



March 19, 2015

Ministry of Transportation and Infrastructure
Suite 310 – 1500 Woolridge Street
Coquitlam, BC V3K 0B8

ISSUED FOR USE
FILE: V23203143-01
Via Email: Terence.Lai@gov.bc.ca

Attention: Mr. Terence Lai, M.Sc.
Assistant Regional Gravel Manager

Dear Mr. Lai:

Subject: December 2014 Water Monitoring Program
Strong Pit, Abbotsford, BC

1.0 INTRODUCTION

The British Columbia Ministry of Transportation and Infrastructure (MOTI) retained Tetra Tech EBA Inc. (Tetra Tech EBA) to complete a biannual water monitoring program for the Strong Pit site (herein referred to as “Strong Pit”) and the four nearby residential properties in Abbotsford, BC. The residential properties are located at s.21 in Abbotsford, BC. The location of Strong Pit is shown on Figure 1, while monitoring well and private water well locations are presented on Figure 2.

The objective of the biannual water monitoring program is to determine groundwater quality at Strong Pit and nearby residential properties, and to assess compliance of Potential Contaminants of Concern (PCOCs) with applicable British Columbia (BC) Contaminated Sites Regulation (CSR) Drinking Water (DW) standards, Health Canada Guidelines for Canadian Drinking Water Quality (GCDWQ), and BC Approved and Working Water Quality Guidelines (BCWQG) for the protection of drinking water.

The PCOCs that are associated with the Strong Pit operations are dissolved and/or total metals, general parameters, total coliforms, and Escherichia Coli (*E.coli*) (SNC-Lavalin 2013¹).

2.0 SCOPE OF WORK

During the December 2014 water monitoring event, Tetra Tech EBA has completed the following tasks:

- Completed a site-specific health and safety plan;
- Contacted the residential well owners to discuss their availability and arrange for well access;
- Recorded groundwater levels, purged, and collected groundwater samples from six groundwater monitoring wells in Strong Pit;
- Measured field parameters (electrical conductivity, pH, Oxidation Reduction Potential (ORP), dissolved oxygen, and temperature) during purging of the groundwater monitoring wells;
- Submitted the samples collected from groundwater monitoring wells to ALS Environmental (ALS) for the following laboratory analysis: hardness, turbidity, total dissolved solids, colour, electrical conductivity,

¹ SNC-Lavalin Inc. Environment Division. January 31, 2013. December 2012 Groundwater Monitoring and Sampling Program Results, Strong Pit, Abbotsford, BC. Project No. 510006.

pH, major anions (chloride, fluoride and sulphate), nutrients (nitrate and nitrite), *E.coli*, total coliforms, and dissolved metals;

- Collected tap water samples from four private water wells located on the nearby residential properties and submitted these samples for laboratory analysis of hardness, turbidity, total dissolved solids, colour, electrical conductivity, pH, major anions (chloride, fluoride and sulphate), nutrients (nitrate and nitrite), *E.coli*, total coliform, and total metals;
- Collected and submitted two duplicate samples for laboratory analysis of the same parameters listed above. The duplicate samples were collected as part of Tetra Tech EBA's Quality Assurance / Quality Control (QA/QC) program to assess the integrity of the sampling methodology and analytical testing;
- Collected and submitted one trip blank and one equipment blank to ALS for *E.coli* and total coliform analysis, to assess the integrity of the sample bottles and sampling methodology;
- Tabulated the field pH measurements and laboratory analytical results collected for this monitoring event, and compared the results to the applicable standards and guideline values; and
- Prepared this report outlining the investigation findings along with short break-out reports to be sent to the four private well owners.

The scope of work completed for this monitoring event was conducted in general accordance to Tetra Tech EBA's proposal dated April 12, 2013.

3.0 BACKGROUND

Strong Pit is currently operating as a gravel pit by Kiewit/Flatiron for the Port Mann/Highway 1 Project until the end of August 2015.

Various groundwater monitoring and sampling programs have been conducted between July 2009 and September 2011 by Tetra Tech EBA, Trow Associates Inc. (Trow), and Levelton Consultants Ltd (Levelton). In 2012, the wells located in Strong Pit and on four residential sites were monitored and sampled on a quarterly basis by SNC-Lavalin Inc., Environment Division (SLE). Tetra Tech EBA has been conducting a biannual water monitoring program since June 2013.

3.1 2012 Groundwater Analytical Results

Results of the groundwater monitoring and sampling by SLE may be summarized as follows:

- Dissolved metal analytical results for all monitoring wells were less than the applicable CSR DW and/or GCDWQ, with the exception of:
 - Arsenic at W11-2, which exceeded both the CSR DW standard and GCDWQ; and
 - Manganese at groundwater monitoring well locations W09-1, W10-17B, W10-11, W11-2, W11-5, and the residential well at ^{s.21} exceeded the GCDWQ aesthetic guideline value.
- The *E.coli* count was below the laboratory method detection limit (MDL) and in compliance with the GCDWQ and BCWQG at all tested locations; and
- Total coliforms were detected at six monitoring well locations in Strong Pit, and in the residential wells at ^{s.21} and ^{s.21}

3.2 2013 and July/August 2014 Groundwater Analytical Results

The 2013 and July/August 2014 analytical results, in general, were consistent with historical data.

Dissolved arsenic in groundwater in monitoring well W11-2 historically exceeded the GCDWQ value (10 µg/L) during all previous sampling events in 2012 and also exceeded the GCDWQ value in December 2013 and July 2014. When sampled in June 2013, dissolved arsenic (9.2 µg/L) in W11-2 was marginally below the GCDWQ value. Arsenic concentrations measured at monitoring well W11-2 during the 2012, 2013 and July/August 2014 monitoring events were similar, to slightly elevated, than the arsenic levels measured at monitoring well W09-1, which is located hydraulically up-gradient from Strong Pit. Groundwater monitoring well W11-2 is located down-gradient from the Strong Pit operations area.

Dissolved manganese in groundwater in monitoring wells W09-1, W11-2, and W11-5, which historically exceeded the GCDWQ value, also exceeded the GCDWQ during at least one sampling event in 2013 and in July/August 2014.

During 2013 and July/August 2014, total coliforms were detected at four Strong Pit monitoring wells (W09-13B, W10-17B, W11-4 and W11-5), and at the residential well located at s.21. Due to the persistent presence of total coliform identified in W10-17B and W11-4 since 2012, shock chlorination was conducted on these two monitoring wells prior to the July/August 2014 sampling event, and total coliforms in these two wells were non-detect during July/August 2014.

4.0 METHODOLOGY

4.1 Health and Safety

Tetra Tech EBA prepared a site-specific health and safety plan that was implemented during the fieldwork to ensure Tetra Tech EBA's standard safety procedures were followed.

4.2 Groundwater Monitoring and Sampling

Strong Pit Monitoring Wells

Tetra Tech EBA sampled the groundwater monitoring wells on December 15 and 16, 2014, using standard Tetra Tech EBA procedures designed to generate samples that are representative of formation water near the well screen and reduce the potential for contaminating samples or wells. Prior to groundwater sampling, Tetra Tech EBA measured the depth to water and depth to well bottom in each well to estimate the well volume. Tetra Tech EBA disinfected the electronic water level indicator with a household bleach wetted cloth between sampling locations to avoid cross-contamination. Tetra Tech EBA positioned the tubing intake at the mid-point of the saturated section of the well screen. Tetra Tech EBA then sampled each well using a Waterra® inertial lift pump as follows:

- Tetra Tech EBA purged until the electrical conductivity, pH, and temperature measured for a purged well volume were within 5% of the values measured for the previous purged well volume;
- Following purging, Tetra Tech EBA collected the samples directly from the tubing and poured the samples into new laboratory-supplied containers. Groundwater samples collected for dissolved metals were field filtered and preserved with nitric acid. Tetra Tech EBA collected a duplicate sample, field labelled as DUP2, from W11-5; and
- Tetra Tech EBA then placed the samples in ice-chilled coolers for transport under Chain-of-Custody protocol to the laboratory for required analysis.

Residential Water Wells

Tetra Tech EBA sampled the private residential wells on December 15, 2014. Before sampling, Tetra Tech EBA disinfected the tap by wiping the faucet with diluted household bleach solution, allowing it to air dry for two minutes, and allowing water to discharge from the tap for approximately two minutes to flush out the chlorinated water. Tetra Tech EBA collected water samples directly from each tap using laboratory-prepared containers appropriate for the required analyses, taking care not to touch the mouth of the containers or the inside of the caps. Tetra Tech EBA then placed the samples in ice-chilled coolers for transport under Chain-of-Custody protocol to the laboratory for required analysis. Tetra Tech EBA collected a duplicate sample, field labelled as DUP1, from the water tap located at s.21 in Abbotsford, BC.

4.3 Quality Assurance / Quality Control Program

During the biannual water monitoring program, Tetra Tech EBA implemented a QA/QC program to assess the integrity of the sampling methodology and analytical testing. The QA/QC program adhered to Tetra Tech EBA's in-house Quality Management System, which was designed to generate representative samples, mitigate potential cross-contamination between sampling locations and samples, and reduce the potential for systematic bias.

The QA/QC protocol included:

- Reviewing applicable regulatory and internal work methods for field sampling to ensure they meet regulatory and industry standards;
- Recording monitoring and sampling of environmental media;
- Recording the results of field activities in the field concurrently with the activities;
- Use of clean, new sampling nitrile gloves at each sampling location;
- Placing samples into new and labelled laboratory-supplied containers, and when warranted, preserving the samples using laboratory-measured and -supplied preservatives;
- When appropriate, forming duplicate samples using industry accepted splitting methods;
- Collecting an equipment blank and a trip blank;
- Transporting temperature-sensitive samples to the analytical laboratory in chilled coolers using Chain-of-Custody procedures and ensuring that maximum holding times were not exceeded;
- Using CALA-affiliated laboratories that are qualified to analyze the samples using MoE-approved procedures;
- Submitting two duplicate samples to the laboratory as "blind" samples meaning that they are not identified as duplicate samples;
- Decontaminating sampling equipment between sample locations;
- Reviewing the results of QA/QC analyses, assessing the significance of the analytical results, and identifying this information in this report; and
- Reviewing of this report by a qualified senior Tetra Tech EBA professional to ensure that the report meets Tetra Tech EBA technical and reporting requirements.

Part of the QA/QC program involved calculating the relative percent difference (RPD) between sample concentrations of paired blind duplicates. Results were calculated as follows:

$$\text{RPD (\%)} = 2 \times 100 \times |X - Y| / (X + Y)$$

Where:

X = the measured concentration in the original sample; and

Y = the measured concentration in the duplicate sample.

RPDs should only be calculated and assessed when both the sample and the duplicate results are greater than five times the laboratory reported detection limit (RDL), referred to as the Practical Quantification Limit.

When evaluating the RPDs for the duplicate samples, Tetra Tech EBA adopted a screening threshold of 1.5 times the acceptable laboratory RPD for groundwater, as recommended by MoE. Should the RPD of a duplicate groundwater sample exceed the 30% threshold value, an explanation of the variation is required.

5.0 INVESTIGATION RESULTS

5.1 Groundwater Monitoring Results

The 2013 and 2014 groundwater elevation results are summarized in Table 1. The 2013 and 2014 results can be summarized as follows:

- In 2013, the average depth to groundwater was approximately 16.7 m below top of the PVC casing stickup (m-btoc) in June, and 17.1 m-btoc in December.
- In 2014, the average depth to groundwater was approximately 17.2 m-btoc in July and 15.3 m-btoc in December.
- The seasonal groundwater level variation observed at the Strong Pit site in general is small (< 1 m), except at monitoring well locations W09-13B and W09-1 where approximately 2.5 to 2.8 m of water level fluctuations were observed during 2013 and 2014.
- The groundwater monitoring wells monitored and sampled were observed to be in generally good condition.
- No evidence of sheen, or odour was noted during purging and sampling of the wells.
- All groundwater monitoring wells recharged readily during purging and sampling.

5.2 Groundwater Analytical Results

Tetra Tech EBA submitted a total of fourteen (14) groundwater samples, including two duplicates, one trip blank, and one equipment blank to ALS for laboratory analysis.

The 2013 and 2014 analytical results of the Strong Pit monitoring wells are evaluated against the GCDWQ, BCWQG, and CSR DW standards, and are presented in Table 2A. The 2013 and 2014 analytical results of the domestic residential wells are evaluated against the GCDWQ, BCWQG, and CSR DW standards, and are presented in Table 2B. The groundwater monitoring wells and private well sampling locations are shown on Figure 2. Copies of the laboratory analytical reports provided by ALS are provided as Appendix B.

The following provides a summary of the groundwater analytical results as compared to the applicable standards.

Strong Pit Monitoring Wells

Physical Parameters, Major Anions and Nutrients

Reported concentrations of the routine physical parameters, major anions and nutrients in the groundwater monitoring wells tested, were all below the CSR DW standards, and BCWQG and GCDWQ guideline values.

When sampled on December 15, 2014, groundwater monitoring well W11-2 had a field pH of 8.58 which was slightly above the upper pH threshold value (8.5) for BCWQG and GCDWQ; however, the laboratory pH (8.19) was below the upper pH threshold value. There is no CSR DW standard for pH.

Dissolved Metals

Reported concentrations of dissolved metals were less than the CSR DW standards, BCWQG and GCDWQ for the tested wells with the following exceptions:

- W11-2 – reported arsenic concentration (11.8 µg/L) was greater than the CSR DW standard and GCDWQ. Both the CSR DW standard and the GCDWQ for arsenic are 10 µg/L;
- W09-1 – reported manganese concentration (52 µg/L) was slightly greater than the GCDWQ aesthetic objective criterion of 50 µg/L for manganese, but was below the CSR DW standard (550 µg/L); and
- W11-5 – reported manganese concentration (60 µg/L; duplicate: 61 µg/L) was greater than the GCDWQ aesthetic objective criterion of 50 µg/L for manganese, but was below the CSR DW standard (550 µg/L).

Bacteriological Species

The following samples had total coliform bacteria counts greater than the GCDWQ of 0 MPN/100 mL:

- W09-1 – total coliform count of 9 MPN/100 mL;
- W10-17B – total coliform count of 2 MPN/100 mL;
- W11-2 – total coliform count of 2 MPN/100 mL; and
- W11-5 – total coliform count of 6 MPN/100 mL (duplicate: 6 MPN/100 mL).

E.coli in all groundwater monitoring wells tested were less than the laboratory MDL of 1 MPN/100 mL. The BCWQG and GCDWQ for *E.coli* is 0 MPN/100 mL.

Residential Water Wells

Physical Parameters, Major Anions and Nutrients

s.21

Total Metals

s.21

s.21

Bacteriological Species

s.21

5.3 Quality Assurance / Quality Control Program

Tetra Tech EBA implemented a QA/QC program to assess the integrity of the sampling methodology and analytical testing. When evaluating the RPDs for the duplicate samples, Tetra Tech EBA adopted a RPD screening threshold of 1.5 times the acceptable laboratory RPD for the same compound as recommended by the MoE²³.

The results of RPD calculations for water samples are provided in Table 3. As shown in Table 3, the calculated RPD values for two pairs of duplicate water samples were all within the screening threshold values. Thus, Tetra Tech EBA considers the analytical results accurately represent the field conditions.

As shown on laboratory certificates presented as Appendix B, during the December 2014 event, the total coliform result of the equipment blank had a positive total coliform count of 29 MPN/100 mL; the equipment blank was collected prior to sampling of W09-6 on December 6, 2014. Total coliforms are widespread in the environment, thus, is not considered a good indicator parameter to monitor the potential impacts of the Strong Pit operations on groundwater quality.

6.0 DISCUSSION

Discussions on groundwater quality are based on review of the groundwater analytical data collected since 2012. Historical (2012) groundwater analytical results are presented in Table 4 and Table 5 for reference.

6.1 Strong Pit Groundwater Quality

Physical Parameters, Major Anions and Nutrients

In general, the 2013 and 2014 data is consistent with the 2012 data, and the seasonal variations in the parameters tested are minimal from the available data.

² BC Ministry of Environment Questions and Answers on Contaminated Sites
<http://www.env.gov.bc.ca/epd/remediation/q-a/#standards>

³ British Columbia Environmental Laboratory Manual. Last updated October 5, 2011.
<http://www.env.gov.bc.ca/epd/wamr/labsys/lab-man-09/index.htm>

Dissolved Manganese

When sampled during 2013 and 2014, the dissolved manganese concentrations measured in monitoring wells W09-1, W11-2, and W11-5 either exceeded or were marginally below the GCDWQ aesthetic value (50 µg/L). However, the reported concentrations were below the CSR DW standard (550 µg/L), which is protective of human health and the applicable standard for groundwater sampled from monitoring wells. Manganese is one of the more abundant metals in the earth's crust and dissolved manganese in groundwater under oxygen-poor condition can reach an elevated level. The 2013 and 2014 data are consistent with the 2012 data.

Dissolved Arsenic

When sampled during 2013 and 2014, the dissolved arsenic concentrations measured in monitoring well W11-2 either slightly exceeded or were marginally below the CSR DW standard and GCDWQ value (10 µg/L). Dissolved arsenic in monitoring well W11-2 has historically been above the CSR DW standard and GCDWQ value in 2012.

The dissolved arsenic concentrations measured in monitoring well W09-1, located up-gradient of the Pit and considered to be representative of background conditions, have been marginally below the applicable standard/guideline values since 2012.

Groundwater in the Fraser River Delta in the Lower Mainland of British Columbia is known to contain naturally-occurring arsenic in concentrations exceeding the CSR DW and GCDWQ value. Arsenic in the region is primarily found in groundwater wells completed in or near marine and glacio-marine, clay-dominated, materials whereas wells completed in or near glacio-fluvial deposits showed the lowest levels of arsenic. A similar observation was made for the Strong Pit monitoring wells and, in general, the data shows a positive correlation between the dissolved arsenic concentration and the clay content in the Strong Pit wells (EBA 2014b). As such, it is very likely that the higher arsenic levels observed in W11-2, and also W09-1, are not related to site operations or other anthropogenic activities.

The 2013 and 2014 data is generally consistent with the 2012 data.

Other Dissolved Metals

Reported concentrations of other dissolved metals have been below the GCDWQ and BCWQG guideline values and CSR DW standards, and, in general, are consistent with historical data. In addition, the seasonal variability of most of the dissolved metals, including dissolved manganese and dissolved arsenic, observed in the Strong Pit monitoring wells is minimal.

Bacteriological Species

Elevated total coliform bacteria were previously identified in groundwater monitoring wells W10-17B and W11-4 and were identified in several monitoring wells (W09-1, W10-17B, W11-2 and W11-5) during the December 2014 sampling event. Total coliforms are naturally found in both faecal and non-faecal environments in soil, vegetation, and water; therefore, monitoring total coliform in these sources does not provide information on the quality of the source water from the perspective of health risk (Health Canada 2012b). As a result, total coliform bacteria is not a good indicator parameter to assess the potential impact of the Strong Pit operations on groundwater quality.

E.coli, which is naturally found in the intestines of humans or warm-blooded animals, are not typically found on plants or in soil or water. *E.coli* can be used as an indicator for recent faecal contamination or gastrointestinal disease. The 2013 and 2014 results have shown that the *E.coli* in the monitoring wells sampled have been non-detect.

6.2 Residential Water Wells

Physical Parameters, Major Anions and Nutrients

In general, the 2013 and 2014 data is consistent with the 2012 data, and the seasonal variability of the parameters tested is minimal.

Total Manganese

s.21

Between 1992 and 1993, BC Ministry of Environment, Lands and Parks (now BC MoE) conducted a two-phase evaluation of the groundwater quality in more than 470 wells in the Fraser Valley. The study concluded that occurrence of manganese is not limited to any one area, or any particular aquifers in the Fraser Valley, and there does not appear to be any link between wells with high manganese values and well depth, construction type or the aquifer into which the well is completed (MoE 1995).

s.21

In general, the 2013 and 2014 data are consistent with the 2012 data.

s.21

7.0 CONCLUSIONS

Based on the results of the 2013/2014 biannual groundwater sampling program, Tetra Tech EBA concluded the following:

- In general, the seasonal variations in most of the physical and chemical (nutrients and dissolved metals) parameters tested are minimal from the available data.
- Since 2012, the dissolved manganese concentrations in monitoring well W11-5 have consistently exceeded the GCDWQ guideline value of 50 µg/L, and the dissolved manganese concentrations in monitoring wells W09-1 and W11-2 have either exceeded or been marginally below the GCDWQ value. However, the reported dissolved manganese concentrations have been below the CSR DW standard of 550 µg/L, which is toxicologically based for the protection of human health and is the applicable standard for groundwater sampled from the Strong Pit monitoring wells. The higher manganese levels measured in W11-5, W11-2 or W09-1 were likely to be naturally occurring in groundwater and not related to the operations or activities on the Site.
- Since 2012, the dissolved arsenic concentrations in groundwater in monitoring well W11-2 have consistently been close to or exceeded the GCDWQ guideline value and CSR DW standard (both 10 µg/L). Arsenic concentrations measured at monitoring well W11-2 during the 2012 and 2013 monitoring events were similar to or slightly elevated than arsenic levels measured at the up-gradient monitoring well W09-1. The higher arsenic levels measured in W11-2 or W09-1 are likely to be naturally occurring in groundwater and not related to the operations or activities on the Site.

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8.0 RECOMMENDATIONS

Based on the results of the 2013/2014 biannual groundwater sampling program, Tetra Tech EBA recommends the following:

- Given the minimal seasonal variability in most of the parameters tested, continue to monitor and sample the Strong Pit monitoring wells to assess annual changes in on-site groundwater quality on an annual basis for the same parameters tested during the 2013/2014 biannual groundwater sampling program.
- Continue to sample the four nearby residential wells to assess annual changes in groundwater quality on an annual basis for the same parameters tested during the 2013/2014 biannual groundwater sampling program.

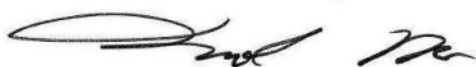
9.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of British Columbia Ministry of Transportation and Infrastructure and their agents. Tetra Tech EBA Inc. (Tetra Tech EBA) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than BC Ministry of Transportation and Infrastructure, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are provided in Appendix A of this report.

10.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech EBA Inc.



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Attachments: Tables (6)
Figures (2)
Appendix A - Tetra Tech EBA's Geoenvironmental Report – General Conditions
Appendix B - Laboratory Analytical Report (December 2014)

REFERENCES

- EBA Engineering Consultants Ltd., operating as EBA, A Tetra Tech Company. August 2013. July 2013 Water Monitoring Program, Strong Pit, Abbotsford, BC. File Number V23203143.
- Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. August 2012. Guidelines for Canadian Drinking Water Quality (2012b).
- Health Canada. April 2012. Guidance Document for Determining Ground Water at Risk of Containing Pathogens (GARP) Including Ground Water Under Direct Influence of Surface Water (GWUDI) (2012a).
- Ministry of Environment. Last updated January 2014. BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 4/2014, January 31, 2014 - Schedules 6 and 10).
- Ministry of Environment. Last updated August 2001. Approved and Working Water Quality Guidelines.
- Ministry of Health, Ministry of Environment, Lands and Parks, Ministry of Agriculture, Fisheries and Food. 1995. Final Report – Fraser Valley Groundwater Monitoring Program.
- SNC-Lavalin Inc. May 2012. March 2012 Groundwater Monitoring and Sampling Program Results, Strong Pit, Abbotsford, BC. Project Number 510006.
- SNC-Lavalin Inc. August 2012. June 2012 Groundwater Monitoring and Sampling Program Results, Strong Pit, Abbotsford, BC. Project Number 510006.
- SNC-Lavalin Inc. November 2012. September 2012 Groundwater Monitoring and Sampling Program Results, Strong Pit, Abbotsford, BC. Project Number 510006.
- SNC-Lavalin Inc. January 2013. December 2012 Groundwater Monitoring and Sampling Program Results, Strong Pit, Abbotsford, BC. Project Number 510006.
- Tetra Tech EBA Inc. December 2014a. July/August 2014 Water Monitoring Program, Strong Pit, Abbotsford, BC. File Number V23203143.
- Tetra Tech EBA Inc. December 2014b. Desktop Study on Naturally-Occurring Arsenic in Groundwater, Strong Pit Area, Abbotsford, BC. File Number V23203143-01.
- Tetra Tech EBA Inc. May 2014. December 2013 Water Monitoring Program, Strong Pit, Abbotsford, BC. File Number V23203143.

TABLES

Table 1	Groundwater Elevations
Table 2A	Groundwater Analytical Results – 2013 and 2014 Groundwater Monitoring Events, Strong Pit Wells
Table 2B	Groundwater Analytical Results – 2013 and 2014 Groundwater Monitoring Events ^{s.21} Residential Wells
Table 3	Quality Assurance/Quality Control – December 2014 Groundwater Analytical Results
Table 4	Historical Groundwater Analytical Results by SNC Lavalin 2012: Summary of Analytical Results for Dissolved Inorganics in Groundwater
Table 5	Historical Groundwater Analytical Results by SNC Lavalin 2012: Summary of Analytical Results for Total Metals and Bacteriological Parameters in Groundwater

Table 1: Groundwater Elevations

Monitoring Well	TOC Elevation ^a (m)	Screen Length ^a (m)	Screen Top Elevation ^a (m)	Well Bottom Elevation ^a (m)	Depth to Groundwater (m-btoc)			
					2013 06 05/07	2013 12 04/05	2014 07 22	2014 12 15/16
W09-01	99.35	3.0	70.05	67.05	10.83	11.23	13.63	11.15
W09-06	89.02	3.0	64.36	61.36	5.22	5.32	5.60	5.12
W09-13B	98.84	3.0	58.54	55.54	25.48	27.51	26.55	25.04
W11-02	88.01	3.0	60.30	57.30	24.16	24.52	24.52	23.82
W10-17B	91.77	3.0	63.91	60.91	24.71	25.69	25.14	25.51
W11-04	94.36	3.0	64.46	61.46	24.46	23.72	23.62	-
W11-05	70.10	3.0	57.68	54.68	1.81	1.89	1.13	1.35
Average (m-btoc)					16.67	17.12	17.17	15.33

Monitoring Well	TOC Elevation ^a (m)	Screen Length ^a (m)	Screen Top Elevation ^a (m)	Well Bottom Elevation ^a (m)	Groundwater Elevation (m)							
					2013 06 05/07	2013 12 04/05	2014 07 22	2014 12 15/16	Minimum	Maximum	Average	Range
W09-01	99.35	3.0	70.05	67.05	88.52	88.12	85.72	88.20	85.72	88.52	87.64	2.80
W09-06	89.02	3.0	64.36	61.36	83.80	83.70	83.43	83.91	83.43	83.91	83.71	0.48
W09-13B	98.84	3.0	58.54	55.54	73.36	71.33	72.29	73.81	71.33	73.81	72.70	2.47
W11-02	88.01	3.0	60.30	57.30	63.85	63.49	63.49	64.19	63.49	64.19	63.76	0.70
W10-17B	91.77	3.0	63.91	60.91	67.06	66.08	66.63	66.26	66.08	67.06	66.51	0.98
W11-04	94.36	3.0	64.46	61.46	69.90	70.64	70.75	-	69.90	70.75	70.43	0.84
W11-05	70.10	3.0	57.68	54.68	68.30	68.21	68.97	68.75	68.21	68.97	68.56	0.76
Average (m)					73.54	73.08	73.04	74.19				

Notes: a. Based on information provided by SNC-Lavalin Inc., Environment Division, in Report "December 2012 Groundwater Monitoring and Sampling Program Results, Strong Pit, Abbotsford, BC", dated January 31, 2013 (Project No. 510006).
 TOC - top of PVC casing stickup.
 m-btoc - metres below top of PVC casing stickup.
 - indicates no data.

Table 2A: Groundwater Analytical Results - 2013 and 2014 Groundwater Monitoring Events, Strong Pit Wells

						Field ID	W09-1*				W09-6*				W09-13B*					W10-17B*					
																DUP 1 (duplicate of W09-13B)						W10-97B * (duplicate of W10-17B)		DUP #2 (duplicate of W10-17B)	
						Date Sampled	05-Jun-13	05-Dec-13	31-Jul-14	15-Dec-14	05-Jun-13	05-Dec-13	31-Jul-14	16-Dec-14	06-Jun-13	06-Jun-13	05-Dec-13	06-Aug-14	15-Dec-14	07-Jun-13	04-Dec-13	04-Dec-13	06-Aug-14	06-Aug-14	16-Dec-14
Sample Code	L1312210-4	L1400400-1	L1495841-2	L1559183-1	L1312210-3	L1400400-4	L1495841-1	L1559183-2	L1312951-4	L1312951-7	L1400400-2	L1498052-1	L1559183-3	L1313281-2	L1399821-2	L1399821-3	L1498052-2	L1498052-3	L1559183-4						
Chemical Group	Parameter	Unit	RDL	BCWQG	CSR Schedule 6 - DW	GCDWQ																			
Field Parameter	pH (field)	pH units	0.01	6.5 to 8.5	-	6.5 to 8.5	8.04	8.62	8.06	8.2	7.03	7.35	7.12	7.12	7.25	-	7.56	7.16	7.33	6.82	7.05	-	7.00	-	6.73
Physical Tests	Turbidity	NTU	0.1	-	-	***	0.3	0.19	0.25	0.31	1.59	10.2	1.45	1.12	0.49	0.92	18.4	0.8	0.61	26	914	636	921	792	325
	TDS (Filtered)	mg/L	10	-	-	500	138	127	138	133	176	178	177	194	190	186	157	178	172	163	171	170	245	240	191
	Hardness as CaCO3	mg/L	0.5	-	-	-	86.7	86.0	85.0	86.4	136	141	137	142	106	107	106	105	106	109	124	123	159	158	133
	Colour, True	CU	5.0	<15	-	<15	-	<5.0	<5.0	<5.0	-	<5.0	<5.0	12.1	-	-	<5.0	<5.0	<5.0	-	<5.0	<5.0	<5.0	<5.0	<5.0
	Conductivity	µS/cm	2.0	-	-	-	-	221	215	221	-	288	277	296	-	-	253	244	256	-	253	256	354	353	290
Anions and Nutrients	pH	pH	0.1	6.5 to 8.5	-	6.5 to 8.5	-	8.33	8.26	8.21	-	7.96	7.83	7.93	-	-	7.98	7.70	7.92	-	7.53	7.73	7.46	7.45	7.70
	Alkalinity, Total (as CaCO3)	µg/L	2000	-	-	-	-	103000	-	-	-	101000	-	-	-	-	68600	-	-	-	95800	97100	-	-	-
	Bromide (Br)	µg/L	50	-	-	-	-	<50	<50	<50	-	<50	<50	<50	-	-	<50	<50	<50	-	51	57	<50	<50	66
	Chloride (Cl)	µg/L	500	250,000	250,000	250,000	-	1430	1410	1520	-	6530	6080	6620	-	-	10900	10100	10600	-	4970	4850	19300	19300	5210
	Fluoride (F)	µg/L	20	1,500	1,500	1,500	-	98	103	98	-	45	54	51	-	-	34	36	34	-	27	27	40	41	24
	Nitrate (as N)	µg/L	5.0	10,000	10,000	10,000	-	<5.0	32.7	41.8	-	5820	3560	5780	-	-	7200	6440	6600	-	2770	2760	2910	2900	2770
	Nitrite (as N)	µg/L	1.0	1,000	3,200	1,000	-	<1.0	<1.0	<1.0	-	48.6	39.3	39.0	-	-	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0
	Sulfate (SO4)	µg/L	500	218000 to 309000	500,000	500,000	-	10300	10100	9240	-	17200	19000	16700	-	-	15600	15800	15700	-	18000	17900	18200	18100	17800
Bacteriological Tests	E. coli	MPN/100mL	1	0 per 100 mL	-	0 per 100 mL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Coliform Bacteria - Total	MPN/100mL	1	-	-	0 per 100 mL	<1	<1	<1	9	<1	<1	<1	<1	<1	<1	<1	1	<1	>201	291	21	<1	<1	2
Dissolved Metals	Aluminum	µg/L	10	200	9500	100 ¹²	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Antimony	µg/L	0.5	-	6	6	<0.5	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50
	Arsenic	µg/L	1	-	10	10	9.7	9.5	9.4	7.3	<1	<1.0	<1.0	<1.0	1.4	1.5	1.4	1.6	1.5	<1	<1.0	<1.0	<1.0	<1.0	<1.0
	Barium	µg/L	20	-	1000	1000	41	40	40	41	23	22	22	22	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
	Beryllium	µg/L	5	-	-	-	<5	<5.0	<5.0	<5.0	<5	<5.0	<5.0	<5.0	<5	<5.0	<5.0	<5.0	<5.0	<5	<5.0	<5.0	<5.0	<5.0	<5.0
	Boron	µg/L	100	-	5000	5000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	Cadmium	µg/L	0.05	-	5	5	<0.05	<0.050	<0.050	<0.050	<0.05	<0.050	<0.050	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	0.203	0.079	<0.050	<0.050	<0.050	0.05
	Calcium	µg/L	100	-	-	-	21000	20700	20600	20800	34900	36100	35000	36200	24600	25000	24600	24800	24500	25800	30300	30300	42800	42700	33700
	Chromium (III+VI)	µg/L	0.5	-	50	50	<0.5	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	<0.50	2.71	2.73	3.16	2.92	3.04	2.23	2.61	2.69	7.33	7.37	2.72
	Cobalt	µg/L	0.5	-	-	-	<0.5	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50
	Copper	µg/L	1	-	1000 ¹¹	1000	<1	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	<1.0
	Iron	µg/L	30	-	6500 ^{11#3}	300	58	56	43	64	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	41	<30
	Lead	µg/L	1	-	10	10	<1	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	<1.0
	Lithium	µg/L	50	-	-	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
	Magnesium	µg/L	100	-	100000 ¹¹	-	8330	8330	8160	8400	11900	12400	12100	12600	10800	11000	10700	10500	10800	10800	11800	11600	12600	12600	13300
	Manganese	µg/L	10	-	550 ^{11#3}	50	55	53	47	52	27	28	28	23	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Mercury	µg/L	0.2	-	1	1	<0.2	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
	Molybdenum	µg/L	1	-	250	-	2.1	2.1	2.2	2.1	<1	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	<1.0
	Nickel	µg/L	5	-	-	-	<5	<5.0	<5.0	<5.0	<5	<5.0	<5.0	<5.0	<5	<5.0	<5.0	<5.0	<5.0	<5	<5.0	<5.0	<5.0	<5.0	<5.0
	Selenium	µg/L	1	-	10	10	<1	<1.0	<1.0	<1.0	<1.0	1.4	1.4	1.3	1.5	<1	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	<1.0
	Silver	µg/L	0.05	-	-	-	<0.05	<0.050	<0.050	<0.050	<0.05	<0.050	<0.050	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	<0.05	<0.050	<0.050	0.066	0.145	<0.050
	Sodium	µg/L	2000	-	200000 ¹¹	200000	13,300	12700	12900	13000	5,600	5500	5800	05600	7,800	8,000	7500	8100	7500	7,200	6500	6100	10100	10100	6600
	Thallium	µg/L	0.2	-	-	-	<0.2	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
	Titanium	µg/L	50	-	-	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
	Uranium	µg/L	0.2	-	20	20	<0.2	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
	Vanadium	µg/L	30	-	-	-	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
	Zinc	µg/L	5	-	5000 ¹¹	5000	<5	<5.0	5.4	<5.0	<5	<5.0	<5.0	<5.0	<5	<5.0	<5.0	<5.0	<5.0	6.8	<5.0	<5.0	<5.0	<5.0	<5.0

NOTES:

1

Concentrations are in µg/L unless otherwise noted.

2

Standard is specific to protection of human health.

3

Standard is for conventional treatment (200 µg/L for other treatments)

-

Standard is no longer applicable based on the CSR Stage 8 Amendments. Results were compared for due diligence purposes.

<

Not analyzed or no applicable CSR standard.

GCDWQ

Concentration is less than the laboratory detection limit indicated.

CSR

Guideline for Canadian Drinking Water Quality (last updated August 2012)

CSR - DW

BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 4/2014, January 31, 2014 - Schedules 6 and 10).

BCWQG

CSR groundwater standards for the protection of groundwater used as drinking water.

RDL

BC Working Quality Guidelines - Working and Approved, for the protection of drinking water.

*

Reported Detection Limit

**

Reported with prefix "MW" in place of "W" on laboratory analytical reports.

Laboratory RDL is greater than the applicable working BCWQG.

To ensure effectiveness of disinfection and for good operation of the distribution system, it is recommended that water entering the distribution system have turbidity of 1.0 NTU or less.

Bold

Bold and shaded indicates an exceedance of the applicable BCWQG, CSR DW or GCDWQ guideline/standard.

Table 2A: Groundwater Analytical Results - 2013 and 2014 Groundwater Monitoring Events, Strong Pit Wells

						Field ID		W11-2*				W11-4*			W11-5*					TRIP BLANK		EQUIPMENT BLANK		FIELD BLANK	
																			DUP 2						
						Date Sampled	07-Jun-13	05-Dec-13	31-Jul-14	15-Dec-14	06-Jun-13	04-Dec-13	01-Aug-14	05-Jun-13	05-Dec-13	31-Jul-14	16-Dec-14	15-Dec-14	05-Dec-13	15-Dec-14	31-Jul-14	15-Dec-14	05-Dec-13	31-Jul-14	
Sample Code	L1313281-1	L1400400-5	L1495841-3	L1559183-16	L1312951-5	L1399821-1	L1496418-1	L1312210-2	L1400400-3	L1495841-4	L1559183-6	L1559183-8	L1400400-10	L1559183-14	L1495841-5	L1559183-13	L1400400-11	L1495841-6							

Chemical Group	Parameter	Unit	RDL	BCWQG	CSR Schedule 6 - DW	GCDWQ																		
Field Parameter	pH (field)	pH units	0.01	6.5 to 8.5	-	6.5 to 8.5	8.1	8.72	8.45	8.58	6.53	6.69	6.16	8.09	8.51	8.03	8.23	-	-	-	-	-	-	-
Physical Tests	Turbidity	NTU	0.1	-	-	***	33.7	355	51.7	9.8	55.1	30.3	5.96	27.6	13.0	2.96	28.70	29.90	-	-	-	-	-	-
	TDS (Filtered)	mg/L	10	-	-	500	160	143	140	134	137	177	152	210	203	215	224	223	-	-	-	-	-	-
	Hardness as CaCO3	mg/L	0.5	-	-	-	49.0	39.5	39.9	384	84.6	124	93.1	171	169	174	172	174	-	-	-	-	-	-
	Colour, True	CU	5.0	<15	-	<15	-	<5.0	<5.0	<5.0	-	<5.0	<5.0	-	<5.0	<5.0	<5.0	<5.0	-	-	-	-	-	-
	Conductivity	µS/cm	2.0	-	-	-	-	218	209	198	-	262	213	-	343	352	354	352	-	-	-	-	-	-
Anions and Nutrients	pH	pH	0.1	6.5 to 8.5	-	6.5 to 8.5	-	8.35	8.34	8.19	-	7.52	7.49	-	8.29	8.28	8.27	8.28	-	-	-	-	-	-
	Alkalinity, Total (as CaCO3)	µg/L	2000	-	-	-	-	95900	-	-	-	103000	-	-	125000	-	-	-	-	-	-	-	-	-
	Bromide (Br)	µg/L	50	-	-	-	-	<50	<50	<50	-	84	168	-	<50	<50	<50	<50	-	-	-	-	-	-
	Chloride (Cl)	µg/L	500	250,000	250,000	250,000	-	2900	1420	1230	-	5620	5600	-	7340	7340	7350	7350	-	-	-	-	-	-
	Fluoride (F)	µg/L	20	1,500	1,500	1,500	-	108	113	111	-	<20	<20	-	41	44	41	42	-	-	-	-	-	-
	Nitrate (as N)	µg/L	5.0	10,000	10,000	10,000	-	<5.0	<5.0	9.4	-	1930	568	-	2890	3140	3300	3290	-	-	-	-	-	-
	Nitrite (as N)	µg/L	1.0	1,000	3,200	1,000	-	<1.0	<1.0	3.5	-	<1.0	<1.0	-	595	665	630	632	-	-	-	-	-	-
	Sulfate (SO4)	µg/L	500	218000 to 309000	500,000	500,000	-	13000	12000	11900	-	16600	13900	-	35000	35100	34700	34700	-	-	-	-	-	-
Bacteriological Tests	E. coli	MPN/100mL	1	0 per 100 mL	-	0 per 100 mL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Coliform Bacteria - Total	MPN/100mL	1	-	-	0 per 100 mL	<1	<1	<1	2	2	<1	<1	<1	<1	13	6	6	<1	<1	<1	29	<1	<1
Dissolved Metals	Aluminum	µg/L	10	200	9500	100 ^{R2}	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	-	-	-	-	-
	Antimony	µg/L	0.5	-	6	6	<0.5	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	1.51	1.39	1.53	1.38	1.46	-	-	-	-	-	-
	Arsenic	µg/L	1	-	10	10	9.2	13.0	12.8	11.8	<1	<1.0	<1.0	2.7	2.7	2.4	2.6	2.6	-	-	-	-	-	-
	Barium	µg/L	20	-	1000	1000	<20	<20	<20	<20	<20	<20	<20	94	88	99	94	95	-	-	-	-	-	-
	Beryllium	µg/L	5	-	-	-	<5	<5.0	<5.0	<5.0	<5	<5.0	<5.0	<5	<5.0	<5.0	<5.0	<5.0	-	-	-	-	-	-
	Boron	µg/L	100	-	5000	5000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	-	-	-	-	-	-
	Cadmium	µg/L	0.05	-	5	5	<0.05	<0.050	<0.050	<0.050	<0.05	<0.050	<0.050	0.108	<0.050	<0.050	<0.050	<0.050	-	-	-	-	-	-
	Calcium	µg/L	100	-	-	-	12100	9170	9030	8710	21500	32700	24800	46700	46500	47300	47100	47500	-	-	-	-	-	-
	Chromium (III+VI)	µg/L	0.5	-	50	50	<0.5	<0.50	<0.50	<0.50	<0.5	0.62	<0.50	<0.5	<0.50	<0.50	<0.50	<0.50	-	-	-	-	-	-
	Cobalt	µg/L	0.5	-	-	-	<0.5	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	<0.5	<0.50	<0.50	<0.50	<0.50	-	-	-	-	-	-
	Copper	µg/L	1	-	1000 ^{R1}	1000	<1	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	-	-	-	-	-	-
	Iron	µg/L	30	-	6500 ^{R1,R3}	300	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	-	-	-	-	-	-
	Lead	µg/L	1	-	10	10	<1	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	-	-	-	-	-	-
	Lithium	µg/L	50	-	-	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	-	-	-	-	-	-
	Magnesium	µg/L	100	-	100000 ^{R1}	-	4570	4020	4220	4040	7500	10200	7560	13200	13000	13700	13300	13500	-	-	-	-	-	-
	Manganese	µg/L	10	-	550 ^{R1,R3}	50	74	75	46	40	<10	<10	<10	58	60	60	60	61	-	-	-	-	-	-
	Mercury	µg/L	0.2	-	1	1	<0.2	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.20	-	-	-	-	-	-
	Molybdenum	µg/L	1	-	250	-	4.4	3.4	3.1	3.1	<1	<1.0	<1.0	1.2	1.1	1.1	1.0	1.0	-	-	-	-	-	-
	Nickel	µg/L	5	-	-	-	<5	<5.0	<5.0	<5.0	<5	<5.0	<5.0	<5	<5.0	<5.0	<5.0	<5.0	-	-	-	-	-	-
	Selenium	µg/L	1	-	10	10	<1	<1.0	<1.0	<1.0	<1	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	-	-	-	-	-	-
	Silver	µg/L	0.05	-	-	-	<0.05	<0.050	<0.050	<0.050	<0.05	<0.050	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	-	-	-	-	-	-
	Sodium	µg/L	2000	-	200000 ^{R1}	200000	32,200	29800	29500	29100	5,900	6300	5800	6,700	6100	6500	6300	6300	-	-	-	-	-	-
	Thallium	µg/L	0.2	-	-	-	<0.2	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	<0.2	<0.20	<0.20	<0.20	<0.20	-	-	-	-	-	-
	Titanium	µg/L	50	-	-	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	-	-	-	-	-	-
	Uranium	µg/L	0.2	-	20	20	0.34	<0.20	<0.20	<0.20	<0.2	<0.20	<0.20	1.38	1.25	1.26	1.22	1.29	-	-	-	-	-	-
	Vanadium	µg/L	30	-	-	-	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	-	-	-	-	-	-
	Zinc	µg/L	5	-	5000 ^{R1}	5000	<5	<5.0	<5.0	<5.0	7.3	<5.0	<5.0	<5	<5.0	<5.0	<5.0	<5.0	-	-	-	-	-	-

NOTES:

- Concentrations are in µg/L unless otherwise noted.
- Standard is specific to protection of human health.
- Standard is for conventional treatment (200 µg/L for other treatments)
- Standard is no longer applicable based on the CSR Stage 8 Amendments. Results were compared for due diligence purposes.
- Not analyzed or no applicable CSR standard.
- Concentration is less than the laboratory detection limit indicated.
- Guideline for Canadian Drinking Water Quality (last updated August 2012)
- BC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 4/2014, January 31, 2014 - Schedules 6 and 10).
- CSR groundwater standards for the protection of groundwater used as drinking water.
- BC Working Quality Guidelines - Working and Approved, for the protection of drinking water.
- Reported Detection Limit
- Reported with prefix "MW" in place of "W" on laboratory analytical reports.
- Laboratory RDL is greater than the applicable working BCWQG.
- To ensure effectiveness of disinfection and for good operation of the distribution system, it is recommended that water entering the distribution system
- Bold and shaded indicates an exceedance of the applicable BCWQG, CSR DW or GCDWG guideline/standard.

Table 2B: Groundwater Analytical Results - 2013 and 2014 Groundwater Monitoring Events, s.21

							s.21
							Field ID
							Date Sampled
							Sample Code
Chemical Group	Parameter	Unit	RDL	BCWQG	CSR Schedule 6 - DW	GCDWQ	
Field Parameter	pH (field)	pH units	s.21				
Physical Tests	Turbidity	NTU					
	TDS (Filtered)	mg/L					
	Hardness as CaCO3	mg/L					
	Colour, True	CU					
	Conductivity	µS/cm					
Anions and Nutrients	pH	pH					
	Alkalinity, Total (as CaCO3)	µg/L					
	Bromide (Br)	µg/L					
	Chloride (Cl)	µg/L					
	Fluoride (F)	µg/L					
	Nitrate (as N)	µg/L					
	Nitrite (as N)	µg/L					
Bacteriological Tests	Sulfate (SO4)	µg/L					
	E. coli	MPN/100mL					
Total Metals	Coliform Bacteria - Total	MPN/100mL					
	Aluminum	µg/L					
	Antimony	µg/L					
	Arsenic	µg/L					
	Barium	µg/L					
	Beryllium	µg/L					
	Boron	µg/L					
	Cadmium	µg/L					
	Calcium	µg/L					
	Chromium (III+VI)	µg/L					
	Cobalt	µg/L					
	Copper	µg/L					
	Iron	µg/L					
	Lead	µg/L					
	Lithium	µg/L					
	Magnesium	µg/L					
	Manganese	µg/L					
	Mercury	µg/L					
	Molybdenum	µg/L					
	Nickel	µg/L					
	Potassium	µg/L					
	Selenium	µg/L					
	Silver	µg/L					
	Sodium	µg/L					
	Thallium	µg/L					
	Titanium	µg/L					
	Uranium	µg/L					
	Vanadium	µg/L					
	Zinc	µg/L					
Dissolved Metals	Aluminium	µg/L					
	Antimony	µg/L					
	Arsenic	µg/L					
	Barium	µg/L					
	Beryllium	µg/L					
	Boron	µg/L					
	Cadmium	µg/L					
	Calcium	µg/L					
	Chromium (III+VI)	µg/L					
	Cobalt	µg/L					
	Copper	µg/L					
	Iron	µg/L					
	Lead	µg/L					
	Lithium	µg/L					
	Magnesium	µg/L					
	Manganese	µg/L					
	Mercury	µg/L					
	Molybdenum	µg/L					
	Nickel	µg/L					
	Selenium	µg/L					
	Silver	µg/L					
	Sodium	µg/L					
	Thallium	µg/L					
	Titanium	µg/L					
	Uranium	µg/L					
	Vanadium	µg/L					
	Zinc	µg/L					

NOTES:

- 1Concentrations are in µg/L unless otherwise noted.
- 2Standard is specific to protection of human health
- Standard is for conventional treatment (200 µg/L for other treatments)
- <Not analyzed or no applicable CSR standard.
- <Concentration is less than the laboratory detection limit indicated.
- GCDWQGuideline for Canadian Drinking Water Quality (last updated August 2012)
- CSRBC Contaminated Sites Regulation (BC Reg. 375/96, includes amendments up to B.C. Reg. 4/2014, January 31, 2014 - Schedules 6 and 10).
- CSR - DWCSR groundwater standards for the protection of groundwater used as drinking water.
- BCWQGB.C Working Quality Guidelines - Working and Approved, for the protection of drinking water.
- RDLReported Detection Limit
- **Laboratory RDL is greater than the applicable working BCWQG.
- ***To ensure effectiveness of disinfection and for good operation of the distribution system, it is recommended that water entering the distribution system have turbidity of 1.0 NTU or less.
- Bold**Bold and shaded indicates an exceedance of the applicable BCWQG, CSR DW or GCDWG guideline/standard.

Table 3: Quality Assurance/Quality Control - December 2014 Groundwater Analytical Results

			Field ID S.21			RPD	W11-5	DUP #2 (Dup of W11-5)	RPD
			Date Sampled	15-Dec-14	15-Dec-14		16-Dec-14	15-Dec-14	
			Sample Code	S.21			L1559183-6	L1559183-8	
Chemical Group	Parameter	Unit	RDL						
Physical Tests	Turbidity	NTU	S.21		28.7	29.9	4.1%		
	TDS (Filtered)	mg/L			224	223	0.4%		
	Hardness as CaCO3	mg/L			172	174	1.2%		
	Colour, True	CU			<5.0	<5.0	-		
	Conductivity	µS/cm			354	352	0.6%		
	pH	pH		8.27	8.28	0.1%			
Anions and Nutrients	Bromide (Br)	µg/L		<50	<50	-			
	Chloride (Cl)	µg/L		7350	7350	0.0%			
	Fluoride (F)	µg/L		41	42	-			
	Nitrate (as N)	µg/L		3300	3290	0.3%			
	Nitrite (as N)	µg/L		630	632	0.3%			
	Sulfate (SO4)	µg/L		34700	34700	0.0%			
Bacteriological Tests	E. coli	MPN/100mL		<1	<1	-			
	Coliform Bacteria - Total	MPN/100mL		6	6	0.0%			
Total Metals	Aluminum	µg/L				-			
	Antimony	µg/L				-			
	Arsenic	µg/L				-			
	Barium	µg/L				-			
	Beryllium	µg/L				-			
	Boron	µg/L				-			
	Cadmium	µg/L				-			
	Calcium	µg/L				-			
	Chromium (III+VI)	µg/L				-			
	Cobalt	µg/L				-			
	Copper	µg/L				-			
	Iron	µg/L				-			
	Lead	µg/L				-			
	Lithium	µg/L				-			
	Magnesium	µg/L				-			
	Manganese	µg/L				-			
	Mercury	µg/L				-			
	Molybdenum	µg/L				-			
	Nickel	µg/L				-			
	Selenium	µg/L				-			
	Silver	µg/L				-			
	Sodium	µg/L				-			
	Thallium	µg/L				-			
	Titanium	µg/L				-			
	Uranium	µg/L				-			
	Vanadium	µg/L				-			
	Zinc	µg/L				-			
Dissolved Metals	Aluminium	µg/L		<10	<10	-			
	Antimony	µg/L		1.38	1.46	-			
	Arsenic	µg/L		2.6	2.6	-			
	Barium	µg/L		94	95	-			
	Beryllium	µg/L		<5.0	<5.0	-			
	Boron	µg/L		<100	<100	-			
	Cadmium	µg/L		<0.050	<0.050	-			
	Calcium	µg/L		47100	47500	0.8%			
	Chromium (III+VI)	µg/L		<0.50	<0.50	-			
	Cobalt	µg/L		<0.50	<0.50	-			
	Copper	µg/L		<1.0	<1.0	-			
	Iron	µg/L		<30	<30	-			
	Lead	µg/L		<1.0	<1.0	-			
	Lithium	µg/L		<50	<50	-			
	Magnesium	µg/L		13300	13500	1.5%			
	Manganese	µg/L		60	61	1.7%			
	Mercury	µg/L		<0.20	<0.20	-			
	Molybdenum	µg/L		1	1	-			
	Nickel	µg/L		<5.0	<5.0	-			
	Selenium	µg/L		<1.0	<1.0	-			
	Silver	µg/L		<0.050	<0.050	-			
	Sodium	µg/L		6300	6300	-			
	Thallium	µg/L		<0.20	<0.20	-			
	Titanium	µg/L		<50	<50	-			
	Uranium	µg/L		1.22	1.29	5.6%			
	Vanadium	µg/L		<30	<30	-			
	Zinc	µg/L		<5.0	<5.0	-			

NOTES:

RPD Relative Percent Difference [%]

RDL Reported Detection Limit

blank Parameter not analyzed

- RPD not calculated

< Concentration is less than the laboratory detection limit indicated.

* RPD is Relative Percentage Difference calculated as $RPD = \frac{C2 - C1}{[(C1 + C2)/2]}$ where C1, C2 = concentrations of parameters in 1st and 2nd sample respectively.

RPDs have only been considered where both concentrations are greater than 5 times the RDL.

High RPDs are in **bold** (acceptable RPD is 30% for inorganics in water, as recommended by BC Ministry of Environment Q&A, and BC Field Sampling Manual).

Table 4: Historical Groundwater Analytical Results by SNC Lavalin 2012: Summary of Analytical Results for Dissolved Inorganics in Groundwater

Sample Location		MW09-1				MW09-6											BC Standards		
Sample ID	Sample Date (yyyy mm dd)	W09-1-120328 2012 03 28	W09-1-120628 2012 06 28	MW09-1-120927 2012 09 27	MW09-1-121213 2012 12 13	W09-6-120328 2012 03 28	W12-A-120328 Duplicate of W09-6-120328	QA/QC RPD %	W09-6-120628 2012 06 28	W12-A-120628 Duplicate of W09-6-120628	QA/QC RPD %	MW09-6-120927 2012 09 27	MW12-A-120927 Duplicate of MW09-6-120927	QA/QC RPD %	MW09-6-121213 2012 12 13	MW12-A-121213 Duplicate of MW09-6-121213	QA/QC RPD %	CSR Drinking Water (DW)	Canadian Drinking Water Quality (DW)
Parameter	Units	Analytical Results																	
Physical Parameters																			
Hardness	µg/L	78,900	79,300	83,500	85,600	109,000	108,000	< 1	105,000	107,000	2	117,000	117,000	0	126,000	124,000	2	n/a	n/a
pH (field)	pH	8.54	7.82	8.5	8.38	7.49	7.49	0	7.63	7.63	0	7.49	7.49	0	7.19	7.19	0	n/a	n/a
Turbidity	NTU	0.46	4.09	1.39	0.13	3.87	5.16	29	2.52	2.3	9	0.55	0.44	*	18	12.5	36	n/a	n/a
Total Dissolved Solids	µg/L	122,000	118,000	114,000	124,000	146,000	142,000	3	138,000	140,000	1	134,000	148,000	10	136,000	172,000	23	n/a	500,000
Dissolved Inorganics																			
Nitrate Nitrogen	µg/L	< 20	< 20	< 20	< 20	4,560	4,400	4	4,160	4,100	2	4,320	4,250	2	5,130	5,230	2	10,000	45,000
Nitrite Nitrogen	µg/L	< 5	< 5	< 5	< 5	17	20	*	7	9.6	*	20.5	20.9	*	41.6	41.2	< 1	3,200	3,200
Nitrate+Nitrite Nitrogen	µg/L	< 20	< 20	< 20	< 20	4,580	4,420	4	4,170	4,110	1	4,340	4,270	2	5,170	5,270	2	10,000	n/a
Sulphate	µg/L	9,630	8,980	10,000	9,260	14,800	15,800	7	14,800	14,700	< 1	16,500	16,600	< 1	15,800	15,400	3	500,000	500,000 (AO)
Total Alkalinity (as CaCO3)	µg/L	102,000	103,000	102,000	102,000	87,900	88,800	1	87,600	88,100	< 1	91,700	92,200	< 1	96,000	95,100	< 1	n/a	n/a
Alkalinity, Phenolphthalein (as CaCO3)	µg/L	< 500	< 500	< 500	< 500	< 500	< 500	*	< 500	< 500	*	< 500	< 500	*	< 500	< 500	*	n/a	n/a
Bicarbonate HCO3	µg/L	124,000	126,000	125,000	125,000	107,000	108,000	< 1	107,000	107,000	0	112,000	113,000	< 1	117,000	116,000	< 1	n/a	n/a
Carbonate CO3	µg/L	< 500	< 500	< 500	< 500	< 500	< 500	*	< 500	< 500	*	< 500	< 500	*	< 500	< 500	*	n/a	n/a
Hydroxide	µg/L	< 500	< 500	< 500	< 500	< 500	< 500	*	< 500	< 500	*	< 500	< 500	*	< 500	< 500	*	n/a	n/a
Geochemical Indicators																			
Dissolved Aluminum	µg/L	10.6	4.5	4.4	6.1	< 3	< 3	*	< 3	< 3	*	< 3	< 3	*	< 3	< 3	*	9,500	100 (AO)
Dissolved Calcium	µg/L	19,100	19,100	20,100	20,500	26,900	26,700	< 1	25,600	25,800	< 1	28,800	28,800	0	31,300	30,600	2	n/a	n/a
Dissolved Iron	µg/L	73	62.3	61.5	64.8	< 5	< 5	*	< 5	< 5	*	< 5	< 5	*	8.5	< 5	*	n/a ^a	300 (AO)
Dissolved Magnesium	µg/L	7,590	7,680	8,070	8,340	10,100	10,100	0	10,000	10,300	3	10,800	11,000	2	11,700	11,500	2	100,000	n/a
Dissolved Manganese	µg/L	58.3	42	49.7	49.7	11.1	11.2	< 1	5	5.1	2	22.1	21.7	2	26.3	26.6	1	n/a ^a	50 (AO)
Dissolved Potassium	µg/L	2,850	2,950	3,130	3,010	1,290	1,290	0	1,260	1,300	3	1,420	1,430	< 1	1,500	1,490	< 1	n/a	n/a
Dissolved Sodium	µg/L	12,000	12,200	12,700	13,000	4,970	5,030	1	5,030	5,110	2	5,290	5,330	< 1	5,660	5,750	2	200,000	200,000 (AO)
Dissolved Metals																			
Antimony	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	*	6	6
Arsenic	µg/L	9	9.21	9.77	9.32	0.44	0.42	*	0.42	0.42	*	0.54	0.54	0	0.59	0.56	5	10	10
Barium	µg/L	37.7	38.5	40.3	40.1	16.1	16.6	3	15.8	15.9	< 1	20.3	20.3	0	22	22.3	1	1,000	1,000
Beryllium	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	*	n/a	n/a
Boron	µg/L	< 50	< 50	< 50	< 50	< 50	< 50	*	< 50	< 50	*	< 50	< 50	*	< 50	< 50	*	5,000	5,000
Cadmium	µg/L	< 0.01	< 0.01	< 0.01	< 0.01	0.033	0.031	*	0.035	0.044	*	0.026	0.023	*	0.019	0.022	*	5	5
Chromium	µg/L	< 1		< 1	< 1	< 1	< 1	*	< 1	< 1	*	< 1	< 1	*	< 1	< 1	*	50	50
Cobalt	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	*	n/a	n/a
Copper	µg/L	44.6	< 0.2	< 0.2	< 0.2	0.25	< 0.2	*	0.21	< 0.2	*	0.32	0.23	*	< 0.2	< 0.2	*	1,000	1,000 (AO)
Lead	µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	*	< 0.2	< 0.2	*	< 0.2	< 0.2	*	< 0.2	< 0.2	*	10	10
Lithium	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	*	< 5	< 5	*	< 5	< 5	*	< 5	< 5	*	730	n/a
Mercury	µg/L	< 0.01	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	*	< 0.05	< 0.05	*	< 0.05	< 0.05	*	< 0.05	< 0.05	*	1	1
Molybdenum	µg/L	2.1	2.2	2.2	2.2	< 1	< 1	*	< 1	< 1	*	< 1	< 1	*	< 1	< 1	*	250	n/a
Nickel	µg/L	< 1	< 1	< 1	< 1	2.8	2.8	*	2.2	2.3	*	3.1	3	*	3	3.1	*	n/a	n/a
Selenium	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	0.87	0.91	5	0.75	0.87	15	1.09	1.1	< 1	1.22	1.21	< 1	10	10
Silver	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	*	n/a	n/a
Thallium	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	*	n/a	n/a
Titanium	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	*	< 5	< 5	*	< 5	< 5	*	< 5	< 5	*	n/a	n/a
Uranium	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	*	< 0.1	< 0.1	*	< 0.1	< 0.1	*	0.12	0.12	*	20	20
Vanadium	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	*	< 5	< 5	*	< 5	< 5	*	< 5	< 5	*	n/a	n/a
Zinc	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	*	< 5	< 5	*	< 5	< 5	*	< 5	< 5	*	5,000	5,000

Associated Maxxam file: B225817, B255954, B255959, B286622, B287204, B287205, B2B3121, B2B3568.

All terms defined within the body of SLE's report.

< Denotes concentration less than indicated detection limit or RPD less than indicated value.

- Denotes analysis not conducted.

n/a Denotes no applicable standard.

* RPDs are not normally calculated where one or more concentrations are less than five times MDL.

AO Denotes aesthetic objective.

BOLD	Concentration greater than CSR Drinking Water (DW) standard.
SHADOW	Concentration greater than or equal to Canadian Drinking Water Quality Drinking Water (DW) guideline.

^a As per Stage 8 amendments to the CSR (January 25, 2013).

Table 4 (Cont'd): Historical Groundwater Analytical Results by SNC Lavalin 2012: Summary of Analytical Results for Dissolved Inorganics in Groundwater

Sample Location Sample ID Sample Date (yyyy mm dd)		MW09-13B			MW10-17B				MW10-11	MW11-2			BC Standards	
		W09-13B-120628 2012 06 28	MW09-13B-120926 2012 09 26	MW09-13B-121213 2012 12 13	W10-17B-120328 2012 03 28	W10-17B-120628 2012 06 28	MW10-17B-120926 2012 09 26/27	MW10-17B-121213 2012 12 13/14	W10-11-120328 2012 03 28	W11-2-120628 2012 06 28	MW11-2-120926 2012 09 26	MW11-2-121213 2012 12 13/14	CSR Drinking Water (DW)	Canadian Drinking Water Quality (DW)
Parameter	Units	Analytical Results												
Physical Parameters														
Hardness	µg/L	100,000	104,000	109,000	103,000	101,000	107,000	110,000	41,500	39,700	40,600	42,000	n/a	n/a
pH (field)	pH	7.64	7.75	7.21	9.28	7.51	7.22	7.07	8.44	7.92	7.92	8.07	n/a	n/a
Turbidity	NTU	3.96	1.93	1.73	30.7	61.9	20.7	40.4	234	461	162	74.6	n/a	n/a
Total Dissolved Solids	µg/L	166,000	104,000	156,000	138,000	140,000	146,000	134,000	214,000	206,000	195,000	172,000	n/a	500,000
Dissolved Inorganics														
Nitrate Nitrogen	µg/L	7,720	7,690	8,060	2,380	2,540	2,620	2,620	162	35	< 20	123	10,000	45,000
Nitrite Nitrogen	µg/L	< 5	< 5	< 5	26	< 5	< 5	< 5	< 5	58.6	< 5	< 5	3,200	3,200
Nitrate+Nitrite Nitrogen	µg/L	7,720	7,690	8,060	2,410	2,540	2,620	2,620	162	94	< 20	123	10,000	n/a
Sulphate	µg/L	13,900	14,100	14,000	15,700	15,900	16,900	16,200	35,300	29,000	18,800	16,600	500,000	500,000 (AO)
Total Alkalinity (as CaCO3)	µg/L	66,000	67,300	68,900	92,700	88,400	90,300	98,600	133,000	112,000	101,000	103,000	n/a	n/a
Alkalinity, Phenolphthalein (as CaCO3)	µg/L	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	n/a	n/a
Bicarbonate HCO3	µg/L	80,500	82,100	84,100	113,000	108,000	110,000	120,000	163,000	137,000	124,000	125,000	n/a	n/a
Carbonate CO3	µg/L	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	n/a	n/a
Hydroxide	µg/L	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	n/a	n/a
Geochemical Indicators														
Dissolved Aluminum	µg/L	5.5	< 3	< 3	20	19.5	3.7	4.1	11.8	7.7	12.4	9.2	9,500	100 (AO)
Dissolved Calcium	µg/L	23,400	24,400	25,200	25,100	24,200	25,500	26,200	10,300	9,710	9,750	9,860	n/a	n/a
Dissolved Iron	µg/L	< 5	< 5	< 5	148	193	40.8	29.7	< 5	37.8	12	< 5	n/a ^a	300 (AO)
Dissolved Magnesium	µg/L	10,100	10,500	11,100	9,820	9,950	10,400	10,900	3,810	3,740	3,950	4,220	100,000	n/a
Dissolved Manganese	µg/L	< 1	< 1	< 1	300	61.9	28.4	10.1	195	189	105	110	n/a ^a	50 (AO)
Dissolved Potassium	µg/L	1,510	1,620	1,690	1,340	1,220	1,210	1,200	6,300	5,960	6,440	6,330	n/a	n/a
Dissolved Sodium	µg/L	6,950	7,610	8,030	5,990	5,620	5,890	6,140	32,300	29,900	40,800	35,100	200,000	200,000 (AO)
Dissolved Metals														
Antimony	µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	6	6
Arsenic	µg/L	1.19	1.36	1.49	1.34	0.59	0.16	0.16	9.74	10.5	12.5	13.2	10	10
Barium	µg/L	10.2	11.2	11.4	20	16.9	18.4	16.2	14.6	13.1	13.9	12.9	1,000	1,000
Beryllium	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/a	n/a
Boron	µg/L	< 50	< 50	< 50	< 50	< 50	< 50	< 50	58	61	62	68	5,000	5,000
Cadmium	µg/L	< 0.01	< 0.01	< 0.01	0.028	0.034	0.043	0.037	0.019	< 0.01	< 0.01	< 0.01	5	5
Chromium	µg/L	2.6	2.9	2.9	< 1	< 1	2.1	2.3	< 1	< 1	< 1	< 1	50	50
Cobalt	µg/L	< 0.5	< 0.5	< 0.5	2.47	0.63	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	n/a	n/a
Copper	µg/L	0.26	0.22	0.21	0.55	< 0.2	0.32	< 0.2	0.4	< 0.2	0.49	< 0.2	1,000	1,000 (AO)
Lead	µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	10	10
Lithium	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	730	n/a
Mercury	µg/L	< 0.05	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05	1	1
Molybdenum	µg/L	< 1	< 1	< 1	1.5	< 1	< 1	< 1	4.8	4.5	4.3	4.3	250	n/a
Nickel	µg/L	< 1	< 1	< 1	3.9	1.8	1.8	1.5	1.4	< 1	< 1	< 1	n/a	n/a
Selenium	µg/L	0.18	0.22	0.23	0.23	0.22	0.26	0.19	< 0.1	< 0.1	0.16	< 0.1	10	10
Silver	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	n/a	n/a
Thallium	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	n/a	n/a
Titanium	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	n/a	n/a
Uranium	µg/L	< 0.1	< 0.1	0.12	0.12	< 0.1	< 0.1	< 0.1	0.31	0.2	0.27	0.19	20	20
Vanadium	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	n/a	n/a
Zinc	µg/L	< 5	< 5	< 5	6.5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	5,000	5,000

Associated Maxxam file: B225817, B255954, B255959, B286622, B287204, B287205, B2B3121, B2B3568.

All terms defined within the body of SLE's report.

< Denotes concentration less than indicated detection limit or RPD less than indicated value.

- Denotes analysis not conducted.

n/a Denotes no applicable standard.

* RPDs are not normally calculated where one or more concentrations are less than five times MDL.

AO Denotes aesthetic objective.

BOLD	Concentration greater than CSR Drinking Water (DW) standard.
SHADOW	Concentration greater than or equal to Canadian Drinking Water Quality Drinking Water (DW) guideline.

^a As per Stage 8 amendments to the CSR (January 25, 2013).

Table 4 (Cont'd): Historical Groundwater Analytical Results by SNC Lavalin 2012: Summary of Analytical Results for Dissolved Inorganics in Groundwater

Sample Location		MW11-4			MW11-5			
Sample ID	Sample Date (yyyy mm dd)	W11-4-120628 2012 06 28	MW11-4-120926 2012 09 26	MW11-4-121213 2012 12 13/14	W11-5-120328 2012 03 28	W11-5-120628 2012 06 28	MW11-5-120926 2012 09 26	MW11-5-121213 2012 12 13
Parameter	Units	Analytical Results						
Physical Parameters								
Hardness	µg/L	120,000	135,000	146,000	143,000	153,000	153,000	160,000
pH (field)	pH	6.7	7.24	6.86	8.58	8.09	8.98	8.05
Turbidity	NTU	52.4	129	0.56	17.1	6.94	162	10.1
Total Dissolved Solids	µg/L	154,000	134,000	48,000	194,000	192,000	178,000	176,000
Dissolved Inorganics								
Nitrate Nitrogen	µg/L	4,070	3,200	< 20	992	< 20	2,420	2,270
Nitrite Nitrogen	µg/L	22.9	< 5	< 5	19	< 5	650	704
Nitrate+Nitrite Nitrogen	µg/L	4,090	3,200	< 20	1,010	< 20	3,070	2,970
Sulphate	µg/L	14,900	12,000	2,950	45,900	36,600	31,900	32,700
Total Alkalinity (as CaCO3)	µg/L	102,000	127,000	37,500	112,000	99,800	120,000	117,000
Alkalinity, Phenolphthalein (as CaCO3)	µg/L	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Bicarbonate HCO3	µg/L	124,000	155,000	45,700	136,000	122,000	147,000	142,000
Carbonate CO3	µg/L	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Hydroxide	µg/L	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Geochemical Indicators								
Dissolved Aluminum	µg/L	< 3	< 3	< 3	5.9	5.5	4.4	5.7
Dissolved Calcium	µg/L	30,300	33,800	36,300	38,300	40,900	41,000	42,600
Dissolved Iron	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Dissolved Magnesium	µg/L	10,700	12,400	13,500	11,400	12,300	12,400	13,000
Dissolved Manganese	µg/L	< 1	< 1	< 1	63.7	53.7	58.2	55.9
Dissolved Potassium	µg/L	1,860	1,940	2,040	3,980	4,340	4,270	4,370
Dissolved Sodium	µg/L	6,220	6,810	7,470	7,230	6,310	6,340	6,630
Dissolved Metals								
Antimony	µg/L	< 0.5	< 0.5	< 0.5	1.76	1.99	1.51	1.65
Arsenic	µg/L	0.27	0.25	0.26	2.55	2.47	2.76	2.73
Barium	µg/L	9.9	10.5	11.7	74.2	90.6	92.4	94.3
Beryllium	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron	µg/L	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Cadmium	µg/L	0.014	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chromium	µg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Copper	µg/L	< 0.2	0.37	< 0.2	0.23	0.38	0.71	0.33
Lead	µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Lithium	µg/L	< 5	< 5	< 5	5.6	6	5.8	5.7
Mercury	µg/L	< 0.05	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Molybdenum	µg/L	< 1	< 1	< 1	1.9	1.2	1.2	1.2
Nickel	µg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Selenium	µg/L	0.34	0.27	0.69	0.58	0.66	0.69	0.71
Silver	µg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Thallium	µg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Uranium	µg/L	0.12	0.14	0.16	1.55	1.5	1.4	1.44
Vanadium	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Zinc	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5

Associated Maxxam file: B225817, B255954, B255959, B286622, B287204, B287205, B2B3121, B2B3568.

All terms defined within the body of SLE's report.

< Denotes concentration less than indicated detection limit or RPD less than indicated value.

- Denotes analysis not conducted.

n/a Denotes no applicable standard.

* RPDs are not normally calculated where one or more concentrations are less than five times MDL.

AO Denotes aesthetic objective.

BOLD	Concentration greater than CSR Drinking Water (DW) standard.
SHADOW	Concentration greater than or equal to Canadian Drinking Water Quality Drinking Water (DW) guideline.

^a As per Stage 8 amendments to the CSR (January 25, 2013).

SS12	BC Standards	
SS12-1-120927 2012 09 27	CSR Drinking Water (DW)	Canadian Drinking Water Quality (DW)
109,000	n/a	n/a
-	n/a	n/a
2.56	n/a	n/a
140,000	n/a	500,000
2,540	10,000	45,000
66	3,200	3,200
2,610	10,000	n/a
27,300	500,000	500,000 (AO)
90,000	n/a	n/a
< 500	n/a	n/a
110,000	n/a	n/a
< 500	n/a	n/a
< 500	n/a	n/a
-	9,500	100 (AO)
-	n/a	n/a
-	n/a ^a	300 (AO)
-	100,000	n/a
-	n/a ^a	50 (AO)
-	n/a	n/a
-	200,000	200,000 (AO)
-	6	6
-	10	10
-	1,000	1,000
-	n/a	n/a
-	5,000	5,000
-	5	5
-	50	50
-	n/a	n/a
-	1,000	1,000 (AO)
-	10	10
-	730	n/a
-	1	1
-	250	n/a
-	n/a	n/a
-	10	10
-	n/a	n/a
-	n/a	n/a
-	n/a	n/a
-	20	20
-	n/a	n/a
-	5,000	5,000

Table 5: Historical Groundwater Analytical Results by SNC Lavalin 2012: Summary of Analytical Results for Total Metals and Bacteriological Parameters in Groundwater

Sample Location		MW09-1				MW09-6											BC Standards		
Sample ID Sample Date (yyyy mm dd)		W09-1-120328 2012 03 28	W09-1-120628 2012 06 28	MW09-1-120927 2012 09 27	MW09-1-121213 2012 12 13	W09-6-120328 2012 03 28	W12-A-120328 Duplicate of W09-6-120328	QA/QC RPD %	W09-6-120628 2012 06 28	W12-A-120628 Duplicate of W09-6-120628	QA/QC RPD %	MW09-6-120927 2012 09 27	MW12-A-120927 Duplicate of MW09-6-120927	QA/QC RPD %	MW09-6-121213 2012 12 13	MW12-A-121213 Duplicate of MW09-6-121213	QA/QC RPD %	CSR Drinking Water (DW)	Canadian Drinking Water Quality (DW)
Parameter	Units	Analytical Results																	
Physical Parameters																			
Hardness	µg/L	78,900	79,300	83,500	85,600	109,000	108,000	< 1	105,000	107,000	2	117,000	117,000	0	126,000	124,000	2	n/a	n/a
pH (field)	pH	8.54	7.82	8.5	8.38	7.49	7.49	0	7.63	7.63	0	7.49	7.49	0	7.19	7.19	0	n/a	n/a
Turbidity	NTU	0.46	4.09	1.39	0.13	3.87	5.16	29	2.52	2.3	9	0.55	0.44	*	18	12.5	36	n/a	n/a
Total Dissolved Solids	µg/L	122,000	118,000	114,000	124,000	146,000	142,000	3	138,000	140,000	1	134,000	148,000	10	136,000	172,000	23	n/a	500,000
Biochemical oxygen demand	mg/L	-	-	< 10	-	-	-	-	-	-	-	< 10	< 10	*	-	-	-	n/a	n/a
Chemical oxygen demand	mg/L	-	-	< 10	-	-	-	-	-	-	-	< 10	< 10	*	-	-	-	n/a	n/a
Total Metals																			
Aluminum	µg/L	6	-	-	-	114	125	9	-	-	-	-	-	-	-	-	-	9,500	100 (AO)
Antimony	µg/L	< 0.5	-	-	-	< 0.5	< 0.5	*	-	-	-	-	-	-	-	-	-	6	6
Arsenic	µg/L	8.7	-	-	-	0.6	0.5	18	-	-	-	-	-	-	-	-	-	10	10
Barium	µg/L	41	-	-	-	20	21	5	-	-	-	-	-	-	-	-	-	1,000	1,000
Beryllium	µg/L	< 0.1	-	-	-	< 0.1	< 0.1	*	-	-	-	-	-	-	-	-	-	n/a	n/a
Bismuth	µg/L	< 1	-	-	-	< 1	< 1	*	-	-	-	-	-	-	-	-	-	n/a	n/a
Boron	µg/L	< 50	-	-	-	< 50	< 50	*	-	-	-	-	-	-	-	-	-	5,000	5,000
Cadmium	µg/L	< 0.01	-	-	-	0.05	0.19	117	-	-	-	-	-	-	-	-	-	5	5
Calcium	µg/L	20,100	-	-	-	27,300	28,800	5	-	-	-	-	-	-	-	-	-	n/a	n/a
Chromium	µg/L	< 1	-	-	-	< 1	< 1	*	-	-	-	-	-	-	-	-	-	50	50
Cobalt	µg/L	< 0.5	-	-	-	< 0.5	< 0.5	*	-	-	-	-	-	-	-	-	-	n/a	n/a
Copper	µg/L	< 0.2	-	-	-	0.7	0.7	*	-	-	-	-	-	-	-	-	-	1,000	1,000 (AO)
Iron	µg/L	65	-	-	-	146	158	8	-	-	-	-	-	-	-	-	-	n/a ^c	300 (AO)
Lead	µg/L	< 0.2	-	-	-	< 0.2	< 0.2	*	-	-	-	-	-	-	-	-	-	10	10
Lithium	µg/L	< 5	-	-	-	< 5	< 5	*	-	-	-	-	-	-	-	-	-	730	n/a
Magnesium	µg/L	8,160	-	-	-	10,200	10,500	3	-	-	-	-	-	-	-	-	-	100,000	n/a
Manganese	µg/L	62	-	-	-	30	26	14	-	-	-	-	-	-	-	-	-	n/a ^c	50 (AO)
Mercury	µg/L	< 0.05	-	-	-	< 0.05	< 0.05	*	-	-	-	-	-	-	-	-	-	1	1
Molybdenum	µg/L	2	-	-	-	< 1	< 1	*	-	-	-	-	-	-	-	-	-	250	n/a
Nickel	µg/L	< 1	-	-	-	4	3	*	-	-	-	-	-	-	-	-	-	n/a	n/a
Potassium	µg/L	3,120	-	-	-	1,380	1,360	2	-	-	-	-	-	-	-	-	-	n/a	n/a
Selenium	µg/L	< 0.1	-	-	-	1	0.9	11	-	-	-	-	-	-	-	-	-	10	10
Silicon	µg/L	8,850	-	-	-	8,230	8,740	6	-	-	-	-	-	-	-	-	-	n/a	n/a
Silver	µg/L	< 0.02	-	-	-	< 0.02	< 0.02	*	-	-	-	-	-	-	-	-	-	n/a	n/a
Sodium	µg/L	12,900	-	-	-	5,370	5,250	2	-	-	-	-	-	-	-	-	-	200,000	200,000 (AO)
Strontium	µg/L	74	-	-	-	102	103	< 1	-	-	-	-	-	-	-	-	-	22,000	n/a
Sulphur	µg/L	3,700	-	-	-	3,700	< 3,000	*	-	-	-	-	-	-	-	-	-	n/a	n/a
Thallium	µg/L	< 0.05	-	-	-	< 0.05	< 0.05	*	-	-	-	-	-	-	-	-	-	n/a	n/a
Tin	µg/L	< 5	-	-	-	< 5	< 5	*	-	-	-	-	-	-	-	-	-	22,000	n/a
Titanium	µg/L	< 5	-	-	-	8	7	*	-	-	-	-	-	-	-	-	-	n/a	n/a
Uranium	µg/L	< 0.1	-	-	-	< 0.1	< 0.1	*	-	-	-	-	-	-	-	-	-	20	20
Vanadium	µg/L	< 5	-	-	-	< 5	< 5	*	-	-	-	-	-	-	-	-	-	n/a	n/a
Zinc	µg/L	< 5	-	-	-	< 5	< 5	*	-	-	-	-	-	-	-	-	-	5,000	5,000
Zirconium	µg/L	< 0.5	-	-	-	< 0.5	< 0.5	*	-	-	-	-	-	-	-	-	-	n/a	n/a
Bacteriological Parameters																			
Fecal Coliform	MPN/0.1L	-	-	-	< 1	-	-	-	-	-	-	-	-	-	< 1	< 1	*	n/a	0 per 100 mL
Total Coliform	MPN/0.1L	< 1	< 1	< 1	< 1	< 1	< 1	*	< 1	< 1	*	< 1	< 1	*	1	< 1	*	n/a	0 per 100 mL
E.coli (MPN/100mL)	MPN/0.1L	< 1	< 1	< 1	-	< 1	< 1	*	< 1	< 1	*	< 1	< 1	*	-	-	-	n/a	0 per 100 mL

Associated Maxxam file: B225817, B255954, B255959, B286622, B287204, B287205, B2B3121, B2B3568.

All terms defined within the body of SLE's report.

< Denotes concentration less than indicated detection limit or RPD less than indicated value.

- Denotes analysis not conducted.

n/a Denotes no applicable standard.

* RPDs are not normally calculated where one or more concentrations are less than five times MDL.

AO Denotes aesthetic objective.

BOLD Concentration greater than CSR Drinking Water (DW) standard.

SHADOW Concentration greater than or equal to Canadian Drinking Water Quality Drinking Water (DW) guideline.

^a Minimum total coliform count due to high bacterial growth interference.

^b Laboratory detection limit exceeds regulatory standard.

^c As per Stage 8 amendments to the CSR (January 25, 2013).

Table 5 (Cont'd): Historical Groundwater Analytical Results by SNC Lavalin 2012: Summary of Analytical Results for Total Metals and Bacteriological Parameters in Groundwater

Sample Location		MW09-13B			MW10-11	MW10-17B			MW11-2			BC Standards		
Sample ID		W09-13B-120628	MW09-13B-120926	MW09-13B-121213	W10-11-120328	W10-17B-120328	W10-17B-120628	MW10-17B-120926	MW10-17B-121213	W11-2-120628	MW11-2-120926	MW11-2-121213	CSR Drinking Water (DW)	Canadian Drinking Water Quality (DW)
Sample Date (yyyy mm dd)		2012 06 28	2012 09 26/27	2012 12 13	2012 03 28	2012 03 28	2012 06 28	2012 09 26/27	2012 12 13/14	2012 06 28	2012 09 26/27	2012 12 13/14		
Parameter	Units	Analytical Results												
Physical Parameters														
Hardness	µg/L	100,000	104,000	109,000	41,500	103,000	101,000	107,000	110,000	39,700	40,600	42,000	n/a	n/a
pH (field)	pH	7.64	7.75	7.21	8.44	9.28	7.51	7.22	7.07	7.92	7.92	8.07	n/a	n/a
Turbidity	NTU	3.96	1.93	1.73	234	30.7	61.9	20.7	40.4	461	162	74.6	n/a	n/a
Total Dissolved Solids	µg/L	166,000	104,000	156,000	214,000	138,000	140,000	146,000	134,000	206,000	195,000	172,000	n/a	500,000
Biochemical oxygen demand	mg/L	-	< 10	-	-	-	-	< 10	-	-	-	-	n/a	n/a
Chemical oxygen demand	mg/L	-	< 10	-	-	-	-	< 10	-	-	-	-	n/a	n/a
Total Metals														
Aluminum	µg/L	-	-	-	8,150	1,550	-	-	-	-	-	-	9,500	100 (AO)
Antimony	µg/L	-	-	-	< 0.5	< 0.5	-	-	-	-	-	-	6	6
Arsenic	µg/L	-	-	-	7.4	1.2	-	-	-	-	-	-	10	10
Barium	µg/L	-	-	-	90	39	-	-	-	-	-	-	1,000	1,000
Beryllium	µg/L	-	-	-	0.6	< 0.1	-	-	-	-	-	-	n/a	n/a
Bismuth	µg/L	-	-	-	< 1	< 1	-	-	-	-	-	-	n/a	n/a
Boron	µg/L	-	-	-	57	< 50	-	-	-	-	-	-	5,000	5,000
Cadmium	µg/L	-	-	-	0.23	0.13	-	-	-	-	-	-	5	5
Calcium	µg/L	-	-	-	21,300	27,400	-	-	-	-	-	-	n/a	n/a
Chromium	µg/L	-	-	-	13	4	-	-	-	-	-	-	50	50
Cobalt	µg/L	-	-	-	4.9	1.9	-	-	-	-	-	-	n/a	n/a
Copper	µg/L	-	-	-	13.5	3.8	-	-	-	-	-	-	1,000	1,000 (AO)
Iron	µg/L	-	-	-	9,640	2,350	-	-	-	-	-	-	n/a ^c	300 (AO)
Lead	µg/L	-	-	-	4.1	0.8	-	-	-	-	-	-	10	10
Lithium	µg/L	-	-	-	8	< 5	-	-	-	-	-	-	730	n/a
Magnesium	µg/L	-	-	-	10,000	10,900	-	-	-	-	-	-	100,000	n/a
Manganese	µg/L	-	-	-	433	180	-	-	-	-	-	-	n/a ^c	50 (AO)
Mercury	µg/L	-	-	-	< 0.05	< 0.05	-	-	-	-	-	-	1	1
Molybdenum	µg/L	-	-	-	9	1	-	-	-	-	-	-	250	n/a
Nickel	µg/L	-	-	-	15	6	-	-	-	-	-	-	n/a	n/a
Potassium	µg/L	-	-	-	8,530	1,550	-	-	-	-	-	-	n/a	n/a
Selenium	µg/L	-	-	-	0.2	0.3	-	-	-	-	-	-	10	10
Silicon	µg/L	-	-	-	22,900	12,800	-	-	-	-	-	-	n/a	n/a
Silver	µg/L	-	-	-	0.05	0.04	-	-	-	-	-	-	n/a	n/a
Sodium	µg/L	-	-	-	44,700	6,720	-	-	-	-	-	-	200,000	200,000 (AO)
Strontium	µg/L	-	-	-	169	133	-	-	-	-	-	-	22,000	n/a
Sulphur	µg/L	-	-	-	10,700	< 3,000	-	-	-	-	-	-	n/a	n/a
Thallium	µg/L	-	-	-	0.09	< 0.05	-	-	-	-	-	-	n/a	n/a
Tin	µg/L	-	-	-	9	< 5	-	-	-	-	-	-	22,000	n/a
Titanium	µg/L	-	-	-	334	72	-	-	-	-	-	-	n/a	n/a
Uranium	µg/L	-	-	-	2.7	0.1	-	-	-	-	-	-	20	20
Vanadium	µg/L	-	-	-	16	< 5	-	-	-	-	-	-	n/a	n/a
Zinc	µg/L	-	-	-	29	14	-	-	-	-	-	-	5,000	5,000
Zirconium	µg/L	-	-	-	3	< 0.5	-	-	-	-	-	-	n/a	n/a
Bacteriological Parameters														
Fecal Coliform	MPN/0.1L	-	-	< 1	-	-	-	-	-	-	-	-	n/a	0 per 100 mL
Total Coliform	MPN/0.1L	< 1	< 1	8	380 ^a	< 1	36	25	1,200	100	< 10 ^b	350	n/a	0 per 100 mL
E.coli (MPN/100mL)	MPN/0.1L	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 10 ^b	< 1	n/a	0 per 100 mL

Associated Maxxam file: B225817, B255954, B255959, B286622, B287204, B287205, B2B3121, B2B3568.

All terms defined within the body of SLE's report.

< Denotes concentration less than indicated detection limit or RPD less than indicated value.

- Denotes analysis not conducted.

n/a Denotes no applicable standard.

* RPDs are not normally calculated where one or more concentrations are less than five times MDL.

AO Denotes aesthetic objective.

BOLD Concentration greater than CSR Drinking Water (DW) standard.

SHADOW Concentration greater than or equal to Canadian Drinking Water Quality Drinking Water (DW) guideline.

^a Minimum total coliform count due to high bacterial growth interference.

^b Laboratory detection limit exceeds regulatory standard.

^c As per Stage 8 amendments to the CSR (January 25, 2013).

Table 5 (Cont'd): Historical Groundwater Analytical Results by SNC Lavalin 2012: Summary of Analytical Results for Total Metals and Bacteriological Parameters in Groundwater

Sample Location		MW11-4			MW11-5			s.21	BC Standards		
Sample ID	Sample Date (yyyy mm dd)	W11-4-120628 2012 06 28	MW11-4-120926 2012 09 26/27	MW11-4-121213 2012 12 13/14	W11-5-120328 2012 03 28	W11-5-120628 2012 06 28	MW11-5-120926 2012 09 26/27		MW11-5-121213 2012 12 13	CSR Drinking Water (DW)	Canadian Drinking Water Quality (DW)
Parameter	Units	Anal									
Physical Parameters											
Hardness	µg/L	120,000	135,000	146,000	143,000	153,000	153,000		160,000	n/a	n/a
pH (field)	pH	6.7	7.24	6.86	8.58	8.09	8.98	8.05	n/a	n/a	
Turbidity	NTU	52.4	129	0.56	17.1	6.94	162	10.1	n/a	n/a	
Total Dissolved Solids	µg/L	154,000	134,000	48,000	194,000	192,000	178,000	176,000	n/a	500,000	
Biochemical oxygen demand	mg/L	-	< 10	-	-	-	< 10	-	n/a	n/a	
Chemical oxygen demand	mg/L	-	12	-	-	-	< 10	-	n/a	n/a	
Total Metals											
Aluminum	µg/L	-	-	-	1,080	-	-	-	9,500	100 (AO)	
Antimony	µg/L	-	-	-	1.6	-	-	-	6	6	
Arsenic	µg/L	-	-	-	3.3	-	-	-	10	10	
Barium	µg/L	-	-	-	79	-	-	-	1,000	1,000	
Beryllium	µg/L	-	-	-	< 0.1	-	-	-	n/a	n/a	
Bismuth	µg/L	-	-	-	< 1	-	-	-	n/a	n/a	
Boron	µg/L	-	-	-	< 50	-	-	-	5,000	5,000	
Cadmium	µg/L	-	-	-	0.03	-	-	-	5	5	
Calcium	µg/L	-	-	-	38,500	-	-	-	n/a	n/a	
Chromium	µg/L	-	-	-	2	-	-	-	50	50	
Cobalt	µg/L	-	-	-	0.7	-	-	-	n/a	n/a	
Copper	µg/L	-	-	-	3.5	-	-	-	1,000	1,000 (AO)	
Iron	µg/L	-	-	-	1,250	-	-	-	n/a ^c	300 (AO)	
Lead	µg/L	-	-	-	0.6	-	-	-	10	10	
Lithium	µg/L	-	-	-	7	-	-	-	730	n/a	
Magnesium	µg/L	-	-	-	10,900	-	-	-	100,000	n/a	
Manganese	µg/L	-	-	-	55	-	-	-	n/a ^c	50 (AO)	
Mercury	µg/L	-	-	-	< 0.05	-	-	-	1	1	
Molybdenum	µg/L	-	-	-	5	-	-	-	250	n/a	
Nickel	µg/L	-	-	-	3	-	-	-	n/a	n/a	
Potassium	µg/L	-	-	-	4,450	-	-	-	n/a	n/a	
Selenium	µg/L	-	-	-	0.7	-	-	-	10	10	
Silicon	µg/L	-	-	-	6,270	-	-	-	n/a	n/a	
Silver	µg/L	-	-	-	< 0.02	-	-	-	n/a	n/a	
Sodium	µg/L	-	-	-	13,000	-	-	-	200,000	200,000 (AO)	
Strontium	µg/L	-	-	-	183	-	-	-	22,000	n/a	
Sulphur	µg/L	-	-	-	13,300	-	-	-	n/a	n/a	
Thallium	µg/L	-	-	-	< 0.05	-	-	-	n/a	n/a	
Tin	µg/L	-	-	-	< 5	-	-	-	22,000	n/a	
Titanium	µg/L	-	-	-	51	-	-	-	n/a	n/a	
Uranium	µg/L	-	-	-	2.3	-	-	-	20	20	
Vanadium	µg/L	-	-	-	< 5	-	-	-	n/a	n/a	
Zinc	µg/L	-	-	-	7	-	-	-	5,000	5,000	
Zirconium	µg/L	-	-	-	0.6	-	-	-	n/a	n/a	
Bacteriological Parameters											
Fecal Coliform	MPN/0.1L	-	-	-	-	-	-	< 1	n/a	0 per 100 mL	
Total Coliform	MPN/0.1L	64	< 10 ^b	48	< 1	< 1	< 10 ^b	< 1	n/a	0 per 100 mL	
<i>E.coli</i> ((MPN/100mL)	MPN/0.1L	< 1	< 10 ^b	< 1	< 1	< 1	< 10 ^b	-	n/a	0 per 100 mL	

Associated Maxxam file: B225817, B255954, B255959, B286622, B287204, B287205, B2B3121, B2B3568.

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SHADOW	Concentration greater than or equal to Canadian Drinking Water Quality Drinking Water (DW) guideline.

^a Minimum total coliform count due to high bacterial growth interference.

^b Laboratory detection limit exceeds regulatory standard.

^c As per Stage 8 amendments to the CSR (January 25, 2013).

Table 5 (Cont'd): Historical Groundwater Analytical Results by SNC Lavalin 2012: Summary of Analytical Results for Total Metals and Bacteriological Parameters in Groundwater

Sample Location Sample ID Sample Date (yyyy mm dd)		BC Standards	
Parameter	Units	CSR Drinking Water (DW)	Canadian Drinking Water Quality (DW)
Physical Parameters			
Hardness	µg/L	n/a	n/a
pH (field)	pH	n/a	n/a
Turbidity	NTU	n/a	n/a
Total Dissolved Solids	µg/L	n/a	500,000
Biochemical oxygen demand	mg/L	n/a	n/a
Chemical oxygen demand	mg/L	n/a	n/a
Total Metals			
Aluminum	µg/L	9,500	100 (AO)
Antimony	µg/L	6	6
Arsenic	µg/L	10	10
Barium	µg/L	1,000	1,000
Beryllium	µg/L	n/a	n/a
Bismuth	µg/L	n/a	n/a
Boron	µg/L	5,000	5,000
Cadmium	µg/L	5	5
Calcium	µg/L	n/a	n/a
Chromium	µg/L	50	50
Cobalt	µg/L	n/a	n/a
Copper	µg/L	1,000	1,000 (AO)
Iron	µg/L	n/a ^c	300 (AO)
Lead	µg/L	10	10
Lithium	µg/L	730	n/a
Magnesium	µg/L	100,000	n/a
Manganese	µg/L	n/a ^c	50 (AO)
Mercury	µg/L	1	1
Molybdenum	µg/L	250	n/a
Nickel	µg/L	n/a	n/a
Potassium	µg/L	n/a	n/a
Selenium	µg/L	10	10
Silicon	µg/L	n/a	n/a
Silver	µg/L	n/a	n/a
Sodium	µg/L	200,000	200,000 (AO)
Strontium	µg/L	22,000	n/a
Sulphur	µg/L	n/a	n/a
Thallium	µg/L	n/a	n/a
Tin	µg/L	22,000	n/a
Titanium	µg/L	n/a	n/a
Uranium	µg/L	20	20
Vanadium	µg/L	n/a	n/a
Zinc	µg/L	5,000	5,000
Zirconium	µg/L	n/a	n/a
Bacteriological Parameters			
Fecal Coliform	MPN/0.1L	n/a	0 per 100 mL
Total Coliform	MPN/0.1L	n/a	0 per 100 mL
<i>E.coli</i> (MPN/100mL)	MPN/0.1L	n/a	0 per 100 mL

Associated Maxxam file: B225817, B255954, B255959, B286622, B287204, B287205, B2B3121, B2B3568.

All terms defined within the body of SLE's report.

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^c As per Stage 8 amendments to the CSR (January 25, 2013).

FIGURES

Figure 1	Site Location Plan
Figure 2	Site Plan

Q:\Vancouver\Drafting\Environmental\2321\23203143-01\23203143-01 Fig.1_R0.dwg [FIGURE 1] May 28, 2014 - 9:19:32 am (BY: BUCHAN, CAMERON)



LEGEND

--- Canada/USA Border

0 2 500
Scale: 1: 50 000 (metres)

CLIENT



Ministry of
Transportation
and Infrastructure



TETRA TECH EBA

**BIANNUAL WATER MONITORING PROGRAM
STRONG PIT - ABBOTSFORD, BC**

SITE LOCATION PLAN

PROJECT NO.
V23203143-01

DWN
CB

CKD
JS

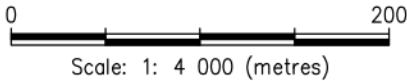
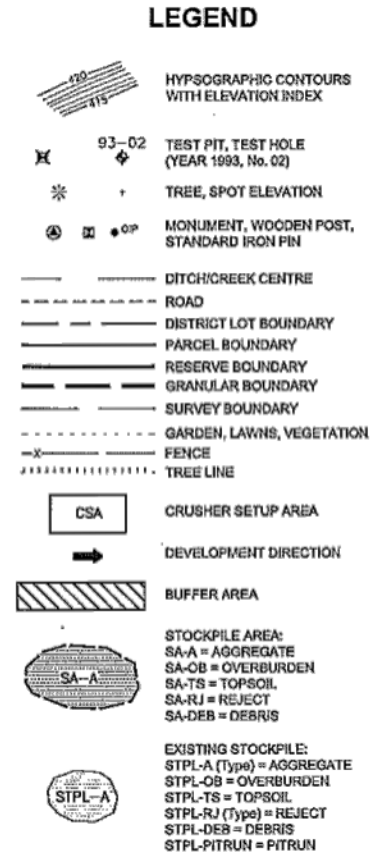
REV
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OFFICE
EBA-WHSE

DATE
July 10, 2013


Figure 1

Q:\Vancouver\Drafting\Environmental\23203143-01\23203143-01 Fig 2-3_R0.dwg [FIGURE 2] September 12, 2014 - 11:45:05 am (BY: BUCHAN, CAMERON)



- NOTES
1. IN 2012, A NEW WELL (W10-17B) WAS DRILLED ADJACENT TO THE ORIGINAL WELL W10-17.
2. IN 2012, A NEW WELL (W11-2) WAS DRILLED TO REPLACE W10-2 DUE TO THE OBSTRUCTION IDENTIFIED IN THE WELL.

ISSUED FOR USE

CLIENT		BIANNUAL WATER MONITORING PROGRAM STRONG PIT - ABBOTSFORD, BC			
 BRITISH COLUMBIA The Best Place on Earth		Ministry of Transportation and Infrastructure			
		SITE PLAN			
PROJECT NO. V23203143-01		DWN CB	CKD JS	REV 0	Figure 2
OFFICE EBA-WHSE		DATE July 10, 2013			

APPENDIX A

TETRA TECH EBA'S GEOENVIRONMENTAL REPORT - GENERAL CONDITIONS

GENERAL CONDITIONS

GEOENVIRONMENTAL REPORT

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Tetra Tech EBA's client. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Tetra Tech EBA's Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Tetra Tech EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. The Client warrants that Tetra Tech EBA's instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by Tetra Tech EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B

LABORATORY ANALYTICAL REPORT (DECEMBER 2014)



Tetra Tech EBA Inc.
ATTN: Jelena Sladojevic
Oceanic Plaza, 9th Floor
1066 West Hastings St.
Vancouver BC V6E 3X2

Date Received: 16-DEC-14
Report Date: 23-DEC-14 13:52 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L1559183
Project P.O. #: NOT SUBMITTED
Job Reference: V23203143
C of C Numbers: 10-217021
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1559183-1 Water 15-DEC-14 MW09-1	L1559183-2 Water 16-DEC-14 MW09-6	L1559183-3 Water 15-DEC-14 MW09-13B	L1559183-4 Water 16-DEC-14 MW10-17B	L1559183-6 Water 16-DEC-14 MW11-5
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	<5.0	12.1	<5.0	<5.0	<5.0
	Conductivity (uS/cm)	221	296	256	290	354
	Hardness (as CaCO3) (ug/L)	86400	142000	106000	139000	172000
	pH (pH)	8.21	7.93	7.92	7.70	8.27
	Total Dissolved Solids (ug/L)	133000	194000	172000	191000	224000
	Turbidity (NTU)	0.31	1.12	0.61	325	28.7
Anions and Nutrients	Bromide (Br) (ug/L)	<50	<50	<50	66	<50
	Chloride (Cl) (ug/L)	1520	6620	10600	5210	7350
	Fluoride (F) (ug/L)	98	51	34	24	41
	Nitrate (as N) (ug/L)	41.8	5780	6600	2770	3300
	Nitrite (as N) (ug/L)	<1.0	39.0	<1.0	<1.0	630
	Sulfate (SO4) (ug/L)	9240	16700	15700	17800	34700
Bacteriological Tests	E. coli (MPN/100mL)	<1	<1	<1	<1	<1
	Coliform Bacteria - Total (MPN/100mL)	9	<1	<1	2	6
Total Metals	Aluminum (Al)-Total (ug/L)					
	Antimony (Sb)-Total (ug/L)					
	Arsenic (As)-Total (ug/L)					
	Barium (Ba)-Total (ug/L)					
	Beryllium (Be)-Total (ug/L)					
	Boron (B)-Total (ug/L)					
	Cadmium (Cd)-Total (ug/L)					
	Calcium (Ca)-Total (ug/L)					
	Chromium (Cr)-Total (ug/L)					
	Cobalt (Co)-Total (ug/L)					
	Copper (Cu)-Total (ug/L)					
	Iron (Fe)-Total (ug/L)					
	Lead (Pb)-Total (ug/L)					
	Lithium (Li)-Total (ug/L)					
	Magnesium (Mg)-Total (ug/L)					
	Manganese (Mn)-Total (ug/L)					
	Mercury (Hg)-Total (ug/L)					
	Molybdenum (Mo)-Total (ug/L)					
	Nickel (Ni)-Total (ug/L)					
	Selenium (Se)-Total (ug/L)					
	Silver (Ag)-Total (ug/L)					
	Sodium (Na)-Total (ug/L)					

* 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	s.21 Water 15-DEC-14 s.21	L1559183-8 Water 15-DEC-14 DUP 2	s.21 Water 15-DEC-14 s.21	Water 15-DEC-14	Water 15-DEC-14	Water 15-DEC-14
Grouping	Analyte							
WATER			s.21	s.21				
Physical Tests	Colour, True (CU)			<5.0				
	Conductivity (uS/cm)			352				
	Hardness (as CaCO3) (ug/L)			174000				
	pH (pH)			8.28				
	Total Dissolved Solids (ug/L)			223000				
	Turbidity (NTU)			29.9				
Anions and Nutrients	Bromide (Br) (ug/L)			<50				
	Chloride (Cl) (ug/L)			7350				
	Fluoride (F) (ug/L)			42				
	Nitrate (as N) (ug/L)			3290				
	Nitrite (as N) (ug/L)			632				
	Sulfate (SO4) (ug/L)			34700				
Bacteriological Tests	E. coli (MPN/100mL)			<1				
	Coliform Bacteria - Total (MPN/100mL)			6				
Total Metals	Aluminum (Al)-Total (ug/L)							
	Antimony (Sb)-Total (ug/L)							
	Arsenic (As)-Total (ug/L)							
	Barium (Ba)-Total (ug/L)							
	Beryllium (Be)-Total (ug/L)							
	Boron (B)-Total (ug/L)							
	Cadmium (Cd)-Total (ug/L)							
	Calcium (Ca)-Total (ug/L)							
	Chromium (Cr)-Total (ug/L)							
	Cobalt (Co)-Total (ug/L)							
	Copper (Cu)-Total (ug/L)							
	Iron (Fe)-Total (ug/L)							
	Lead (Pb)-Total (ug/L)							
	Lithium (Li)-Total (ug/L)							
	Magnesium (Mg)-Total (ug/L)							
	Manganese (Mn)-Total (ug/L)							
	Mercury (Hg)-Total (ug/L)							
	Molybdenum (Mo)-Total (ug/L)							
	Nickel (Ni)-Total (ug/L)							
	Selenium (Se)-Total (ug/L)							
	Silver (Ag)-Total (ug/L)							
	Sodium (Na)-Total (ug/L)							

* 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	L1559183-13 Water 15-DEC-14 EQUIPMENT BLANK	L1559183-14 Water 15-DEC-14 TRAVEL BLANK	s.21 Water 15-DEC-14 s.21	L1559183-16 Water 15-DEC-14 MW10-11	
Grouping	Analyte						
WATER					s.21		
Physical Tests	Colour, True (CU)					<5.0	
	Conductivity (uS/cm)					198	
	Hardness (as CaCO3) (ug/L)					38400	
	pH (pH)					8.19	
	Total Dissolved Solids (ug/L)					134000	
	Turbidity (NTU)					9.80	
Anions and Nutrients	Bromide (Br) (ug/L)					<50	
	Chloride (Cl) (ug/L)					1230	
	Fluoride (F) (ug/L)					111	
	Nitrate (as N) (ug/L)					9.4	
	Nitrite (as N) (ug/L)					3.5	
	Sulfate (SO4) (ug/L)					11900	
Bacteriological Tests	E. coli (MPN/100mL)		<1	<1		<1	
	Coliform Bacteria - Total (MPN/100mL)		29	<1		2	
Total Metals	Aluminum (Al)-Total (ug/L)						
	Antimony (Sb)-Total (ug/L)						
	Arsenic (As)-Total (ug/L)						
	Barium (Ba)-Total (ug/L)						
	Beryllium (Be)-Total (ug/L)						
	Boron (B)-Total (ug/L)						
	Cadmium (Cd)-Total (ug/L)						
	Calcium (Ca)-Total (ug/L)						
	Chromium (Cr)-Total (ug/L)						
	Cobalt (Co)-Total (ug/L)						
	Copper (Cu)-Total (ug/L)						
	Iron (Fe)-Total (ug/L)						
	Lead (Pb)-Total (ug/L)						
	Lithium (Li)-Total (ug/L)						
	Magnesium (Mg)-Total (ug/L)						
	Manganese (Mn)-Total (ug/L)						
	Mercury (Hg)-Total (ug/L)						
	Molybdenum (Mo)-Total (ug/L)						
	Nickel (Ni)-Total (ug/L)						
	Selenium (Se)-Total (ug/L)						
	Silver (Ag)-Total (ug/L)						
	Sodium (Na)-Total (ug/L)						

* 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		L1559183-1 Water 15-DEC-14 MW09-1	L1559183-2 Water 16-DEC-14 MW09-6	L1559183-3 Water 15-DEC-14 MW09-13B	L1559183-4 Water 16-DEC-14 MW10-17B	L1559183-6 Water 16-DEC-14 MW11-5
Grouping	Analyte					
WATER						
Total Metals	Thallium (Tl)-Total (ug/L)					
	Titanium (Ti)-Total (ug/L)					
	Uranium (U)-Total (ug/L)					
	Vanadium (V)-Total (ug/L)					
	Zinc (Zn)-Total (ug/L)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (ug/L)	<10	<10	<10	<10	<10
	Antimony (Sb)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	1.38
	Arsenic (As)-Dissolved (ug/L)	7.3	<1.0	1.5	<1.0	2.6
	Barium (Ba)-Dissolved (ug/L)	41	22	<20	<20	94
	Beryllium (Be)-Dissolved (ug/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Boron (B)-Dissolved (ug/L)	<100	<100	<100	<100	<100
	Cadmium (Cd)-Dissolved (ug/L)	<0.050	<0.050	<0.050	0.050	<0.050
	Calcium (Ca)-Dissolved (ug/L)	20800	36200	24500	33700	47100
	Chromium (Cr)-Dissolved (ug/L)	<0.50	<0.50	3.04	2.72	<0.50
	Cobalt (Co)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Copper (Cu)-Dissolved (ug/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Iron (Fe)-Dissolved (ug/L)	64	<30	<30	<30	<30
	Lead (Pb)-Dissolved (ug/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Lithium (Li)-Dissolved (ug/L)	<50	<50	<50	<50	<50
	Magnesium (Mg)-Dissolved (ug/L)	8400	12600	10800	13300	13300
	Manganese (Mn)-Dissolved (ug/L)	52	23	<10	<10	60
	Mercury (Hg)-Dissolved (ug/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Molybdenum (Mo)-Dissolved (ug/L)	2.1	<1.0	<1.0	<1.0	1.0
	Nickel (Ni)-Dissolved (ug/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Selenium (Se)-Dissolved (ug/L)	<1.0	1.5	<1.0	<1.0	<1.0
	Silver (Ag)-Dissolved (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Sodium (Na)-Dissolved (ug/L)	13000	5600	7500	6600	6300
	Thallium (Tl)-Dissolved (ug/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Titanium (Ti)-Dissolved (ug/L)	<50	<50	<50	<50	<50
	Uranium (U)-Dissolved (ug/L)	<0.20	<0.20	<0.20	<0.20	1.22
	Vanadium (V)-Dissolved (ug/L)	<30	<30	<30	<30	<30
	Zinc (Zn)-Dissolved (ug/L)	<5.0	<5.0	<5.0	<5.0	<5.0

* 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		s.21 Water 15-DEC-14 s.21	L1559183-8 Water 15-DEC-14 DUP 2	s.21 Water 15-DEC-14 s.21	Water 15-DEC-14	Water 15-DEC-14
Grouping	Analyte					
WATER		s.21		s.21		
Total Metals	Thallium (Tl)-Total (ug/L)					
	Titanium (Ti)-Total (ug/L)					
	Uranium (U)-Total (ug/L)					
	Vanadium (V)-Total (ug/L)					
	Zinc (Zn)-Total (ug/L)					
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD			
	Dissolved Metals Filtration Location		FIELD			
	Aluminum (Al)-Dissolved (ug/L)		<10			
	Antimony (Sb)-Dissolved (ug/L)		1.46			
	Arsenic (As)-Dissolved (ug/L)		2.6			
	Barium (Ba)-Dissolved (ug/L)		95			
	Beryllium (Be)-Dissolved (ug/L)		<5.0			
	Boron (B)-Dissolved (ug/L)		<100			
	Cadmium (Cd)-Dissolved (ug/L)		<0.050			
	Calcium (Ca)-Dissolved (ug/L)		47500			
	Chromium (Cr)-Dissolved (ug/L)		<0.50			
	Cobalt (Co)-Dissolved (ug/L)		<0.50			
	Copper (Cu)-Dissolved (ug/L)		<1.0			
	Iron (Fe)-Dissolved (ug/L)		<30			
	Lead (Pb)-Dissolved (ug/L)		<1.0			
	Lithium (Li)-Dissolved (ug/L)		<50			
	Magnesium (Mg)-Dissolved (ug/L)		13500			
	Manganese (Mn)-Dissolved (ug/L)		61			
	Mercury (Hg)-Dissolved (ug/L)		<0.20			
	Molybdenum (Mo)-Dissolved (ug/L)		1.0			
	Nickel (Ni)-Dissolved (ug/L)		<5.0			
	Selenium (Se)-Dissolved (ug/L)		<1.0			
	Silver (Ag)-Dissolved (ug/L)		<0.050			
	Sodium (Na)-Dissolved (ug/L)		6300			
	Thallium (Tl)-Dissolved (ug/L)		<0.20			
	Titanium (Ti)-Dissolved (ug/L)		<50			
	Uranium (U)-Dissolved (ug/L)		1.29			
	Vanadium (V)-Dissolved (ug/L)		<30			
	Zinc (Zn)-Dissolved (ug/L)		<5.0			

* 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		L1559183-13 Water 15-DEC-14 EQUIPMENT BLANK	L1559183-14 Water 15-DEC-14 TRAVEL BLANK	s.21 Water 15-DEC-14 s.21	L1559183-16 Water 15-DEC-14 MW10-11	
Grouping	Analyte					
WATER				s.21		
Total Metals	Thallium (Tl)-Total (ug/L)					
	Titanium (Ti)-Total (ug/L)					
	Uranium (U)-Total (ug/L)					
	Vanadium (V)-Total (ug/L)					
	Zinc (Zn)-Total (ug/L)					
Dissolved Metals	Dissolved Mercury Filtration Location				FIELD	
	Dissolved Metals Filtration Location				FIELD	
	Aluminum (Al)-Dissolved (ug/L)				<10	
	Antimony (Sb)-Dissolved (ug/L)				<0.50	
	Arsenic (As)-Dissolved (ug/L)				11.8	
	Barium (Ba)-Dissolved (ug/L)				<20	
	Beryllium (Be)-Dissolved (ug/L)				<5.0	
	Boron (B)-Dissolved (ug/L)				<100	
	Cadmium (Cd)-Dissolved (ug/L)				<0.050	
	Calcium (Ca)-Dissolved (ug/L)				8710	
	Chromium (Cr)-Dissolved (ug/L)				<0.50	
	Cobalt (Co)-Dissolved (ug/L)				<0.50	
	Copper (Cu)-Dissolved (ug/L)				<1.0	
	Iron (Fe)-Dissolved (ug/L)				<30	
	Lead (Pb)-Dissolved (ug/L)				<1.0	
	Lithium (Li)-Dissolved (ug/L)				<50	
	Magnesium (Mg)-Dissolved (ug/L)				4040	
	Manganese (Mn)-Dissolved (ug/L)				40	
	Mercury (Hg)-Dissolved (ug/L)				<0.20	
	Molybdenum (Mo)-Dissolved (ug/L)				3.1	
	Nickel (Ni)-Dissolved (ug/L)				<5.0	
	Selenium (Se)-Dissolved (ug/L)				<1.0	
	Silver (Ag)-Dissolved (ug/L)				<0.050	
	Sodium (Na)-Dissolved (ug/L)				29100	
	Thallium (Tl)-Dissolved (ug/L)				<0.20	
	Titanium (Ti)-Dissolved (ug/L)				<50	
	Uranium (U)-Dissolved (ug/L)				<0.20	
	Vanadium (V)-Dissolved (ug/L)				<30	
	Zinc (Zn)-Dissolved (ug/L)				<5.0	

* 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	Nitrite (as N)	DLM	L1559183-1, -10, -12, -2, -3, -4, -6, -7, -8, -9
Duplicate	Bromide (Br)	DLM	L1559183-15, -16
Matrix Spike	Nitrate (as N)	MS-B	L1559183-15, -16
Matrix Spike	Copper (Cu)-Total	MS-B	L1559183-10, -12, -15, -7, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects.
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**
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.			
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.			
Concurrent measurement of sample pH is recommended.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
ECOLI-COLI-BCDW-VA	Water	E.coli by Colilert	APHA METHOD 9223
This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-DIS-CVAFS-VA	Water	Dissolved Mercury in Water by CVAFS	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).			
HG-TOT-CVAFS-VA	Water	Total Mercury in Water by CVAFS	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).			
MET-DIS-ICP-VA	Water	Dissolved Metals in Water by ICP-OES	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 procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-DIS-LOW-MS-VA	Water	Dissolved Metals in Water by ICPMS(Low)	EPA SW-846 3005A/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 involves preliminary sample treatment by filtration (EPA Method 3005A).			

Reference Information

Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TOT-ICP-VA Water Total Metals 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 (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-LOW-MS-VA Water Total Metals in Water by ICPMS(Low) EPA SW-846 3005A/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 either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-BCDW-VA Water Total coliform by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** 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
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VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
----	---

Chain of Custody Numbers:

10-217021

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 ww - 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.



L1559183-COFC

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

10-217021

Page ____ of ____

Report To		Report Format / Distribution		Service Request (Rush subject to availability - Contact ALS to confirm TAT)													
Company:	Tetra Tech EBA	Standard:	Other (specify):	<input checked="" type="checkbox"/> Regular (Standard Turnaround Times - Business Days)													
Contact:	1066 W. Hastings	Select:	PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital <input checked="" type="checkbox"/> Fax	Priority (2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT													
Address:		Email 1:	Matt.Hosford@TetraTech.com	Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT													
		Email 2:	Selena.Sindjovic@TetraTech.com	Same Day or Weekend Emergency - Contact ALS to confirm TAT													
Phone:	Fax:			Analysis Request													
Invoice To	Same as Report? (circle) Yes or No (if No, provide details)	Client / Project Information		(Indicate Filtered or Preserved, F/P)													
	Copy of Invoice with Report? (circle) Yes or No	Job #:															
Company:		PO / AFE:															
Contact:		LSD:															
Address:		Quote #:															
Phone:	Fax:																
Lab Work Order # (lab use only)		ALS Contact:	Sampler:														
Sample #	Sample Identification		Date	Time	Sample Type	Dissolved Metals	Nutrients (Nitrate)	Physical Parameters	Major Anions	Total Metals	Number of Containers						
	(This description will appear on the report)		(dd-mm-yy)	(hh:mm)													
	MW09-1		15-Dec-14		Water												4
	MW09-6		16														
	MW09-13B		15														
	MW10-17B		16														
	MW11-2		16														
	MW11-5		16														
	s.21		15														
	Duo 2		15														
s.21		15															
		15															
		15															
		15															
Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details																	
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:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:							
Matt Hosford	Dec/16/14		Shayon	Dec-16	15:25	7 °C				Yes / No ? If Yes add SIF							

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY

YELLOW - CLIENT COPY

Page 42 of 44 TRA-215-52510



L1559183-COFC

BC and YUKON Drinking Water Submission Form

In British Columbia, the Drinking Water Protection Act requires laboratories to immediately report positive results for Fecal Coliform and *Escherichia coli* in drinking water samples directly to the Water Supplier, the Drinking Water Officer, and the Medical Health Officer in the region the water samples were taken. Immediate reporting is not required if the sample is water for which a public advisory to boil for drinking water has been issued, or if the sample is not a drinking water.

Are your samples intended for human consumption in BC?

Yes

No

Does your water supply serve more than one family dwelling?

Yes

No

Please complete sections A, C and D – your samples are subject to BC DW Protection Act

Please complete sections A and B

Please submit samples by 1:00 pm Monday to Friday, or contact ALS to make other arrangements

A. Please complete this section for all Drinking Water (DW) Samples(s)

THIS COLUMN FOR LAB USE ONLY

all outside or pump house taps.

SAMPLE LOCATION (e.g. Kitchen Tap)

YY MM DD

DATE / TIME COLLECTED

TEST OPTIONS (Please tick below which tests you wish to complete on each sample)

INDIVIDUAL SAMPLE DECLARATION (please circle Yes/No if the following applies)

Total Coliform + E. Coli - Package A	Physicals + Dissolved Anions - Package B	Total Metals - Package C	Sample subject to BC DW Protection Act?	Boil Water Advisory in effect?
/	/	/	Y/N	Y/N
/	/	/	Y/N	Y/N
/	/	/	Y/N	Y/N
/	/	/	Y/N	Y/N
/	/	/	Y/N	Y/N

PLEASE TURN OVER TO COMPLETE FORM



L1559183-COFC

COLIFORM and E. COLI SAMPLE DECLARATION FORM (Page 2 of 2)

B. GENERAL INFORMATION - Please complete this section for all Drinking Water sample(s) and indicate whether rush or routine service is required by circling below

Contact Name: <i>Selena Stodjevic</i>		Service Required: ROUTINE RUSH	
Address: <i>1006 W. Hastings, 9th Fl Vancouver, BC</i>	Phone No: <i>(604) 685 0275</i>	Fax No: ()	After Hours / Emergency No: ()
Sampler (person who took the sample): <i>CS/MH</i>	Phone No: ()	Fax No: ()	After Hours / Emergency No: ()
Released By (sign below): <i>[Signature]</i>	Date: <i>16/12/2014</i>	Received By (For lab use only):	Date:

C. Please complete this section ONLY if the samples are BC Drinking Water sample(s)

Company, Water System Name or Name of Home Owner:

Address:	Phone No: ()	Fax No: ()	After Hours / Emergency No: ()
Water Supplier (name of person results should be sent to):	Phone No: ()	Fax No: ()	After Hours / Emergency No: ()
Sampler (Person who took the sample if different from above):	Phone No: ()	Fax No: ()	After Hours / Emergency No: ()

D. Please complete this section ONLY if the samples are subject to regulation under the Drinking Water Protection Act

Health Authority Region and/or Service Area:

Drinking Water Officer Name:	Phone No: ()	Fax No: ()	After Hours / Emergency No: ()
Medical Health Officer Name:	Phone No: ()	Fax No: ()	After Hours / Emergency No: ()

* There are five BC Health Authority Regions and 16 associated Health Service Delivery Areas.

- | | |
|-----------------------|---|
| 1. Northern: | Northwest, Northeast and Northern Interior |
| 2. Interior: | East Kootenay, Kootenay/Boundary, Okanagan and Thompson/Cariboo |
| 3. Vancouver Island: | North Vancouver Island, Central Vancouver Island and South Vancouver Island |
| 4. Vancouver Coastal: | North Shore/Coast-Capital, Vancouver and Richmond |
| 5. Fraser: | Fraser North, Fraser South and Fraser East |