creek? I know there were a few that were not captured.....	As per earlier comments, this should be assessed as part of a larger program review to ensure that appropriate samples are being collected.