REPORT

2017 WATER QUALITY MONITORING REPORT, REGIONAL BIOSOLIDS COMPOSTING FACILITY, 551 COMMONAGE ROAD, VERNON, BC

Submitted to:

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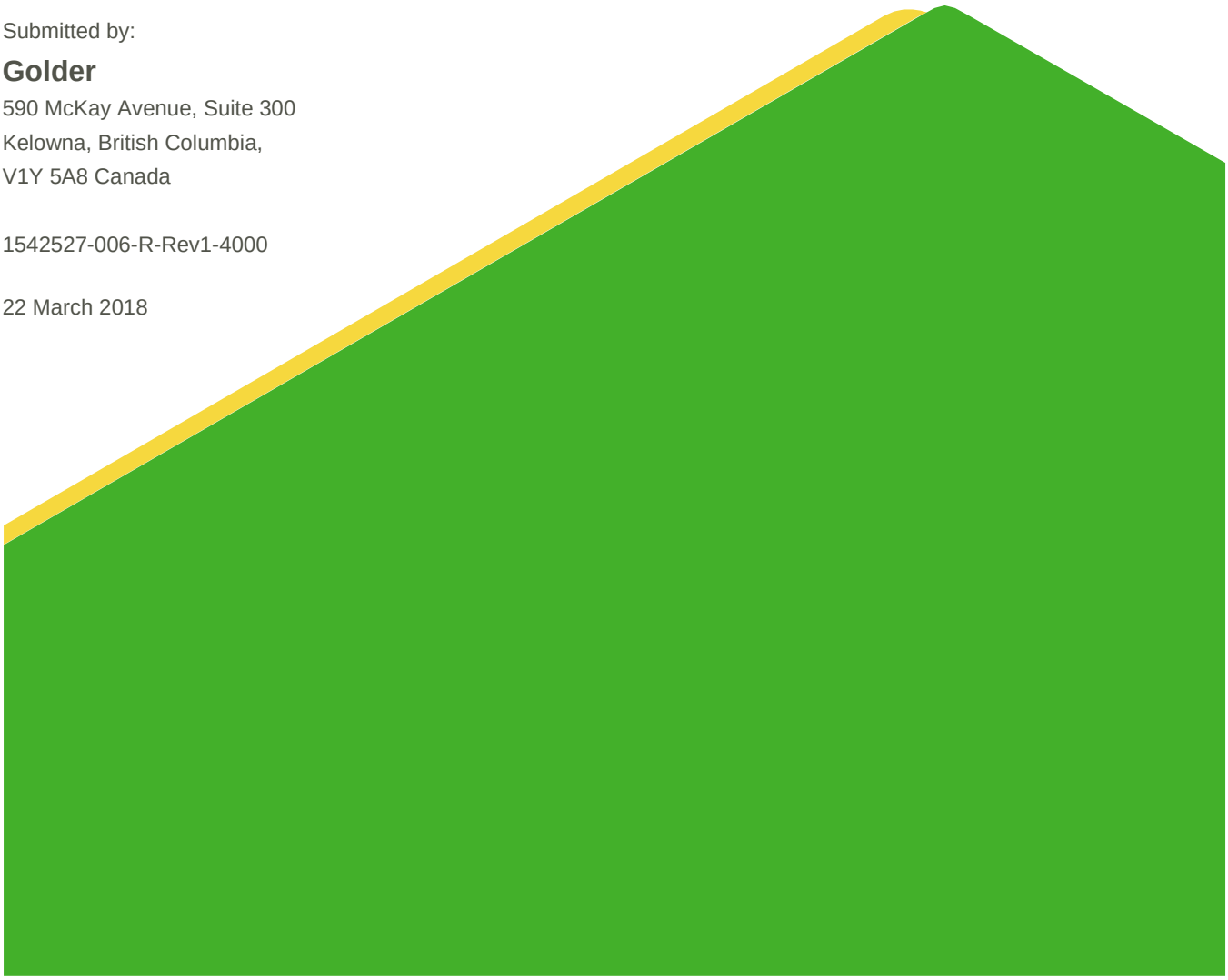
1542527-006-R-Rev1-4000

22 March 2018



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APPENDICES

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) is pleased to provide the City of Kelowna (CoK) with this monitoring report that documents the results of water quality monitoring completed in 2017 at the Regional Biosolids Composting Facility (RBCF) located at 551 Commonage Road in Vernon, BC (hereafter referred to as the Site). The monitoring data were collected by CoK personnel and provided to Golder for compiling this report.

It is our understanding that the purpose of the monitoring program is to assess potential leachate infiltration of stormwater runoff and leachate that is generated at the Site. The monitoring program satisfies the requirements of Ministry of Environment (MoE) discharge Permit 108537 with regards to implementing a surface water monitoring program at the Site (Section 4.2 of Permit). The monitoring program also addresses recommendations made by the MoE in a letter to the CoK entitled "*Response to the Notice of Proposed Expansion of Biosolid Composting Facility*", dated 27 April 2010; and by Golder in subsequent letters and annual monitoring reports prepared for the CoK for submission to MoE.

This report satisfies the reporting requirements of Permit 108537, including data interpretation and trend analysis and an evaluation of the impacts of discharges on the receiving environment (Section 5.5.3 of Permit).

2.0 BACKGROUND

The RBCF was constructed in 2006 and is located on Commonage Road in Vernon, BC (Figures 1 and 2). The Site composts wastewater treatment plant biosolid material and currently consists of an administration building, sludge receiving building, a mixing building, primary and secondary aeration cells, and a compost curing area. An expansion of the facility and facility upgrades were completed in 2010, at which time the entire composting curing area was paved. Prior to the construction of the RBCF, a septage disposal facility was operated at the Site by the City of Vernon (CoV) and the North Okanagan Regional District (NORD).

The Site is surrounded primarily by undeveloped and agricultural land. Surface water bodies in close proximity to the Site include the following (refer to Figures 1 and 2):

- Drainage Pond: located approximately 100 m west of the RBFC, between the Site and Commonage Road, and used to store stormwater runoff generated at the Site.
- Rose's Pond: located approximately 200 m northwest of the RBFC (and approximately 100 m northwest of the Drainage Pond), on the northwest side of Commonage Road.
- Davidson Pond: a privately-owned pond on the Davidson Property, located approximately 100 m south of the RBFC (and approximately 200 m south and southwest of the Drainage Pond).

Our understanding of the Site operations is as follows: stormwater runoff generated at the Site is directed towards a drainage trench along the Site's south-western boundary, and then gravity-fed into the Drainage Pond (Figure 2). Water entering the drainage trench and Drainage Pond consists primarily of stormwater that may contain leachate from the compost material stored on the curing pads; and potentially process water runoff, as water is regularly added to the compost material, particularly in the hot summer months. Leachate from the primary and secondary aeration cells at the Site is directed to a holding tank and then truck-hauled for treatment at NORD's septage facility located at 1700 Polson Drive, Vernon BC, which then discharges into the COV's Water Reclamation Centre located at 2100 43rd Street, Vernon BC.

In the summer months, treated (chlorinated) effluent from the CoV's MacKay Reservoir (located approximately 2 km west-southwest of the Site) is periodically used to flush the drainage trench; in the winter months, effluent on route to the MacKay Reservoir from CoV's Water Reclamation Centre is diverted and treated (filtered and/or chlorinated) at the Site, then used to flush the drainage trench. When the water level at the Drainage Pond is near capacity, water is pumped to the MacKay Reservoir.

In 2009, the CoK retained Golder to complete an initial review of the Site, which was documented in the report titled "*Interim Report on Leachate Drainage Pond, Kelowna – Vernon Compost Facility*", dated 17 February 2010. The purpose of the report was to compile local and regional data on the hydrogeology in the area, monitor water quality, and monitor drainage and pond water levels to assess potential infiltration of leachate. The 2010 report indicated that the RBFC and the Drainage Pond are located on dense glacial tills that inhibit water infiltration into the groundwater aquifer located within the underlying bedrock. It was inferred that water infiltrating into the ground would likely migrate along the top of the glacial till and may eventually discharge into local ponds (i.e., Davidson Pond and Rose's Pond), with a small component of infiltration migrating vertically through the till into deeper bedrock fractures.

Between 2010 and 2017, the CoK conducted monitoring programs at the Drainage Pond, Davidson Pond and Rose's Pond (except in 2013 and 2016), to assess whether water at the Drainage Pond may be infiltrating into the ground and discharging into Rose's Pond and/or Davidson Pond. The results of these monitoring programs have been documented in various reports prepared by Golder and submitted to the CoK.

In July 2010, CoK personnel installed an evaporation pan at the Drainage Pond to monitor daily water levels in the pan, along with water levels at the Drainage Pond, as an indicator of water loss due to evaporation or potential infiltration. In 2010, it was found that the regular flushing of the one-inch and/or six-inch drainage lines, combined with the outflow pump operating intermittently, did not allow for a meaningful assessment of water loss at the Drainage Pond. For this reason, subsequent recommendations were to conduct observations on days when the drainage lines were not flushing and the pump was shut-off, and when no rainfall was expected.

Pursuant to the 9 June 2016 amendments to the Organic Matter Recycling Regulation, Permit 108537 was issued to the CoK on 12 July 2017 authorizing the discharge of contaminants to the air from the Site, and specifying surface water monitoring and reporting requirements at the Site.

3.0 2017 SCOPE OF WORK

The 2017 monitoring scope of work was based on Golder's recommendations outlined in our report entitled "*2016 Water Quality Monitoring Report, Vernon Compost Facility, 551 Commonage Road, Vernon, BC*", dated 7 June 2017, as follows. The field portion of the scope of work was completed by CoK personnel:

- Collect monthly samples between May and October of 2017 at the Drainage Pond, Rose's Pond and Davidson Pond for analysis of potential indicators of biosolids (i.e., septage) contaminants including:
  - Phosphorous, chloride, ammonia, nitrate, nitrite, total kjeldahl nitrogen and total nitrogen.
  - Biological oxygen demand (BOD) and chemical oxygen demand (COD).
  - Microbiological analyses (total coliforms and Escherichia coli [E. coli]).
  - Metals (total and dissolved; with lower detection limits for total beryllium and total selenium).
  - pH, conductivity, total suspended solids (TSS) and hardness.

- Field measurement of pH and temperature of water during sample collection.
- Review of analytical results.
- Conduct an observation period of Drainage Pond levels and evaporation pan readings.

It is noted that the recommendations for 2017 included that Drainage Pond level measurements and pan readings be recorded over three 48-hour periods; once in the spring months (i.e., May or June), once in the summer months (i.e., July or August) and again in the fall (i.e., September or October). Site operations did not allow for three monitoring periods in 2017; rather, only a limited set of data was obtained during the summer of 2017.

Based on the above scope of work, Golder has prepared this monitoring report for submission to MoE by the CoK. The monitoring report provides discussions on:

- Water quality results for the Drainage pond.
- Water quality results for Davidson Pond and Rose's Pond, including potential impacts from the Drainage Pond.
- The 2017 Drainage Pond levels in comparison to evaporation pan readings, as well as other published evapotranspiration rates.
- Recommendations for the 2018 water quality monitoring program.

4.0 SURFACE WATER ASSESSMENT CRITERIA

Pond water quality data were tabulated by Golder and compared to the following standards and/or criteria:

- Freshwater aquatic life (AW) standards in the BC Contaminated Sites Regulation (CSR) (B.C. Reg. 375/96; last amended 1 November 2017 by B.C. Reg. 253/2016, as amended by B.C. Reg. 196/2017).
- Drinking water (DW) standards in the CSR.
- "*British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture, Summary Report",* dated January 2017 (BCWQG) for freshwater aquatic life (AW) criteria. Where applicable, the most conservative of the long-term average and short-term maximum guidelines are referenced.
- "*Working Water Quality Guidelines for British Columbia (June 2017)"* for freshwater aquatic life (AW) criteria.

According to BC Technical Guidance Document 15: *Concentration Limits for the Protection of Aquatic Receiving Environments* (Version 2.0; 1 November 2017):

- For maintained watercourses, the CSR AW standards are applicable to surface water, porewater and groundwater.
- Surface water in aquatic receiving environments other than maintained watercourses should be evaluated against the BCWQG.

For the purposes of this assessment, the Drainage Pond is considered to be a maintained watercourse; and as there is no overland flow from the Drainage Pond, and potential contaminants can only migrate through groundwater to other surface water bodies or drinking water wells, the water quality data from the Drainage Pond has been compared to the CSR AW and DW standards. Rose's Pond and Davidson Pond are considered to be aquatic receiving environments, and water quality data for these two ponds have been compared to the BCWQG, and conservatively against the CSR AW and DW standards.

As of 1 November 2017, Stage 11 amendments to the CSR have been brought into force, resulting in updated standards for groundwater parameters. This report was prepared based on the new CSR regulations and associated standards. In addition, re-screening of the water quality data from 2014 through 2016 was completed and the results of re-screening are included in this report where applicable.

For the comparison of ammonia concentrations, the BCWQG AW guideline for ammonia is pH and temperature dependent and was derived using the pH and temperature measured in the field during collection of each water sample. The CSR AW standard for ammonia is pH dependant and assumes a temperature of 10 degrees Celsius; the CSR AW standard for ammonia was derived using the field pH.

For the comparison of metals concentrations, the total metals (unfiltered) concentrations in the samples were used for comparison to the CSR standards and the BCWQG AW guidelines, in accordance with standard practice for surface water samples. Total metals parameter exceedances of the applicable criteria are shown in tables and discussed in the body of this report. For inclusiveness, the dissolved metals (filtered) concentrations were also compared to the CSR standards and the BCWQG AW guidelines; however, while dissolved metals parameter exceedances are shown in applicable tables, they are not further discussed in the body of this report.

5.0 FIELD MONITORING

5.1 Field Monitoring

Field monitoring in 2017 was conducted between May and October 2017 and included the following tasks:

- Sampling of the Drainage Pond monthly in May through October 2017 (for a total of six samples) and analysis of samples for septage contaminants listed under Section 3.0.
- Sampling of Davidson Pond and Rose's Pond monthly in May through October 2017 (for a total of six samples) and analysis of samples for septage contaminants listed under Section 3.0.
- Measuring the pH and temperature (in degrees Celsius) of pond water during sample collection.
- In the month of July (between 4 and 7 July 2017), without stormwater discharge occurring, pond levels were measured during a 69-hour observation period. Within the 69-hour period, Drainage Pond level measurements and evaporation pan measurements were collected at the same time each day.

5.2 Field Sampling Methods

CoK staff collected all water levels and water samples described in this report. Grab samples were collected from below the water surface near the shoreline of each pond and placed in bottles supplied by ALS Environmental Laboratory (ALS) of Burnaby, BC. The sample bottles were placed in chilled coolers and transported via overnight courier. The ALS laboratory analytical reports were provided to Golder by the CoK. During each sampling event, CoK staff measured pH and temperature of the pond water.

Golder tabulated the 2017 data to allow for an assessment of the water quality results; tabulated data are provided in this report along with the 2014, 2015, and 2016 data.

6.0 RESULTS

6.1 Drainage Pond Quality

A summary of the analytical results for water samples collected from the Drainage Pond in 2017 is presented in Table 1, attached. The ALS laboratory analytical reports (laboratory report numbers L1924064-1, L1946645-1, L1965494-1, L1984896-1, L1994913-1, and L2016326-1) are included in Appendix A.

The following is a summary of the 2017 analytical results. Results were compared to the CSR AW and DW standards, where applicable.

- Ammonia (as N) concentrations exceeded the applicable CSR AW standard during the June, September, and October sampling events (there is no CSR DW standard for ammonia as N).
- Total lithium concentrations exceeded the CSR DW standard during the May, June, July, and August sampling events (there is no CSR AW standard for lithium). Although total lithium concentrations in September and October 2017 were below the laboratory reporting limit (<0.050 mg/L), but above the applicable standard (0.008 mg/L), they were not flagged as exceedances at this time. As part of the Stage 11 amendments to the CSR, the CSR DW standard for lithium was lowered to 0.008 mg/L from 0.73 mg/L, the latter of which was used in previous reports.
- As part of the Stage 11 amendments to the CSR, the CSR AW standard for beryllium was lowered to 0.0015 mg/L from 0.053 mg/L, the latter of which was used in previous reports. The laboratory reported detection limits for beryllium in September and October 2017 (and in 2014 through 2016) (i.e., 0.005 mg/L) were greater than the current CSR AW standard of 0.0015 mg/L; however, as beryllium concentrations in the May through August 2017 samples were less than the current CSR AW standard, beryllium is not inferred to be a parameter of concern at the Site.
- All other concentrations of nutrients parameters, chloride and total metals in the Drainage Pond were below the applicable CSR AW and DW standards.
- Nitrate (as N) concentrations were elevated in May, June and October as compared to those in July, August, and September, but still well below standards.
- Concentrations of total coliforms and E. coli in the samples collected from the Drainage Pond were the lowest in May, with most probable number (mpn) per 100 mL of 980 for total coliforms and 23 mpn/100 mL for E. coli. The highest concentrations were measured in June with total coliforms of 90,000 mpn/100mL and <10,000 mpn/100mL of E. coli.

- Dissolved metals parameter concentrations (including hardness) were significantly lower in October 2017, compared to the total metals parameter concentrations in October 2017 and to the remaining results at the Drainage Pond. The cause of the lower concentrations in October 2017 is not known at this time; however, it may be due to sample collection, preservation and/or filtration methods.

The following is a summary of notable trends observed between 2014 and 2017.

- Parameters concentrations were variable between 2014 and 2017, with elevated concentrations generally apparent during the spring sampling events. Ammonia (as N) concentration trends at the Drainage Pond are shown in Figure A below.
- Parameter concentrations measured in 2017 were generally within the range of concentrations measured in 2014, 2015, and 2016, except for the chloride concentration in June 2017 (132 mg/L), which was higher than those measured in 2014, 2015, 2016, and the remainder of 2017 monitoring events. Chloride concentration trends at the Drainage Pond are shown in Figure A below.
- In previous years (2014 – 2016), the reported analytical detection limit for lithium (0.05 mg/L) was greater than the current CSR DW standard of 0.008 mg/L, and thus, it is not known whether the previous parameter concentrations would have exceeded the current CSR DW standard of 0.008 mg/L at that time.

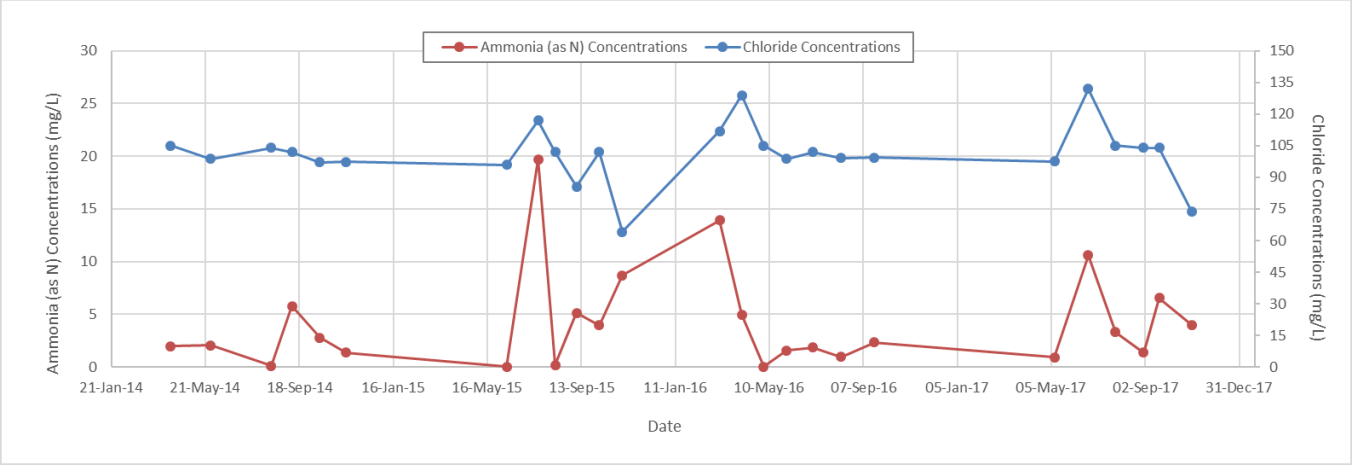

Figure A. Ammonia (as N) and chloride concentration trends in water at the Drainage Pond (2014 - 2017 data).

6.2 Davidson Pond and Rose's Pond Quality

A summary of the analytical results for water samples collected from the neighbouring Davidson and Rose's Ponds in 2017 is presented in Table 2, attached. The ALS laboratory analytical reports (laboratory report numbers for Davidson Pond: L1924064-2, L1946645-2, L1965494-2, L1984896-2, L1994913-2, and L2016326-2; and for Rose's Pond: L1924064-3, L1946645-3, L1965494-3, L1984896-3, L1994913-3, and L2016326-3) are included in Appendix A.

The following is a summary of the 2017 analytical results. Results were compared to the BCWQG AW guidelines and the CSR AW and DW standards, where applicable.

6.2.1 Davidson Pond

Concentrations of most parameters were less than the BCWQG AW guidelines and CSR AW and DW standards during the six sampling events in 2017, except for the following parameters:

- Chloride concentrations exceeded the long-term average BCWQG AW guideline and the CSR DW standard, but were less than the short-term maximum BCWQG AW guideline and the CSR AW standard, during all sampling events.
- Total lithium concentrations exceeded the CSR DW standard during all sampling events.
- Total sodium concentrations exceeded the CSR DW standard during all sampling events. There are no BCWQG AW or CSR AW criteria for sodium.
- The reported analytical detection limit for total beryllium exceeded the applicable BCWQG AW guideline during all sampling events (with the exception of the August 2017 event).
- The reported analytical detection limit for total phosphorus exceeded the BCWQG AW guideline during all sampling events.
- As per the CSR Stage 11 amendments, there is no longer a CSR DW standard for magnesium; thus, total magnesium concentrations that were reported as exceedances in the 2015 and 2016 monitoring events are no longer considered exceedances. There is no CSR AW standard or BCWQG AW guideline for magnesium.
- Dissolved metals parameter concentrations (including hardness) were significantly lower in October 2017 compared to the total metals parameter concentrations in October 2017 and to the remaining results at Davidson Pond. The cause of the lower concentrations in October 2017 is not known at this time; however, it may be due to sample collection, preservation and/or filtration.
- Total coliform and E.coli counts at Davidson Pond were variable, but within the range of 2014 – 2016 results. The highest total coliform and E. coli counts were measured in July 2017 (24,200 mpn/100mL) and May 2017 (1000 mpn/100mL), respectively.

Parameter concentrations measured in 2017 at Davidson Pond were generally within the range of concentrations measured in 2014, 2015, and 2016. Ammonia (as N), chloride and total sodium concentration trends are provided in Figure B below. A slight decreasing trend is noted in ammonia (as N) concentrations, and a very slight decreasing trend is noted in sodium concentrations.

6.2.2 Rose's Pond

Concentrations of most parameters were less than the BCWQG AW guidelines and CSR AW and DW standards during the six sampling events in 2017, except for the following parameters:

- Chloride concentrations exceeded the long-term average BCWQG AW guideline and the CSR DW standard, but were less than the short-term maximum BCWQG AW guideline and the CSR AW standard, during all sampling events.
- Total lithium and total sodium concentrations exceeded the CSR DW standard during all sampling events.

- The BCWQG for arsenic has been removed in 2017, and as such, there were no exceedances of total arsenic concentrations in 2017, which had previously (2014, 2015, and summer of 2016) been identified to exceed the guideline.
- As there is no longer a CSR DW standard for magnesium; total magnesium concentrations that were reported as exceedances in the 2015 and 2016 monitoring events are no longer considered exceedances.
- The reported detection limits for total beryllium and total phosphorus exceeded the applicable BCWQG AW guidelines during most sampling events.
- Dissolved metals parameter concentrations (including hardness) were significantly lower in October 2017 compared to the total metals parameter concentrations in October 2017 and to the remaining results at Rose's Pond. The cause of the lower concentrations in October 2017 is not known at this time; however, it may be due to sample collection, preservation and/or filtration methods.
- Total coliform and E. coli counts at Rose's Pond were variable, but within the 2014 – 2016 results. The highest total coliform and E. coli counts were measured in July 2017 (29,900 mpn/100mL) and June 2017 (12 mpn/100mL), respectively.

Some parameter concentrations measured in 2017 at Rose's Pond appear to be on a decreasing trend (including chloride, arsenic, lithium, magnesium and sodium); while other parameter concentrations appear to be on an increasing trend (including calcium, manganese, molybdenum, potassium, silicon, strontium and uranium). Ammonia (as N), chloride and total sodium concentration trends are provided in Figure B below.

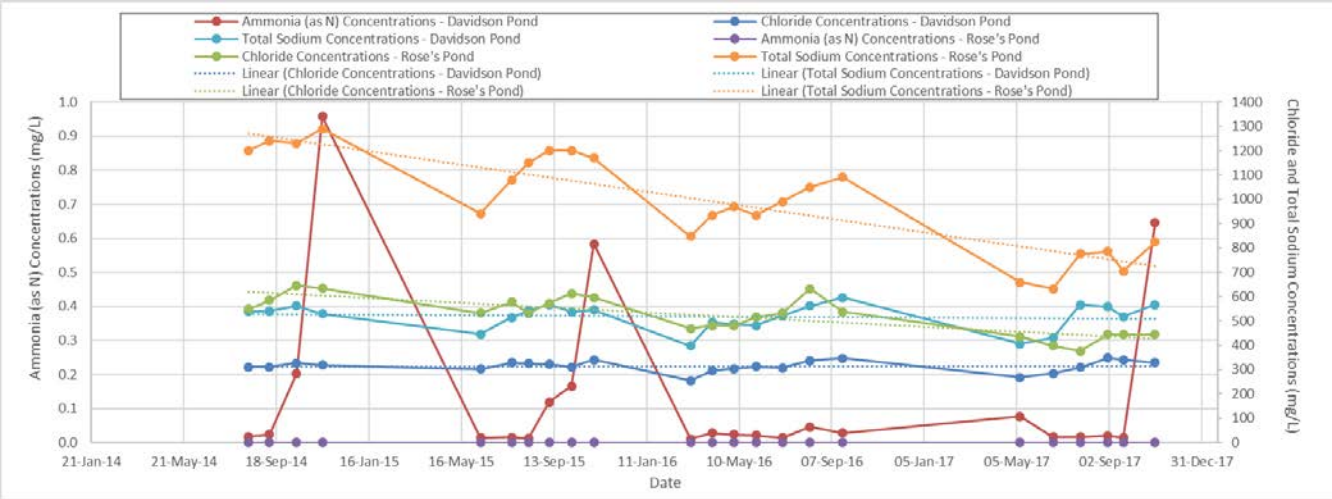

Figure B. Ammonia (as N), chloride and total sodium concentration trends in water at Davidson's Pond and Rose's Pond (2014 - 2017 data).

6.3 Evaporation Pan Monitoring

In 2017, a 69-hour observation period was conducted between 4 and 7 July 2017. The days selected were during times of no rainfall, and when the one-inch and six-inch drainage lines were not flushed and the pump was shut-off. The results for the observation period are presented in Table 3 below.

Table 3: Evaporation Pan and Drainage Pond Levels - 2017

Date	Time	Pan Reading (mm)	Drainage Pond (mm)	Daily Temperature (^{0}C) (low – high)
4-Jul-17	2:00 pm	252	532	12.4 – 31.7
5-Jul-17	2:00 pm	244	530	13.3 – 34.3
6-Jul-17	2:00 pm	234	526	16.2 – 36.9
7-Jul-17	11:00 am	230	522	17.2 – 33.8
Total Decrease (mm)		**22**	**10**	-
Daily Average Decrease (mm)*		**7**	**3**	-

Note:

Temperature data are for the Kelowna UBCO Station (Environment Canada)

*Approximate

The following summarizes the results of each observation period:

- Evaporation Pan: The total decline of water levels in the evaporation pan based on the evaporation pan measurements, was 22 mm over the observation period of 69 hours; and,
- Drainage Pond: The total decline of water levels at the Drainage Pond based on measurements collected from the staff gauge at the Drainage Pond was 10 mm over the observation period of 69 hours.

The evaporation pan and Drainage Pond measurement data provided above, as well as previous measurements, supports the inference that evaporation from the Drainage Pond accounts for most of the losses within the Drainage Pond (compared to infiltration).

7.0 DISCUSSION

The concentrations of typical septage contaminants (ammonia as N, BOD, nitrate, nitrite, total nitrogen and orthophosphate and microbiological parameters) at the Drainage Pond, Davidson Pond and Rose's Pond were generally within the range of concentrations previously measured in 2014, 2015, and 2016, and generally within the range of analysis from month to month during the sampling events in 2017 (except concentrations of ammonia, BOD, total coliforms and E. coli, which exhibited variability between the 2017 sampling events).

The ammonia (as N) concentrations at the Drainage Pond exceeded the CSR AW standard on three occasions in 2017. The ammonia (as N) concentrations at the Drainage Pond were much greater than the nitrate (as N) and

nitrite (as N) concentrations (as in 2014, 2015, and 2016), indicative that little nitrification is occurring. The total nitrogen concentrations at the Drainage Pond were greater than the combined ammonia, nitrate and nitrite concentrations (as in 2014, 2015, and 2016), indicative that a portion of the total nitrogen in the water samples was organic nitrogen.

CoK personnel have observed waterfowl at the Drainage Pond, Davidson Pond and Rose's Pond; and have noted that cattle have access to Davidson's Pond. It is likely that wildlife using these ponds have contributed to the elevated total coliform and E. coli counts measured at the ponds. As these parameters were generally higher at the Drainage Pond than at Davidson Pond and Rose's Pond, it is possible that elevated total coliform and E. coli counts at the Drainage Pond may also be due to Site runoff into the Drainage Pond.

As in 2014 – 2016, samples collected during the 2017 sampling events indicated that biosolids (i.e., septage) parameter concentrations were higher at the Drainage Pond than at Davidson Pond and Rose's Pond, as follows:

- Total nitrogen concentrations were more than approximately 2 times greater at the Drainage Pond than at Davidson Pond and Rose's Pond.
- BOD concentrations were generally higher (up to approximately 7 times greater) at the Drainage Pond than at Davidson Pond and Rose's Pond.
- Orthophosphate concentrations were approximately 1 to 3 orders of magnitude greater at the Drainage Pond than at Davidson Pond and Rose's Pond.
- Certain metals parameters were higher at the Drainage Pond than at Davidson Pond and Rose's Pond (including: aluminum, barium, boron, copper, iron, magnesium, manganese, molybdenum, phosphorus, silicon and zinc).

As in 2014 – 2016, samples collected during the 2017 sampling events indicated that certain inorganic and metals parameters were higher at Davidson Pond and Rose's Pond relative to the Drainage Pond, as follows:

- Chloride concentrations were approximately 2 to 3 times higher at Davidson Pond, and approximately 3 to 6 times higher at Rose's Pond, than at the Drainage Pond.
- Sodium concentrations were approximately 3 to 7 times higher at Davidson Pond, and approximately 5 to 10 times higher than at Rose's Pond, than at the Drainage Pond.
- Arsenic concentrations were slightly higher at Rose's Pond than at Davidson Pond; arsenic concentrations at both ponds were higher than at the Drainage Pond.
- Lithium concentrations were on average approximately 2 to 4 times higher at Davidson Pond and Rose's Pond than at the Drainage Pond.
- Potassium concentrations were on average approximately 2 times higher at Davidson Pond, and approximately 2 to 4 times higher at Rose's Pond, than at the Drainage Pond.

The cause of the suspect dissolved metals parameter concentrations in October 2017 is not known and may have been due to errors in sample collection, preservation and/or filtration. However, as only total metals exceedances are discussed in this report, the October 2017 total metals data can be relied upon for this annual monitoring report. Implementation of a quality assurance/quality control (QA/QC) program may help to address these issues in the future, should they occur again.

8.0 CONCLUSIONS

Water potentially infiltrating from the Drainage Pond may be considered a source of contamination for groundwater, particularly with respect to ammonia, which exceeded applicable standards on three occasions in 2017; however, as it has previously been assessed that evaporation from the Drainage Pond is inferred to account for most of the losses within the Drainage Pond (compared to infiltration) and as exceedances noted at one pond(s) were not noted at the other pond(s), the water quality at Davidson Pond and Rose's Pond does not appear to be adversely impacted by water that may be infiltrating and migrating from the Drainage Pond.

The City of Kelowna should confirm that the quality of the water pumped from the Drainage Pond to the CoV's Mackay Reservoir is acceptable, particularly with respect to ammonia and orthophosphate concentrations.

9.0 RECOMMENDATIONS FOR 2018

As per Section 4.2. *Surface Water Monitoring* of discharge Permit 108537, the City is required to continue to implement a surface water monitoring program at the Site, in accordance with recommendations from a Qualified Professional.

Golder proposes monthly monitoring at the Drainage Pond and at the neighbouring Davidson Pond and Rose's Pond between April and November (or, when the pond is not frozen) in 2018, as follows:

- Collecting and analyzing samples for potential septage contaminants including:
  - Phosphorous (ortho-phosphate), chloride, ammonia, nitrate, nitrite, and total kjeldahl nitrogen.
  - BOD and COD.
  - Metals (total and dissolved).
  - pH, total dissolved solids (TDS), total suspended solids (TSS) and hardness.
- The City of Kelowna should request that the laboratory use lower analytical detection limits for beryllium (i.e., <0.0001 mg/L), lithium (i.e., <0.008 mg/L), and phosphorus (i.e., <0.005 mg/L) for reasonable comparison of results with the applicable guidelines.
- Compile an annual report to the City of Kelowna with comparison of surface water sample results to applicable criteria.
- Continue to obtain evaporation pan readings and staff gauge measurement at the Drainage Pond. In order to have a meaningful interpretation of pond evaporation versus infiltration, it is recommended that these readings/measurements be taken over three long-term (i.e., 48-hour) periods in 2018; once in the spring (i.e., May or June), once in the summer (i.e., July or August) and again in the fall (i.e., September or October). *The spring and fall periods will be important for assessing potentially smaller differences between evaporation and infiltration, as lower evaporation rates are expected during spring/fall compared to summer*. Consideration should be given to collecting this evaporation pan and water level data with pressure transducers to capture the small level changes.
- The field pH and temperature of the water samples should be measured with a properly-calibrated meter by CoK personnel during the collection of pond water samples, so that the suitability of the ammonia guidelines can be assessed. Often laboratory-measured pH can be slightly different than field pH, due to geochemical changes in the sample bottle during transport. The field pH and temperature will be used in the assessment of pond water quality and in determining the appropriate criteria to use in the comparison of analytical ammonia results.

- Implement a QA/QC program to minimize errors in the field and obtain accurate monitoring results. This may include: i) collection of a field duplicate sample from a select pond during each sampling event; ii) use of dedicated monitoring and sampling sheets during the collection of water samples (refer to next bullet); iii) review of analytical results soon after receipt; and iv) contacting analytical laboratory should anomalous analytical results be identified to determine whether anomalous results are laboratory-related.
- Dedicated monitoring and sampling sheets should be completed during sampling events at each location and reviewed in conjunction with the analytical water quality data. Field notes on the sheets should include: sample location, date and time of sample collection, weather, surface water conditions, approximate pond levels at the time of sample collection, the approximate depth that each sample is collected (from top of water surface), equipment used for sampling, field (pH and temperature) parameter measurements, apparent sample turbidity, type and size of bottles used, and whether the sample was preserved (including preservative type) and/or field filtered.
- Samples should be taken such that minimal to no suspended particles or disturbed sediment are collected in the sampling bottles, and that no surface matter (i.e., algae) is inadvertently collected.

10.0 LIMITATIONS AND USE OF REPORT

This report was prepared for the exclusive use of the City of Kelowna and MoE. The findings, interpretations and conclusions are based solely on the Site conditions during the sampling events. The data presented in this report represent the leachate quality conditions at the sampling locations tested. Leachate conditions may vary with location, depth, sampling, methodology, analytical techniques and other factors.

Except where specifically stated to the contrary, the information contained in this report (including reports, information and data) was provided to Golder by others and has not been independently verified or otherwise examined by Golder to determine its accuracy of completeness. Golder has relied in good faith on this information and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the report as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation.

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The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

If new information is discovered during future work, including excavations, borings or other studies, Golder should be requested to re-evaluate the conclusions presented in this report and to provide amendments as required.

11.0 CLOSURE

We trust that this report provides the information you require at this time. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Yours very truly,

Golder Associates Ltd.

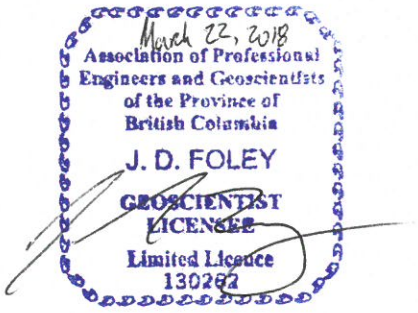

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Table 1: 2014 - 2017 Results of Water Analyses - Drainage Pond
City of Kelowna-Vernon Biosolids Facility
511 Commonage Road, Vernon, BC

Location					Drainage Pond																					
ALS Laboratory ID	Aquatic Life CSR-AW[1] (freshwater)	Notes	Drinking Water CSR-DW[1]	Notes	L1440745-1	L1462088-1	L1502217-1	L1515479-1	L1532630-1	L1547862-3	L1625288-1	L1645255-1	L1656492-1	L1669705-1	L1684336-1	L1698669-1	L1742616-1	L1752610-1	L1763882-1	L1777367-1	L1794599-1	L1811981-1	L1832582-1	L1924064-1	L1946645-1	L1965494-1	L1984896-1	L1994913-1	L2016326-1
Date					7-Apr-14	28-May-14	13-Aug-14	9-Sep-14	14-Oct-14	17-Nov-14	10-Jun-15	20-Jul-15	11-Aug-15	7-Sep-15	6-Oct-15	4-Nov-15	8-Mar-16	5-Apr-16	3-May-16	1-Jun-16	5-Jul-16	10-Aug-16	21-Sep-16	9-May-17	21-Jun-17	26-Jul-17	31-Aug-17	20-Sep-17	31-Oct-17
General Parameters																												
Temperature (field)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.0	20.0	24.0	19.0	13.0	3.0
pH (field)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.6	8.0	8.0	8.0	8.1	8.7
pH (laboratory)					9.13	8.15	9.21	8.25	8.50	8.11	9.44	8.12	8.67	8.22	8.19	7.57	7.82	8.19	9.11	8.17	8.03	8.19	8.24	8.00	8.23	8.20	8.20	8.19	8.68
conductivity (laboratory)					1460	949	922	977	928	918	883	1250	944	847	987	769	1670	1710	1050	992	919	961	962	899	1590	1070	913	1020	784
total suspended solids (TSS)					43.9	4.6	46.9	9.2	35.7	7.4	37.8	31.0	27.6	34.0	16.0	52.4	21.5	32.1	22.4	7.5	24.8	5.0	<3.0	3.6	19.2	4.9	9.1	11.6	31.3
biochemical oxygen demand (5-day BOD)					25.9	3.8	27.7	6.0	13.5	<2.0	13.1	41.1	13.2	13.1	6.1	15.5	12.8	13.6	7.3	3.7	10.8	<2.0	6.2	<2.0	13.4	<2.0	3.9	3.0	15.0
chemical oxygen demand					118	59	155	92	93	57	109	430	92	88	102	195	158	86	60	37	102	55	75	28	261	61	49	121	117
hardness as CaCO3					576	247	233	246	242	217	239	260	232	199	227	157	575	592	305	247	225	234	222	217	484	279	226	254	107
Inorganics																												
ammonia (total; as N)	1.31 - 18.4	pH/T			**1.97***	2.06	0.0990	**5.76***	**2.79***	1.35	0.0265	**19.7***	0.192	**5.13***	**3.94***	8.68	**13.9***	**4.98***	0.0232	1.55	1.84	0.965	2.33	0.915	**10.6**	3.29	1.38	**6.55**	**3.99**
nitrate (as N)	400		10		1.35	0.540	0.068	0.118	0.997	2.75	<0.010	<0.025	0.568	0.172	0.090	0.222	6.84	5.82	0.029	0.521	0.408	0.533	0.336	1.21	1.72	0.356	0.314	0.150	1.04
nitrite (as N)	0.2 - 2	Cl	1		0.127	0.032	0.034	0.094	0.085	0.077	<0.0020	<0.0050	0.226	0.109	0.0160	0.678	0.513	0.229	0.0886	0.0606	0.159	0.127	0.211	0.0156	0.287	0.106	0.0230	0.106	0.104
total nitrogen					8.76	4.31	7.02	8.56	7.43	5.54	4.68	36.6	5.02	9.70	7.75	17.5	25.1	15.6	2.98	3.66	3.38	3.26	4.71	3.26	25.5	5.63	3.17	12.0	10.3
chloride	1500		250		105	98.7	104	102	97.2	97.4	96	117	102	85.6	102	64.1	112	129	105	98.7	102	99.2	99.4	97.6	132	105	104	104	73.8
ortho-phosphate (dissolved; as P)					0.455	1.42	1.84	2.02	1.02	0.683	0.450	4.92	1.03	2.68	1.60	3.99	2.98	1.19	0.464	0.968	2.01	1.21	1.36	0.647	1.65	2.05	0.929	1.69	2.51
Total Kjeldahl Nitrogen					-	-	-	-	-	-	-	-	-	-	-	-	-	9.06	2.39	3.08	2.81	2.77	4.16	2.03	23.5	5.17	2.83	11.7	9.20
Microbiological Analyses																												
total coliforms (mpn/100mL)					236	3650	10500	242000	38700	5790	12000	92100	1180	>241960	41100	>241960	37200	1780	100	>24196	64900	>241960	1660	980	90000	24200	>24196	3260	24200
Escherichia coli (mpn/100mL)					1	107	4	14100	980	62	7	13000	12	19900	2420	19900	2000	30	<10	70	411	130000	<10	23	<10000	120	480	70	290
Total Metals																												
aluminum			9.5		0.074	0.065	0.038	0.069	0.130	0.021	0.068	0.198	0.066	0.258	0.166	0.705	0.225	0.182	0.066	0.116	0.080	0.088	0.116	0.0282	0.215	0.047	0.108	0.026	0.069
antimony	0.09		0.006		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0007	<0.00050	<0.00050	<0.00050	<0.00050
arsenic	0.05		0.01		0.0019	0.0012	0.0016	0.0017	0.0014	<0.0010	0.0013	0.0050	0.0013	0.0022	0.0016	0.0029	0.0033	0.0019	0.0013	0.0011	0.0023	0.0011	0.00136	0.00086	0.00447	0.0015	0.00130	0.0020	0.0024
barium	10		1		0.028	0.022	0.025	0.030	0.023	<0.020	0.025	0.036	0.023	0.034	0.030	0.050	0.048	0.039	0.027	0.029	0.027	0.033	0.034	0.029	0.056	0.035	0.035	0.030	0.023
beryllium	0.0015		0.008		***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	***<0.0050***	***<0.0050***
bismuth					<0.20	<0.20	<0.20	-	-	-	-	<0.20	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
boron	12		5		0.14	0.16	0.17	0.20	0.17	0.17	0.17	0.21	0.16	0.16	0.17	0.14	0.13	0.14	0.15	0.16	0.17	0.14	0.16	0.15	0.17	0.14	0.15	0.16	0.16
cadmium	0.0005 - > 0.004	H	0.005		<0.000050	<0.000050	0.000087	<0.000050	<0.000050	<0.000050	<0.000050	0.000467	<0.000050	0.000095	0.000063	0.000272	0.000146	0.000071	<0.000050	<0.000050	<0.000050	<0.000050	0.0000468	0.0000125	0.000285	<0.000050	0.0000249	<0.000050	0.000063
calcium					117	58.1	55.5	64.3	55.3	50.9	57.0	62.6	55.0	48.9	54.7	41.5	123	122	65.5	58.9	54.4	54.5	53.1	56.2	105	72.1	55.6	57.7	41.1
chromium	0.010[VI], 0.090[III]	V	0.05		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00098	<0.00050	0.00066	<0.00050	0.00168	0.00104	0.00090	<0.00050	<0.00050	<0.00050	0.00177	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	0.00063
cobalt	0.04		0.001		0.00064	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00081	<0.00050	<0.00050	<0.00050	0.00074	0.00076	0.00076	<0.00050	<0.00050	<0.00050	<0.00050	0.00042	0.00030	0.00081	<0.00050	0.00033	<0.00050	<0.00050
copper	0.020 - 0.090	H	1.5		0.0056	0.0061	0.0090	0.0066	0.0051	0.0071	0.0045	0.0531	0.0051	0.0148	0.0092	0.0373	0.0234	0.0118	0.0039	0.0036	0.0070	0.0047	0.0117	0.0032	0.0544	0.0043	0.0039	0.0062	0.0130
iron			6.5		0.205	0.154	0.094	0.162	0.238	0.057	0.142	0.384	0.114	0.272	0.238	0.893	0.472	0.409	0.130	0.225	0.179	0.141	0.206	0.061	0.484	0.205	0.170	0.108	0.237
lead	0.040 - 0.160	H	0.01		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0034	<0.0010	0.0013	<0.0010	0.0031	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	0.00123	<0.0010	<0.00050	<0.0010	<0.0010
lithium			0.008		***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	**0.0107**	**0.0102**	**0.0178**	**0.0131**	**0.0105**	***<0.050***	***<0.050***
magnesium					64.8	25.2	23.2	27.0	23.8	21.9	23.6	25.2	22.1	19.8	22.3	16.1	66.1	68.6	30.4	23.8	22.1	21.2	22.0	23.3	54.8	28.4	23.1	23.6	18.4
manganese			1.5		0.221	0.143	0.087	0.159	0.122	<0.010	0.123	0.193	0.104	0.140	0.130	0.276	0.265	0.208	0.109	0.158	0.124	0.126	0.147	0.0980	0.272	0.183	0.117	0.095	0.137
mercury	0.00025		0.001		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0000050	<0.0000050	0.000062	<0.0000050	0.0000135	<0.00020	<0.00020
molybdenum	10		0.25		0.0057	0.0066	0.0075	0.0065	0.0048	0.0043	0.0057	0.0069	0.0053	0.0057	0.0060	0.0042	0.0067	0.0056	0.0052	0.0045	0.0055	0.0045	0.0044	0.0043	0.0119	0.0044	0.0043	0.0042	0.0039
nickel	0.250 - 1.5	H	0.08		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0025	0.0017	0.0044	<0.0050	0.0019	<0.0050	<0.0050
phosphorus					1.35	1.67	2.52	-	-	-	-	6.10	-	-	1.90	5.73	3.85	1.88	0.93	1.20	2.99	1.53	1.66	0.85	2.59	2.31	1.22	1.84	3.33
potassium					24.4	21.0	28.4	-	-	-	-	72.7	-	-	24.7	27.2	33.3	26.7	19.9	22.0	25.5	19.9	22.1	19.5	44.5	22.6	20.8	28.9	25.2
selenium	0.02		0.01		0.0025	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	0.0042	0.0035	<0.0010	<0.0010	<0.0010	<0.0010	0.000534	0.000512	0.00187	<0.0010	0.000622	<0.0010	<0.0010
silicon					5.41	3.61	2.84	-	-	-	-	4.47	-	-	4.28	4.16	5.98	5.81	3.56	3.54	3.75	3.46	3.96	2.96	4.76	4.11	3.68	3.92	0.49
silver	0.0005 - 0.015	H	0.02		0.000051	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000279	<0.000050	0.000111	0.000098	0.000215	0.000093	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000063	<0.000020	0.000227	<0.000050	0.000036	<0.000050	<0.000050
sodium			200		125	104	105	116	95.4	101	93.1	106	98.2	90.0	93.9	73.3	131	146	110	103	99.8	101	108	103	135	103	103	109	81.4
strontium			2.5		1.18	0.583	0.535	-	-	-	-	0.566	-	-	0.545	0.359	1.16	1.23	0.642	0.566	0.549	0.527	0.558	0.541	1.10	0.647	0.551	0.569	0.376
thallium	0.003				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.000010	<0.00020	<0.00020
titanium	1				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050
tin			2.5		<0.030	<0.030	<0.030	-	-	-	-	<0.030	-	-	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.00050	<0.00050	0.00080	<0.00050	<0.00050	<0.030	<0.030
uranium	0.085		0.02		0.00444	0.00197	0.00209	0.00180	0.00178	0.00100	0.00223	0.00250	0.00202	0.00214	0.00241	0.00116	0.00615	0.00592	0.00265	0.00204	0.00224	0.00210	0.00193	0.00241	0.00984	0.00306	0.00275	0.00262	0.00134
vanadium					<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.00126	0.00088	0.00193	0.00071	0.00136	<0.030	<0.030
zinc	0.075 - > 2.4	H	3		0.0267	0.0266	0.0282	0.0180	0.0238	0.0385	0.0196	0.0866	0.0198	0.0310	0.0188	0.0822	0.0715	0.0539	0.0240	0.0229	0.0191	0.0237	0.0284	0.0270	0.0574	0.0130	0.0226	0.0177	0.0418

Table 1: 2014 - 2017 Results of Water Analyses - Drainage Pond
City of Kelowna-Vernon Biosolids Facility
511 Commonage Road, Vernon, BC

Location					Drainage Pond																					
ALS Laboratory ID	Aquatic Life CSR-AW[1] (freshwater)	Notes	Drinking Water CSR-DW[1]	Notes	L1440745-1	L1462088-1	L1502217-1	L1515479-1	L1532630-1	L1547862-3	L1625288-1	L1645255-1	L1656492-1	L1669705-1	L1684336-1	L1698669-1	L1742616-1	L1752610-1	L1763882-1	L1777367-1	L1794599-1	L1811981-1	L1832582-1	L1924064-1	L1946645-1	L1965494-1	L1984896-1	L1994913-1	L2016326-1
Date					7-Apr-14	28-May-14	13-Aug-14	9-Sep-14	14-Oct-14	17-Nov-14	10-Jun-15	20-Jul-15	11-Aug-15	7-Sep-15	6-Oct-15	4-Nov-15	8-Mar-16	5-Apr-16	3-May-16	1-Jun-16	5-Jul-16	10-Aug-16	21-Sep-16	9-May-17	21-Jun-17	26-Jul-17	31-Aug-17	20-Sep-17	31-Oct-17
Dissolved Metals																												
aluminum			9.5		0.036	0.013	0.014	0.017	0.021	0.072	0.017	0.067	0.018	0.063	0.033	0.104	0.045	0.025	0.015	0.013	0.030	0.010	0.0185	0.0056	0.0818	0.020	0.0136	0.031	<0.010
antimony	0.09		0.006		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00054	<0.00050	<0.00050	<0.00050	<0.00050
arsenic	0.05		0.01		0.0016	0.0012	0.0015	0.0016	0.0013	<0.0010	0.0011	0.0046	0.0012	0.0020	0.0016	0.0026	0.0031	0.0018	0.0012	0.0010	0.0021	0.0012	0.00114	0.00081	0.00449	0.0015	0.00120	0.0021	<0.0010
barium	10		1		<0.020	<0.020	<0.020	0.023	<0.020	<0.020	<0.020	0.028	0.020	<0.020	0.024	<0.020	0.032	0.032	0.026	0.026	0.020	0.033	0.030	0.027	0.043	0.036	0.030	0.031	0.023
beryllium	0.0015		0.008		***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	***<0.0050***	***<0.0050***
bismuth					<0.20	<0.20	<0.20	-	-	-	-	<0.20	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
boron	12		5		0.14	0.16	0.17	0.17	0.18	0.16	0.17	0.20	0.16	0.16	0.17	0.13	0.13	0.14	0.15	0.16	0.16	0.16	0.17	0.13	0.16	0.15	0.14	0.18	<0.10
cadmium	0.0005 - > 0.004	H	0.005		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000154	<0.000050	<0.000050	<0.000050	0.000126	0.000088	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.0000229	0.0000102	0.000159	<0.000050	0.0000150	0.000059	<0.000050
calcium					121	57.5	54.7	58.3	56.6	50.0	56.8	62.4	55.7	47.5	54.9	37.9	120	123	70.2	59.7	53.8	57.2	53.9	51.0	99.5	65.0	53.9	61.3	28.3
chromium	0.010[VI], 0.090[III]	V	0.05		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00064	<0.00050	0.00066	<0.00050	<0.00050	<0.00050	0.00064	0.00058	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050
cobalt	0.04		0.001		0.00055	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00064	<0.00050	<0.00050	<0.00050	<0.00050	0.00067	0.00069	<0.00050	<0.00050	<0.00050	<0.00050	0.00032	<0.00030	0.00059	<0.00050	<0.00030	<0.00050	<0.00050
copper	0.020 - 0.090	H	1.5		0.0025	0.0036	0.0059	0.0037	0.0025	0.0096	0.0030	0.0219	0.0030	0.0065	0.0045	0.0174	0.0147	0.0057	0.0024	0.0021	0.0048	0.0031	0.0036	0.0025	0.0142	0.0020	0.0024	0.0085	0.0025
iron			6.5		<0.030	0.056	<0.030	0.046	<0.030	0.174	<0.030	0.210	<0.030	0.034	0.041	0.177	0.162	0.064	<0.030	0.053	0.072	0.037	0.043	<0.030	0.144	0.104	<0.030	0.112	0.121
lead	0.040 - 0.160	H	0.01		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0010	<0.0010
lithium			0.008		***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	0.0095	0.0098	0.0172	0.0120	0.0101	***<0.050***	***<0.050***
magnesium					66.4	25.1	23.3	24.4	24.4	21.7	23.6	25.2	22.4	19.4	21.9	15.2	66.8	69.0	31.4	23.9	22.1	22.1	21.2	21.8	57.2	28.3	22.2	24.6	8.79
manganese			1.5		0.026	0.062	0.010	<0.010	<0.010	0.074	<0.010	0.023	<0.010	<0.010	<0.010	0.128	0.144	0.102	<0.010	0.139	0.050	0.102	0.0596	0.0835	0.211	0.171	0.0413	<0.010	<0.010
mercury	0.00025		0.001		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.000025	<0.0000050	<0.000025	<0.0000050	<0.0000050	<0.00020	<0.00020
molybdenum	10		0.25		0.0060	0.0065	0.0072	0.0065	0.0049	0.0050	0.0057	0.0063	0.0053	0.0056	0.0057	0.0041	0.0065	0.0056	0.0049	0.0041	0.0052	0.0042	0.0040	0.0041	0.0055	0.0042	0.0040	0.0041	<0.0010
nickel	0.250 - 1.5	H	0.08		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0016	0.0015	0.0035	<0.0050	0.0017	<0.0050	<0.0050
phosphorus					0.81	1.51	1.42	-	-	-	-	5.32	-	-	1.74	4.37	3.31	1.34	0.64	1.15	2.58	1.48	1.49	0.76	2.09	2.45	1.08	1.94	3.44
potassium					24.6	20.9	28.6	-	-	-	-	76.4	-	-	24.3	25.6	31.3	24.9	21.1	21.7	25.4	20.5	20.3	18.3	44.3	25.4	19.7	30.3	2.2
selenium	0.02		0.01		0.0020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0039	0.0034	<0.0010	<0.0010	<0.0010	<0.0010	0.000507	0.000579	0.00137	<0.0010	0.000572	<0.0010	<0.0010
silicon					5.44	3.43	2.87	-	-	-	-	3.63	-	-	4.08	3.30	5.50	5.73	3.61	3.35	3.62	3.45	3.71	2.71	4.56	4.17	3.33	3.91	0.273
silver	0.0005 - 0.015	H	0.02		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000071	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000020	<0.000020	<0.000020	<0.000050	<0.000020	<0.000050	<0.000050
sodium			200		126	103	107	106	98.2	99.2	93.9	110	100	86.9	94.8	71.2	125	148	118	103	99.5	105	101	96.0	136	108	97.3	108	7.3
strontium			2.5		1.16	0.578	0.522	-	-	-	-	0.557	-	-	0.546	0.316	1.10	1.27	0.682	0.568	0.542	0.549	0.539	0.515	1.09	0.639	0.544	0.572	0.133
thallium	0.003				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000014	<0.00020	<0.00020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.000010	<0.000010
tin			2.5		<0.030	<0.030	<0.030	-	-	-	-	<0.030	-	-	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.030	<0.030
titanium	1				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050
uranium	3		0.02		0.00478	0.00195	0.00197	0.00182	0.00179	-	0.00217	0.00246	0.00208	0.00198	0.00233	0.00079	0.00602	0.00606	0.00185	0.00173	0.00210	0.00194	0.00173	0.00202	0.00620	0.00275	0.00246	0.00254	<0.00020
vanadium					<0.030	<0.030	<0.030	<0.030	<0.030	0.00122	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.00097	0.00077	0.00161	0.00062	0.00096	<0.030	<0.030
zinc	0.075 - > 2.4	H	3		0.0118	0.0254	0.0146	0.0134	0.0169	<0.030	0.0072	0.0508	0.0144	0.0137	0.0119	0.0448	0.0549	0.0423	0.0194	0.0248	0.0181	0.0238	0.0212	0.0242	0.0394	0.0103	0.0145	0.0206	0.0233

Notes:
All concentrations in milligrams per litre (mg/L), unless otherwise noted.
(1) Standards from the Contaminated Sites Regulation (CSR), updated to 1 November 2017.
Land Use abbreviations: AW (Aquatic Life); and DW (Drinking Water).
H = standard is Hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; V = standard is valence dependent, VI=chromium VI and III=chromium III; T = standard varies with temperature (10 deg C assumed for ammonia criteria).
19.7 indicates parameter concentration exceeds applicable CSR AW or DW standards
*Exceedance based on laboratory pH

Table 2: 2014 - 2017 Results of Water Analyses at Davidson Pond and Rose's Pond
City of Kelowna-Vernon Biosolids Facility
511 Commonage Road, Vernon, BC

Location							Davidson Pond																	
ALS Laboratory ID	Aquatic Life CSR-AW (freshwater)	Notes	Drinking Water CSR-DW	Notes	BC Water Quality Aquatic Life (freshwater)	Notes	L1502217-2	L1515479-2	L1532630-2	L1547862-2	L1625288-2	L1645255-2	L1656492-2	L1669705-2	L1684336-2	L1698669-2	L1742616-2	L1752610-2	L1763882-2	L1777367-2	L1794599-2	L1811981-2	L1832582-2	L1924064-2	L1946645-2	L1965494-2	L1984896-2	L1994913-2	L2016326-2
Date							13-Aug-14	9-Sep-14	14-Oct-14	17-Nov-14	10-Jun-15	20-Jul-15	11-Aug-15	7-Sep-15	6-Oct-15	4-Nov-15	8-Mar-16	5-Apr-16	3-May-16	1-Jun-16	5-Jul-16	10-Aug-16	21-Sep-16	9-May-17	21-Jun-17	26-Jul-17	31-Aug-17	20-Sep-17	31-Oct-17
Parameters																												
Temperature (field)							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	21	23.5	24	15	5
pH (field)					6.5 - 9.0		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.8	9.1	8.8	9.3	9.2	7.8
pH (laboratory)					6.5 - 9.0		8.68	8.77	8.49	8.31	8.70	8.67	8.71	8.64	8.46	8.35	8.75	8.73	8.81	8.66	8.77	8.82	8.62	8.76	8.89	8.74	8.96	8.78	8.36
conductivity (laboratory)							3140	3110	3160	3210	2870	3250	3350	3230	3500	3480	2480	2980	3100	3250	3140	3470	3550	2500	2720	3010	3150	3290	3510
total suspended solids (TSS)							<3.0	6.6	8.9	19.0	5.5	4.6	3.0	10.2	23.3	16.3	12.8	<3.0	3.4	<3.0	6.0	3.4	<3.0	22.8	24.2	6.1	4.1	6.6	16.7
biochemical oxygen demand (5-day BOD)							<2.0	<2.0	<2.0	<2.0	<2.0	2.9	<2.0	<2.0	4.9	4.1	5.7	<2.0	<2.0	<2.0	<2.0	<2.0	2.1	<2.0	<2.0	<2.0	<2.0	<2.0	2.9
chemical oxygen demand (COD)							56	63	70	90	64	64	63	58	79	63	1050	57	56	61	58	101	75	49	68	64	71	72	65
hardness as CaCO3							532	526	531	545	539	527	525	544	549	564	461	533	566	561	540	563	565	482	514	560	556	535	139
Inorganics																												
ammonia (total; as N)	1.31 - 18.4	pH/T			0.131 - 1.84*	pH/T	0.0176	0.0235	0.203	0.957*	0.0142	0.0149	0.0114	0.119	0.166	0.583*	0.0111	0.0283	0.0238	0.0208	0.0143	0.0455	0.0278	0.0768	0.0161	0.0160	0.0198	0.0140	0.645
nitrate (as N)	400		10		3.0		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.79	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
nitrite (as N)	0.2 - 2	Cl	1		0.02 - 0.20*	Cl	<0.020	<0.020	<0.020	0.050	<0.020	<0.020	<0.020	<0.020	<0.020	0.030	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.13
total nitrogen							1.60	467	1.82	2.79	1.60	1.69	1.71	1.90	2.47	2.62	1.69	1.70	1.55	2.49	1.72	1.81	1.72	1.52	1.75	1.76	2.24	1.88	2.42
chloride	1500		250		150*, 600*		310	311	327	319	303	329	326	322	311	340	254	296	304	312	307	336	347	268	285	309	348	340	328
ortho-phosphate (dissolved; as P)					0.005 to 0.015	see note 1	0.011	0.0022	0.0085	0.0883	<0.0010	<0.0010	<0.0010	<0.0010	0.0027	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	0.0087	<0.0010	<0.0010	0.0010	<0.0010	0.0363
Total Kjeldahl Nitrogen							-	-	-	-	-	-	-	-	-	-	-	1.66	1.54	2.49	1.72	1.73	1.72	1.52	1.75	1.76	2.24	1.88	2.42
Microbiological Analyses																												
total coliforms (mpn/100mL)							173000	13000	2910	411	11200	92100	24200	1730	1530	248	88	71	365	387	>2419.6	>241960	488000	1000	4610	24200	9800	2420	37
Escherichia coli (mpn/100mL)							261	61	17	2	3	17	3	6	22	12	48	6	1	<1	<1	21	2720	1000	5	6	<10	1	9
Total Metals																												
aluminum			9.5		See Dissolved Metals		<0.010	0.166	0.038	0.053	0.027	<0.010	<0.010	0.012	0.122	0.034	0.056	0.0107	<0.0060	0.0063	<0.0060	0.0435	<0.015	0.0256	0.174	0.0122	0.0174	<0.0060	0.0143
antimony	0.09		0.006		0.009	W	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00052	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
arsenic	0.05		0.01		0.005		0.0031	0.0034	0.0035	0.0032	0.0032	0.0028	0.0028	0.0036	0.0046	0.0038	0.0026	0.00312	0.00298	0.00317	0.00358	0.00347	0.00358	0.00273	0.00314	0.00386	0.00342	0.00321	0.00408
barium	10		1		1	W	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
beryllium	0.0015		0.008		0.00013	W	***<0.0050***	***<0.010***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0020***	<0.00010	***<0.00020***	***<0.00020***
bismuth							<0.20	-	-	-	-	<0.20	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
boron	12		5		1.2		<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
cadmium	0.0005 - > 0.004	H	0.005		See Dissolved Metals		<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000025	<0.000010	0.00001	<0.000010	0.0000052	<0.000010	<0.000010
calcium							59.9	62.2	61.7	61.0	64.6	58.2	57.0	58.7	61.5	60.5	61.7	67.5	66.4	64.1	59.9	54.9	52.4	64.5	58.1	54.9	50.2	47.0	59.3
chromium	0.010[VI], 0.090[III]	V	0.05		0.001[VI], 0.0089[III]	W	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010
cobalt	0.04		0.001		0.004		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00050	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
copper	0.020 - 0.090	H	1.5		calculation	H	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0025	0.0017	<0.0010	<0.0010	0.0012	0.0010	<0.0010	<0.0010	<0.0025	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
iron			6.5		1*		<0.030	0.083	0.069	0.111	0.043	<0.030	<0.030	<0.030	0.153	0.053	0.094	<0.030	<0.030	<0.030	<0.030	0.054	<0.030	0.043	0.233	0.033	0.041	<0.030	0.043
lead	0.040 - 0.160	H	0.01		calculation	H	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
lithium			0.008				***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	0.0392	0.0402	0.0423	0.0474	0.0495	0.0501	0.0323	0.0348	0.0485	0.0447	0.0427	0.0472
magnesium							91.6	93.9	99.1	97.2	88.5	88.3	96.7	98.7	101	98.9	75.9	91.1	89.8	93.1	97.7	104	110	82.6	90.1	108	110	97.2	119
manganese			1.5		calculation	H	0.029	0.032	0.125	0.103	0.032	0.022	0.012	0.129	0.161	0.158	0.111	0.0340	0.0405	0.0415	0.0110	0.0149	0.0841	0.0358	0.0326	0.0245	0.0222	0.0306	0.157
mercury	0.00025		0.001				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000089	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum	10		0.25		<1		<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	0.0011	0.0017	<0.0010	<0.0010	0.0011	<0.0010	0.0011	0.0012	<0.0010	<0.0010	<0.0010	<0.0010
nickel	0.250 - 1.5	H	0.08		0.15	H ≥ 180 mg/L CaCO3; W	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0016	0.0019	0.0014	0.0017	0.0021	<0.0025	0.0014	0.0020	0.0018	0.0018	0.0017	0.0018
phosphorus					0.005 to 0.015	see note 1	***<0.30***	-	-	-	-	***<0.30***	-	-	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***
potassium							41.7	-	-	-	-	40.9	-	-	46.6	43.6	32.6	39.2	37.7	40.4	41.1	44.5	46.2	32.5	35.9	44.0	43.2	40.1	44.3
selenium	0.02		0.01		0.002	see note 2	<0.0020	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00020	0.00011	<0.00010	<0.00010	0.00016	<0.00025	0.00013	0.00015	0.00031	0.000116	0.00010	<0.00010
silicon							2.24	-	-	-	-	3.80	-	-	4.69	1.76	1.25	0.461	0.340	1.05	1.46	1.61	1.63	0.76	0.57	1.42	1.11	1.48	2.56
silver	0.0005 - 0.015	H	0.02		0.0015	H > 100 mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000050	<0.000020	<0.000020	0.000486	<0.000020	<0.000020	<0.000020
sodium			200				539	540	561	529	446	514	542	567	537	546	397	494	487	481	520	561	596	405	431	567	559	518	566
strontium			2.5				0.664	-	-	-	-	0.690	-	-	0.797	0.775	0.648	0.773	0.779	0.783	0.832	0.772	0.784	0.775	0.766	0.753	0.734	0.706	0.874
thallium	0.003				0.0008	W	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	***<0.0020***	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.000010	<0.00020	<0.00020
titanium	1						<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
tin			2.5				<0.030	-	-	-	-	<0.030	-	-	<0.030	<0.030	<0.030	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
uranium	0.085		0.02		0.0085	W	0.00396	0.00415	0.00462	0.00527	0.00564	0.00505	0.00492	0.00498	0.00640	0.00585	0.00516	0.00590	0.00611	0.00540	0.00583	0.00623	0.00481	0.00545	0.00525	0.00493	0.00551	0.00502	0.00548
vanadium							<0.030	<0.060	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0025	<0.0010	0.0011	<0.0010	0.00082	<0.0010	<0.0010
zinc	0.075 - > 2.4	H	3		calculation	H; H > 90 mg/L	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0060	<0.0060	<0.0060	<0.0050	<0.0060	<0.0060

Table 2: 2014 - 2017 Results of Water Analyses at Davidson Pond and Rose's Pond
City of Kelowna-Vernon Biosolids Facility
511 Commonage Road, Vernon, BC

Location							Davidson Pond																	
ALS Laboratory ID	Aquatic Life CSR-AW (freshwater)	Notes	Drinking Water CSR-DW	Notes	BC Water Quality Aquatic Life (freshwater)	Notes	L1502217-2	L1515479-2	L1532630-2	L1547862-2	L1625288-2	L1645255-2	L1656492-2	L1669705-2	L1684336-2	L1698669-2	L1742616-2	L1752610-2	L1763882-2	L1777367-2	L1794599-2	L1811981-2	L1832582-2	L1924064-2	L1946645-2	L1965494-2	L1984896-2	L1994913-2	L2016326-2
Date							13-Aug-14	9-Sep-14	14-Oct-14	17-Nov-14	10-Jun-15	20-Jul-15	11-Aug-15	7-Sep-15	6-Oct-15	4-Nov-15	8-Mar-16	5-Apr-16	3-May-16	1-Jun-16	5-Jul-16	10-Aug-16	21-Sep-16	9-May-17	21-Jun-17	26-Jul-17	31-Aug-17	20-Sep-17	31-Oct-17
Dissolved Metals																												
aluminum			9.5		0.05˜ (dis)	pH >6.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0059	<0.0050	<0.0050
antimony	0.09		0.006				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
arsenic	0.05		0.01				0.0031	0.0031	0.0028	0.0031	0.0032	0.0029	0.0028	0.0032	0.0039	0.0037	0.0024	0.00289	0.00328	0.00333	0.00316	0.00340	0.00338	0.00269	0.00308	0.00339	0.00337	0.00318	<0.00050
barium	10		1				<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
beryllium	0.0015		0.008				***<0.0050***	***<0.010***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	***<0.0050***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00010	<0.00020	<0.00020
bismuth							<0.20	-	-	-	-	<0.20	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
boron	12		5				<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
cadmium	0.0005 - > 0.004	H	0.005		calculation (dis)	H	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.0000050	<0.000010	<0.000010
calcium							60.0	60.5	58.7	60.1	65.9	60.4	55.1	58.2	60.0	60.9	61.0	66.9	70.6	66.5	58.3	54.2	53.6	60.5	55.8	53.6	50.3	52.3	35.5
chromium	0.010[VI], 0.090[III]	V	0.05				<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
cobalt	0.04		0.001				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
copper	0.020 - 0.090	H	1.5			H	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0022
iron			6.5		0.35* (dis)		<0.030	<0.060	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
lead	0.040 - 0.160	H	0.01				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
lithium			0.008				***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	0.0386	0.0427	0.0444	0.0453	0.0467	0.0434	0.0325	0.0353	0.0487	0.0453	0.0482	<0.0020
magnesium							92.8	91.1	93.3	95.9	90.9	91.4	94.1	96.7	97.0	100	75.0	89.0	94.6	95.8	95.8	104	105	80.3	90.9	103	105	98.2	12.3
manganese			1.5				<0.010	<0.010	0.094	0.089	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	0.00123	0.0343	0.0302	0.00362	0.00863	0.0273	0.0267	0.0137	0.0147	0.0137	0.0077	0.00267
mercury	0.00025		0.001				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum	10		0.25				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.001	<0.0010	<0.0010	<0.0010	<0.0010
nickel	0.250 - 1.5	H	0.08				<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0017	0.0016	0.0013	0.0016	0.0021	0.0012	0.0014	0.0015	0.0016	0.0016	0.0015	0.0035
phosphorus							<0.30	-	-	-	-	<0.30	-	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
potassium							41.3	-	-	-	-	42.8	-	-	44.3	43.2	31.6	35.9	39.1	40.4	40.1	43.3	43.9	30.4	34.7	43.1	41.0	41.6	<2.0
selenium	0.02		0.01				<0.0020	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00019	0.00012	0.00012	0.00012	<0.00010	0.00016	0.00012	0.00010	0.00019	0.000122	<0.00010	0.00011
silicon							2.22	-	-	-	-	3.93	-	-	4.28	1.40	0.437	0.417	0.261	1.06	1.40	1.50	1.51	0.67	0.23	1.32	1.00	1.49	2.54
silver	0.0005 - 0.015	H	0.02				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000020	0.000025	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
sodium			200				**536**	**524**	**532**	**531**	**449**	**537**	**530**	**561**	**524**	**546**	**392**	**464**	**510**	**488**	**506**	**551**	**560**	**386**	**431**	**543**	**529**	**527**	10.7
strontium			2.5				0.660	-	-	-	-	0.717	-	-	0.775	0.775	0.636	0.730	0.820	0.803	0.808	0.764	0.761	0.752	0.807	0.712	0.728	0.770	0.183
thallium	0.003						<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.000020	<0.00020	<0.00020	<0.000050	<0.000020	<0.000020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
tin			2.5				<0.030	-	-	-	-	<0.030	-	-	<0.030	<0.030	<0.030	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
titanium	1						<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
uranium	0.085		0.02				0.00374	0.00421	0.00427	0.00516	0.00593	0.00534	0.00499	0.00485	0.00641	0.00572	0.00516	0.00588	0.00627	0.00537	0.00538	0.00553	0.00526	0.00574	0.00552	0.00453	0.00524	0.00541	<0.00020
vanadium							<0.030	<0.060	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00059	<0.0010	<0.0010
zinc	0.075 - > 2.4	H	3				<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0134

Notes:
All concentrations in milligrams per litre (mg/L), unless otherwise noted.
Standards from the Contaminated Sites Regulation (CSR), updated 1 November 2017. Land Use abbreviations: AW (Aquatic Life); and DW (Drinking Water).
BCWQG = British Columbia Approved (updated January 2017) and Working (updated June 2017) Water Quality Guidelines. Approved WQG provided, unless otherwise noted (as W: Working WQG).
H = standard is Hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; V = standard is valence dependent,
VI=chromium VI and III=chromium III; T = standard varies with temperature (10 deg C assumed for ammonia criteria).
Note 1: the guidelines provided for ortho-phosphate are the BCWQG for total phosphorus (as P), and are applicable for lakes where salmonids are the predominant fish species. Guidelines are for reference only, and may not be applicable to Davidson Pond or Rose's Pond.
+ = long-term average BCWQG AW guideline; * = short-term maximum BCWQG AW guideline. Long-term average BCWQG provided, unless otherwise noted.
(dis) = BCWQG AW guideline is for dissolved concentration.
calcuation = indicates that a calculation is required to determine BCWQG. No exceedences were identified for those parameters where BCWQG was calculated.
Note 2: the guideline of 0.001 mg/L is an alert concentration; the guideline of 0.002 mg/L is the BCWQG.

310	indicates parameter concentration exceeds applicable CSR AW or DW standards
0.957	indcates parameter concentration exceeds applicable BCWQG guideline
340	indicates parameter concentration exceeds applicable CSR DW standard and long-term average BCWQG guideline
645	indicates parameter concentration exceeds applicable CSR DW standard and short-term maximum BCWQG guideline
<0.0050	indicates that the reported detection limit is greater than the applicable criteria

*Exceedance based on laboratory pH

Table 2: 2014 - 2017 Results of Water Analyses at Davidson Pond and Rose's Pond
City of Kelowna-Vernon Biosolids Facility
511 Commonage Road, Vernon, BC

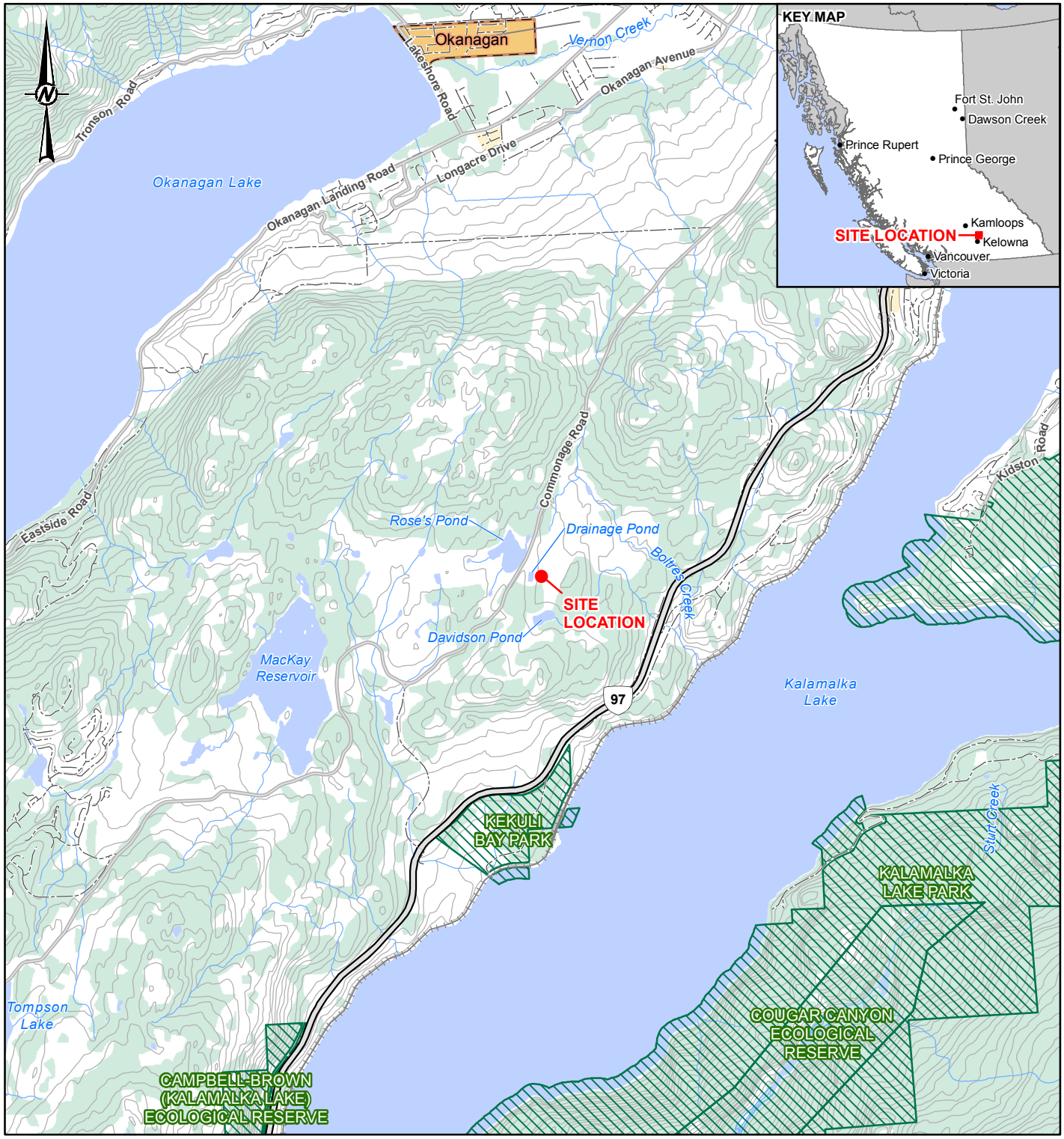
Location							Rose's Pond																		
ALS Laboratory ID	Aquatic Life CSR-AW (freshwater)	Notes	Drinking Water CSR-DW	Notes	BC Water Quality Aquatic Life (freshwater)	Notes	L1502217-3	L1515479-3	L1532630-3	L1547862-1	L1625288-3	L1645255-3	L1656492-3	L1669705-3	L1684336-3	L1698669-3	L1742616-3	L1752610-3	L1763882-3	L1777367-3	L1794599-3	L1811981-3	L1832582-3	L1924064-3	L1946645-3	L1965494-3	L1984896-3	L1994913-3	L2016326-3
Date							13-Aug-14	9-Sep-14	14-Oct-14	17-Nov-14	10-Jun-15	20-Jul-15	11-Aug-15	7-Sep-15	6-Oct-15	4-Nov-15	8-Mar-16	5-Apr-16	3-May-16	1-Jun-16	5-Jul-16	10-Aug-16	21-Sep-16	9-May-17	21-Jun-17	26-Jul-17	31-Aug-17	20-Sep-17	31-Oct-17
Parameters																												
Temperature (field)							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	19	23	21	16	5
pH (field)					6.5 - 9.0		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.4	8.5	8.5	9.1	8.9	8.4
pH (laboratory)					6.5 - 9.0		8.94	8.86	8.75	8.58	8.80	8.71	8.88	8.85	8.82	8.55	8.47	8.60	8.62	8.57	8.72	8.76	8.56	8.45	8.44	8.43	8.72	8.67	8.49
conductivity (laboratory)							7350	7310	7270	7350	6030	6860	7240	6990	7520	7400	5490	5790	5940	6350	6050	6800	7030	4330	4380	4930	4890	5130	5440
total suspended solids (TSS)							10.2	9.4	27.3	17.3	9.5	8.0	6.7	<3.0	6.9	9.4	10.4	7.6	5.8	5.5	4.6	3.8	4.8	8.8	6.8	9.3	9.7	15.2	6.1
biochemical oxygen demand (5-day BOD)							<2.0	<2.0	<2.0	2.2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	4.9	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.2	2.1	<2.0
chemical oxygen demand (COD)							70	78	83	91	71	75	71	66	78	69	58	66	56	61	59	69	76	46	54	63	75	80	62
hardness as CaCO3							1790	1780	1830	1840	1550	1680	1690	1750	1650	1700	1310	1410	1440	1460	1440	1570	1620	1070	1130	1220	1230	1080	18.8
Inorganics																													
ammonia (total; as N)	1.31 - 18.4	pH/T			0.131 - 1.84[+]	pH/T	0.0188	0.0231	0.0181	0.0132	0.0131	0.0266	0.0089	0.0194	0.0167	0.0441	0.0117	0.0129	0.0321	0.0210	0.0184	0.0520	0.0237	0.0771	0.0228	0.0104	0.0117	0.0097	0.0187
nitrate (as N)	400		10		3.0[*]		0.28	<0.25	<0.25	<0.25	<0.25	<0.25	0.31	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.57	<0.10	<0.10	<0.10	<0.10	0.12
nitrite (as N)	0.2 - 2	Cl	1		0.02 - 0.20[+]	Cl	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	***<0.050***	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
total nitrogen							1.79	1.91	1.77	2.04	1.70	1.72	1.67	1.74	1.85	1.99	1.67	1.78	1.55	1.54	1.64	1.66	1.55	1.77	1.43	1.58	1.64	1.85	1.81
chloride	1500		250		150[~], 600*		549	584	645	634	532	578	530	573	613	596	468	482	479	515	533	632	537	436	397	377	444	443	443
ortho-phosphate (dissolved; as P)					0.005 to 0.015	see note 1	0.010	0.0013	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	0.0023	<0.0010	0.0011	<0.0010	<0.0010	0.0020	<0.0010	0.0114	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen							-	-	-	-	-	-	-	-	-	-	-	1.74	1.53	1.54	1.64	1.61	1.55	1.20	1.43	1.58	1.64	1.85	1.70
Microbiological Analyses																													
total coliforms (mpn/100mL)							43500	29900	1960	57	24200	41100	19900	7270	236	225	65	205	387	921	>2419.6	<1	2480	225	19900	29900	17300	2480	25
Escherichia coli (mpn/100mL)							7	<1	1	<1	6	82	16	52	5	<1	3	43	42	11	326	<1	<10	4	12	1	10	2	<1
Total Metals																													
aluminum			9.5		See Dissolved Metals		<0.015	0.029	<0.015	<0.030	0.021	0.016	<0.015	<0.015	<0.015	0.080	0.022	0.030	<0.015	<0.015	0.021	0.024	0.015	0.021	<0.015	0.024	0.0218	<0.015	0.0090
antimony	0.09		0.006		0.009	W	0.00071	0.00086	0.00082	<0.0010	0.00066	0.00074	0.00070	0.00079	0.00085	0.00074	0.00059	0.00060	0.00071	0.00054	0.00063	0.00060	0.00063	<0.00050	<0.00050	<0.00050	0.00057	0.00056	0.00053
arsenic	0.05		0.01		0.005		0.0058	0.0063	0.0067	0.0058	0.0068	0.0060	0.0056	0.0061	0.0062	0.0058	0.0045	0.00405	0.00475	0.00441	0.00519	0.00501	0.00525	0.00332	0.00382	0.00419	0.00483	0.00422	0.00442
barium	10		1		1	W	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.024	0.025	0.02	0.021	<0.020	<0.020
beryllium	0.0015		0.008		0.00013	W	***<0.010***	***<0.010***	***<0.010***	***<0.010***	***<0.0050***	***<0.010***	***<0.010***	***<0.010***	***<0.010***	***<0.010***	***<0.0050***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0010***	***<0.0050***	<0.00010	***<0.00050***	***<0.00020***
bismuth							<0.40	-	-	-	-	<0.40	-	-	<0.40	<0.40	<0.20	<0.40	<0.20	<0.20	<0.20	<0.40	<0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
boron	12		5		1.2		<0.20	<0.20	<0.20	<0.20	0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.10	<0.20	<0.10	<0.10	<0.10	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
cadmium	0.0005 - > 0.004	H	0.005		See Dissolved Metals		<0.00025	<0.00025	<0.00025	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.0000050	<0.000025	<0.000010
calcium							36.9	48.7	41.5	44.4	57.2	53.3	46.1	47.6	47.2	47.8	65.4	71.6	70.9	62.2	59.1	52.8	52.5	84.8	80.9	85.4	81.3	71.3	79.7
chromium	0.010[VI], 0.090[III]	V	0.05		0.001[VI], 0.0089[III]	W	***<0.0025***	***<0.0025***	***<0.0025***	***<0.0050***	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
cobalt	0.04		0.001		0.004		<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00030	<0.00050	<0.00030
copper	0.020 - 0.090	H	1.5		calculation	H	<0.0025	<0.0025	<0.0025	<0.0050	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0010	<0.0025	<0.0010
iron			6.5		1*		<0.060	<0.060	<0.060	<0.060	<0.030	<0.060	<0.060	<0.060	<0.060	0.130	0.039	<0.060	<0.030	<0.030	<0.030	<0.060	<0.060	<0.050	<0.050	<0.050	<0.030	<0.050	<0.030
lead	0.040 - 0.160	H	0.01		calculation	H	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
lithium			0.008				0.073	0.078	0.076	0.076	0.063	0.066	0.068	0.073	0.073	0.073	0.054	0.0540	0.0592	0.0601	0.0647	0.0622	0.0752	0.0410	0.0398	0.0547	0.0471	0.0503	0.0558
magnesium							393	403	422	419	336	377	389	392	393	384	280	306	308	300	314	354	370	231	226	255	277	231	288
manganese			1.5		calculation	H	0.030	0.043	0.015	<0.010	0.036	0.096	0.012	0.035	0.026	0.063	0.201	0.113	0.0511	0.0312	0.0355	0.0356	0.0426	0.0789	0.0449	0.0527	0.102	0.0169	0.0514
mercury	0.00025		0.001				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum	10		0.25		<1		<0.0010	0.0012	<0.0010	0.0012	0.0013	0.0012	0.0012	0.0011	0.0011	<0.0010	0.0016	0.0017	0.0019	0.0014	0.0014	0.0011	<0.0010	0.0025	0.0023	0.0022	0.0023	0.0020	0.0019
nickel	0.250 - 1.5	H	0.08		0.15	H ≥ 180 mg/L CaCO3; W	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0025	<0.0025	<0.0025	<0.0025	0.0026	<0.0025	<0.0025	<0.0025	<0.0025	0.0012	<0.0025	0.0011
phosphorus					0.005 to 0.015	see note 1	***<0.60***	-	-	-	-	***<0.60***	-	-	***<0.60***	***<0.60***	***<0.30***	***<0.60***	***<0.30***	***<0.30***	***<0.30***	***<0.60***	***<0.60***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***	***<0.30***
potassium							119	-	-	-	-	108	-	-	118	115	84.6	89.9	91.6	83.8	92.7	103	105	70.3	69.1	79.8	82.2	70.4	85.2
selenium	0.02		0.01		0.002	see note 2	***<0.0050***	***<0.0050***	***<0.0050***	***<0.010***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00051	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00057	<0.00025	0.00030	0.000267	0.00027	0.00022
silicon							0.24	-	-	-	-	0.32	-	-	0.12	0.26	1.49	0.15	0.253	0.129	0.348	0.38	0.43	1.49	0.54	1.06	1.07	0.96	1.17
silver	0.0005 - 0.015	H	0.02		0.0015	H > 100 mg/L	<0.000050	<0.000050	<0.000050	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000134	<0.000020	<0.000050	<0.000020
sodium			200				1200	1240	1230	1290	942	1080	1150	1200	1200	1170	847	935	969	935	991	1050	1090	659	632	776	786	704	825
strontium			2.5				0.293	-	-	-	-	0.485	-	-	0.410	0.434	0.620	0.711	0.693	0.600	0.580	0.480	0.483	0.802	0.785	0.777	0.770	0.686	0.737
thallium	0.003				0.0008	W	<0.00050	<0.00050	<0.00050	***<0.0010***	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.000050	<0.000010	<0.000050	<0.000020
titanium	1						<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.030	<0.020	0.013	<0.010	<0.010	<0.020	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
tin			2.5				<0.060	<0.060	-	-	-	<0.060	-	-	<0.060	<0.060	<.050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
uranium	0.085		0.02		0.0085	W	0.00403	0.00462	0.00461	0.00481	0.00486	0.00485	0.00459	0.00452	0.00495	0.00456	0.00466	0.00514	0.00574	0.00486	0.00518	0.00483	0.00434	0.00607	0.00562	0.00553	0.00591	0.00560	0.00637
vanadium							<0.060	<0.060	<0.060	<0.060	<0.030	<0.060	<0.060	<0.060	<0.060	<0.060	<0.030	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.00099	<0.0025	<0.0010
zinc	0.075 - > 2.4	H	3		calculation	H; H > 90 mg/L	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.010	<0.010	<0.015	<0.015	<0.015	<0.0050	<0.015	<0.0060

Table 2: 2014 - 2017 Results of Water Analyses at Davidson Pond and Rose's Pond
City of Kelowna-Vernon Biosolids Facility
511 Commonage Road, Vernon, BC

Location							Rose's Pond																		
ALS Laboratory ID	Aquatic Life CSR-AW (freshwater)	Notes	Drinking Water CSR-DW	Notes	BC Water Quality Aquatic Life (freshwater)	Notes	L1502217-3	L1515479-3	L1532630-3	L1547862-1	L1625288-3	L1645255-3	L1656492-3	L1669705-3	L1684336-3	L1698669-3	L1742616-3	L1752610-3	L1763882-3	L1777367-3	L1794599-3	L1811981-3	L1832582-3	L1924064-3	L1946645-3	L1965494-3	L1984896-3	L1994913-3	L2016326-3
Date							13-Aug-14	9-Sep-14	14-Oct-14	17-Nov-14	10-Jun-15	20-Jul-15	11-Aug-15	7-Sep-15	6-Oct-15	4-Nov-15	8-Mar-16	5-Apr-16	3-May-16	1-Jun-16	5-Jul-16	10-Aug-16	21-Sep-16	9-May-17	21-Jun-17	26-Jul-17	31-Aug-17	20-Sep-17	31-Oct-17
Dissolved Metals																												
aluminum			9.5		0.05+ (dis)	pH >6.5	<0.015	<0.015	<0.015	<0.030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	0.0086	0.0073	<0.0050	<0.0050	<0.0050	0.0051	<0.0050	<0.0050
antimony	0.09		0.006				0.00070	0.00078	0.00075	<0.0010	0.00070	0.00074	0.00072	0.00075	0.00077	0.00075	0.00053	0.00052	0.00062	0.00051	0.00057	0.00062	0.00066	<0.00050	<0.00050	<0.00050	<0.00050	0.0005	<0.00050
arsenic	0.05		0.01				0.0057	0.0058	0.0063	0.0062	0.0068	0.0056	0.0055	0.0060	0.0060	0.0057	0.0046	0.00416	0.00463	0.00442	0.00502	0.00523	0.00521	0.00310	0.00372	0.00410	0.00440	0.00377	<0.00050
barium	10		1				<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.021	0.023	<0.020	<0.020	<0.020	<0.020
beryllium	0.0015		0.008				***<0.010***	***<0.010***	***<0.010***	***<0.010***	***<0.0050***	***<0.010***	***<0.010***	***<0.010***	***<0.010***	***<0.010***	***<0.0050***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.00020
bismuth							<0.40	-	-	-	-	<0.40	-	-	<0.40	<0.40	<0.20	<0.40	<0.20	<0.20	<0.20	<0.40	<0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
boron	12		5				<0.20	<0.20	<0.20	<0.20	0.12	<0.20	<0.20	<0.20	<0.20	<0.20	<0.10	<0.20	<0.10	<0.10	0.11	<0.20	<0.20	<0.10	<0.10	<0.10	0.11	<0.10	<0.10
cadmium	0.0005 - > 0.004	H	0.005		calculation (dis)	H	<0.00025	<0.00025	<0.00025	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000010
calcium							37.5	47.0	41.9	43.0	58.2	53.7	45.6	45.9	44.6	47.7	65.6	70.6	72.5	65.9	59.0	51.8	51.1	76.2	81.6	83.1	78.9	71.3	6.54
chromium	0.010[VI], 0.090[III]	V	0.05				<0.0025	<0.0025	<0.0025	<0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
cobalt	0.04		0.001				<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00030
copper	0.020 - 0.090	H	1.5			H	<0.0025	<0.0025	<0.0025	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
iron			6.5		0.35* (dis)		<0.060	<0.060	<0.060	<0.060	<0.030	<0.060	<0.060	<0.060	<0.060	<0.060	<0.030	<0.060	<0.030	<0.030	<0.030	<0.060	<0.060	<0.050	<0.050	<0.050	<0.050	<0.050	<0.030
lead	0.040 - 0.160	H	0.01				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
lithium			0.008				**0.072**	**0.076**	**0.076**	**0.077**	**0.062**	**0.066**	**0.064**	**0.072**	**0.071**	**0.072**	**0.052**	**0.0530**	**0.0614**	**0.0615**	**0.0625**	**0.0648**	**0.0645**	**0.0382**	**0.0404**	**0.0531**	**0.0491**	**0.0497**	<0.0020
magnesium							411	403	418	419	342	376	382	398	372	383	278	300	307	315	314	349	362	214	224	246	250	220	0.61
manganese			1.5				0.027	<0.010	<0.010	0.021	<0.010	0.079	<0.010	<0.010	<0.010	<0.010	0.168	0.0464	0.0373	0.00671	0.0208	0.00583	0.0257	0.0689	0.0354	0.00622	0.0316	0.00138	0.0161
mercury	0.00025		0.001				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum	10		0.25				<0.0010	0.0011	<0.0010	0.0012	0.0014	0.0014	0.0011	<0.0010	0.0011	0.0011	0.0011	0.0014	0.0018	0.0014	0.0014	0.0012	<0.0010	0.0023	0.0024	0.0020	0.0021	0.0020	<0.0010
nickel	0.250 - 1.5	H	0.08				<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0025	<0.0025	<0.0025	<0.0025	0.0028	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0010
phosphorus							<0.60	-	-	-	-	<0.60	-	-	<0.60	<0.60	<0.30	<0.60	<0.30	<0.30	<0.30	<0.60	<0.60	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
potassium							122	-	-	-	-	107	-	-	110	114	83.0	85.9	92.7	86.7	92.9	99.4	108	62.5	65.5	78.2	78.7	68.4	<2.0
selenium	0.02		0.01				<0.0050	<0.0050	<0.0050	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00033	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00054	0.00026	0.00026	0.00025	<0.00025	<0.00010
silicon							0.25	-	-	-	-	0.33	-	-	<0.10	<0.10	1.41	<0.10	0.248	0.104	0.301	0.34	0.39	1.21	0.48	0.92	0.86	0.97	0.37
silver	0.0005 - 0.015	H	0.02				<0.000050	<0.000050	<0.000050	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000020
sodium			200				**1220**	**1200**	**1240**	**1250**	**950**	**1070**	**1120**	**1150**	**1130**	**1170**	**841**	**908**	**983**	**968**	**990**	**1020**	**1140**	**599**	**615**	**748**	**721**	**675**	6.7
strontium			2.5				0.301	-	-	-	-	0.487	-	-	0.388	0.429	0.615	0.691	0.707	0.623	0.578	0.469	0.521	0.742	0.814	0.747	0.751	0.672	0.0291
thallium	0.003						<0.00050	<0.00050	<0.00050	<0.0010	<0.00020	<0.000050	<0.00020	<0.00020	<0.000050	<0.000050	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
tin			2.5				<0.060	-	-	-	-	<0.060	-	-	<0.060	<0.060	<0.030	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
titanium	1						<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020	0.012	<0.010	<0.010	<0.020	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
uranium	0.085		0.02				0.00426	0.00443	0.00445	0.00478	0.00512	0.00478	0.00468	0.00438	0.00479	0.00455	0.00472	0.00510	0.00586	0.00483	0.00505	0.00490	0.00436	0.00597	0.00597	0.00520	0.00545	0.00557	<0.00020
vanadium							<0.060	<0.060	<0.060	<0.060	<0.030	<0.060	<0.060	<0.060	<0.060	<0.060	<0.030	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
zinc	0.075 - > 2.4	H	3				<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.010	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0125

Notes:
All concentrations in milligrams per litre (mg/L), unless otherwise noted.
Standards from the Contaminated Sites Regulation (CSR), updated 1 November 2017. Land Use abbreviations: AW (Aquatic Life); and DW (Drinking Water).
BCWQG = British Columbia Approved (updated January 2017) and Working (updated January 2017) Water Quality Guidelines. Approved WQG provided, unless otherwise noted (as W: Working WQG).
H = standard is Hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; S = refer to CSR Schedule 10; V = standard is valence dependent, VI=chromium VI and III=chromium III; T = standard varies with temperature (10 deg C assumed for ammonia criteria).
Note 1: the guidelines provided for ortho-phosphate are the BCWQG for total phosphorus (as P), and are applicable for lakes where salmonids are the predominant fish species. Guidelines are for reference only, and may not be applicable to Davidson Pond or Rose's Pond.
+ = long-term average BCWQG AW guideline; * = short-term maximum BCWQG AW guideline. Long-term average BCWQG provided, unless otherwise noted.
(dis) = BCWQG AW guideline is for dissolved concentration.
calcuation = indicates that a calculation is required to determine BCWQG. No exceedences were identified for those parameters where BCWQG was calculated.
Note 2: the guideline of 0.001 mg/L is an alert concentration; the guideline of 0.002 mg/L is the BCWQG.

310	indicates parameter concentration exceeds applicable CSR AW or DW standards
0.957	indcates parameter concentration exceeds applicable BCWQG guideline
340	indicates parameter concentration exceeds applicable CSR DW standard and long-term average BCWQG guideline
645	indicates parameter concentration exceeds applicable CSR DW standard and short-term maximum BCWQG guideline
<0.0050	indicates that the reported detection limit is greater than the applicable criteria



LEGEND

- SITE LOCATION
- AIRFIELD
- INDIAN RESERVE
- PARK / PROTECTED AREA
- RESIDENTIAL AREA
- WETLAND
- WATERBODY
- WOODED AREA
- HIGHWAY
- MAJOR ROAD
- LOCAL ROAD
- RAILWAY
- WATERCOURSE
- CONTOUR (20m)

0 1,000 2,000

1:50,000 METRES

REFERENCES

1. ROAD, CONTOUR, WOODED AREA, HYDROLOGY, RESIDENTIAL AREAS AND AIRFIELD DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. INDIAN RESERVES, PARK / PROTECTED AREAS, RAILWAY AND TOWN DATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – BRITISH COLUMBIA.
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
CITY OF KELOWNA

PROJECT
2017 ANNUAL MONITORING REPORT
BIOSOLID COMPOSTING FACILITY, VERNON, BC.

TITLE
KEY PLAN

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-02-07
DESIGNED	HH
PREPARED	JP
REVIEWED	HH
APPROVED	PA

PROJECT NO.	PHASE	REV.	FIGURE
1542527	4000	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

25mm

0

PATH: Y:\burnaby\CAD-GIS\Client\City_of_Kelowna\Vernon\99_PROJECTS\1542527_2014_2015_ANNUAL_MONITORING_REPORT\02_PRODUCTION\ANNUAL_REPORT\MXD\Report\1542527_FIG1_KEY_PLAN_2017.mxd

LEGEND

MAJOR ROAD

0 150 300

1:6,000 METRES

REFERENCES

1. ROAD DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. IMAGERY COPYRIGHT © ESRI AND ITS LICENSORS. SOURCE: VERNON, BC ORTHOPHOTOS. USED UNDER LICENSE, ALL RIGHTS RESERVED. IMAGERY DATE: 20130115
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 11N

CLIENT
CITY OF KELOWNA

PROJECT
2017 ANNUAL MONITORING REPORT
BIOSOLID COMPOSTING FACILITY, VERNON, BC.

TITLE
SITE PLAN

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-02-07
DESIGNED	HH
PREPARED	JP
REVIEWED	HH
APPROVED	PA

PROJECT NO.	PHASE	REV.	FIGURE
1542527	4000	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

25mm

0

PATH: Y:\burnaby\CAD-GIS\Client\City_of_Kelowna\Vernon\99_PROJECTS\1542527_2014_2015_ANNUAL_MONITORING_REPORT\02_PRODUCTION\ANNUAL_REPORT\MXD\Report\1542527_FIG2_SITE_PLAN_2017.mxd

APPENDIX A

ALS Laboratory Certificates of Analysis (2017)

CITY OF KELOWNA
ATTN: Marcia Browne
Glenmore Landfill
2720 John Hindle Drive
Kelowna BC V1V 2C5

Date Received: 10-MAY-17
Report Date: 18-MAY-17 18:06 (MT)
Version: FINAL

Client Phone: 250-469-8796

Certificate of Analysis

Lab Work Order #: L1924064

Project P.O. #: 520747
Job Reference: 1186-202 POND
C of C Numbers:
Legal Site Desc:

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1924064-1	L1924064-2	L1924064-3		
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE		
	Sampled Date	09-MAY-17	09-MAY-17	09-MAY-17		
	Sampled Time	11:00	10:30	10:05		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	899	2500	4330		
	Hardness (as CaCO3) (mg/L)	217	482	1070		
	pH (pH)	8.00	8.76	8.45		
	Total Suspended Solids (mg/L)	3.6	22.8	8.8		
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	0.915	0.0768	0.0771		
	Chloride (Cl) (mg/L)	97.6	268	436		
	Nitrate (as N) (mg/L)	1.21	<0.10 DLDS	0.57		
	Nitrite (as N) (mg/L)	0.0156	<0.020 DLDS	<0.020 DLDS		
	Total Kjeldahl Nitrogen (mg/L)	2.03	1.52	1.20		
	Total Nitrogen (mg/L)	3.26	1.52	1.77		
	Orthophosphate-Dissolved (as P) (mg/L)	0.647	0.0087	0.0114		
Bacteriological Tests	E. coli (MPN/100mL)	23	1000	4		
	Coliform Bacteria - Total (MPN/100mL)	980	1000	225		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0282	0.0256	0.021		
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Total (mg/L)	0.00086	0.00273	0.00332		
	Barium (Ba)-Total (mg/L)	0.029	<0.020	0.024		
	Beryllium (Be)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Total (mg/L)	0.15	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	0.0000125	<0.000010 DLA	<0.000025 DLA		
	Calcium (Ca)-Total (mg/L)	56.2	64.5	84.8		
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Cobalt (Co)-Total (mg/L)	0.00030	<0.00030	<0.00050 DLA		
	Copper (Cu)-Total (mg/L)	0.0032	<0.0010	<0.0025 DLA		
	Iron (Fe)-Total (mg/L)	0.061	0.043	<0.050 DLA		
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Lithium (Li)-Total (mg/L)	0.0102	0.0323	0.0410		
	Magnesium (Mg)-Total (mg/L)	23.3	82.6	231		
	Manganese (Mn)-Total (mg/L)	0.0980	0.0358	0.0789		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.0043	0.0011	0.0025		
	Nickel (Ni)-Total (mg/L)	0.0017	0.0014	<0.0025 DLA		
	Phosphorus (P)-Total (mg/L)	0.85	<0.30	<0.30		
	Potassium (K)-Total (mg/L)	19.5	32.5	70.3		
	Selenium (Se)-Total (mg/L)	0.000512	0.00013	0.00057		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1924064-1	L1924064-2	L1924064-3		
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE		
	Sampled Date	09-MAY-17	09-MAY-17	09-MAY-17		
	Sampled Time	11:00	10:30	10:05		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Total Metals	Silicon (Si)-Total (mg/L)	2.96	0.76	1.49		
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000050 DLA		
	Sodium (Na)-Total (mg/L)	103	405	659		
	Strontium (Sr)-Total (mg/L)	0.541	0.775	0.802		
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010		
	Uranium (U)-Total (mg/L)	0.00241	0.00545	0.00607		
	Vanadium (V)-Total (mg/L)	0.00088	<0.0010 DLA	<0.0025 DLA		
	Zinc (Zn)-Total (mg/L)	0.0270	<0.0060 DLA	<0.015 DLA		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0056	<0.0050	<0.0050		
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Dissolved (mg/L)	0.00081	0.00269	0.00310		
	Barium (Ba)-Dissolved (mg/L)	0.027	<0.020	0.021		
	Beryllium (Be)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Dissolved (mg/L)	0.13	<0.10	<0.10		
	Cadmium (Cd)-Dissolved (mg/L)	0.0000102	<0.000010 DLA	<0.000025 DLA		
	Calcium (Ca)-Dissolved (mg/L)	51.0	60.5	76.2		
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00050 DLA		
	Copper (Cu)-Dissolved (mg/L)	0.0025	<0.0010	<0.0010		
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.050 DLA		
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Lithium (Li)-Dissolved (mg/L)	0.0098	0.0325	0.0382		
	Magnesium (Mg)-Dissolved (mg/L)	21.8	80.3	214		
	Manganese (Mn)-Dissolved (mg/L)	0.0835	0.0267	0.0689		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.0041	0.0011	0.0023		
	Nickel (Ni)-Dissolved (mg/L)	0.0015	0.0014	<0.0025 DLA		
	Phosphorus (P)-Dissolved (mg/L)	0.76	<0.30	<0.30		
	Potassium (K)-Dissolved (mg/L)	18.3	30.4	62.5		
	Selenium (Se)-Dissolved (mg/L)	0.000579	0.00012	0.00054		
	Silicon (Si)-Dissolved (mg/L)	2.71	0.67	1.21		
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000050 DLA		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1924064-1	L1924064-2	L1924064-3		
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE		
	Sampled Date	09-MAY-17	09-MAY-17	09-MAY-17		
	Sampled Time	11:00	10:30	10:05		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Sodium (Na)-Dissolved (mg/L)	96.0	386	599		
	Strontium (Sr)-Dissolved (mg/L)	0.515	0.752	0.742		
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Uranium (U)-Dissolved (mg/L)	0.00202	0.00574	0.00597		
	Vanadium (V)-Dissolved (mg/L)	0.00077	<0.0010 DLA	<0.0025 DLA		
	Zinc (Zn)-Dissolved (mg/L)	0.0242	<0.0050	<0.0050		
Aggregate Organics	BOD (mg/L)	<2.0	<2.0	<2.0		
	COD (mg/L)	28	49	46		

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

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
WSMD	Water sample(s) for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	COD	MS-B	L1924064-1, -2, -3
Matrix Spike	Barium (Ba)-Total	MS-B	L1924064-1, -2, -3
Matrix Spike	Boron (B)-Total	MS-B	L1924064-1, -2, -3
Matrix Spike	Calcium (Ca)-Total	MS-B	L1924064-1, -2, -3
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1924064-1, -2, -3
Matrix Spike	Manganese (Mn)-Total	MS-B	L1924064-1, -2, -3
Matrix Spike	Potassium (K)-Total	MS-B	L1924064-1, -2, -3
Matrix Spike	Sodium (Na)-Total	MS-B	L1924064-1, -2, -3
Matrix Spike	Strontium (Sr)-Total	MS-B	L1924064-1, -2, -3
Matrix Spike	Total Nitrogen	MS-B	L1924064-1, -2, -3
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1924064-1, -2, -3

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
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**
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

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.

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

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.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-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.

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 CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

Reference Information

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

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

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

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

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.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

TCOLI-COLI-ENV-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).

TKN-CALC-VA Water TKN in Water (Calculation) BC MOE LABORATORY MANUAL (2005)

Total Kjeldahl Nitrogen is a calculated parameter. Total Kjeldahl Nitrogen (calc) = Total Nitrogen - [Nitrite (as N) + Nitrate (as N)].

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** 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

Reference Information

VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Enul

Short Holding Time

Rush Processing

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

COC # _____

Page ___ of ___

Report To				**Report Format / Distribution**				**Service Requested** (Rush for routine analysis subject to availability)
Company:	City of Kelowna			☐ Standard	☐ Other			◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Marcia Browne			☑ PDF	☑ Excel	☐ Digital	☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	2720 John Hindle Drive. Kelowna BC V1V2C5			Email 1:	mbrowne@kelowna.ca			○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
				Email 2:	mlewis@kelowna.ca			○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-469-8796	Fax:	250-862-3342	Email 3:				**Analysis Request**
Invoice To	Same as Report ?	☑ Yes	☐ No	**Client / Project Information**				Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?		☐ Yes	☑ No	Job #:	1186-202 POND			
Company:				PO / AFE:	520747			
Contact:				LSD:				
Address:								
Phone:		Fax:		Quote #:				
[redacted]				**ALS Contact:**	Dean Watt	**Sampler:**		

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total metals	Dissolved metals	BOD,COD	T. Coliform, E. Coli	TSS, Ammonia	O-PO4-P	Total Nitrogen, TKN	NO2-N, NO3-N	Total hardness	EC	Chloride	pH	Number of Containers
[redacted]	Commonage Drainage Pond	MAY 9/17	11:00	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
[redacted]	Davidson Pond	09/05/17	10:30	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
[redacted]	Rose's Pond	09/05/17	10:05am	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
[redacted]																	
[redacted]																	
[redacted]	Please return cooler and icepacks with replacement bottles [redacted]																
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	

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

Please use CCME/ BC WQG guidelines for both Davidson Pond and Rose's Pond for Total Metals Analysis and continue using BC CSR guidelines for Commonage Drainage Pond. Please return cooler , ice packs and replacment bottles and preservatives. Thank you

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 provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

[redacted] SHIPMENT RELEASE (client use) [redacted]			[redacted] SHIPMENT RECEPTION (lab use only) [redacted]				[redacted] SHIPMENT VERIFICATION (lab use only) [redacted]			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
			JC	MAY 10 2017	8:30	0.6 °C				

GENF 20.00 Front

CITY OF KELOWNA
ATTN: Marcia Browne
Glenmore Landfill
2720 John Hindle Drive
Kelowna BC V1V 2C5

Date Received: 22-JUN-17
Report Date: 29-JUN-17 18:49 (MT)
Version: FINAL

Client Phone: 250-469-8796

Certificate of Analysis

Lab Work Order #: L1946645

Project P.O. #: 520747
Job Reference: 1186-202 POND
C of C Numbers:
Legal Site Desc:

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1946645-1	L1946645-2	L1946645-3		
Description	Surface Water	Surface Water	Surface Water		
Sampled Date	21-JUN-17	21-JUN-17	21-JUN-17		
Sampled Time	11:15	11:15	11:15		
Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**				
WATER					
Physical Tests	Conductivity (uS/cm)	1590	2720	4380		
	Hardness (as CaCO3) (mg/L)	484	514	1130		
	pH (pH)	8.23	8.89	8.44		
	Total Suspended Solids (mg/L)	19.2	24.2	6.8		
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	10.6	0.0161	0.0228		
	Chloride (Cl) (mg/L)	132	285	397		
	Nitrate (as N) (mg/L)	1.72	<0.10 DLDS	<0.10 DLDS		
	Nitrite (as N) (mg/L)	0.287	<0.020 DLDS	<0.020 DLDS		
	Total Kjeldahl Nitrogen (mg/L)	23.5	1.75	1.43		
	Total Nitrogen (mg/L)	25.5	1.75	1.43		
	Orthophosphate-Dissolved (as P) (mg/L)	1.65	<0.0010	<0.0010		
Bacteriological Tests	E. coli (MPN/100mL)	<10000	5	12		
	Coliform Bacteria - Total (MPN/100mL)	90000	4610	19900		
Total Metals	Aluminum (Al)-Total (mg/L)	0.215	0.174	<0.015 DLA		
	Antimony (Sb)-Total (mg/L)	0.00070	<0.00050	<0.00050		
	Arsenic (As)-Total (mg/L)	0.00447	0.00314	0.00382		
	Barium (Ba)-Total (mg/L)	0.056	<0.020	0.025		
	Beryllium (Be)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Total (mg/L)	0.17	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	0.000285	0.000010	<0.000025 DLA		
	Calcium (Ca)-Total (mg/L)	105	58.1	80.9		
	Chromium (Cr)-Total (mg/L)	<0.0010	0.0011	<0.0010		
	Cobalt (Co)-Total (mg/L)	0.00081	<0.00030	<0.00050 DLA		
	Copper (Cu)-Total (mg/L)	0.0544	<0.0010	<0.0025 DLA		
	Iron (Fe)-Total (mg/L)	0.484	0.233	<0.050 DLA		
	Lead (Pb)-Total (mg/L)	0.00123	<0.00050	<0.00050		
	Lithium (Li)-Total (mg/L)	0.0178	0.0348	0.0398		
	Magnesium (Mg)-Total (mg/L)	54.8	90.1	226		
	Manganese (Mn)-Total (mg/L)	0.272	0.0326	0.0449		
	Mercury (Hg)-Total (mg/L)	0.000062	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.0119	0.0012	0.0023		
	Nickel (Ni)-Total (mg/L)	0.0044	0.0020	<0.0025 DLA		
	Phosphorus (P)-Total (mg/L)	2.59	<0.30	<0.30		
	Potassium (K)-Total (mg/L)	44.5	35.9	69.1		
	Selenium (Se)-Total (mg/L)	0.00187	0.00015	<0.00025 DLA		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1946645-1	L1946645-2	L1946645-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	21-JUN-17	21-JUN-17	21-JUN-17		
	Sampled Time	11:15	11:15	11:15		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Total Metals	Silicon (Si)-Total (mg/L)	4.76	0.57	0.54		
	Silver (Ag)-Total (mg/L)	0.000227	<0.000020	<0.000050 DLA		
	Sodium (Na)-Total (mg/L)	135	431	632		
	Strontium (Sr)-Total (mg/L)	1.10	0.766	0.785		
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Tin (Sn)-Total (mg/L)	0.00080	<0.00050	<0.00050		
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010		
	Uranium (U)-Total (mg/L)	0.00984	0.00525	0.00562		
	Vanadium (V)-Total (mg/L)	0.00193	0.0011	<0.0025 DLA		
	Zinc (Zn)-Total (mg/L)	0.0574	<0.0060 DLA	<0.015 DLA		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0818	<0.0050	<0.0050		
	Antimony (Sb)-Dissolved (mg/L)	0.00054	<0.00050	<0.00050		
	Arsenic (As)-Dissolved (mg/L)	0.00449	0.00308	0.00372		
	Barium (Ba)-Dissolved (mg/L)	0.043	<0.020	0.023		
	Beryllium (Be)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Dissolved (mg/L)	0.16	<0.10	<0.10		
	Cadmium (Cd)-Dissolved (mg/L)	0.000159	<0.000010 DLA	<0.000025 DLA		
	Calcium (Ca)-Dissolved (mg/L)	99.5	55.8	81.6		
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Cobalt (Co)-Dissolved (mg/L)	0.00059	<0.00030	<0.00050 DLA		
	Copper (Cu)-Dissolved (mg/L)	0.0142	<0.0010	<0.0010		
	Iron (Fe)-Dissolved (mg/L)	0.144	<0.030	<0.050 DLA		
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Lithium (Li)-Dissolved (mg/L)	0.0172	0.0353	0.0404		
	Magnesium (Mg)-Dissolved (mg/L)	57.2	90.9	224		
	Manganese (Mn)-Dissolved (mg/L)	0.211	0.0137	0.0354		
	Mercury (Hg)-Dissolved (mg/L)	<0.000025 DLM	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.0055	0.0010	0.0024		
	Nickel (Ni)-Dissolved (mg/L)	0.0035	0.0015	<0.0025 DLA		
	Phosphorus (P)-Dissolved (mg/L)	2.09	<0.30	<0.30		
	Potassium (K)-Dissolved (mg/L)	44.3	34.7	65.5		
	Selenium (Se)-Dissolved (mg/L)	0.00137	0.00010	0.00026		
	Silicon (Si)-Dissolved (mg/L)	4.56	0.23	0.48		
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000050 DLA		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1946645-1	L1946645-2	L1946645-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	21-JUN-17	21-JUN-17	21-JUN-17		
	Sampled Time	11:15	11:15	11:15		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Sodium (Na)-Dissolved (mg/L)	136	431	615		
	Strontium (Sr)-Dissolved (mg/L)	1.09	0.807	0.814		
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Uranium (U)-Dissolved (mg/L)	0.00620	0.00552	0.00597		
	Vanadium (V)-Dissolved (mg/L)	0.00161	<0.0010 DLA	<0.0025 DLA		
	Zinc (Zn)-Dissolved (mg/L)	0.0394	<0.0050	<0.0050		
Aggregate Organics	BOD (mg/L)	13.4	<2.0	<2.0		
	COD (mg/L)	261	68	54		

* 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)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1946645-1, -2, -3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1946645-1, -2, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1946645-1, -2, -3
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1946645-1, -2, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1946645-1, -2, -3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1946645-1, -2, -3
Matrix Spike	Barium (Ba)-Total	MS-B	L1946645-1, -2, -3
Matrix Spike	Calcium (Ca)-Total	MS-B	L1946645-1, -2, -3
Matrix Spike	Copper (Cu)-Total	MS-B	L1946645-1, -2, -3
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1946645-1, -2, -3
Matrix Spike	Sodium (Na)-Total	MS-B	L1946645-1, -2, -3
Matrix Spike	Strontium (Sr)-Total	MS-B	L1946645-1, -2, -3
Matrix Spike	Total Nitrogen	MS-B	L1946645-2, -3
Matrix Spike	Total Nitrogen	MS-B	L1946645-2, -3
Matrix Spike	Total Nitrogen	MS-B	L1946645-2, -3
Matrix Spike	Total Nitrogen	MS-B	L1946645-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
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**
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

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.

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

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.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-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.

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 CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Reference Information

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

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

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

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

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.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

TCOLI-COLI-ENV-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).

TKN-CALC-VA Water TKN in Water (Calculation) BC MOE LABORATORY MANUAL (2005)

Total Kjeldahl Nitrogen is a calculated parameter. Total Kjeldahl Nitrogen (calc) = Total Nitrogen - [Nitrite (as N) + Nitrate (as N)].

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

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

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

L1946645-COFC

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

COC # _____

Page ____ of ____

Report To		**Report Format / Distribution**	**Service Requested** (Rush for routine analysis subject to availability)
Company:	City of Kelowna	☐ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Marcia Browne	☑ PDF ☑ Excel ☐ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	2720 John Hindle Drive. Kelowna BC V1V2C5	Email 1: mbrowne@kelowna.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
		Email 2: mlewis@kelowna.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-469-8796 Fax: 250-862-3342	Email 3:	**Analysis Request**
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**	Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #: 1186-202 POND	
Company:		PO / AFE: 520747	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	
Lab Work Order # (lab use only)	[redacted]	ALS Contact: Dean Watt	Sampler:

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total metals	Dissolved metals	BOD,COD	T. Coliform, E. Coli	TSS, TDS, Ammonia	O-PO4-P	Total Nitrogen, TKN	NO2-N, NO3-N	Total hardness	EC	Chloride	pH	Number of Containers
[redacted]	Commonage Drainage Pond	21/06/17	11:15	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
[redacted]	Davidson Pond	21/06/17	10:30	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
[redacted]	Rose's Pond	21/06/17	10:00	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
[redacted]																	
[redacted]																	
[redacted]	Please return cooler and icepacks with replacement bottles ~~and preservatives~~																
[redacted]	+ 40 mL - 6 pack holder (styro.) please.																
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	

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

Please use CCME/ BC WQG guidelines for both Davidson Pond and Rose's Pond for Total Metals Analysis and continue using BC CSR guidelines for Commonage Drainage Pond. Please return cooler , ice packs and replacment bottles and preservatives. Thank you TSD has been added to the list of parameters. Please use lower detection limit for Beryllium <0.0001 mg/L

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 provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: (C) IP	Date: JUN 22 2017	Time: 8:45 AM	Temperature: 1 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

L1946645

Dean Watt, B.Sc.

CITY OF KELOWNA

KEL400

CITY OF KELOWNA
ATTN: Marcia Browne
Glenmore Landfill
2720 John Hindle Drive
Kelowna BC V1V 2C5

Date Received: 27-JUL-17
Report Date: 10-AUG-17 14:10 (MT)
Version: FINAL

Client Phone: 250-469-8796

Certificate of Analysis

Lab Work Order #: L1965494

Project P.O. #: 520747
Job Reference: 1186-202 POND
C of C Numbers:
Legal Site Desc:

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1965494-1	L1965494-2	L1965494-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	26-JUL-17	26-JUL-17	26-JUL-17		
	Sampled Time	11:00	10:20	10:40		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	1070	3010	4930		
	Hardness (as CaCO3) (mg/L)	279	560	1220		
	pH (pH)	8.20	8.74	8.43		
	Total Suspended Solids (mg/L)	4.9	6.1	9.3		
	Total Dissolved Solids (mg/L)	679	2120	3600		
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	3.29	0.0160	0.0104		
	Chloride (Cl) (mg/L)	105	309	377		
	Nitrate (as N) (mg/L)	0.356	<0.10 DLDS	<0.10 DLDS		
	Nitrite (as N) (mg/L)	0.106	<0.020 DLDS	<0.020 DLDS		
	Total Kjeldahl Nitrogen (mg/L)	5.17	1.76	1.58		
	Total Nitrogen (mg/L)	5.63	1.76	1.58		
	Orthophosphate-Dissolved (as P) (mg/L)	2.05	<0.0010	<0.0010		
Bacteriological Tests	E. coli (MPN/100mL)	120	6	1		
	Coliform Bacteria - Total (MPN/100mL)	24200	24200	29900		
Total Metals	Aluminum (Al)-Total (mg/L)	0.047	0.0122	0.024		
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Total (mg/L)	0.0015	0.00386	0.00419		
	Barium (Ba)-Total (mg/L)	0.035	<0.020	0.020		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00020 DLA	<0.00050 DLA		
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Total (mg/L)	0.14	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	<0.000050	<0.000010 DLA	<0.000025 DLA		
	Calcium (Ca)-Total (mg/L)	72.1	54.9	85.4		
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Cobalt (Co)-Total (mg/L)	<0.00050	<0.00030	<0.00050 DLA		
	Copper (Cu)-Total (mg/L)	0.0043	<0.0010	<0.0025 DLA		
	Iron (Fe)-Total (mg/L)	0.205	0.033	<0.050 DLA		
	Lead (Pb)-Total (mg/L)	<0.0010	<0.00050	<0.00050		
	Lithium (Li)-Total (mg/L)	0.0131	0.0485	0.0547		
	Magnesium (Mg)-Total (mg/L)	28.4	108	255		
	Manganese (Mn)-Total (mg/L)	0.183	0.0245	0.0527		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.0044	<0.0010	0.0022		
	Nickel (Ni)-Total (mg/L)	<0.0050	0.0018	<0.0025 DLA		
	Phosphorus (P)-Total (mg/L)	2.31	<0.30	<0.30		
	Potassium (K)-Total (mg/L)	22.6	44.0	79.8		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1965494-1	L1965494-2	L1965494-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	26-JUL-17	26-JUL-17	26-JUL-17		
	Sampled Time	11:00	10:20	10:40		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	<0.0010	0.00031	0.00030		
	Silicon (Si)-Total (mg/L)	4.11	1.42	1.06		
	Silver (Ag)-Total (mg/L)	<0.000050	0.000486	0.000134		
	Sodium (Na)-Total (mg/L)	103	567	776		
	Strontium (Sr)-Total (mg/L)	0.647	0.753	0.777		
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.000020 DLA	<0.000050 DLA		
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010		
	Uranium (U)-Total (mg/L)	0.00306	0.00493	0.00553		
	Vanadium (V)-Total (mg/L)	0.00071	<0.0010 DLA	<0.0025 DLA		
	Zinc (Zn)-Total (mg/L)	0.0130	<0.0060 DLA	<0.015 DLA		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.020	<0.0050	<0.0050		
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Dissolved (mg/L)	0.0015	0.00339	0.00410		
	Barium (Ba)-Dissolved (mg/L)	0.036	<0.020	<0.020		
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00020 DLA	<0.00050 DLA		
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Dissolved (mg/L)	0.15	<0.10	<0.10		
	Cadmium (Cd)-Dissolved (mg/L)	<0.000050	<0.000010 DLA	<0.000025 DLA		
	Calcium (Ca)-Dissolved (mg/L)	65.0	53.6	83.1		
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00050	<0.00030	<0.00050 DLA		
	Copper (Cu)-Dissolved (mg/L)	0.0020	<0.0010	<0.0010		
	Iron (Fe)-Dissolved (mg/L)	0.104	<0.030	<0.050 DLA		
	Lead (Pb)-Dissolved (mg/L)	<0.0010	<0.00050	<0.00050		
	Lithium (Li)-Dissolved (mg/L)	0.0120	0.0487	0.0531		
	Magnesium (Mg)-Dissolved (mg/L)	28.3	103	246		
	Manganese (Mn)-Dissolved (mg/L)	0.171	0.0147	0.00622		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.0042	<0.0010	0.0020		
	Nickel (Ni)-Dissolved (mg/L)	<0.0050	0.0016	<0.0025 DLA		
	Phosphorus (P)-Dissolved (mg/L)	2.45	<0.30	<0.30		
	Potassium (K)-Dissolved (mg/L)	25.4	43.1	78.2		
	Selenium (Se)-Dissolved (mg/L)	<0.0010	0.00019	0.00026		
	Silicon (Si)-Dissolved (mg/L)	4.17	1.32	0.92		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1965494-1	L1965494-2	L1965494-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	26-JUL-17	26-JUL-17	26-JUL-17		
	Sampled Time	11:00	10:20	10:40		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000020	<0.000050 DLA		
	Sodium (Na)-Dissolved (mg/L)	108	543	748		
	Strontium (Sr)-Dissolved (mg/L)	0.639	0.712	0.747		
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Uranium (U)-Dissolved (mg/L)	0.00275	0.00453	0.00520		
	Vanadium (V)-Dissolved (mg/L)	0.00062	<0.0010 DLA	<0.0025 DLA		
	Zinc (Zn)-Dissolved (mg/L)	0.0103	<0.0050	<0.0050		
Aggregate Organics	BOD (mg/L)	<2.0	<2.0	<2.0		
	COD (mg/L)	61	64	63		

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

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
WSMD	Water sample(s) for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

Qualifiers for Individual Samples Listed:

Sample Numbe	Client Sample ID	Qualifier	Description
L1965494-1	COMMONAGE DRAINAGE F	WSMD	Water sample(s) for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Total	MS-B	L1965494-1, -2, -3
Matrix Spike	Calcium (Ca)-Total	MS-B	L1965494-1, -2, -3
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1965494-1, -2, -3
Matrix Spike	Sodium (Na)-Total	MS-B	L1965494-1, -2, -3
Matrix Spike	Strontium (Sr)-Total	MS-B	L1965494-1, -2, -3
Matrix Spike	Uranium (U)-Total	MS-B	L1965494-1, -2, -3
Matrix Spike	Total Nitrogen	MS-B	L1965494-1, -2, -3

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
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**
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

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.

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

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.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-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.

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 CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Reference Information

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

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

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

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

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.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

TCOLI-COLI-ENV-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.

TKN-CALC-VA Water TKN in Water (Calculation) BC MOE LABORATORY MANUAL (2005)

Total Kjeldahl Nitrogen is a calculated parameter. Total Kjeldahl Nitrogen (calc) = Total Nitrogen - [Nitrite (as N) + Nitrate (as N)].

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** 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

Reference Information

VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L1965494-COFC

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page ____ of ____

Report To		Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	City of Kelowna	☐ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Marcia Browne	☑ PDF ☑ Excel ☐ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	2720 John Hindle Drive. Kelowna BC V1V2C5	Email 1: mbrowne@kelowna.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
		Email 2: mlewis@kelowna.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-469-8796 Fax: 250-862-3342	Email 3:	
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #: 1186-202 POND	
Company:		PO / AFE: 520747	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	
Lab Work Order # (lab use only)		ALS Contact: Dean Watt	Sampler:

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total metals	Dissolved metals	BOD,COD	T. Coliform, E. Coli	TSS, TDS, Ammonia	O-PO4-P	Total Nitrogen, TKN	NO2-N, NO3-N	Total hardness	EC	Chloride	pH	Number of Containers
	Commonage Drainage Pond	26/07/17	10:00	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Davidson Pond	26/07/17	10:20	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Rose's Pond	26/07/17	10:40	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Please return cooler and icepacks with replacement bottles ~~and preservative~~ & Syringes.																

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

Please use CCME/ BC WQG guidelines for both Davidson Pond and Rose's Pond for Total Metals Analysis and continue using BC CSR guidelines for Commonage Drainage Pond. Please return cooler , ice packs and replacment bottles and preservatives. Thank you TSD has been added to the list of parameters. Please use lower detection limit for Beryllium <0.0001 mg/L

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 provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: AMANPR1	Date: 27-07-17	Time: 9.50	Temperature: 3 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

CITY OF KELOWNA
ATTN: Marcia Browne
Glenmore Landfill
2720 John Hindle Drive
Kelowna BC V1V 2C5

Date Received: 01-SEP-17
Report Date: 11-SEP-17 18:00 (MT)
Version: FINAL

Client Phone: 250-469-8796

Certificate of Analysis

Lab Work Order #: L1984896

Project P.O. #: 520747
Job Reference: 1186-202 POND
C of C Numbers:
Legal Site Desc:

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984896-1	L1984896-2	L1984896-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	31-AUG-17	31-AUG-17	31-AUG-17		
	Sampled Time	11:23	12:25	11:10		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	913	3150	4890		
	Hardness (as CaCO3) (mg/L)	226	556	1230		
	pH (pH)	8.20	8.96	8.72		
	Total Suspended Solids (mg/L)	9.1	4.1	9.7		
	Total Dissolved Solids (mg/L)	600	2250	3910		
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	1.38	0.0198	0.0117		
	Chloride (Cl) (mg/L)	104	348	444		
	Nitrate (as N) (mg/L)	0.314	<0.10 DLDS	<0.10 DLDS		
	Nitrite (as N) (mg/L)	0.0230	<0.020 DLDS	<0.020 DLDS		
	Total Kjeldahl Nitrogen (mg/L)	2.83	2.24	1.64		
	Total Nitrogen (mg/L)	3.17	2.24	1.64		
	Orthophosphate-Dissolved (as P) (mg/L)	0.929	0.0010	<0.0010		
Bacteriological Tests	E. coli (MPN/100mL)	480	<10	10		
	Coliform Bacteria - Total (MPN/100mL)	>24196	9800	17300		
Total Metals	Aluminum (Al)-Total (mg/L)	0.108	0.0174	0.0218		
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	0.00057		
	Arsenic (As)-Total (mg/L)	0.00130	0.00342	0.00483		
	Barium (Ba)-Total (mg/L)	0.035	<0.020	0.021		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Total (mg/L)	0.15	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	0.0000249	0.0000052	<0.0000050		
	Calcium (Ca)-Total (mg/L)	55.6	50.2	81.3		
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Cobalt (Co)-Total (mg/L)	0.00033	<0.00030	<0.00030		
	Copper (Cu)-Total (mg/L)	0.0039	<0.0010	<0.0010		
	Iron (Fe)-Total (mg/L)	0.170	0.041	<0.030		
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Lithium (Li)-Total (mg/L)	0.0105	0.0447	0.0471		
	Magnesium (Mg)-Total (mg/L)	23.1	110	277		
	Manganese (Mn)-Total (mg/L)	0.117	0.0222	0.102		
	Mercury (Hg)-Total (mg/L)	0.0000135	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.0043	<0.0010	0.0023		
	Nickel (Ni)-Total (mg/L)	0.0019	0.0018	0.0012		
	Phosphorus (P)-Total (mg/L)	1.22	<0.30	<0.30		
	Potassium (K)-Total (mg/L)	20.8	43.2	82.2		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984896-1	L1984896-2	L1984896-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	31-AUG-17	31-AUG-17	31-AUG-17		
	Sampled Time	11:23	12:25	11:10		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	0.000622	0.000116	0.000267		
	Silicon (Si)-Total (mg/L)	3.68	1.11	1.07		
	Silver (Ag)-Total (mg/L)	0.000036	<0.000020	<0.000020		
	Sodium (Na)-Total (mg/L)	103	559	786		
	Strontium (Sr)-Total (mg/L)	0.551	0.734	0.770		
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010		
	Uranium (U)-Total (mg/L)	0.00275	0.00551	0.00591		
	Vanadium (V)-Total (mg/L)	0.00136	0.00082	0.00099		
	Zinc (Zn)-Total (mg/L)	0.0226	<0.0050	<0.0050		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0136	0.0059	0.0051		
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Dissolved (mg/L)	0.00120	0.00337	0.00440		
	Barium (Ba)-Dissolved (mg/L)	0.030	<0.020	<0.020		
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00050 DLA		
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Dissolved (mg/L)	0.14	<0.10	0.11		
	Cadmium (Cd)-Dissolved (mg/L)	0.0000150	<0.0000050	<0.000025 DLA		
	Calcium (Ca)-Dissolved (mg/L)	53.9	50.3	78.9		
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00050 DLA		
	Copper (Cu)-Dissolved (mg/L)	0.0024	<0.0010	<0.0010		
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.050 DLA		
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Lithium (Li)-Dissolved (mg/L)	0.0101	0.0453	0.0491		
	Magnesium (Mg)-Dissolved (mg/L)	22.2	105	250		
	Manganese (Mn)-Dissolved (mg/L)	0.0413	0.0137	0.0316		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.0040	<0.0010	0.0021		
	Nickel (Ni)-Dissolved (mg/L)	0.0017	0.0016	<0.0025 DLA		
	Phosphorus (P)-Dissolved (mg/L)	1.08	<0.30	<0.30		
	Potassium (K)-Dissolved (mg/L)	19.7	41.0	78.7		
	Selenium (Se)-Dissolved (mg/L)	0.000572	0.000122	0.00025		
	Silicon (Si)-Dissolved (mg/L)	3.33	1.00	0.86		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984896-1	L1984896-2	L1984896-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	31-AUG-17	31-AUG-17	31-AUG-17		
	Sampled Time	11:23	12:25	11:10		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000050 DLA		
	Sodium (Na)-Dissolved (mg/L)	97.3	529	721		
	Strontium (Sr)-Dissolved (mg/L)	0.544	0.728	0.751		
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Uranium (U)-Dissolved (mg/L)	0.00246	0.00524	0.00545		
	Vanadium (V)-Dissolved (mg/L)	0.00096	0.00059	<0.0025 DLA		
	Zinc (Zn)-Dissolved (mg/L)	0.0145	<0.0050	<0.0050		
Aggregate Organics	BOD (mg/L)	3.9	<2.0	2.2		
	COD (mg/L)	49	71	75		

* 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)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1984896-1, -2, -3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1984896-1, -2, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1984896-1, -2, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1984896-1, -2, -3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1984896-1, -2, -3
Matrix Spike	Total Nitrogen	MS-B	L1984896-2, -3
Matrix Spike	Total Nitrogen	MS-B	L1984896-1
Matrix Spike	Total Nitrogen	MS-B	L1984896-1
Matrix Spike	Total Nitrogen	MS-B	L1984896-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
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**
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

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.

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

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.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-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.

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 CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Reference Information

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

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

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

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

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.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

TCOLI-COLI-ENV-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.

TKN-CALC-VA	Water	TKN in Water (Calculation)	BC MOE LABORATORY MANUAL (2005)

Total Kjeldahl Nitrogen is a calculated parameter. Total Kjeldahl Nitrogen (calc) = Total Nitrogen - [Nitrite (as N) + Nitrate (as N)].

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

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

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

L1984896-COFC

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page ____ of ____

Report To			
Company:	City of Kelowna		
Contact:	Marcia Browne		
Address:	2720 John Hindle Drive. Kelowna BC V1V2C5		
Phone:	250-469-8796	Fax:	250-862-3342
Invoice To	Same as Report ? ☑ Yes ☐ No		
Hardcopy of Invoice with Report?	☐ Yes ☑ No		
Company:			
Contact:			
Address:			
Phone:		Fax:	

Report Format / Distribution			
☐ Standard	☐ Other		
☑ PDF	☑ Excel	☐ Digital	☐ Fax
Email 1:	mbrowne@kelowna.ca		
Email 2:	mlewis@kelowna.ca		
Email 3:			

Client / Project Information	
Job #:	1186-202 POND
PO / AFE:	520747
LSD:	
Quote #:	

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Lab Work Order # (lab use only)		ALS Contact:	Dean Watt	Sampler:	

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total metals	Dissolved metals	BOD,COD	T. Coliform, E. Coli	TSS, TDS, Ammonia	O-PO4-P	Total Nitrogen, TKN	NO2-N, NO3-N	Total hardness	EC	Chloride	pH	Number of Containers
	Commonage Drainage Pond	31/0817	11:23	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Davidson Pond	31/08/17	12:25	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Rose's Pond	31/08/17	11:10	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Please return cooler and icepacks with replacement bottles																
	and preservatives. Thank you.																

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

Please use CCME/ BC WQG guidelines for both Davidson Pond and Rose's Pond for Total Metals Analysis and continue using BC CSR guidelines for Commonage Drainage Pond. Please return cooler , ice packs and replacment bottles and preservatives. Thank you TSD has been added to the list of parameters. Please use lower detection limit for Beryllium <0.0001 mg/L

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 provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
			PAUL	SEP 1	08:45	7.7, 10.4 °C 5.6 8.4				

GENF 20.00 Front

CITY OF KELOWNA
ATTN: Marcia Browne
Glenmore Landfill
2720 John Hindle Drive
Kelowna BC V1V 2C5

Date Received: 21-SEP-17
Report Date: 28-SEP-17 16:13 (MT)
Version: FINAL

Client Phone: 250-469-8796

Certificate of Analysis

Lab Work Order #: L1994913

Project P.O. #: 520747
Job Reference: 1186-202 POND
C of C Numbers:
Legal Site Desc:

Comments: ADDITIONAL 27-SEP-17 17:36

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1994913-1	L1994913-2	L1994913-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	20-SEP-17	20-SEP-17	20-SEP-17		
	Sampled Time	11:00	10:45	10:30		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSONN POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	1020	3290	5130		
	Hardness (as CaCO3) (mg/L)	254	535	1080		
	pH (pH)	8.19	8.78	8.67		
	Total Suspended Solids (mg/L)	11.6	6.6	15.2		
	Total Dissolved Solids (mg/L)	668	2320	4020		
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	6.55	0.0140	0.0097		
	Chloride (Cl) (mg/L)	104	340	443		
	Nitrate (as N) (mg/L)	0.150	<0.10 DLDS	<0.10 DLDS		
	Nitrite (as N) (mg/L)	0.106	<0.020 HTD	<0.020 DLDS		
	Total Kjeldahl Nitrogen (mg/L)	11.7	1.88	1.85		
	Total Nitrogen (mg/L)	12.0	1.88	1.85		
	Orthophosphate-Dissolved (as P) (mg/L)	1.69	<0.0010	<0.0010		
Bacteriological Tests	E. coli (MPN/100mL)	70	1	2		
	Coliform Bacteria - Total (MPN/100mL)	3260	2420	2480		
Total Metals	Aluminum (Al)-Total (mg/L)	0.026	<0.0060 DLA	<0.015 DLA		
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	0.00056		
	Arsenic (As)-Total (mg/L)	0.0020	0.00321	0.00422		
	Barium (Ba)-Total (mg/L)	0.030	<0.020	<0.020		
	Beryllium (Be)-Total (mg/L)	<0.0050	<0.00020 DLA	<0.00050 DLA		
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Total (mg/L)	0.16	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	<0.000050	<0.000010 DLA	<0.000025 DLA		
	Calcium (Ca)-Total (mg/L)	57.7	47.0	71.3		
	Chromium (Cr)-Total (mg/L)	<0.00050	<0.0010	<0.0010		
	Cobalt (Co)-Total (mg/L)	<0.00050	<0.00030	<0.00050 DLA		
	Copper (Cu)-Total (mg/L)	0.0062	<0.0010	<0.0025 DLA		
	Iron (Fe)-Total (mg/L)	0.108	<0.030	<0.050 DLA		
	Lead (Pb)-Total (mg/L)	<0.0010	<0.00050	<0.00050		
	Lithium (Li)-Total (mg/L)	<0.050	0.0427	0.0503		
	Magnesium (Mg)-Total (mg/L)	23.6	97.2	231		
	Manganese (Mn)-Total (mg/L)	0.095	0.0306	0.0169		
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.0042	<0.0010	0.0020		
	Nickel (Ni)-Total (mg/L)	<0.0050	0.0017	<0.0025 DLA		
	Phosphorus (P)-Total (mg/L)	1.84	<0.30	<0.30		
	Potassium (K)-Total (mg/L)	28.9	40.1	70.4		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1994913-1	L1994913-2	L1994913-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	20-SEP-17	20-SEP-17	20-SEP-17		
	Sampled Time	11:00	10:45	10:30		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSONN POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	<0.0010	0.00010	0.00027		
	Silicon (Si)-Total (mg/L)	3.92	1.48	0.96		
	Silver (Ag)-Total (mg/L)	<0.000050	<0.000020	<0.000050 DLA		
	Sodium (Na)-Total (mg/L)	109	518	704		
	Strontium (Sr)-Total (mg/L)	0.569	0.706	0.686		
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.000020 DLA	<0.000050 DLA		
	Tin (Sn)-Total (mg/L)	<0.030	<0.00050	<0.00050		
	Titanium (Ti)-Total (mg/L)	<0.050	<0.010	<0.010		
	Uranium (U)-Total (mg/L)	0.00262	0.00502	0.00560		
	Vanadium (V)-Total (mg/L)	<0.030	<0.0010 DLA	<0.0025 DLA		
	Zinc (Zn)-Total (mg/L)	0.0177	<0.0060 DLA	<0.015 DLA		
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB	LAB		
	Dissolved Metals Filtration Location	LAB	LAB	LAB		
	Aluminum (Al)-Dissolved (mg/L)	0.031	<0.0050	<0.0050		
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	0.00050		
	Arsenic (As)-Dissolved (mg/L)	0.0021	0.00318	0.00377		
	Barium (Ba)-Dissolved (mg/L)	0.031	<0.020	<0.020		
	Beryllium (Be)-Dissolved (mg/L)	<0.0050	<0.00020 DLA	<0.00050 DLA		
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Dissolved (mg/L)	0.18	<0.10	<0.10		
	Cadmium (Cd)-Dissolved (mg/L)	0.000059	<0.000010 DLA	<0.000025 DLA		
	Calcium (Ca)-Dissolved (mg/L)	61.3	52.3	71.3		
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.0010	<0.0010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00050	<0.00030	<0.00050 DLA		
	Copper (Cu)-Dissolved (mg/L)	0.0085 DTC	<0.0010	<0.0010		
	Iron (Fe)-Dissolved (mg/L)	0.112	<0.030	<0.050 DLA		
	Lead (Pb)-Dissolved (mg/L)	<0.0010	<0.00050	<0.00050		
	Lithium (Li)-Dissolved (mg/L)	<0.050	0.0482	0.0497		
	Magnesium (Mg)-Dissolved (mg/L)	24.6	98.2	220		
	Manganese (Mn)-Dissolved (mg/L)	<0.010	0.00770	0.00138		
	Mercury (Hg)-Dissolved (mg/L)	<0.00020	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.0041	<0.0010	0.0020		
	Nickel (Ni)-Dissolved (mg/L)	<0.0050	0.0015	<0.0025 DLA		
	Phosphorus (P)-Dissolved (mg/L)	1.94	<0.30	<0.30		
	Potassium (K)-Dissolved (mg/L)	30.3	41.6	68.4		
	Selenium (Se)-Dissolved (mg/L)	<0.0010	<0.00010 DLA	<0.00025 DLA		
	Silicon (Si)-Dissolved (mg/L)	3.91	1.49	0.97		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1994913-1	L1994913-2	L1994913-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	20-SEP-17	20-SEP-17	20-SEP-17		
	Sampled Time	11:00	10:45	10:30		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSONN POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000020	<0.000050 DLA		
	Sodium (Na)-Dissolved (mg/L)	108	527	675		
	Strontium (Sr)-Dissolved (mg/L)	0.572	0.770	0.672		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.00020	<0.00020		
	Tin (Sn)-Dissolved (mg/L)	<0.030	<0.00050	<0.00050		
	Titanium (Ti)-Dissolved (mg/L)	<0.050	<0.010	<0.010		
	Uranium (U)-Dissolved (mg/L)	0.00254	0.00541	0.00557		
	Vanadium (V)-Dissolved (mg/L)	<0.030	<0.0010 DLA	<0.0025 DLA		
	Zinc (Zn)-Dissolved (mg/L)	0.0206	<0.0050	<0.0050		
Aggregate Organics	BOD (mg/L)	3.0	<2.0	2.1		
	COD (mg/L)	121	72	80		

* 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)
Method Blank	Molybdenum (Mo)-Dissolved	MB-LOR	L1994913-1, -2, -3
Method Blank	Aluminum (Al)-Total	MB-LOR	L1994913-1, -2, -3
Method Blank	Barium (Ba)-Total	MB-LOR	L1994913-1, -2, -3
Method Blank	Calcium (Ca)-Total	MB-LOR	L1994913-1, -2, -3
Method Blank	Lead (Pb)-Total	MB-LOR	L1994913-1, -2, -3
Method Blank	Magnesium (Mg)-Total	MB-LOR	L1994913-1, -2, -3
Method Blank	Manganese (Mn)-Total	MB-LOR	L1994913-1, -2, -3
Method Blank	Sodium (Na)-Total	MB-LOR	L1994913-1, -2, -3
Matrix Spike	Mercury (Hg)-Total	MS-B	L1994913-2, -3
Matrix Spike	Mercury (Hg)-Total	MS-B	L1994913-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1994913-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1994913-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1994913-1
Matrix Spike	Total Nitrogen	MS-B	L1994913-1
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1994913-1, -2, -3
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1994913-1, -2, -3

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
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**
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

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.

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

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.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-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.

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 CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Reference Information

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-DIS-CVAFS-VA Water Dissolved Hg in Water by CVAFS LOR=50ppt APHA 3030B/EPA 1631E (mod)

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-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-TOT-CVAFS-VA Water Total Hg in Water by CVAFS LOR=50ppt EPA 1631E (mod)

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-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-DIS-ICP-VA Water Dissolved 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 procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

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).

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

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

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

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

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.

Reference Information

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

TCOLI-COLI-ENV-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.

TKN-CALC-VA	Water	TKN in Water (Calculation)	BC MOE LABORATORY MANUAL (2005)

Total Kjeldahl Nitrogen is a calculated parameter. Total Kjeldahl Nitrogen (calc) = Total Nitrogen - [Nitrite (as N) + Nitrate (as N)].

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

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

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page ____ of ____

Report To		Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	City of Kelowna	☐ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Marcia Browne	☑ PDF ☑ Excel ☐ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	2720 John Hindle Drive. Kelowna BC V1V2C5	Email 1: mbrowne@kelowna.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
		Email 2: mlewis@kelowna.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-469-8796 Fax: 250-862-3342	Email 3:	
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #: 1186-202 POND	
Company:		PO / AFE: 520747	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	

Lab Work Order # (lab use only)	ALS Contact: Dean Watt	Sampler:

Sample # (lab use only)	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total metals	Dissolved metals	BOD,COD	T. Coliform, E. Coli	TSS, TDS, Ammonia	O-PO4-P	Total Nitrogen, TKN	NO2-N, NO3-N	Total hardness	EC	Chloride	pH	Number of Containers
	Commonage Drainage Pond	20-09-17	11:00	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Davidson Pond	20-09-17	10:45	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Rose's Pond	20-09-17	10:30	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Please return cooler and icepacks with replacement bottles.																

L1994913-COFC

B

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

Please use CCME/ BC WQG guidelines for both Davidson Pond and Rose's Pond for Total Metals Analysis and continue using BC CSR guidelines for Commonage Drainage Pond. Please return cooler , ice packs and replacment bottles and preservatives. Thank you TSD has been added to the list of parameters. Please use lower detection limit for Beryllium <0.0001 mg/L

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 provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
			PAUL	SEP 21	08:40	3-9 °C				

7.6°C

7.4°C.

GENF 20.00 Front

CITY OF KELOWNA
ATTN: Marcia Browne
Glenmore Landfill
2720 John Hindle Drive
Kelowna BC V1V 2C5

Date Received: 01-NOV-17
Report Date: 17-NOV-17 19:06 (MT)
Version: FINAL

Client Phone: 250-469-8796

Certificate of Analysis

Lab Work Order #: L2016326

Project P.O. #: 520747
Job Reference: 1186-202 POND
C of C Numbers:
Legal Site Desc:

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2016326-1	L2016326-2	L2016326-3		
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE		
	Sampled Date	31-OCT-17	31-OCT-17	31-OCT-17		
	Sampled Time	10:27	11:15	10:10		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	784	3510	5440		
	Hardness (as CaCO3) (mg/L)	107	139	18.8		
	pH (pH)	8.68	8.36	8.49		
	Total Suspended Solids (mg/L)	31.3	16.7	6.1		
	Total Dissolved Solids (mg/L)	481	2270	4080		
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	3.99	0.645	0.0187		
	Chloride (Cl) (mg/L)	73.8	328	443		
	Nitrate (as N) (mg/L)	1.04	<0.10 DLDS	0.12		
	Nitrite (as N) (mg/L)	0.104	<0.13 DLM	<0.020 DLDS		
	Total Kjeldahl Nitrogen (mg/L)	9.20	2.42	1.70		
	Total Nitrogen (mg/L)	10.3	2.42	1.81		
	Orthophosphate-Dissolved (as P) (mg/L)	2.51	0.0363	<0.0010		
Bacteriological Tests	E. coli (MPN/100mL)	290	9	<1		
	Coliform Bacteria - Total (MPN/100mL)	24200	37	25		
Total Metals	Aluminum (Al)-Total (mg/L)	0.069	0.0143	0.0090		
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	0.00053		
	Arsenic (As)-Total (mg/L)	0.0024	0.00408	0.00442		
	Barium (Ba)-Total (mg/L)	0.023	<0.020	<0.020		
	Beryllium (Be)-Total (mg/L)	<0.0050	<0.00020 DLA	<0.00020 DLA		
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Total (mg/L)	0.16	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	0.000063	<0.000010 DLA	<0.000010 DLA		
	Calcium (Ca)-Total (mg/L)	41.1	59.3	79.7		
	Chromium (Cr)-Total (mg/L)	0.00063	<0.0010	<0.0010		
	Cobalt (Co)-Total (mg/L)	<0.00050	<0.00030	<0.00030		
	Copper (Cu)-Total (mg/L)	0.0130	<0.0010	<0.0010		
	Iron (Fe)-Total (mg/L)	0.237	0.043	<0.030		
	Lead (Pb)-Total (mg/L)	<0.0010	<0.00050	<0.00050		
	Lithium (Li)-Total (mg/L)	<0.050	0.0472	0.0558		
	Magnesium (Mg)-Total (mg/L)	18.4	119	288		
	Manganese (Mn)-Total (mg/L)	0.137	0.157	0.0514		
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.0039	<0.0010	0.0019		
	Nickel (Ni)-Total (mg/L)	<0.0050	0.0018	0.0011		
	Phosphorus (P)-Total (mg/L)	3.33	<0.30	<0.30		
	Potassium (K)-Total (mg/L)	25.2	44.3	85.2		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2016326-1	L2016326-2	L2016326-3		
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE		
	Sampled Date	31-OCT-17	31-OCT-17	31-OCT-17		
	Sampled Time	10:27	11:15	10:10		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	<0.0010	<0.00010 DLA	0.00022		
	Silicon (Si)-Total (mg/L)	0.49	2.56	1.17		
	Silver (Ag)-Total (mg/L)	<0.000050	<0.000020	<0.000020		
	Sodium (Na)-Total (mg/L)	81.4	566	825		
	Strontium (Sr)-Total (mg/L)	0.376	0.874	0.737		
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.000020 DLA	<0.000020 DLA		
	Tin (Sn)-Total (mg/L)	<0.030	<0.00050	<0.00050		
	Titanium (Ti)-Total (mg/L)	<0.050	<0.010	<0.010		
	Uranium (U)-Total (mg/L)	0.00134	0.00548	0.00637		
	Vanadium (V)-Total (mg/L)	<0.030	<0.0010 DLA	<0.0010 DLA		
	Zinc (Zn)-Total (mg/L)	0.0418	<0.0060 DLA	<0.0060 DLA		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	<0.010	<0.0050	<0.0050		
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Dissolved (mg/L)	<0.0010	<0.00050	<0.00050		
	Barium (Ba)-Dissolved (mg/L)	0.023	<0.020	<0.020		
	Beryllium (Be)-Dissolved (mg/L)	<0.0050	<0.00020 DLA	<0.00020 DLA		
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10		
	Cadmium (Cd)-Dissolved (mg/L)	<0.000050	<0.000010 DLA	<0.000010 DLA		
	Calcium (Ca)-Dissolved (mg/L)	28.3	35.5	6.54		
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.0010	<0.0010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00050	<0.00030	<0.00030		
	Copper (Cu)-Dissolved (mg/L)	0.0025	0.0022	<0.0010		
	Iron (Fe)-Dissolved (mg/L)	0.121	<0.030	<0.030		
	Lead (Pb)-Dissolved (mg/L)	<0.0010	<0.00050	<0.00050		
	Lithium (Li)-Dissolved (mg/L)	<0.050	<0.0020 DLA	<0.0020 DLA		
	Magnesium (Mg)-Dissolved (mg/L)	8.79	12.3	0.61		
	Manganese (Mn)-Dissolved (mg/L)	<0.010	0.00267	0.0161		
	Mercury (Hg)-Dissolved (mg/L)	<0.00020	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Nickel (Ni)-Dissolved (mg/L)	<0.0050	0.0035	<0.0010		
	Phosphorus (P)-Dissolved (mg/L)	3.44	<0.30	<0.30		
	Potassium (K)-Dissolved (mg/L)	2.2	<2.0	<2.0		
	Selenium (Se)-Dissolved (mg/L)	<0.0010	0.00011	<0.00010 DLA		
	Silicon (Si)-Dissolved (mg/L)	0.273	2.54	0.37		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2016326-1	L2016326-2	L2016326-3		
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE		
	Sampled Date	31-OCT-17	31-OCT-17	31-OCT-17		
	Sampled Time	10:27	11:15	10:10		
	Client ID	COMMONAGE DRAINAGE POND	DAVIDSON POND	ROSE'S POND		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000020	<0.000020		
	Sodium (Na)-Dissolved (mg/L)	7.3	10.7	6.7		
	Strontium (Sr)-Dissolved (mg/L)	0.133	0.183	0.0291		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.00020	<0.00020		
	Tin (Sn)-Dissolved (mg/L)	<0.030	<0.00050	<0.00050		
	Titanium (Ti)-Dissolved (mg/L)	<0.050	<0.010	<0.010		
	Uranium (U)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Vanadium (V)-Dissolved (mg/L)	<0.030	<0.0010 DLA	<0.0010 DLA		
	Zinc (Zn)-Dissolved (mg/L)	0.0233	0.0134	0.0125		
Aggregate Organics	BOD (mg/L)	15.0	2.9	<2.0		
	COD (mg/L)	117	65	62		

* 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)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2016326-1, -2, -3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2016326-1, -2, -3
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2016326-1, -2, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2016326-1, -2, -3
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2016326-1, -2, -3
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2016326-1, -2, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2016326-1, -2, -3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2016326-1, -2, -3
Matrix Spike	Barium (Ba)-Total	MS-B	L2016326-1, -2, -3
Matrix Spike	Boron (B)-Total	MS-B	L2016326-1, -2, -3
Matrix Spike	Calcium (Ca)-Total	MS-B	L2016326-1, -2, -3
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2016326-1, -2, -3
Matrix Spike	Manganese (Mn)-Total	MS-B	L2016326-1, -2, -3
Matrix Spike	Sodium (Na)-Total	MS-B	L2016326-1, -2, -3
Matrix Spike	Strontium (Sr)-Total	MS-B	L2016326-1, -2, -3
Matrix Spike	Total Nitrogen	MS-B	L2016326-1, -2, -3

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
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**
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

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.

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

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.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-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.

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 CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-DIS-CVAFS-VA	Water	Dissolved Hg in Water by CVAFS LOR=50ppt	APHA 3030B/EPA 1631E (mod)

Reference Information

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by 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-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-TOT-CVAFS-VA Water Total Hg in Water by CVAFS LOR=50ppt EPA 1631E (mod)

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-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

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

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

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.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

TCOLI-COLI-ENV-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.

TKN-CALC-VA Water TKN in Water (Calculation) BC MOE LABORATORY MANUAL (2005)

Total Kjeldahl Nitrogen is a calculated parameter. Total Kjeldahl Nitrogen (calc) = Total Nitrogen - [Nitrite (as N) + Nitrate (as N)].

Reference Information

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

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

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of 2

Report To		Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	City of Kelowna	☐ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Marcia Browne	☑ PDF ☑ Excel ☐ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	2720 John Hindle Drive. Kelowna BC V1V2C5	Email 1: mbrowne@kelowna.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
		Email 2: mlewis@kelowna.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-469-8796 Fax: 250-862-3342	Email 3:	
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	Analysis Request
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #: 1186-202 POND	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:		PO / AFE: 520747	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	
Lab Work Order # (lab use only)		ALS Contact: Dean Watt	Sampler:

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total metals	Dissolved metals	BOD,COD	T. Coliform, E. Coli	TSS, TDS, Ammonia	O-PO4-P	Total Nitrogen, TKN	NO2-N, NO3-N	Total hardness	EC	Chloride	pH	Number of Containers
	Commonage Drainage Pond	31/10/17	10:27	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Davidson Pond	31/10/17	11:15	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Rose's Pond	31/10/17	10:10	Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	
	Please return cooler and icepacks with replacement bottles																
	Thank you.																
	[redacted]																
	[redacted]																
	[redacted]																
	[redacted]																
	[redacted]																

60mL only please!

No preservatives this time, thanks. We have lots [redacted] Thanks! Trying to use up supplies :)

L2016326-COFC

B

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

Please use CCME/ BC WQG guidelines for both Davidson Pond and Rose's Pond for Total Metals Analysis and continue using BC CSR guidelines for Commonage Drainage Pond. Please return cooler , ice packs and replacment bottles and preservatives. Thank you TSD has been added to the list of parameters. Please use lower detection limit for Beryllium <0.0001 mg/L

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 provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
			PAUL	NOV 1	08:35	1.5 °C				

GENF 20.00 Front

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