ANNEX XI: APPENDIX B

QUALITY ASSURANCE AND QUALITY CONTROL

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Tables

Abbreviations

Abbreviation	Definition
—	no data or not applicable
BTEX	benzene, toluene, ethylbenzene, xylene
CALA	Canadian Association for Laboratory Accreditation
$CaCO_3$	calcium carbonate
CV	coefficient of variation
DO	dissolved oxygen
e.g.,	for example
et al.	and more than one additional author
Golder	Golder Associates Ltd.
H+	hydrogen ions
i.e.,	that is
MDL	method detection limit
QA	quality assurance
QC	quality control
QA/QC	quality assurance and quality control
pH	potential of hydrogen; provides measure of the acidity or alkalinity of a solution on a scale of 0 to 14
PHC	petroleum hydrocarbons
RPD	relative percent difference

Units of Measure

Unit	Definition
%	percent
<	less than
>	greater than
µg/L	micrograms per litre
µS/cm	microsiemens per centimetre
CFU/100 mL	coliform forming units per 100 millilitres
mg/kg	milligrams per kilogram
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mg N/L	milligrams nitrogen per litre
mg P/L	milligrams phosphorus per litre
mm	millimetre
NTU	nephelometric turbidity unit

B1 INTRODUCTION

Quality assurance and quality control (QA/QC) practices determine data integrity and are relevant to all aspects of a study, from sample collection to data analysis and reporting. Quality assurance (QA) encompasses management and technical practices designed to confirm that the data generated are of consistent high quality. Quality control (QC) is an aspect of QA and includes the procedures used to measure and evaluate data quality, and the corrective actions to be taken when data quality objectives are not met. This appendix describes QA/QC practices applied during this study, evaluates QC data, and describes the implications of QC results to the interpretation of study results

B2 QUALITY ASSURANCE

Quality assurance applicable to this study covers three areas of internal and external management, as described below.

B2.1 Field Staff Training and Operations

Golder Associates Ltd. (Golder) field staff are trained to be proficient in standardized field sampling procedures, data recording, and equipment operations applicable to water and sediment quality sampling. Fieldwork was completed according to approved specific work instructions and established Golder technical procedures. Specific work instructions are standardized forms that describe exact sampling locations and provide specific sampling instructions, equipment needs and calibration requirements, required technical procedures, sample labelling and shipping protocols, and laboratory contacts. They also provide specific guidelines for field record keeping and sample tracking. Technical procedures are consistent with standard field methods described in the relevant scientific literature (e.g., Environment Canada 1993; APHA 2012), and outline sample collection, preservation, handling, storage, and shipping protocols.

A pre-field meeting with the field crew and the project/task manager was held before the field work to discuss the purpose of the field program, specify the roles of crew members, address questions regarding the specific work instructions, and discuss equipment needs, field logistics, and contingency plans. During field work, field data were recorded on standardized field data sheets or in a bound field book, according to established field record-keeping procedures. In addition, field crews checked in with task managers regularly to provide an update on work completed. Samples were documented and tracked using chain-of-custody forms, and receipt of samples by the analytical laboratory was confirmed.

One field crew member was responsible for managing the sample shipping process so that:

- all required samples were collected;
- chain-of-custody and analytical request forms were completed and correct; and,
- proper labelling and documentation procedures were followed.

B2.2 Laboratory

One member of the project team was designated as the laboratory liaison. So that high-quality data were generated, the laboratories that were used for the sample analysis are accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Under CALA's accreditation program, performance evaluation assessments are conducted for laboratory procedures, methods, and internal QC.

B2.3 Office Operations

Office-related QA included using appropriately trained personnel for each task and senior review of work products at appropriate milestones, using standardized data manipulation/summary tools, filing data and project information according to standardized protocols, and establishing a data management system to confirm an organized, consistent system of data storage, QC, and retrieval.

B3 QUALITY CONTROL

B3.1 Field Control Procedures

The water quality field QC program consisted of the collection and analysis of field blank samples and field duplicate samples. The plankton field QC program consisted of the collection of field triplicate samples for chlorophyll *a*, phytoplankton, and zooplankton. Results from the chlorophyll *a* triplicate analysis are included in this report; phytoplankton and zooplankton results are provided in Annex XII (Plankton Baseline Report). The sediment quality field QC program consisted of the collection and analysis of duplicate samples. The QC sample types are described as follows:

- **Field blanks** consist of de-ionized water provided by the analytical laboratory, which is exposed to the sampling environment at the sample site and handled in the same manner as the surface water samples collected during the field program (e.g., preserved, filtered). Field blanks are used to detect potential sample contamination during sample collection, handling, shipping, and analysis.
- **Duplicate samples** are additional samples collected at the same time and location as surface water or sediment samples collected during a field program, using the same sampling methods. They are used to check within-site variation, and the precision of field sampling methods and laboratory analysis.
- **Triplicate samples** for chlorophyll *a* analysis were collected to check within-site variation, and the precision of field sampling methods and laboratory analytical methods.

Quality control field blanks and field duplicate samples were collected during the water quality field program and accounted for approximately 10 percent (%) of the total number of samples submitted for analysis. Quality control field duplicate samples were collected during the sediment quality field program and accounted for approximately 10% of the total number of samples submitted for analysis. These samples were handled, stored, and shipped along with field-collected surface water samples, and were submitted “blind” to the analytical laboratories. Quality control samples were analyzed for the same set of parameters as the samples collected from surface waters. The triplicate chlorophyll *a* samples were collected at each station during each sampling event, and were handled, stored, and shipped in the same manner to the analytical laboratory as “blind” duplicates.

B3.2 Office Quality Control Procedures

Relevant elements of office-based QC were:

- saving unaltered lab files in the Project directory;
- comparing sample data entered into the Project database against final laboratory reports to confirm data accuracy;
- creating backup files before each major operation as data were being manipulated;
- checking the data in the Project database against the raw data obtained from databases or analytical laboratories; and,
- verifying the accuracy of calculations performed to generate summary statistics.

B3.3 Initial Laboratory Data Screening

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

- verification that all required parameters and samples were analyzed;
- verification that data were reported using the appropriate units;
- verification that analyses were done with the appropriate detection limit;
- verification that field versus laboratory data were similar for parameters with parallel field and laboratory data (i.e., conductivity); if large discrepancies were found, then laboratory data were considered correct;
- logic checks: presence of zero values, comparisons of total dissolved solids and conductivity, hardness and alkalinity, total and dissolved phosphorus, total and dissolved organic carbon, total and dissolved metals, measured and calculated total dissolved solids;
- presence of outliers;
- review of field blank results for evidence of contamination (Section B3.4.1);
- review of duplicate sample results for evidence of unacceptable variation (Section B3.4.2);
- review of laboratory QC data (i.e., sample temperature and integrity of containers upon receipt, review laboratory qualifiers, holding times, internal duplicates, ion balance, percent recovery of spiked analytes); and,
- review of field-collected data for completeness, and unexpected values and trends.

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

B3.4 Quality Control Data Evaluation

B3.4.1 Field Blanks

Concentrations in water quality field blanks were considered notable if they were greater than or equal to five times the corresponding method detection limit (MDL). This threshold is based on the Practical Quantitation Limit defined by the United States Environmental Protection Agency (USEPA 2000; AENV 2006), and takes into account the potential for reduced accuracy when concentrations approach or are below MDLs. This criterion was not applied to pH because detection limits are not applicable to pH in the deionized water used to prepare field blanks.

The implications of notable results in field blanks to data quality were evaluated relative to concentrations observed in surface waters sampled during the field program. The aim of this evaluation was to determine:

1) whether contamination was limited to a field blank or was apparent in the corresponding water samples as well;

2) whether it resulted in a consistent bias; and,

3) whether it was severe enough to warrant invalidating the affected data.

To address these questions, notable concentrations in field blanks were interpreted as follows:

- If the field blank had a detectable concentration of a parameter that was higher than those in the corresponding surface water samples, it was assumed that the concentration in the field blank was the result of an isolated field or lab error. In this case, the corresponding water samples were considered uncontaminated.
- If the detectable concentration in the field blank was less than 10% of the corresponding surface water concentration, and less than five times the mean MDL, the data for the corresponding water samples were considered acceptable for the parameter in question and were included in further analysis.

B3.4.2 Duplicate Samples

Differences between concentrations measured in duplicate water and sediment samples were calculated as the relative percent difference (RPD) for each parameter. Before calculating the RPD, concentrations below the MDL were replaced with the MDL value in cases when only one of the concentrations for a given parameter was detectable. The RPD was calculated using the following formula:

RPD = (|difference in concentration between two of the duplicate samples| / mean concentration) x 100

The RPD value for a given parameter was considered notable if:

- it was greater than 20%; and,
- concentrations in one or both samples were greater than or equal to five times the MDL.

The number of parameters with exceedances of the evaluation criteria was compared with the total number of parameters analyzed to evaluate analytical precision. Analytical precision was rated as follows:

- **high**, if less than 10% of the total number of parameters were notably different from one another;
- **moderate**, if 10% to 30% of the total number of parameters were notably different from one another; or,
- **low**, if more than 30% of the total number of parameters were notably different from one another.

B3.4.3 Triplicate Samples

Differences between concentrations measured in triplicate chlorophyll *a* samples were calculated as the standard deviation, standard error, and coefficient of variation (CV) for each station and date (field QC samples) or for each station, date, and field duplicate (laboratory QC samples). The CV was calculated using the following formula:

CV= (standard deviation / average) x 100

B3.4.4 Dissolved to Total Results Comparison

Measured dissolved concentrations in the water quality data were compared to measured total concentrations. Samples were screened by a comparison of values between samples (RPD) and the value relative to the detection limit (greater than 5 x MDL; and greater than 10 x MDL). Only samples with concentrations more than 20% different between samples and with values more than five times the detection limit failed this QC check and were considered notable.

B3.5 Quality Control Results

B3.5.1 Water Quality Field Measurements

Several multi-meters were used to take in situ measurements of water temperature, pH, dissolved oxygen (DO), and conductivity. Several multi-meters were used because there were multiple crews in the field at the same time. In addition, certain multi-meters did not function reliably (e.g., periodically reading pH and dissolved oxygen parameters at levels that were outside of an acceptable range) despite successful calibrations and servicing of the field meters.

For the late spring program, the meters used included a Hydrolab Series 5 Minisonde multiprobe, an Oakton DO 300 series DO and temperature meter, and a YSI 600QS multi-meter. For the summer program, the same Hydrolab and YSI meters from July were used. For the fall program, the meters used included a Hydrolab Series 5 Datasonde multiprobe, two different YSI 600QS multi-meters, and a YSI Pro 20. Additionally, a Hanna 2776AE meter (Hanna pen) was used periodically for surface measurements only. The most accurate and consistent results were achieved with the Hydrolab Series 5 minisonde multiprobe. The ongoing unreliability of certain instrumentation presented a limitation for field data collection. To the extent possible, the more reliable equipment was used. As a result of the limitations, certain field data were not collected or were considered unreliable.

Throughout the program, the field meters were tested daily by dissolved oxygen titrations. Water was collected with a Kemmerer at a depth that had an in situ DO reading measured, and transferred to biochemical oxygen demand bottles, which were filled such that there was no air space in the bottle after filling. Titrations were performed as soon as possible after the samples were collected. Each DO titration was performed using a Hach model OX-2P titration kit which measures DO between 0.2 and 20 milligrams per litre (mg/L). The Winkler DO data were compared to the field dissolved oxygen readings at the end of each day, to test the reliability of the readings. The Winkler DO data were used when dissolved oxygen results obtained from field readings were considered to be out of range.

Steps were taken in the field to achieve the highest quality of field data possible, but due to the lack of consistency in the data, it was decided to not include field-measured pH data in the baseline report.

B3.5.2 Water Quality Field Blanks

Five field blank samples were collected and analyzed during the water quality program. The field blank data were reviewed for parameters with concentrations reported at more than or equal to five times the detection limit. There were detectable parameters in select field blank samples, and one concentration was above the QC limit (0.2% of the entire dataset).

Results for the water quality field blank samples are provided in Section B4, Table B4-1.

B3.5.3 Water Quality Duplicate Samples

Nine water quality duplicate samples were collected during the 2013 program: three in each of late spring, summer, and fall. Duplicate samples were collected as follows:

- late spring: Ac-2, Af-7, and C-S1;
- summer: Aa-2, PL-2 Top, and Hammer-1 Top; and,
- fall: Hammer-1, PL-4, and Ad-1.

Across the dataset of duplicate samples (i.e., nine pairs of samples in total), 4.2% of the values differed by more than 20% between duplicate pairs (Table B3.5-1). Overall, the level of precision for this dataset is rated as high.

Table B3.5-1 Summary of Relative Percent Difference Between Water Quality Duplicate Samples

Sample Month	Duplicate Pairs	RPD over 20%	
		Number of Parameters	Percent of Parameters
Late spring	Ac-2	4	3.8
	Af-7	3	2.9
	C-S1	2	1.9
Summer	Aa-2	3	2.9
	PL-2 Top	2	1.9
	Hammer-1 Top	18	17.1
Fall	Hammer-1	4	3.8
	PL-4	2	1.9
	Ad-1	2	1.9
All duplicate pairs (total)		40	4.2

RPD = relative percent difference; % = percent.

Results for the water quality duplicate samples are provided in Section B4, Table B4-2.

B3.5.4 Sediment Quality Duplicate Samples

Four sediment quality duplicate samples were collected during the 2013 summer program.

Across the dataset of duplicate samples (i.e., four pairs of samples in total), 4.7% of the values differed by more than 20% between duplicate pairs (Table B3.5-2). Overall, the level of precision for this dataset is rated as high. Of the 43 parameters, 8 of them had RPD values over 20% in at least one pair of duplicate samples.

Table B3.5-2 Summary of Relative Percent Difference Between Sediment Quality Duplicate Samples

Sample Month	Duplicate Pairs	RPD over 20%	
		Number of Parameters	Percent of Parameters
Summer	Ab-2	1	2.3
	Ac-1	6	14.0
	Ac-2	0	0
	Ae-1	1	2.3
All duplicate pairs (total)		8	4.7

RPD = relative percent difference; % = percent.

Results for the sediment quality duplicate samples are provided in Section B4, Table B4-4.

B3.5.5 Chlorophyll *a* Triplicate Samples

Triplicate samples were collected for chlorophyll *a* analyses at all stations during all sampling events associated with the 2013 sampling program (Table B4-3a). None of the duplicate samples within the field QC samples were considered notable; therefore, an acceptable level of reproducibility in field data collection was concluded (Table B4-3b). However, one duplicate sample failed the QC criteria in the internal laboratory QC samples. The sample was from Lac du Sauvage (Station Aa-1, Duplicate c) collected in September (the sample had a CV value of 36%). Overall, the level of precision in the laboratory duplicates for the chlorophyll *a* data is rated as high.

B3.5.6 Dissolved to Total Results Comparison

Measured dissolved concentrations in all data were compared to measured total concentrations. Seven percent (7%) of the dissolved and total organic carbon results had a RPD of over 20%; however, their values were less than five times the detection limit.

Notable dissolved and total results are as follows: 0.8% of aluminum values; 0.8% of arsenic values; 8.6% of barium values, 1.6% of copper values, 0.8% of iron values, 0.8% of manganese values, 0.8% of nickel values, 0.8% of tin values, and 0.8% of zinc values. Tin and zinc values were greater than 10 times the detection limit, while the rest of the notable results were greater than 5 times the detection limit.

Across the dataset, 0.2% of the values differed by more than 20% between dissolved and total samples. The overall level of precision for this dataset is therefore rated as high.

B3.6 Overall Data Quality

The Project quality control program included: a review of field data; evaluation of water quality field blank samples; water and sediment quality duplicate samples; a comparison of dissolved and total parameter concentrations; and, evaluation of chlorophyll *a* triplicate samples.

The results of the overall review of field data indicated that, although the appropriate steps were taken in the field to achieve the highest quality of field data possible, the range observed in the pH data was too large to report and field-measured pH data have therefore not been included in the baseline report. Evaluation of the water and sediment quality QC samples indicated that, across the entire dataset there were detectable parameters in 0.2% of the field blank samples, 4.2% of the values differed by more than 20% between water quality duplicate pairs, 4.7% of the values differed by more than 20% between sediment quality duplicate pairs, and 0.2% of the values differed by more than 20% between dissolved and total water quality parameters. The overall quality of the water and sediment quality data was determined to be high. The results of the evaluation of field and laboratory chlorophyll *a* triplicate samples indicated that there was an acceptable level of reproducibility in field data collection and the level of precision in the laboratory duplicates for the chlorophyll *a* data was high.

B4 DETAILED RESULTS TABLES

Table B4-1 Water Quality Field Blank Results From the Jay Project Baseline Study Area during the Open-Water Season, 2013

Sample Name			Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
Sampling Season			Late Spring	Summer	Summer	Fall	Fall
Sample Date	Unit	MDL	26-Jul-13	11-Aug-13	16-Aug-13	13-Sep-13	15-Sep-13
Conventional Parameters							
Alkalinity, gran (as H+)	meq/L	0.1	<0.1	<0.1	<0.1	<0.1	0.19
Alkalinity, total (as $CaCO_3$)	mg/L	2	<2	<2	<2	<2	<2
Conductance	µS/cm	0.2	0.92	0.54	0.67	0.64	0.8
Hardness	mg/L	1	—	—	—	—	—
pH	pH units	—	5.37	5.06	5.07	5.01	5.24
Total dissolved solids	mg/L	10	<10	<10	<10	<10	<10
Total suspended solids	mg/L	3	<3	<3	<3	<3	<3
Turbidity	NTU	0.1	<0.1	<0.1	0.17	<0.1	<0.1
Major Ions							
Bicarbonate	mg/L	5	<5	<5	<5	<5	<5
Calcium	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	0.027
Chloride	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	0.0041
Potassium	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Sodium	mg/L	0.005	<0.005	0.0071	0.0095	<0.005	0.0079
Sulfate	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nutrients							
Total organic carbon	mg/L	1	<1	<1	<1	<1	<1
Dissolved organic carbon	mg/L	1	<1	<1	<1	<1	<1
Total nitrogen (calculated)	mg N/L	0.05	<0.050	<0.050	<0.050	<0.050	<0.050
Total Kjeldahl nitrogen	mg N/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total ammonia	mg N/L	0.005	0.0065	<0.005	<0.005	<0.005	<0.005
Nitrate	mg N/L	0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Nitrite	mg N/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total phosphorus	mg P/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total dissolved phosphorus	mg P/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved orthophosphate	mg P/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silica, reactive	mg/L	0.005	<0.0050	<0.0050	0.0053	<0.0050	0.107

Table B4-1 Water Quality Field Blank Results From the Jay Project Baseline Study Area during the Open-Water Season, 2013

Sample Name			Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
Sampling Season			Late Spring	Summer	Summer	Fall	Fall
Sample Date	Unit	MDL	26-Jul-13	11-Aug-13	16-Aug-13	13-Sep-13	15-Sep-13
Total Metals							
Aluminum	µg/L	0.3	<0.3	<0.3	0.96	0.74	0.72
Antimony	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Barium	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Beryllium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	1	2.1	4.6	2	1.9	2.1
Cadmium	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Chromium VI	µg/L	1	<1	<1	<1	<1	<1
Cobalt	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	µg/L	1	<1	<1	<1	<1	<1
Lead	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	µg/L	0.05	<0.05	<0.05	0.058	0.079	<0.05
Mercury	µg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Selenium	µg/L	0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Thallium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	0.1	<0.1	<0.1	0.11	<0.1	0.18
Uranium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	0.8	<0.8	<0.8	<0.8	<0.8	<0.8

Table B4-1 Water Quality Field Blank Results From the Jay Project Baseline Study Area during the Open-Water Season, 2013

Sample Name			Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
Sampling Season			Late Spring	Summer	Summer	Fall	Fall
Sample Date	Unit	MDL	26-Jul-13	11-Aug-13	16-Aug-13	13-Sep-13	15-Sep-13
Dissolved Metals							
Aluminum	µg/L	0.3	<0.3	0.38	0.99	0.5	0.9
Antimony	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Barium	µg/L	0.05	<0.05	<0.05	0.077	0.115	0.059
Beryllium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	1	1.9	1.5	2.1	2	2.3
Cadmium	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cesium	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	µg/L	1	<1	<1	1	<1	1.1
Lead	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	µg/L	0.05	<0.05	<0.05	0.099	0.112	0.062
Mercury	µg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Selenium	µg/L	0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Thallium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	0.8	<0.8	<0.8	<0.8	<0.8	1.09

Table B4-1 Water Quality Field Blank Results From the Jay Project Baseline Study Area during the Open-Water Season, 2013

Sample Name			Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
Sampling Season			Late Spring	Summer		Fall	Fall
Sample Date	Unit	MDL	26-Jul-13	11-Aug-13	16-Aug-13	13-Sep-13	15-Sep-13
Other Parameters							
Fecal Coliforms	CFU/100 mL	1	<1	<1	<1	<1	<1
Benzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylene	µg/L	0.71	<0.71	<0.71	<0.71	<0.71	<0.71
PHC - F1 (C_6-C_{10})	µg/L	100	<100	<100	<100	<100	<100
PHC - F1 (C_6-C_{10}) - BTEX	µg/L	100	<100	<100	<100	<100	<100
PHC - F2 (C_{10}-C_{16})	µg/L	250	<250	<250	<250	<250	<250
Total Recoverable Hydrocarbons	µg/L	1,000	<1,000	<1,000	<1,000	<1,000	<1,000
Values over five times the MDL	%	—	0.0	0.0	0.0	0.0	0.0

Notes: The percentage of values over five times the MDL for the entire dataset is 0%.

MDL = method detection limit; H+ = hydrogen ions; $CaCO_3$ = calcium carbonate; PHC = petroleum hydrocarbons; BTEX = benzene, toluene, ethylbenzene, xylene; — = no data or not applicable; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microsiemens per centimetre; NTU = nephelometric turbidity units; mg P/L = milligrams phosphorus per litre; mg N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; % = percent; < = less than.

Table B4-2 Water Quality Duplicate Results From the Jay Project Baseline Study Area During the Open-Water Season, 2013

Location			Ac-2			Af-7			C-S1			Aa-2			PL-2 Top			Hammer-1 Top			Hammer-1			PL-4			Ad-1		
Sample Name			Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate	
Sampling Season			Late Spring	Late Spring		Late Spring	Late Spring		Late Spring	Late Spring		Summer	Summer		Summer	Summer		Summer	Summer		Fall	Fall		Fall	Fall		Fall	Fall	
Sample Date (2013)	Unit	MDL	21-Jul	21-Jul	RPD	26-Jul	26-Jul	RPD	26-Jul	26-Jul	RPD	13-Aug	13-Aug	RPD	14-Aug	14-Aug	RPD	20-Aug	20-Aug	RPD	13-Sep	13-Sep	RPD	15-Sep	15-Sep	RPD	7-Sep	7-Sep	RPD
Conventional Parameters																													
Alkalinity, gran (as H+)	meq/L	0.1	0.1	0.11	—	<0.1	<0.1	—	0.14	0.14	—	<0.1	<0.1	—	<0.1	0.11	—	0.16	0.14	—	<0.1	0.14	—	<0.1	0.12	—	<0.1	0.1	—
Alkalinity, total (as $CaCO_3$)	mg/L	2	4.4	4	—	3.2	3.2	—	5.5	5.5	—	3.8	3.8	—	5.6	7.2	—	5.3	5.2	—	4.9	5.1	—	5.8	5.2	—	4.4	5.5	—
Conductance	µS/cm	0.2	14.9	13.8	7.7%	11.9	11.8	0.8%	20.4	20.5	0.5%	14.6	14.2	2.8%	28	32.6	15.2%	22.4	22.6	0.9%	21.1	21.3	0.9%	17.8	16.6	7.0%	13.8	14.4	4.3%
Hardness	mg/L	1	4.7	4.6	—	4	3.9	—	7.4	7.6	2.7%	4.5	4.5	—	5.9	5.9	0.0%	4.2	7.1	—	7.1	7.1	0.0%	5.9	5.9	0.0%	4.9	4.9	—
pH	pH units		6.75	6.41	5.2%	6.42	6.36	0.9%	6.5	6.51	2.3%	6.11	6.28	2.7%	6.75	6.96	3.1%	6.59	6.59	0.0%	6.6	6.59	2.3%	6.55	6.63	1.2%	6.61	6.64	0.5%
Total dissolved solids	mg/L	10	16	15	—	25	20	—	31	37	—	10	11	—	12	<10	—	27	26	—	22	26	—	19	18	—	25	19	—
Total suspended solids	mg/L	3	<3	<3	—	<3	<3	—	<3	<3	—	<3	<3	—	<3	<3	—	<3	<3	—	<3	<3	—	<3	<3	—	<3	<3	—
Turbidity	NTU	0.1	0.62	0.58	6.7%	0.73	0.71	2.8%	0.51	0.53	3.8%	0.55	0.4	—	0.74	0.77	4.0%	0.7	0.68	2.9%	0.77	0.6	**24.8%**	0.87	0.9	3.4%	0.59	0.58	1.7%
Major Ions																													
Bicarbonate	mg/L	5	5.4	<5	—	<5	<5	—	6.7	6.7	—	<5	<5	—	6.8	8.8	—	6.5	6.4	—	6	6.2	—	7	6.3	—	5.4	6.7	—
Calcium	mg/L	0.02	0.852	0.836	1.9%	0.734	0.698	5.0%	1.08	1.15	6.3%	0.828	0.794	4.2%	0.967	0.942	2.6%	0.654	1.08	**49.1%**	1.05	1.03	1.9%	0.941	0.953	1.3%	0.824	0.933	12.4%
Chloride	mg/L	0.5	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	0.63	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—
Fluoride	mg/L	0.02	<0.02	<0.02	—	<0.02	<0.02	—	0.034	0.031	—	<0.02	0.021	—	<0.02	<0.02	—	0.025	0.028	—	0.026	0.025	—	<0.02	<0.02	—	<0.02	<0.02	—
Magnesium	mg/L	0.004	0.624	0.618	1.0%	0.518	0.52	0.4%	1.13	1.14	0.9%	0.603	0.604	0.2%	0.839	0.859	2.4%	0.615	1.07	**54.0%**	1.08	1.11	2.7%	0.861	0.863	0.2%	0.656	0.635	3.3%
Potassium	mg/L	0.02	0.534	0.534	0.0%	0.486	0.488	0.4%	0.791	0.806	1.9%	0.53	0.529	0.2%	0.581	0.587	1.0%	0.542	0.8	**38.5%**	0.804	0.809	0.6%	0.623	0.623	0.0%	0.547	0.532	2.8%
Sodium	mg/L	0.005	0.604	0.596	1.3%	0.583	0.591	1.4%	0.755	0.771	2.1%	0.636	0.627	1.4%	0.676	0.715	5.6%	0.619	0.936	**40.8%**	0.899	0.912	1.4%	0.691	0.685	0.9%	0.601	0.642	6.6%
Sulfate	mg/L	0.05	1.15	1.17	1.7%	0.34	0.873	**87.9%**	2.34	2.3	1.7%	1.71	1.29	**28.0%**	1.13	1.14	0.9%	2.54	2.57	1.2%	3.04	3.01	1.0%	1.79	1.81	1.1%	1.05	1.07	1.9%
Nutrients																													
Total organic carbon	mg/L	1	3.4	3.1	—	3.8	3.3	—	3.5	3.6	—	3.6	3.7	—	5.2	5.1	1.9%	6.6	5.8	12.9%	6.2	6.3	1.6%	4.5	4.5	—	3.5	3.5	—
Dissolved organic carbon	mg/L	1	3.3	3.1	—	4.2	4.1	—	4	4.1	—	3.8	3.6	—	5	5	—	6.4	6.1	4.8%	6.1	6.1	0.0%	4.5	4.5	—	3.5	3.5	—
Total nitrogen (calculated)	mg N/L	0.05	0.23	0.16	—	0.20	0.22	—	0.27	0.27	1.5%	<0.050	<0.050	—	0.14	0.28	**69.2%**	0.32	0.30	6.4%	0.22	0.30	**29.7%**	0.24	0.40	**51.7%**	0.13	0.11	—
Total Kjeldahl Nitrogen	mg N/L	0.05	0.234	0.158	—	0.198	0.215	—	0.215	0.211	—	<0.05	<0.05	—	0.136	0.28	—	0.321	0.301	6.4%	0.221	0.404	—	0.238	0.298	—	0.126	0.109	—
Total ammonia	mg N/L	0.005	0.0083	0.0126	—	0.0148	0.0153	—	0.014	0.0166	—	0.0071	0.0073	—	0.0139	0.0119	—	0.0184	0.0118	—	<0.005	0.0057	—	<0.005	<0.005	—	0.0159	0.0114	—
Nitrate	mg N/L	0.006	<0.006	<0.006	—	<0.006	<0.006	—	0.0586	0.0589	0.5%	<0.006	<0.006	—	<0.006	<0.006	—	<0.006	<0.006	—	<0.006	<0.006	—	<0.006	<0.006	—	<0.006	<0.006	—
Nitrite	mg N/L	0.002	<0.002	<0.002	—	<0.002	<0.002	—	<0.002	<0.002	—	<0.002	<0.002	—	<0.002	<0.002	—	<0.002	<0.002	—	<0.002	<0.002	—	<0.002	<0.002	—	<0.002	<0.002	—
Total phosphorus	mg P/L	0.001	0.0057	0.0069	19.0%	0.0131	0.0092	**35.0%**	0.0058	0.0058	0.0%	0.0065	0.0081	**21.9%**	0.0093	0.0083	11.4%	0.0095	0.0123	**25.7%**	0.01	0.0118	16.5%	0.0117	0.0104	11.8%	0.0066	0.0083	**22.8%**
Total dissolved phosphorus	mg P/L	0.001	0.0015	0.0028	—	0.002	0.0018	—	0.0032	0.0033	—	0.0025	0.0019	—	0.0027	0.0028	—	0.0019	0.0032	—	0.0038	0.0045	—	0.004	0.0034	—	0.002	0.002	—
Dissolved orthophosphate	mg P/L	0.001	—	<0.001		<0.001	<0.001	—	<0.001	<0.001	—	<0.001	<0.001	—	<0.001	<0.001	—	<0.001	<0.001	—	<0.001	<0.001	—	<0.001	<0.001	—	<0.001	<0.001	—
Silica, reactive	mg/L	0.005	0.12	0.12	3.4%	0.16	0.16	1.2%	0.31	0.31	0.3%	—	—	—	0.17	0.16	2.4%	0.22	0.22	0.5%	0.20	0.20	2.5%	0.19	0.18	2.7%	0.11	0.11	4.6%
Total Metals																													
Aluminum	µg/L	0.3	11.2	11.5	2.6%	13.1	13.2	0.8%	15.2	21.2	**33.0%**	5.85	4.84	18.9%	14	12.9	8.2%	14.3	44.6	**102.9%**	22.9	24.7	7.6%	14.9	15.9	6.5%	6.36	4.09	**43.4%**
Antimony	µg/L	0.02	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—
Arsenic	µg/L	0.02	0.291	0.284	2.4%	0.513	0.495	3.6%	0.349	0.351	0.6%	0.454	0.425	6.6%	0.82	0.793	3.3%	0.411	0.963	**80.3%**	0.337	0.338	0.3%	0.513	0.482	6.2%	0.292	0.316	7.9%
Barium	µg/L	0.05	1.23	1.25	1.6%	1.96	2.11	7.4%	3.34	3.25	2.7%	1.16	1.24	6.7%	1.43	1.43	0.0%	3.06	71.6	**183.6%**	2.71	2.8	3.3%	1.71	1.71	0.0%	0.902	0.974	7.7%
Beryllium	µg/L	0.01	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—
Bismuth	µg/L	0.01	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—
Boron	µg/L	1	1.9	2.6	—	5.1	2.8	—	3.3	4.6	—	3	3.3	—	3.3	5.3	—	3.3	16.4	—	2.8	2.8	—	2.7	3.1	—	2.5	4.1	—
Cadmium	µg/L	0.005	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—

Table B4-2 Water Quality Duplicate Results From the Jay Project Baseline Study Area During the Open-Water Season, 2013

Location			Ac-2			Af-7			C-S1			Aa-2			PL-2 Top			Hammer-1 Top			Hammer-1			PL-4			Ad-1		
Sample Name			Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate	
Sampling Season			Late Spring	Late Spring		Late Spring	Late Spring		Late Spring	Late Spring		Summer	Summer		Summer	Summer		Summer	Summer		Fall	Fall		Fall	Fall		Fall	Fall	
Sample Date (2013)	Unit	MDL	21-Jul	21-Jul	RPD	26-Jul	26-Jul	RPD	26-Jul	26-Jul	RPD	13-Aug	13-Aug	RPD	14-Aug	14-Aug	RPD	20-Aug	20-Aug	RPD	13-Sep	13-Sep	RPD	15-Sep	15-Sep	RPD	7-Sep	7-Sep	RPD
Total Metals (Continued)																													
Cesium	µg/L	0.1	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—
Chromium	µg/L	0.06	<0.06	0.074	—	<0.06	<0.06	—	0.078	0.069	—	<0.06	<0.06	—	0.067	0.061	—	0.099	0.244	—	0.141	0.143	—	0.096	0.107	—	<0.06	<0.06	—
Chromium VI	µg/L	1	<1	<1	—	<1	<1	—	<1	<1	—	<1	<1	—	<1	<1	—	<1	<1	—	<1	<1	—	<1	<1	—	<1	<1	—
Cobalt	µg/L	0.01	0.02	0.022	—	0.03	0.032	—	0.082	0.083	1.2%	0.017	0.015	—	0.06	0.064	6.5%	0.034	1.43	—	0.047	0.052	—	0.039	0.043	—	0.012	0.014	—
Copper	µg/L	0.1	0.58	0.71	**20.2%**	0.66	0.63	4.7%	0.83	0.84	1.2%	0.56	0.65	14.9%	1.17	1.27	8.2%	1.35	1.01	**28.8%**	1.51	1.5	0.7%	1.1	1.13	2.7%	0.56	0.57	1.8%
Iron	µg/L	1	20.1	20	0.5%	55.1	52.3	5.2%	140	161	14.0%	12.8	12.4	3.2%	54.3	49	10.3%	139	958	**149.3%**	164	170	3.6%	40	42.8	6.8%	10.8	10.3	4.7%
Lead	µg/L	0.01	<0.01	<0.01	—	0.017	0.012	—	<0.01	<0.01	—	<0.01	<0.01	—	0.014	<0.01	—	<0.01	0.048	—	0.021	0.02	—	0.01	0.019	—	0.016	<0.01	—
Lithium	µg/L	0.5	1.03	1.05	—	1.08	1.18	—	1.35	1.46	—	1.3	1.22	—	1.57	1.46	—	1.41	1.51	—	1.53	1.77	—	1.57	1.63	—	1.27	1.14	—
Manganese	µg/L	0.05	4.64	4.57	1.5%	4.5	4.53	0.7%	5.58	5.96	6.6%	2.92	2.74	6.4%	9.32	9.04	3.1%	2.73	93.8	**188.7%**	2.27	2.28	0.4%	5.42	5.48	1.1%	4.36	4.74	8.4%
Mercury	µg/L	0.0005	<0.0005	0.00051	—	0.00053	<0.0005	—	0.00094	0.00083	—	<0.0005	<0.0005	—	<0.0005	<0.0005	—	0.00076	0.0011	—	0.00098	0.00134	—	0.00075	0.0006	—	<0.00001	<0.00001	—
Molybdenum	µg/L	0.05	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	0.051	0.054	—	0.051	0.053	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—
Nickel	µg/L	0.06	0.317	0.301	5.2%	0.343	0.289	—	0.757	0.751	0.8%	0.241	0.226	—	0.635	0.654	2.9%	0.92	1.56	**51.6%**	0.86	0.834	3.1%	0.537	0.55	2.4%	0.267	0.286	—
Selenium	µg/L	0.04	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—
Silver	µg/L	0.005	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—
Strontium	µg/L	0.05	5.23	5.25	0.4%	4.79	4.87	1.7%	7.07	7.29	3.1%	5.22	5.22	0.0%	6.77	6.7	1.0%	7.37	8.56	14.9%	6.81	6.93	1.7%	6.33	6.38	0.8%	5.21	5.34	2.5%
Thallium	µg/L	0.01	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—
Tin	µg/L	0.05	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—
Titanium	µg/L	0.1	0.61	0.5	—	0.52	0.39	—	0.29	1.1	—	<0.1	0.47	—	0.21	0.21	—	0.28	1.11	—	0.63	0.81	**25.0%**	0.68	0.86	**23.4%**	0.25	0.25	—
Uranium	µg/L	0.01	0.024	0.023	—	0.036	0.035	—	0.043	0.043	—	0.017	0.016	—	0.038	0.038	—	0.034	0.037	—	0.032	0.033	—	0.036	0.039	—	0.022	0.022	—
Vanadium	µg/L	0.05	<0.05	<0.05	—	0.056	0.052	—	0.064	0.087	—	<0.05	<0.05	—	0.078	0.084	—	0.075	0.191	—	0.119	0.119	—	0.076	0.059	—	<0.05	<0.05	—
Zinc	µg/L	0.8	<0.8	1.16	—	<0.8	1.34	—	1.41	1.23	—	<0.8	<0.8	—	1.6	1.66	—	<0.8	45.6	—	<0.8	1.04	—	<0.8	2.43	—	<0.8	<0.8	—
Dissolved Metals																													
Aluminum	µg/L	0.3	7.31	4.26	**52.7%**	5.83	4.88	17.7%	11.5	12.4	7.5%	3.66	3.93	7.1%	8.31	7.88	5.3%	6.72	15.1	**76.8%**	13.8	17.2	**21.9%**	5.1	4.51	12.3%	3.28	0.77	—
Antimony	µg/L	0.02	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—	<0.02	<0.02	—
Arsenic	µg/L	0.02	0.289	0.265	8.7%	0.422	0.464	9.5%	0.352	0.317	10.5%	0.473	0.388	19.7%	0.744	0.755	1.5%	0.275	0.428	**43.5%**	0.328	0.333	1.5%	0.454	0.444	2.2%	0.309	0.309	0.0%
Barium	µg/L	0.05	1.17	1.18	0.9%	1.9	1.77	7.1%	3.17	3.33	4.9%	1.12	1.11	0.9%	1.3	1.31	0.8%	1.31	2.88	**74.9%**	2.58	2.63	1.9%	1.53	1.48	3.3%	0.88	0.93	5.5%
Beryllium	µg/L	0.01	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—
Bismuth	µg/L	0.01	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—
Boron	µg/L	1	2.5	5.3	—	3.2	2.4	—	3.8	3.8	—	3.3	3	—	4.7	3.7	—	3.7	3.4	—	6.7	2.9	—	4.2	2.5	—	2.4	2.3	—
Cadmium	µg/L	0.005	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	0.0311	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—
Cesium	µg/L	0.1	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—
Chromium	µg/L	0.06	<0.06	<0.06	—	<0.06	<0.06	—	0.064	0.072	—	<0.06	<0.06	—	0.062	0.072	—	<0.06	0.095	—	0.103	0.124	—	0.08	0.064	—	<0.06	<0.06	—
Cobalt	µg/L	0.01	0.011	<0.01	—	0.018	0.012	—	0.079	0.083	4.9%	0.01	0.01	—	0.019	0.017	—	0.022	0.036	—	0.031	0.038	—	0.025	0.024	—	<0.01	0.011	—
Copper	µg/L	0.1	0.62	0.74	17.6%	0.61	0.63	3.2%	0.82	0.84	2.4%	0.56	0.65	14.9%	1.14	1.22	6.8%	0.58	**1.36**[a]	**80.4%**	1.48	1.51	2.0%	1.07	1.05	1.9%	0.54	0.55	1.8%
Iron	µg/L	1	8.8	3.5	—	16.8	15.5	8.0%	69.4	66.1	4.9%	4.1	4.5	—	14.5	12.8	12.5%	38.1	144	**116.3%**	109	115	5.4%	12.3	11.1	10.3%	4.3	3.9	—
Lead	µg/L	0.01	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	0.028	—	<0.01	<0.01	—	0.018	<0.01	—	<0.01	0.011	—	0.014	0.015	—	<0.01	<0.01	—	<0.01	<0.01	—
Lithium	µg/L	0.5	1.31	1.17	—	1.28	1.17	—	1.34	1.5	—	1.29	1.16	—	1.48	1.31	—	0.7	1.66	—	1.74	1.65	—	1.53	1.68	—	1.14	1.23	—

Table B4-2 Water Quality Duplicate Results From the Jay Project Baseline Study Area During the Open-Water Season, 2013

Location			Ac-2			Af-7			C-S1			Aa-2			PL-2 Top			Hammer-1 Top			Hammer-1			PL-4			Ad-1		
Sample Name			Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate	
Sampling Season			Late Spring	Late Spring		Late Spring	Late Spring		Late Spring	Late Spring		Summer	Summer		Summer	Summer		Summer	Summer		Fall	Fall		Fall	Fall		Fall	Fall	
Sample Date (2013)	Unit	MDL	21-Jul	21-Jul	RPD	26-Jul	26-Jul	RPD	26-Jul	26-Jul	RPD	13-Aug	13-Aug	RPD	14-Aug	14-Aug	RPD	20-Aug	20-Aug	RPD	13-Sep	13-Sep	RPD	15-Sep	15-Sep	RPD	7-Sep	7-Sep	RPD
Dissolved Metals (Continued)																													
Manganese	µg/L	0.05	1.26	0.881	**35.4%**	1.06	0.635	**50.1%**	5.03	5.3	5.2%	0.805	0.732	9.5%	0.351	0.365	3.9%	2.6	2.62	0.8%	1.24	1.28	3.2%	0.714	0.806	12.1%	1.15	0.996	14.4%
Mercury	µg/L	0.0005	0.00056	<0.0005	—	0.00053	<0.0005	—	0.00093	0.00065	—	<0.0005	<0.0005	—	<0.0005	<0.0005	—	0.00056	0.00079	—	0.00075	0.00084	—	<0.0005	<0.0005	—	<0.00001	<0.00001	—
Molybdenum	µg/L	0.05	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	0.053	0.055	—	<0.05	0.061	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—
Nickel	µg/L	0.06	0.273	0.29	—	0.323	0.303	6.4%	0.726	0.821	12.3%	0.22	0.244	—	0.612	0.596	2.6%	0.285	0.898	—	0.815	0.849	4.1%	0.489	0.51	4.2%	0.271	0.278	—
Selenium	µg/L	0.04	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—	<0.04	<0.04	—
Silver	µg/L	0.005	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—	<0.005	<0.005	—
Strontium	µg/L	0.05	5.49	5.38	2.0%	4.92	4.79	2.7%	7.02	7.4	5.3%	5.19	5.1	1.7%	6.69	6.55	2.1%	4.76	7.53	**45.1%**	6.91	6.71	2.9%	6.39	6.4	0.2%	5.14	5.46	6.0%
Thallium	µg/L	0.01	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—	<0.01	<0.01	—
Tin	µg/L	0.05	0.054	<0.05	—	0.102	<0.05	—	0.399	0.428	7.0%	<0.05	2.96	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—	<0.05	<0.05	—
Titanium	µg/L	0.1	0.22	<0.1	—	**0.72**[a]	0.1	—	0.15	0.33	—	<0.1	<0.1	—	0.27	0.26	—	0.13	0.36	—	0.31	0.42	—	0.23	0.33	—	0.17	0.17	—
Uranium	µg/L	0.01	0.026	0.022	—	0.033	0.033	—	0.038	0.04	—	0.015	0.016	—	0.036	0.036	—	0.012	0.036	—	0.029	0.03	—	0.036	0.034	—	0.02	0.021	—
Vanadium	µg/L	0.05	<0.05	<0.05	—	<0.05	<0.05	—	0.054	0.061	—	<0.05	<0.05	—	0.053	0.065	—	<0.05	0.075	—	0.082	0.089	—	<0.05	<0.05	—	<0.05	<0.05	—
Zinc	µg/L	0.8	<0.8	<0.8	—	1.38	<0.8	—	1.52	3.11	—	<0.8	<0.8	—	<0.8	<0.8	—	2.01	2.21	—	1.36	1.33	—	1.41	<0.8	—	<0.8	0.96	—
Other Parameters																													
Fecal Coliforms	CFU/100mL	1	<1	<1	—	<1	<1	—	7	13	**60.0%**	<1	<1	—	<1	<1	—	<1	<1	—	<1	<1	—	<1	<1	—	<1	<1	—
Benzene	µg/L	0.5	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—
Ethylbenzene	µg/L	0.5	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—
Toluene	µg/L	0.5	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—	<0.5	<0.5	—
Xylene	µg/L	0.71	<0.71	<0.71	—	<0.71	<0.71	—	<0.71	<0.71	—	<0.71	<0.71	—	<0.71	<0.71	—	<0.71	<0.71	—	<0.71	<0.71	—	<0.71	<0.71	—	<0.71	<0.71	—
PHC - F1 (C_6-C_{10})	µg/L	100	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—
PHC - F1 (C_6-C_{10}) - BTEX	µg/L	100	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—	<100	<100	—
PHC - F2 (C_{10}-C_{16})	µg/L	250	<250	<250	—	<250	<250	—	<250	<250	—	<250	<250	—	<250	<250	—	<250	<250	—	<250	<250	—	<250	<250	—	<250	<250	—
Total Recoverable Hydrocarbons	µg/L	1,000	<1,000	<1,000	—	<1,000	<1,000	—	<1,000	<1,000	—	<1,000	—		<1,000	<1,000	—	<1,000	<1,000	—	<1,000	<1,000	—	<1,000	<1,000	—	<1,000	<1,000	—
RPD values over 20%	—			—	3.2%	—	—	3.2%	—	—	2.1%	—	—	2.1%	—	—	1.0%	—	—	19.0%	—	—	4.3%	—	—	2.1%	—	—	2.1%

Notes: **Bolded** values failed to pass one or more quality control checks (**bolded** RPD values are greater than 20%).

The percentage of RPD values over 20% for the entire dataset is 4.3%.

a) Value exceeds the corresponding total metal value by 20% or more.

MDL = method detection limit; H+ = hydrogen ions; $CaCO_3$ = calcium carbonate; PHC = petroleum hydrocarbons; BTEX = benzene, toluene, ethylbenzene, xylene; — = no data or not applicable; meq/L = milliequivalents per litre; mg/L = milligrams per litre; µS/cm = microsiemens per centimetre; NTU = nephelometric turbidity units; mg P/L = milligrams phosphorus per litre; mg N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; CFU/100 mL = coliform forming units per 100 millilitres; % = percent; < = less than.

Table B4-3a Chlorophyll *a* Field Duplicate Samples Collected in Lac du Sauvage, Duchess Lake, Paul Lake, and Sub-Basin Lakes C, D, G, H, and E During the Open-Water Season, 2013

Lake	Station	Date	Rep 1 (µg/L)	Rep 2 (µg/L)	Rep 3 (µg/L)	Average (µg/L)	Standard Deviation	Standard Error	CV (%)	QC Fail
Lac du Sauvage	Aa-1	24-Jul-13	2.74	2.92	2.85	2.84	0.07	0.04	2.60	N
		13-Aug-13	2.21	2.31	2.26	2.26	0.04	0.02	1.74	N
		11-Sep-13	3.14	2.92	2.76	2.94	0.16	0.09	5.35	N
	Ab-1	23-Jul-13	1.31	1.46	1.32	1.36	0.07	0.04	5.15	N
		12-Aug-13	0.64	0.65	0.66	0.65	0.01	0.00	1.11	N
		11-Sep-13	3.01	3.47	3.24	3.24	0.19	0.11	5.76	N
	Ac-1	20-Jul-13	1.58	1.75	1.61	1.65	0.07	0.04	4.44	N
		10-Aug-13	0.93	0.97	0.99	0.96	0.02	0.01	2.35	N
		11-Sep-13	3.27	3.05	3.00	3.11	0.12	0.07	3.73	N
	Ac-4	21-Jul-13	1.17	1.15	1.16	1.16	0.01	0.00	0.59	N
		11-Aug-13	0.89	0.87	0.93	0.89	0.02	0.01	2.66	N
		11-Sep-13	3.27	3.10	3.23	3.20	0.07	0.04	2.24	N
	Ac-7	20-Jul-13	1.72	1.65	1.52	1.63	0.08	0.05	5.03	N
		11-Aug-13	0.81	0.90	0.91	0.87	0.04	0.02	4.90	N
		11-Sep-13	3.21	3.34	2.99	3.18	0.15	0.08	4.59	N
	Ad-1	25-Jul-13	1.70	1.75	1.59	1.68	0.07	0.04	4.05	N
		10-Aug-13	1.19	1.25	1.25	1.23	0.03	0.02	2.24	N
		07-Sep-13	2.79	2.79	2.79	2.79	0.00	0.00	0.10	N
	Ae-1	25-Jul-13	1.65	1.98	2.11	1.91	0.19	0.11	10.19	N
		09-Aug-13	1.12	1.21	1.11	1.15	0.04	0.02	3.77	N
		05-Sep-13	2.06	2.43	1.63	2.04	0.33	0.19	16.08	N
Duchess Lake	Af-1	22-Jul-13	2.82	3.29	3.02	3.04	0.19	0.11	6.32	N
		08-Aug-13	2.44	2.43	2.77	2.54	0.16	0.09	6.27	N
		07-Sep-13	5.22	4.93	5.21	5.12	0.13	0.08	2.61	N
	Af-7	26-Jul-13	2.94	2.71	2.77	2.80	0.10	0.06	3.46	N
		08-Aug-13	3.23	3.78	3.77	3.59	0.26	0.15	7.17	N
		07-Sep-13	5.15	5.20	5.29	5.21	0.06	0.03	1.10	N

Table B4-3a Chlorophyll *a* Field Duplicate Samples Collected in Lac du Sauvage, Duchess Lake, Paul Lake, and Sub-Basin Lakes C, D, G, H, and E During the Open-Water Season, 2013

Lake	Station	Date	Rep 1 (µg/L)	Rep 2 (µg/L)	Rep 3 (µg/L)	Average (µg/L)	Standard Deviation	Standard Error	CV (%)	QC Fail
Lake Af1	Af-10	26-Jul-13	9.72	9.30	9.44	9.49	0.18	0.10	1.85	N
		17-Aug-13	12.89	13.79	13.66	13.45	0.40	0.23	2.97	N
		12-Sep-13	9.61	8.44	8.79	8.95	0.49	0.28	5.49	N
Lake E1	E-L1-1	—	—	—	—	—	—	—	—	—
		17-Aug-13	4.07	4.44	4.23	4.25	0.15	0.09	3.60	N
		12-Sep-13	3.91	4.17	3.94	4.01	0.12	0.07	2.91	N
	E-L1-2	12-Sep-13	3.53	2.60	3.31	3.15	0.40	0.23	12.58	N
Sub-Basin Lake C1	C-L1	20-Aug-13	3.17	2.81		2.99	0.18	0.13	6.03	N
Sub-Basin Lake D3 (Counts Lake)	D-L3	20-Aug-13	1.92	2.01	2.06	1.99	0.06	0.03	2.92	N
Sub-Basin Lake G2	G-L2	10-Sep-13	4.21	4.14	4.58	4.31	0.19	0.11	4.42	N
Sub-Basin Lake H1	H-L1	11-Sep-13	5.67	5.38	5.31	5.45	0.15	0.09	2.80	N
Paul Lake	PL-1	28-Jul-13	3.80	3.77	3.88	3.82	0.05	0.03	1.25	N
		14-Aug-13	4.50	4.27	4.04	4.27	0.19	0.11	4.33	N
		—	—	—	—	—	—	—	—	—
	PL-2	28-Jul-13	3.24	3.26	3.21	3.24	0.02	0.01	0.59	N
		14-Aug-13	3.26	3.23	3.35	3.28	0.05	0.03	1.65	N
		15-Sep-13	4.26	4.09	4.11	4.15	0.07	0.04	1.77	N
	PL-3	29-Jul-13	2.70	2.49	2.74	2.64	0.11	0.06	4.19	N
		15-Aug-13	0.173	0.253	0.221	0.22	0.03	0.02	15.21	N
		15-Sep-13	5.92	5.88	5.50	5.77	0.19	0.11	3.27	N
	PL-4	29-Jul-13	2.62	2.53	2.71	2.62	0.08	0.04	2.91	N
		—	—	—	—	—	—	—	—	—
		15-Sep-13	5.45	5.37	4.72	5.18	0.33	0.19	6.36	N
	PL-5	—	—	—	—	—	—	—	—	—
		15-Aug-13	—	0.184	0.170	0.18	0.01	0.00	3.99	N
		15-Sep-13	4.39	4.07	4.48	4.31	0.17	0.10	4.03	N

µg/L = micrograms per litre; % = percent; CV = coefficient of variation; QC = quality control; N = no; — = no sample collected.

Table B4-3b Chlorophyll *a* Laboratory Duplicate Samples Collected From Lac du Sauvage, Duchess Lake, Paul Lake, and Sub-basin Lakes C, D, G, H, and E During the Open-Water Season, 2013

Lake	Station	Replicate	Date	Rep 1 (µg/L)	Rep 2 (µg/L)	Rep 3 (µg/L)	Average (µg/L)	Standard Deviation	CV (%)	QC Fail
Lac du Sauvage	Aa-1	a	24-Jul-13	2.83	2.75	2.65	2.74	0.07	2.68	N
		b		2.81	2.74	3.22	2.92	0.21	7.24	N
		c		2.95	2.81	2.79	2.85	0.07	2.50	N
		a	13-Aug-13	2.24	2.12	2.28	2.21	0.07	3.07	N
		b		2.37	2.35	2.21	2.31	0.07	3.08	N
		c		2.42	2.33	2.04	2.26	0.16	7.16	N
		a	11-Sep-13	3.15	3.14	3.14	3.14	0.00	0.15	N
		b		3.27	3.13	2.35	2.92	0.40	13.88	N
		c		**2.67**	**2.85**	**1.09**	**2.20**	**0.79**	**35.89**	**Y**
	Ab-1	a	23-Jul-13	1.17	1.16	1.59	1.31	0.20	15.34	N
		b		1.65	1.34	1.40	1.46	0.13	9.17	N
		c		1.34	1.21	1.42	1.32	0.09	6.54	N
		a	12-Aug-13	0.59	0.67	0.66	0.64	0.04	5.56	N
		b		0.67	0.60	0.69	0.65	0.04	5.91	N
		c		0.63	0.63	0.71	0.66	0.04	5.74	N
		a	11-Sep-13	2.85	3.19	2.99	3.01	0.14	4.64	N
		b		3.24	3.66	3.50	3.47	0.17	4.99	N
		c		3.46	3.67	2.58	3.24	0.47	14.59	N
	Ac-1	a	20-Jul-13	1.71	1.40	1.64	1.58	0.13	8.38	N
		b		1.68	1.75	1.82	1.75	0.06	3.27	N
		c		1.55	1.63	1.65	1.61	0.04	2.68	N
		a	10-Aug-13	0.93	0.92	0.95	0.93	0.01	1.34	N
		b		0.98	0.95	0.99	0.97	0.02	1.75	N
		c		1.05	0.97	0.94	0.99	0.05	4.71	N
		a	11-Sep-13	3.12	3.28	3.40	3.27	0.11	3.51	N
		b		3.15	3.13	2.87	3.05	0.13	4.18	N
		c		2.97	3.03	3.00	3.00	0.02	0.82	N

Table B4-3b Chlorophyll *a* Laboratory Duplicate Samples Collected From Lac du Sauvage, Duchess Lake, Paul Lake, and Sub-basin Lakes C, D, G, H, and E During the Open-Water Season, 2013

Lake	Station	Replicate	Date	Rep 1 (µg/L)	Rep 2 (µg/L)	Rep 3 (µg/L)	Average (µg/L)	Standard Deviation	CV (%)	QC Fail
Lac du Sauvage	Ac-4	a	21-Jul-13	1.09	1.20	1.22	1.17	0.06	4.89	N
		b		1.23	1.01	1.22	1.15	0.10	8.79	N
		c		1.18	1.28	1.02	1.16	0.11	9.23	N
		a	11-Aug-13	0.89	0.84	0.93	0.89	0.04	4.15	N
		b		0.86	0.88	0.87	0.87	0.01	0.94	N
		c		0.91	0.87	1.00	0.93	0.05	5.87	N
		a	11-Sep-13	3.19	3.12	3.49	3.27	0.16	4.91	N
		b		3.18	2.98	3.14	3.10	0.09	2.79	N
		c		3.33	3.19	3.17	3.23	0.07	2.20	N
	Ac-7	a	20-Jul-13	1.69	1.83	1.63	1.72	0.08	4.88	N
		b		1.70	1.52	1.74	1.65	0.10	5.79	N
		c		1.26	1.53	1.77	1.52	0.21	13.71	N
		a	11-Aug-13	0.80	0.85	0.79	0.81	0.03	3.23	N
		b		0.91	0.89	0.89	0.90	0.01	1.05	N
		c		0.89	0.87	0.97	0.91	0.04	4.75	N
		a	11-Sep-13	3.27	3.11	3.26	3.21	0.07	2.28	N
		b		3.50	3.26	3.27	3.34	0.11	3.32	N
		c		2.44	3.30	3.23	2.99	0.39	13.04	N
	Ad-1	a	25-Jul-13	1.70	1.83	1.56	1.70	0.11	6.50	N
		b		1.71	1.76	1.78	1.75	0.03	1.68	N
		c		1.65	1.34	1.77	1.59	0.18	11.42	N
		a	10-Aug-13	1.13	1.23	1.21	1.19	0.04	3.63	N
		b		1.24	1.30	1.21	1.25	0.04	2.99	N
		c		1.29	1.17	1.28	1.25	0.05	4.36	N
		a	07-Sep-13	2.65	2.84	2.89	2.79	0.10	3.70	N
		b		2.83	2.66	2.88	2.79	0.09	3.38	N
		c		2.91	2.72	2.73	2.79	0.09	3.13	N

Table B4-3b Chlorophyll *a* Laboratory Duplicate Samples Collected From Lac du Sauvage, Duchess Lake, Paul Lake, and Sub-basin Lakes C, D, G, H, and E During the Open-Water Season, 2013

Lake	Station	Replicate	Date	Rep 1 (µg/L)	Rep 2 (µg/L)	Rep 3 (µg/L)	Average (µg/L)	Standard Deviation	CV (%)	QC Fail
Lac du Sauvage	Ae-1	a	25-Jul-13	1.57	1.77	1.60	1.65	0.09	5.35	N
		b		1.81	2.04	2.08	1.98	0.12	6.02	N
		c		2.24	2.15	1.94	2.11	0.13	5.96	N
		a	09-Aug-13	1.09	1.19	1.07	1.12	0.05	4.70	N
		b		1.26	1.13	1.23	1.21	0.06	4.61	N
		c		1.10	1.06	1.18	1.11	0.05	4.48	N
		a	05-Sep-13	1.82	2.44	1.93	2.06	0.27	13.09	N
		b		2.35	2.42	2.53	2.43	0.07	3.04	N
		c		1.23	1.79	1.87	1.63	0.28	17.47	N
Duchess Lake	Af-1	a	22-Jul-13	2.72	2.63	3.11	2.82	0.21	7.39	N
		b		3.27	3.50	3.10	3.29	0.16	4.98	N
		c		2.91	3.04	3.12	3.02	0.09	2.86	N
		a	08-Aug-13	2.17	2.52	2.62	2.44	0.19	7.92	N
		b		2.43	2.47	2.38	2.43	0.04	1.52	N
		c		2.79	2.82	2.70	2.77	0.05	1.84	N
		a	07-Sep-13	5.51	4.77	5.38	5.22	0.32	6.18	N
		b		5.10	4.82	4.87	4.93	0.12	2.47	N
		c		4.94	5.50	5.18	5.21	0.23	4.41	N
	Af-7	a	26-Jul-13	2.70	3.09	3.02	2.94	0.17	5.78	N
		b		2.72	2.58	2.82	2.71	0.10	3.64	N
		c		2.91	2.89	2.51	2.77	0.18	6.64	N
		a	08-Aug-13	3.31	2.65	3.73	3.23	0.44	13.76	N
		b		3.78	3.81	3.75	3.78	0.02	0.65	N
		c		3.95	3.83	3.54	3.77	0.17	4.56	N
		a	07-Sep-13	5.07	5.27	5.10	5.15	0.09	1.71	N
		b		4.99	5.30	5.32	5.20	0.15	2.90	N
		c		4.42	5.52	5.92	5.29	0.63	12.00	N

Table B4-3b Chlorophyll *a* Laboratory Duplicate Samples Collected From Lac du Sauvage, Duchess Lake, Paul Lake, and Sub-basin Lakes C, D, G, H, and E During the Open-Water Season, 2013

Lake	Station	Replicate	Date	Rep 1 (µg/L)	Rep 2 (µg/L)	Rep 3 (µg/L)	Average (µg/L)	Standard Deviation	CV (%)	QC Fail
Lake Af1	Af-10	a	26-Jul-13	9.24	9.07	10.85	9.72	0.80	8.25	N
		b		8.40	9.19	10.30	9.30	0.78	8.38	N
		c		9.47	8.84	10.02	9.44	0.48	5.11	N
		a	17-Aug-13	11.68	12.75	14.23	12.89	1.05	8.11	N
		b		13.37	12.47	15.54	13.79	1.29	9.34	N
		c		12.70	14.18	14.09	13.66	0.68	4.96	N
		a	12-Sep-13	9.27	10.01	9.56	9.61	0.30	3.17	N
		b		8.94	8.25	8.14	8.44	0.35	4.19	N
		c		9.40	8.05	8.91	8.79	0.56	6.35	N
Sub-Basin Lake C	C-L1	a	20-Aug-13	2.91	3.66	2.93	3.17	0.35	11.02	N
		b		2.96	2.52	2.94	2.81	0.20	7.23	N
		c		—	—	—	—	—	—	—
Sub-Basin Lake D	Counts-1	a	20-Aug-13	1.93	1.95	1.87	1.92	0.03	1.77	N
		b		1.90	2.12	2.01	2.01	0.09	4.47	N
		c		1.96	2.15	2.06	2.06	0.08	3.77	N
Sub-Basin Lake G	G-L2	a	10-Sep-13	4.67	3.70	4.25	4.21	0.40	9.44	N
		b		4.37	4.53	3.53	4.14	0.44	10.59	N
		c		4.23	4.45	5.05	4.58	0.35	7.54	N
Sub-Basin Lake H	H-L1	a	11-Sep-13	5.53	5.57	5.90	5.67	0.17	2.93	N
		b		5.79	5.13	5.23	5.38	0.29	5.40	N
		c		5.06	5.47	5.41	5.31	0.18	3.40	N

Table B4-3b Chlorophyll *a* Laboratory Duplicate Samples Collected From Lac du Sauvage, Duchess Lake, Paul Lake, and Sub-basin Lakes C, D, G, H, and E During the Open-Water Season, 2013

Lake	Station	Replicate	Date	Rep 1 (µg/L)	Rep 2 (µg/L)	Rep 3 (µg/L)	Average (µg/L)	Standard Deviation	CV (%)	QC Fail
Sub-Basin Lake E-L1	E-L1-1	a	17-Aug-13	4.10	4.18	3.93	4.07	0.10	2.56	N
		b		4.29	4.83	4.21	4.44	0.28	6.20	N
		c		4.61	4.23	3.85	4.23	0.31	7.33	N
		a	12-Sep-13	4.58	3.69	3.45	3.91	0.49	12.44	N
		b		4.07	3.93	4.51	4.17	0.25	5.93	N
		c		3.89	3.78	4.16	3.94	0.16	4.05	N
	E-L1-2	a	12-Sep-13	3.57	3.57	3.46	3.53	0.05	1.47	N
		b		2.80	2.55	2.46	2.60	0.14	5.53	N
		c		3.10	3.40	3.42	3.31	0.15	4.43	N
Paul Lake	PL-1	a	28-Jul-13	4.00	3.68	3.73	3.80	0.14	3.70	N
		b		3.93	3.65	3.73	3.77	0.12	3.12	N
		c		3.92	3.91	3.82	3.88	0.04	1.16	N
		a	14-Aug-13	3.71	4.62	5.16	4.50	0.60	13.31	N
		b		4.47	4.41	3.93	4.27	0.24	5.66	N
		c		4.20	3.96	3.97	4.04	0.11	2.74	N
		a	—	—	—	—	—	—	—	—
		b		—	—	—	—	—	—	—
		c		—	—	—	—	—	—	—
	PL-2	a	28-Jul-13	3.28	3.30	3.13	3.24	0.08	2.34	N
		b		3.30	3.03	3.45	3.26	0.17	5.33	N
		c		3.32	3.16	3.16	3.21	0.08	2.35	N
		a	14-Aug-13	3.24	3.12	3.41	3.26	0.12	3.65	N
		b		3.17	3.11	3.40	3.23	0.12	3.87	N
		c		3.49	3.26	3.31	3.35	0.10	2.95	N
		a	15-Sep-13	4.17	4.33	4.27	4.26	0.07	1.55	N
		b		4.14	4.10	4.03	4.09	0.05	1.11	N
		c		4.26	4.05	4.03	4.11	0.10	2.53	N

Table B4-3b Chlorophyll *a* Laboratory Duplicate Samples Collected From Lac du Sauvage, Duchess Lake, Paul Lake, and Sub-basin Lakes C, D, G, H, and E During the Open-Water Season, 2013

Lake	Station	Replicate	Date	Rep 1 (µg/L)	Rep 2 (µg/L)	Rep 3 (µg/L)	Average (µg/L)	Standard Deviation	CV (%)	QC Fail
Paul Lake	PL-3	a	29-Jul-13	2.51	2.73	2.87	2.70	0.15	5.48	N
		b		2.59	2.44	2.43	2.49	0.07	2.94	N
		c		2.73	2.74	2.74	2.74	0.00	0.17	N
		a	15-Aug-13	3.60	3.26	3.65	3.50	0.17	4.95	N
		b		3.39	3.49	2.91	3.26	0.25	7.76	N
		c		3.89	3.38	3.48	3.58	0.22	6.16	N
		a	15-Sep-13	6.00	6.20	5.55	5.92	0.27	4.59	N
		b		5.28	6.31	6.05	5.88	0.44	7.44	N
		c		5.50	—	—	5.50	0.00	0.00	N
	PL-4	a	29-Jul-13	2.62	2.53	2.71	2.62	0.07	2.80	N
		b		2.54	2.53	2.51	2.53	0.01	0.49	N
		c		2.58	2.72	2.84	2.71	0.11	3.92	N
		a	—	—	—	—	—	—	—	—
		b		—	—	—	—	—	—	—
		c		—	—	—	—	—	—	—
		a	15-Sep-13	5.40	5.46	5.50	5.45	0.04	0.75	N
		b		4.78	5.00	6.33	5.37	0.68	12.75	N
		c		4.57	5.13	4.45	4.72	0.30	6.28	N
	PL-5	a	—	—	—	—	—	—	—	—
		b		—	—	—	—	—	—	—
		c		—	—	—	—	—	—	—
		a	15-Aug-13	2.99	2.94	2.99	2.97	0.02	0.79	N
		b		2.69	2.29	2.67	2.55	0.18	7.22	N
		c		2.90	2.53	2.55	2.66	0.17	6.39	N
		a	15-Sep-13	4.33	4.29	4.54	4.39	0.11	2.50	N
		b		4.28	3.47	4.47	4.07	0.43	10.65	N
		c		4.55	4.31	4.58	4.48	0.12	2.70	N

Note: **Bolded** values failed quality control checks for chlorophyll *a*.

µg/L = micrograms per litre; % = percent; CV = coefficient of variation; QC = quality control; N = no; Y = yes; — = no sample collected.

Table B4-4 Sediment Quality Duplicate Results from the Jay Project Baseline Study Area during the Open-Water Season, 2013

Location			Ab-2			Ac-1			Ac-2			Ae-1		
Sample Name			Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate	
Sampling Season			Summer	Summer		Summer	Summer		Summer	Summer		Summer	Summer	
Sample Date	Unit	MDL	26-Aug-13	26-Aug-13	RPD	25-Aug-13	25-Aug-13	RPD	25-Aug-13	25-Aug-13	RPD	18-Aug-13	18-Aug-13	RPD
Physical Parameters														
Organic Matter	%	1	3.4	3.4	—	3	3.2	—	2.4	2.5	—	2	2.1	—
pH	pH units	—	6.16	6.17	0.1%	5.68	6.11	7.3%	5.95	6.02	1.2%	6.32	6.81	7.5%
Clay (<4 µm)	%	0.1	8.99	10.5	15.5%	21.2	21.3	0.5%	18.7	19.5	4.2%	18.4	18.7	1.6%
Silt Content (4 µm to 0.063 mm)	%	0.1	60.5	58.8	2.8%	77	76.3	0.9%	73.3	72.4	1.2%	81.2	81	0.2%
Fine Sand (0.063 mm to 0.2 mm)	%	0.1	22	21.7	1.4%	1.45	2.22	**42.0%**	4.65	4.96	6.5%	0.29	0.29	—
Coarse Sand (0.2 mm to 2.0 mm)	%	0.1	8.39	8.68	3.4%	0.35	0.22	—	3.13	2.8	11.1%	0.11	<0.1	—
Gravel (>2 mm)	%	0.1	0.14	0.25	—	<0.1	<0.1	—	0.22	0.3	—	<0.1	<0.1	—
Nutrients														
Available Ammonium-N	mg/kg	1.6	14.4	15.8	9.3%	16.4	12.1		12.1	11.9		10.8	11.1	
Nitrogen, Organic	%	0.02	0.187	0.186	0.5%	0.154	0.139	10.2%	0.116	0.113	2.6%	0.097	0.096	—
Nitrogen, Total Kjeldahl	%	0.02	0.189	0.188	0.5%	0.156	0.14	10.8%	0.117	0.114	2.6%	0.098	0.097	—
Phosphate, Available-P	mg/kg	2	101	94	7.2%	10.6	27.1	**87.5%**	30.5	30.1	1.3%	9.2	12.5	—
Phosphorus	mg/kg	50	511	481	6.0%	1,090	1,720	**44.8%**	1,170	1,160	0.9%	853	777	9.3%
Carbon, Total	%	0.1	1.9	2	5.1%	1.5	1.5	0.0%	1.1	1.1	0.0%	1	1	0.0%
Carbon, Inorganic	%	0.1	0.16	0.14	—	0.16	0.15	—	0.15	0.21	—	0.21	0.13	—
Carbon, Total Organic	%	0.1	1.72	1.83	6.2%	1.36	1.32	3.0%	0.98	0.91	7.4%	0.76	0.85	11.2%
$CaCO_3$ equivalent	%	0.8	1.34	1.18	—	1.32	1.29	—	1.22	1.73	—	1.77	1.06	—
Metals														
Aluminum	mg/kg	50	14,700	14,700	0.0%	19,000	17,900	6.0%	17,800	17,100	4.0%	17,400	16,500	5.3%
Antimony	mg/kg	0.1	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—	<0.1	<0.1	—
Arsenic	mg/kg	0.1	9.02	8.52	5.7%	73.2	104	**34.8%**	38.2	37.6	1.6%	81.3	76.7	5.8%

Table B4-4 Sediment Quality Duplicate Results from the Jay Project Baseline Study Area during the Open-Water Season, 2013

Location			Ab-2			Ac-1			Ac-2			Ae-1		
Sample Name			Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate	
Sampling Season			Summer	Summer		Summer	Summer		Summer	Summer		Summer	Summer	
Sample Date	Unit	MDL	26-Aug-13	26-Aug-13	RPD	25-Aug-13	25-Aug-13	RPD	25-Aug-13	25-Aug-13	RPD	18-Aug-13	18-Aug-13	RPD
Metals (Continued)														
Barium	mg/kg	1	120	120	0.0%	151	151	0.0%	122	122	0.0%	143	139	2.8%
Beryllium	mg/kg	0.5	<0.5	<0.5	—	0.57	0.52	—	0.51	0.51	—	<0.5	<0.5	—
Bismuth	mg/kg	1	<1	<1	—	<1	<1	—	<1	<1	—	<1	<1	—
Cadmium	mg/kg	0.1	0.15	0.15	—	0.16	0.19	—	<0.1	<0.1	—	0.13	0.12	—
Chromium	mg/kg	0.5	59.2	56.3	5.0%	69.7	64.7	7.4%	63.7	63.2	0.8%	61.8	60.3	2.5%
Cobalt	mg/kg	1	12.7	12.4	2.4%	19.9	23	14.5%	17.9	17.9	0.0%	15.8	15.4	2.6%
Copper	mg/kg	1	27.1	26.4	2.6%	30.5	31.5	3.2%	26.5	26.6	0.4%	22.6	24.3	7.2%
Iron	mg/kg	50	21,100	20,300	3.9%	39,800	49,500	**21.7%**	35,600	36,100	1.4%	34,600	33,500	3.2%
Lead	mg/kg	1	4.2	3.9	—	5.1	4.8	—	4.7	4.7	—	4.8	4.6	—
Lithium	mg/kg	2	36.6	34.3	6.5%	48.8	42.7	13.3%	46	45.8	0.4%	40.6	41.9	3.2%
Manganese	mg/kg	1	396	375	5.4%	1,010	2,310		835	809	3.2%	2,330	2,460	5.4%
Mercury	mg/kg	0.005	0.0258	0.0589	**78.2%**	0.0144	0.0113	—	0.0064	0.0068	—	0.0141	0.0124	—
Molybdenum	mg/kg	1	1.1	1	—	2.2	2.8	—	1.5	1.5	—	3.4	3.3	—
Nickel	mg/kg	1	38.4	37.2	3.2%	48.6	46.9	3.6%	37.9	38.2	0.8%	36.8	35.9	2.5%
Selenium	mg/kg	0.2	<0.2	<0.2	—	<0.2	0.2	—	<0.2	<0.2	—	<0.2	<0.2	—
Silver	mg/kg	0.2	<0.2	<0.2	—	<0.2	<0.2	—	<0.2	<0.2	—	<0.2	<0.2	—
Strontium	mg/kg	1	10.5	10.2	2.9%	13.8	13	6.0%	12	12.5	4.1%	15	13.9	7.6%
Sulfur	mg/kg	500	600	700	—	700	500	—	<500	500	—	<500	<500	—
Thallium	mg/kg	0.1	0.24	0.22	—	0.31	0.29	—	0.27	0.27	—	0.27	0.26	—
Tin	mg/kg	2	<2	<2	—	<2	<2	—	<2	<2	—	<2	<2	—
Titanium	mg/kg	5	934	911	2.5%	1,150	1,010	13.0%	1,020	1,050	2.9%	1,150	1,080	6.3%
Uranium	mg/kg	0.1	2.66	2.45	8.2%	2.89	2.78	3.9%	2.46	2.52	2.4%	2.39	2.28	4.7%
Vanadium	mg/kg	1	47.4	45.4	4.3%	56.9	55.1	3.2%	51.6	51.1	1.0%	50.9	50.6	0.6%

Table B4-4 Sediment Quality Duplicate Results from the Jay Project Baseline Study Area during the Open-Water Season, 2013

Location			Ab-2			Ac-1			Ac-2			Ae-1		
Sample Name			Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate	
Sampling Season			Summer	Summer		Summer	Summer		Summer	Summer		Summer	Summer	
Sample Date	Unit	MDL	26-Aug-13	26-Aug-13	RPD	25-Aug-13	25-Aug-13	RPD	25-Aug-13	25-Aug-13	RPD	18-Aug-13	18-Aug-13	RPD
Metals (Continued)														
Zinc	mg/kg	5	60.4	59.2	2.0%	74.7	73.1	2.2%	63.5	63.9	0.6%	62.4	61.7	1.1%
RPD values over 20%	—	—	—	—	2.3%	—	—	11.4%	—	—	0.0%	—	—	0.0%

Notes: **Bolded** values failed to pass one or more quality control checks (**bolded** RPD values are greater than 20%).

The percentage of RPD values over 20% for the entire dataset is 3.4%.

MDL = method detection limit; RPD = relative percent difference; $CaCO_3$ = calcium carbonate; — = no data or not applicable; µm = micrometre; mm = millimetre; mg/kg = milligrams per kilogram; % = percent; < = less than; > = greater than.

B5 REFERENCES

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