



Staff Report

Applicant: City of Yellowknife	
Location: Yellowknife, NT	Application: MV2009L3-0007
Date Prepared: July 25, 2016	Meeting Date: August 11, 2015
Subject: 2015 Annual Water Licence Report and 2015 Biotreatment Pad Annual Report	

1. Purpose/Report Summary

The purpose of this Report is to present to the Mackenzie Valley Land and Water Board (the Board) the following two annual reports submitted by the City of Yellowknife (City) as required by their municipal Water Licence (Licence) MV2009L3-0007:

- a) 2015 Annual Water Licence Report; and
- b) 2015 Biotreatment Pad Annual Report.

2. Background

- May 31, 2010 – Licence MV2009L3-0007 issued for a period of 12 years;
- April 18, 2016 – 2015 Annual Reports received;
- May 5, 2016 – 2015 Annual Reports sent for review;
- June 2, 2016 – Reviewer comments due;
- June 14, 2016 – Proponent’s response due;
- **August 11, 2016 – 2015 Annual Reports presented to the Board;** and
- May 30, 2022 – Licence MV2009L3-0007 expires.

3. Discussion

The 2015 Annual Water Licence Report and 2015 Biotreatment Pad Annual Report (Annual Reports) were filed in accordance with Part B, item 3 and Schedule 1, item 1 of the Licence; these are included in Appendix A of this Staff Report. Although formal approval of these Annual Reports is not required under the Licence, the Board must be satisfied that the City is operating and has reported in accordance with the requirements of their Licence.

Type A Licence MV2009L3-0007 was issued to the City for the use of water and disposal of waste for municipal undertakings. Water is drawn from the Yellowknife River for drinking water; sewage is deposited into the Fiddlers Lake Lagoon System (lagoon); and solid waste is deposited at the Solid Waste Disposal Facilities (SWDF), located just off of Hwy # 4 north of the City.

The operation of the City's Biotreatment Pad is regulated through the City's Licence. The facility is located at the Solid Waste Disposal Facility (SWDF). The Biotreatment Pad accepts hydrocarbon-contaminated soil and water for treatment. Treated soil that meets criteria outlined in the Licence is reused as cover at the SWDF. Treated water meeting criteria is either reused at the Biotreatment Pad or discharged to land. The Biotreatment Pad received its last shipment of contaminated soil in 2015 and all remaining soil was treated and removed. The Biotreatment Pad, including the lagoon, were dismantled and closed at the end of the 2015 treatment season. The remaining infrastructure from these operations will be cleaned up and removed from site in 2016. The City has not yet determined the future uses for this site.

4. Comments

Water use (Schedule 1, item 1.a):

The City's Licence authorizes the annual withdrawal of up to 3,600,000 cubic metres of water from the Yellowknife River. The City stated that it was unable to obtain water volume information for eight months of 2015 due to the commissioning of the water treatment plant (WTP). In 2014 the City reported a water withdrawal of 3,491,910 cubic metres for the year. This represented an increase of 400,000 cubic metres from 2013. It is anticipated that the quantity of water the City is currently licenced to withdraw will be exceeded in the next year or two.

Reporting on Waste discharged to the lagoon (Schedule 1, item 1.b):

This section of the Licence requires reporting of the monthly and annual quantities in cubic metres of each and all Waste discharged to the Waste Disposal Facilities. The 2015 Annual Report includes the monthly and annual volume of sewage that was discharged into the lagoon. The City was unable to report on sewage volumes for three months due to changes associated with the commissioning of the WTP. However, there are other sources of Waste that may be discharged into the lagoon for which quantities were not reported: Baling Facility leachate and sludge, compost leachate, leachate from the sump at Cell A, and sludge and wastewater from the WTP may all be potentially disposed of at the lagoon.

In response to the Board's November 14, 2013 direction regarding the Landfill Operation and Maintenance Plan (LOMP) (attached), the City is working to determine a method of tracking the volume of liquid discharged from the Baling Facility. In section o) of the both the 2014 and 2015 Annual Reports the City acknowledges this request; however, the City has not yet reported these volumes.

Tabular summaries of all data generated under the Surveillance Network Program (Schedule 1, item 1.e):

The City has provided tabular summaries of data collected for three of the Surveillance Network Program (SNP) sites, however only lab results and not tabular summaries were provided for the remaining SNP stations, making it difficult to review sampling results.

Stormwater Monitoring Plan (Schedule 1, item 1.r):

An additional sampling location in Grace Lake has been added to the monitoring program.

5. Review Comments

By June 2, 2016, comments and recommendations on the 2015 Annual Reports were received from Environment and Climate Change Canada (ECCC), Environment and Natural Resources (ENR), and Board staff.

The City responded on June 14, 2016. The reviewer comment summary table (attached) presents the concerns identified through the review of the Annual Reports.

6. Conclusion

The reporting requirements as laid out in Part B, item 3 and Schedule 1, item 1 of the Licence have been met. The Annual Reports, as submitted, provide an overview of activities that occurred under Licence MV2009L3-0007 during the reporting year of 2015. The Annual Reports are not for Board approval; however, the Board may wish to follow up with the City based on the information provided in the Annual Reports.

7. Recommendation

Board staff recommends the Board accept the Annual Reports and has prepared a draft response letter with the following options for the Board's consideration. One or more of these options could be chosen to include in the Board's acceptance letter to address the issues that have been identified:

- a) The Board could note that the City is approaching the maximum volume of water authorized for withdrawal as defined under Part C, item 2 of their Water Licence. The Board could encourage the City to contact Board staff to discuss next steps if an increase to the allowable limit is anticipated.
- b) The Board could note that Schedule 1, item 1.b) of the Licence requires the reporting of monthly and annual quantities in cubic metres of each and all Waste discharged to the Waste Disposal Facilities. This may include: Baling facility leachate and sludge, compost leachate, leachate from the sump at Cell A, and sludge and wastewater from the Wastewater Treatment Plant. For clarity, the Board could request that the City report on each of these sources of Waste every year, even if no waste was discharged.
- c) The Board could remind the City that Schedule 1, item 1.e) requires tabular summaries of all data generated under the SNP and request that summaries of bioassay test results also be included (as per ECCC comment #3).
- d) The Board could note that a new sampling location has been added to the monitoring program associated with the Stormwater Monitoring Plan and that this information should be included in an updated Plan to be submitted with the Annual Report, as per Schedule 1, item 1.i) of the Licence.
- e) The Board could remind the City that as per section 5.1 of the LOMP approved by the Board on November 20, 2014, sampling of the sump from cell A shall occur prior to disposal of the leachate with results submitted to the MVLWB for review and approval prior to disposal at the City's sewage lagoon (as per ECCC comment #2).
- f) The Board could encourage the City to include a table summarizing all water quality exceedances at SNP station 0032-F3, the site of compliance, in the main body of future Annual Reports. The table should include missed sampling events. A discussion of non-compliant items, referencing relevant letters and

previous documents as needed, would promote a better understanding of the results and the City's ongoing efforts to address exceedences for all parties. This information will support the requirements laid out in Schedule 1, item 1.t) of the Licence.

8. Attachments

- [2015 Annual Report](#);
- [2015 Biotreatment Pad Annual Report](#);
- [November 14, 2013 letter approving the Landfill Operations and Maintenance Plan](#)
- Comment Summary Table;
- Draft Board Acceptance Letter;
- Appendix A – Water Licence conditions pertaining to the Annual Reports.

Respectfully submitted,



Miki Ehrlich
Regulatory Officer



Heather Scott
Technical Advisor

Appendix A

Water Licence Conditions pertaining to the Annual Report

B.3 The Licensee shall file an annual report with the Board not later than March 31 of the year following the calendar year reported which shall contain the information as set out in Schedule 1, Item 1, included in this Licence.

Schedule 1 – General Conditions

1. The Annual Report referred to in Part B, item 3 shall include, but not necessarily be limited to, the following:
 - a) The monthly and annual quantities in cubic metres of fresh Water obtained from all sources;
 - b) The monthly and annual quantities in cubic metres of each and all Waste discharged to the Waste Disposal Facilities;
 - c) The monthly and annual quantities of Waste removed from the Waste Disposal Facilities;
 - d) A summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures;
 - e) Tabular summaries of all data generated under the Surveillance Network Program;
 - f) A summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;
 - g) A summary of any studies requested by the Board that relate to Waste disposal, Water use or reclamation, and a brief description of any future studies planned;
 - h) A list of unauthorized discharges;
 - i) Comparison of Waste volumes accepted to the remaining storage volume at the Waste Disposal Facilities;
 - j) The monthly and annual quantities of organics received and quantity of compost produced and/or distributed from the compost facility;
 - k) Record of Biotreatment Pad containment pond liner inspections;
 - l) Updates or revisions to the approved Stormwater Management Plan;
 - m) Updates or revisions to the approved Sewage Disposal Facilities Operation and Maintenance Plan;
 - n) Updates or revisions to the approved Spill Contingency Plan;
 - o) Updates or revisions to the approved Solid Waste Disposal Facilities Operation and Maintenance Plan;
 - p) Updates or revisions to the approved Biotreatment Pad Operation and Maintenance Plan;
 - q) Updates or revisions to the approved Hazardous Waste Management Plan;
 - r) Tabular summaries of all data generated from the Stormwater Effluent Monitoring Program;
 - s) At each of the seven sampling locations for stormwater, provide trends of biological and heavy metal data collected in the Stormwater Effluent Monitoring Program (short term) and Surveillance Network Program monitoring station (long term);

- t) Comparison of the Surveillance Network Program data to Water Licence regulated limits and sampling and analysis requirements;
- u) The inclusion of all formal written correspondence between the Inspector and Licensee;
- v) A summary of efforts to monitor, manage, treat and dispose of sewage sludge at the Sewage Disposal Facilities; and
- w) Any other details on Water use or Waste disposal requested by the Board by November 1 of the year being reported.

Review Comment Table

Board:	MVLWB
Review Item:	City of Yellowknife - 2015 Annual Water Licence Report and Biotreatment Pad Annual Report (MV2009L3-0007)
File(s):	MV2009L3-0007
Proponent:	City of Yellowknife
Document(s):	MV2009L3-0005 - City of Yellowknife - 2015 Annual Water Licence Report (1 MB) MV2009L3-0005 - City of Yellowknife - 2015 Biotreatment Pad Annual Report (5 MB)
Item For Review Distributed On:	May 5 at 11:28 Distribution List
Reviewer Comments Due By:	June 2, 2016
Proponent Responses Due By:	June 14, 2016
Item Description:	<p>The City of Yellowknife has submitted an Annual Water Licence Report and Biotreatment Pad Annual Report for 2015 as per Item B.3 and Schedule 1 of their municipal Water Licence MV2009L3-0007. Although formal approval of Annual Reports is not required under the Licence, the Board must be satisfied that the Licensee has reported and performed sampling and analyses in accordance with the requirements of their Licence.</p> <p>Therefore, reviewers are invited to submit comments on the Annual Reports. Recommendations on the results reported as well as recommendations that may assist the City in the development and completion of future Annual Reports are welcome.</p> <p>If you have questions or comments regarding this review or the Online Review System please contact Miki Ehrlich at (867)766-7469 or mehrllich@mvlwb.com.</p>
General Reviewer Information:	<p>In addition to the email distribution list, the following organizations received review materials by fax:</p> <ul style="list-style-type: none"> • Fort Resolution Métis Council - Trudy King (867)394-3322 • Hay River Metis Council - Karen Lafferty, President (867)874-4472 • NWT Metis Nation - Tim Heron, NWTMN IMA Coordinator (867)872-3586
Contact Information:	<p>Heather Scott 867-766-7463 Jen Potten 867-766-7468 Miki Ehrlich 867-766-7469</p>

Comment Summary

Environment and Climate Change Canada: Bradley Summerfield				
ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Response
1	General File	Comment (doc) ECCC comments cover letter Recommendation		
2	Schedule 1.e) of the licence - Solid Waste Facility Surveillance Network Program (SNP) Stations	Comment The Annual Report includes lab sheets for sampling results for the Solid waste site stations. Environment and Climate Change Canada (ECCC) notes that tabular summaries would be easier to review, rather than the 40 pages of lab sheets. For several samples, a number of parameters are above guidelines for the protection of aquatic life (e.g. ammonia, arsenic, aluminum, manganese, iron). This raises the question of whether any poor quality runoff/leachate is reaching surface waters. Cell A leachate quality was poor, and it is not clear where this is discharged. Samples from 0032-20 and 0032-21 had elevated aluminum, iron and zinc. These could be associated with particulates and not necessarily in a bioavailable form, and it would be helpful to include analysis of total suspended solids to assess this. Recommendation Clarify discharge location for Cell A effluent; consider analysing total suspended solids in runoff/seepage samples.	June 13: The City will include tabular summaries of all sampling results in future submissions. Leachate was discharged to the active face of cell A in 2015. This method was not as effective as hoped and in 2016 the City intends to discharge the leachate to Fiddler's Lake Lagoon. The City will consider analysing total suspended solids in runoff/seepage samples.	Tabular summaries of all sampling results should be included with future annual report submissions. The City is reminded that as per section 5.1 of the Landfill O&M Plan approved by the Board on November 20, 2014, sampling of the sump from cell A will occur prior to disposal of the leachate with results submitted to the MVLWB for review and approval prior to disposal at the City's sewage lagoon. Board staff will work with ECCC to ensure they are aware of the process for submitting a request to revise the SNP.

3	Schedule 1.e) of the licence - Toxicity testing	<p>Comment Section D.2 of the water licence states that effluent must be non-acutely toxic with a pass of 70 per cent survival for trout and daphnia. The SNP specifies sampling two times per year for toxicity testing, using rainbow trout and Daphnia magna bioassays. The Annual Report did not include and toxicity test results, and it is not stated whether the tests were conducted.</p> <p>Recommendation Provide bioassay test results for 2015.</p>	<p>June 13: Bioassay test results were submitted with quarterly reports, in the future summaries will be included in the annual reports. June 13: See attached for the bioassay results for 2015.</p>	<p>Bioassay results should be included with future annual report submissions.</p>
---	---	--	---	---

GNWT - ENR: Central Email GNWT

ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Response
1	General File	<p>Comment (doc) ENR Letter with Comments and Recommendations</p> <p>Recommendation</p>		
2	Topic 1: SNP Data Reporting	<p>Comment The 2015 report presents the results for water quality monitoring at SNP Station 0032-F3 but the format make it cumbersome to evaluate. While some of the results for regulatory analytes (e.g. TSS, Fecal Coliform) were displayed in graphical format in the main body of the report, tabular data was absent. Section T of the report notes one (1) TSS exceedance of maximum grab sample limit of 40 mg/L at SNP 0032-F3 on October 28, 2015. Also reported were a number of pH exceedances in the summer of 2015 and one (1) fecal coliform exceedance on August 14, 2015. However, no actual values or discussion is presented in the main body of the report, the data is only</p>	<p>June 13: (a) The City does have standardized water sampling and naming protocols. SNP 0032-F3 samples are labeled as such on the Certificate of Analysis and manifests, none of which were included in this report. Only the tabular data in Appendix B presents the lab results for 0032-F3. (b) A table summarizing all water quality exceedances at 0032-F3 will be included in the main body of future Annual Reports. This table will also included missed sampling events and non-compliant items will be discussed. However, some exceedances, specifically for pH and phosphorous, have been</p>	<p>A table summarizing all water quality exceedances at 0032-F3 (site of compliance) should be included in the main body of future annual reports. The table should include missed sampling events. Non-compliant items shall include a discussion; referencing relevant letters and previous documents as needed. This information will support the</p>

		<p>provided in graphical format. ENR had to review the raw laboratory data included in the Appendix in order to determine if other exceedances occurred and, if so, their magnitude. The City of Yellowknife (theCity) naming convention for water samples makes it challenging to determine what results correspond to SNP 0032-F3. Without a clear understanding of what data belongs to the compliance point (SNP 0032-F3), ENR was not fully able to determine all potential Water Licence exceedances in 2015.</p> <p>Recommendation 1) ENR recommends that the City of Yellowknife implement the following: a) Should establish and follow standardized water sampling and naming protocols to ensure consistent sampling and reporting. SNP 0032-F3 samples should be labeled as such on the Certificate of Analysis and manifests; b) At minimum, a table should be provided in the main body of the Annual Reports that presents all water quality exceedances of the Water Licence limits at SNP 0032-F3. This table should also include any missed sample events. When non-compliant items are identified a discussion on the items should also be provided; c) Provide the values/concentrations for all SNP samples that exceeded the regulatory limits for 2015. It would be helpful if the City also provide confirmation of</p>	<p>discussed at length. PH exceedances were discussed in our Oct 11, 2014 letter, to which you responded on Oct 26, 2015. In future reports, can the City reference these discussions rather than revisit the issue every year? Phosphorous was outstanding based on our Fiddlers Lake Treatment System Plan, which was not approved in Nov 2015. A stipulation of that non-approval was to complete a phosphorous study. Due to the timing of the letter (late in 2015) the study was not included in the 2016 budget and will not be completed this year. (c) All values/concentrations which exceed the regulatory limits will be summarized in the main body of future Annual Reports. (d) Exceedances of any Water License requirement will be reported to the Inspector and Board immediately. However, does the board want notice of exceedances when they occur for pH and phosphorous as these are ongoing issues and have been discussed at length? (see b)</p>	<p>requirements laid out in Schedule 1, item 1.t) of the Licence.</p>
--	--	--	---	---

		Sample IDs associated with the Laboratory Certificate of Analysis; and, d) During the course of the year when SNP monitoring results become available, as per standard practice, exceedances of any Water Licence requirement should be reported to the Inspector and the Board immediately.		
3	Topic 2: Water Use	<p>Comment The 2014 Annual Water Licence Report noted that annual water withdrawal was approaching the Water Licence limit of 3,600,000 m³ annually. The 2015 Annual Report does not report the water use from the Yellowknife River or Yellowknife Bay for the months of May to December (note only November 2015 is excluded for the Yellowknife Bay). This omission of reporting is explained by the City as a result of commissioning the new Water Treatment Plant.</p> <p>Recommendation 1) ENR recommends that the City provide clarification on the estimate water use for 2015. The volume could be compared qualitatively to that which was used in 2014 quantities (e.g. similar to 2014, greater than 2014, etc.). Note that reporting the amount of water used is a regulatory requirement and there is a limit to the amount of water the City can withdraw under their Water Licence.</p>	<p>June 13: Given the limited data available due to the commissioning of the new Water Treatment Plant, the City is unable to provide an accurate estimate. The City can provide a comparison from the first 4 months, but again, we don't feel comfortable providing an estimate based on the limited data.</p>	<p>Acceptable response. The Board notes that the City is approaching the maximum volume of water authorized for withdrawal as defined under Part C, item 2 of their Water Licence.</p> <p>The City is encouraged to contact Board staff to discuss next steps if an increase to the allowable limit is anticipated.</p>
4	None	<p>Comment None</p> <p>Recommendation 2) ENR</p>	<p>June 13: The City will assess this and make the</p>	<p>Acceptable response.</p>

		recommends that the City assess their water use records from previous years to determine if an amendment to the Type A Water Licence is required. The current limit is presented under Part C of the current Water Licence.	request if it is determined to be necessary ,	
--	--	---	---	--

MVLWB: Heather Scott

ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Response
1	Annual Report, Modifications and Maintenance Work: Compost Facility	<p>Comment Item (d), Part (3) of the Annual Report notes that "Construction of Phase 2 of the new compost pad as part of the expansion to Centralized Composting Project". As per Part G, item (1) of MV2009L3-0007, Prior to construction of any dams, dykes, or control structures intended to contain, withhold, divert, or retain Waters or Wastes, the Licensee shall submit to the Board, at least 60 days prior to construction, final design drawings stamped and signed by an Engineer, which notes "issued for construction" or similar phrase. The drawings received thus far by the MVLWB include only Phase 1 of the Composting Facility.</p> <p>Recommendation As per Part G, item (1) of MV2009L3-0007, submit construction drawings 60 days prior to construction of Phase 2 of the Composting Facility.</p>	<p>June 13: In previous discussions with the MVLWB it was decided that the City would submit as-built drawing after the entire compost pad had been completed (2017). Design drawings for phase 2 and 3 have been submitted.</p>	Acceptable response.
2	Annual Report, Modifications and Maintenance Work:	<p>Comment As per Part G, item (2) of MV2009L3-0007, "Construction of designed structures shall be carried out as approved by the Board".</p> <p>Recommendation As per Part G, item (2) all</p>	<p>June 13: There is no response required, all construction will be carried out as approved by the MVLWB.</p>	Acceptable response.

	Compost Facility	construction under MV2009L3-0007 shall be carried out as approved by the MVLWB.		
3	Annual Report, Abandonment and Restoration Work: Phase 2-4 of Composting Facility	<p>Comment Item (f), Part (1) of the Annual Report notes that "Phase 2 of the new Centralized Composting Facility was constructed". As per Part G, item (3) of MV2009L3-0007, "The Licensee shall provide to the Board as-built plans and Record Drawings, signed and stamped by an Engineer, of the constructed facilities referred to in Part G, Item 1 within 90 days of completion".</p> <p>Recommendation As per Part G, item (3) of MV2009L3-0007, submit as-built plans and Record Drawings, signed and stamped by an Engineer, within 90 days of completion.</p>	<p>June 13: In previous discussions with the MVLWB it was decided that the City would submit as-built drawing after the entire compost pad had been completed (2017). Design drawings for phase 2 and 3 have been submitted.</p>	Acceptable response.
4	Annual Report, Phosphorus Levels at 0032-F3	<p>Comment Part (t), Item (1) iv) states that MVLWB has asked the City to do a risk assessment of ammonia and phosphorus concentrations from the Fiddler's Lake Treatment System on Great Slave Lake.</p> <p>Recommendation The MVLWB is expecting submission of the risk assessment of ammonia and phosphorus concentrations from Fiddler's Lake Treatment System on Great Slave Lake.</p>	<p>June 13: This risk assessment is outside the scope of the annual report and has not yet been completed. It is expected to be included in the budget for 2017.</p>	The City has submitted an extension request for these studies, which is currently out for review and comment. The City has requested a due date of May 31, 2018.
5	Biotreatment Pad Annual Report, Soil	<p>Comment Table 2 in Appendix C illustrates various samples that exceeded the criteria for soil reuse for</p>	<p>June 13: The values in Table 2 are presented chronologically from top to bottom for each lot. When</p>	Acceptable response.

	Reuse Criteria	<p>capping material at the Yellowknife landfill as per Part D, item 8 of MV2009L3-0007; however, Section 4.2 of the Report indicates that: "The treated soil, totalling 3,114.89 t, from 20 lots, was removed from the treatment pad and made available to the landfill operators for eventual reuse. Lots 122-124, 132, 154, and 156-170 were all successfully treated during summer of 2015". Some of these lots showed elevated levels of F1 and F2 hydrocarbons in Table 1=2. Recommendation Please clarify the values in Table 2 and how lots 122-124, 132, 154 and 156-170 were deemed to have met the criteria in MV2009L3-0007 Part D, item 8.</p>	<p>you look at the results for the samples taken in 2015, each lot has acceptable levels of F1 and F2.</p>	
--	----------------	---	--	--



Environmental Protection Operations Directorate (EPOD)
Prairie & Northern Region (PNR)
5019 52nd Street, 4th Floor
P.O. Box 2310
Yellowknife, NT X1A 2P7

June 2, 2016

EC File: 5200 000 001/004
WLWB File: MV2009L3-0007

Heather Scott
Technical Advisor
Mackenzie Valley Land and Water Board
7th Floor, 4922 48th St.
P.O. Box 2130
Yellowknife, NT X1A 2P6

Submitted via online review system

**RE: MV2009L3-0007 – City of Yellowknife – 2015 Annual Water Licence Report and
Bioremediation Pad Annual Report**

Attention: Heather Scott

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Mackenzie Valley Land and Water Board (MVLWB) regarding the above-mentioned Annual Reports and is submitting comments to the MVLWB via the online review system. ECCC's specialist advice is provided based on our mandate pursuant to the *Canadian Environmental Protection Act*, the pollution prevention provisions of the *Fisheries Act*, the *Migratory Birds Convention Act*, and the *Species at Risk Act*.

Should you require further information, please do not hesitate to contact me at (867) 669-4707 or Bradley.Summerfield@Canada.ca

Sincerely,

Bradley Summerfield
Environmental Assessment Coordinator, Environmental Assessment North (NT and NU),
EPOD-PNR

Attachment: ECCC Comments on City of Yellowknife 2015 Annual Water Licence Report and Biotreatment Pad Annual Report

cc: Wade Romanko, Head, Environmental Assessment North (NT and NU), PNR-EPOD

June 2, 2016

Miki Ehrlich
Regulatory Officer
Mackenzie Valley Land and Water Board
7th Floor – 4910 50th Avenue
P.O. Box 2130
Yellowknife, NT
X1A 2P6

Dear Ms. Ehrlich,

**Re: City of Yellowknife
Water Licence – MV2009L3-0007
2015 Annual Water Licence Report and Biotreatment Pad Annual Report
Request for Review and Comments**

The Department of Environment and Natural Resources (ENR), Government of the Northwest Territories has reviewed the reports at reference based on its mandated responsibilities under the *Environmental Protection Act*, the *Forest Management Act*, the *Forest Protection Act*, the *Waters Act* and the *Wildlife Act* and provides the following comments and recommendations for the consideration of the Board.

Topic 1: SNP Data Reporting

Comment(s):

The 2015 report presents the results for water quality monitoring at SNP Station 0032-F3 but the format make it cumbersome to evaluate. While some of the results for regulatory analytes (e.g. TSS, Fecal Coliform) were displayed in graphical format in the main body of the report, tabular data was absent. Section T of the report notes one (1) TSS exceedance of maximum grab sample limit of 40 mg/L at SNP 0032-F3 on October 28, 2015. Also reported were a number of pH exceedances in the summer of 2015 and one (1) fecal coliform exceedance on August 14, 2015. However, no actual values or discussion is presented in the main body of the report, the data is only provided in graphical format.

ENR had to review the raw laboratory data included in the Appendix in order to determine if other exceedences occurred and, if so, their magnitude. The City of Yellowknife (theCity) naming convention for water samples makes it challenging to determine what results correspond to SNP 0032-F3. Without a clear understanding of what data belongs to the compliance point (SNP 0032-F3), ENR was not fully able to determine all potential Water Licence exceedences in 2015.

Recommendation(s):

- 1) ENR recommends that the City of Yellowknife implement the following:
 - a) Should establish and follow standardized water sampling and naming protocols to ensure consistent sampling and reporting. SNP 0032-F3 samples should be labeled as such on the Certificate of Analysis and manifests;
 - b) At minimum, a table should be provided in the main body of the Annual Reports that presents all water quality exceedences of the Water Licence limits at SNP 0032-F3. This table should also include any missed sample events. When non-compliant items are identified a discussion on the items should also be provided;
 - c) Provide the values/concentrations for all SNP samples that exceeded the regulatory limits for 2015. It would be helpful if the City also provide confirmation of Sample ID's associated with the Laboratory Certificate of Analysis; and,
 - d) During the course of the year when SNP monitoring results become available, as per standard practice, exceedences of any Water Licence requirement should be reported to the Inspector and the Board immediately.

Topic 2: Water Use

Comment(s):

The 2014 Annual Water Licence Report noted that annual water withdrawal was approaching the Water Licence limit of 3,600,000 m³ annually. The 2015 Annual Report does not report the water use from the Yellowknife River or Yellowknife Bay for the months of May to December (note only November 2015 is excluded for the Yellowknife Bay). This omission of reporting is explained by the City as a result of commissioning the new Water Treatment Plant.

Recommendation(s):

- 1) ENR recommends that the City provide clarification on the estimate water use for 2015. The volume could be compared qualitatively to that which was used in 2014 quantities (e.g. similar to 2014, greater than 2014, etc.). Note that reporting the amount of water used is a regulatory requirement and there is a limit to the amount of water the City can withdraw under their Water Licence.
- 2) ENR recommends that the City assess their water use records from previous years to determine if an amendment to the Type A Water Licence is required. The current limit is presented under Part C of the current Water Licence.

Comments and recommendations were provided by ENR technical experts in the Water Resources Division and the North Slave Region and were coordinated and collated by the Environmental Impact Assessment Section, Conservation, Assessment and Monitoring Division (CAM).

Should you have any questions or concerns, please do not hesitate to contact Patrick Clancy, Environmental Regulatory Analyst at (867) 767-9233 Ext: 53096 or email patrick_clancy@gov.nt.ca.

Sincerely,



Patrick Clancy
Environmental Regulatory Analyst
Environmental Impact Assessment
Conservation, Assessment and Monitoring Division
Department of Environment and Natural Resources
Government of the Northwest Territories



ATTN: Judy Mah
Taiga Environmental Laboratory
Box 1320 4601- 52 Ave.
Yellowknife, NT
Canada X1A 2L9

Received: 2015/06/19
Report Date: 2015/06/26
Version: FINAL

HydroQual Test Report

Client: TAI109
Reference: 15-0711
Billing: not given

A handwritten signature in cursive script that reads "Jacquelyn Poole".

Senior Verifier

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.

HydroQual Laboratories Ltd., #4, 6125 12th Street SE, Calgary, Alberta, Canada T2H 2K1
Tel (403) 253-7121 fax (403) 252-9363 www.hydroqual.ca

Result Summary

Client: TAI109 Reference: 15-0711-01-TRS

Client: Taiga Environmental Laboratory; operation Yellowknife

Sample: 150385-002 (F3)

Collection: collected on 2015/06/17 at 0945 by not given

Receipt: received on 2015/06/19 at 1345 by HKS

Containers: received 5 x 5 L pails at 18 °C, in good condition with no seals and no initials

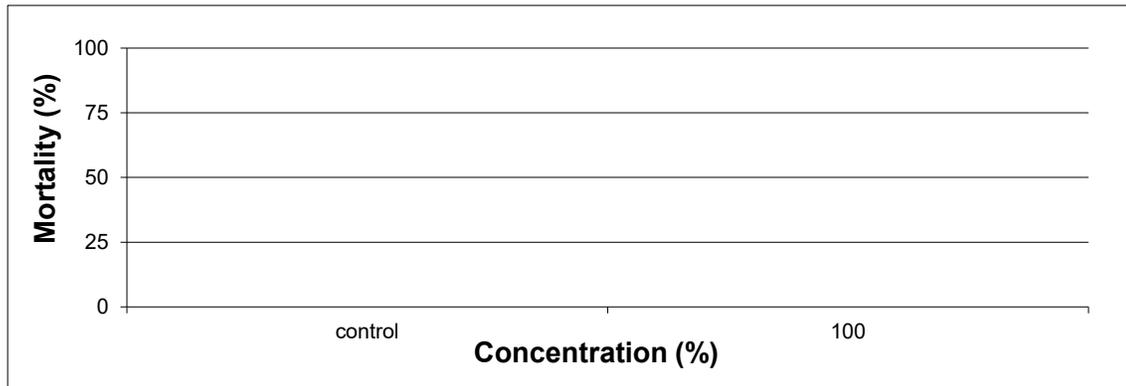
Description: type: water, collection method: not given

Test: started on 2015/06/20 ; ended on 2015/06/24

Contents	
Result Summary.....	1
Test Conditions.....	2
Test Data.....	3
Comments/Statistics..	5
QA/QC.....	6

Result:

Sample	Client Code	Mortality (%)	Comment
control	lab control	0	
100%	150385-002 (F3)	0	none



The test data and results are authorized and verified correct.



Senior Verifier

Test Conditions

Client: TAI109
Reference: 15-07111-01-TRS

Method: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 2000. Environment Canada, EPS 1/RM/13. Second Edition (amended 2007).

Test type: Trout 96-h Static Acute Test (WTR-ME-041)

Species: *Oncorhynchus mykiss*

Organism source: Miracle Springs (Batch 20150527TR)

Acclimation: 24 days (must be ≥ 2 weeks)

Stock mortality: 0.44% (seven days preceding testing)

Sample initial chemistry: pH: 7.1; EC: 226 ($\mu\text{S}/\text{cm}$ @ 25°C); DO: 8.2 (mg/L); temperature: 17 °C
hardness (mg CaCO_3/L): 76; colour: yellow; odour: odourless

Sample holding time: 3 days (must be ≤ 5 days)

Sample storage: 4 \pm 2°C in darkness

Test vessel: The test was conducted in 22 L plastic pails with polyethylene liners

Test volume: 20 Litres (depth of solution in each test vessel $\geq 15\text{cm}$)

Sample pre-treatment: All test solutions and controls were pre-aerated for 30 minutes at 6.5 \pm 1 mL/min/L
Dissolved oxygen in full strength sample was 8.4 mg/L after pre-aeration
The sample was not filtered or pH adjusted prior to or during testing

Loading density: 0.235 g/Litre (must be ≤ 0.5 g/Litre)

Control water: Dechlorinated City of Calgary water acclimated to test conditions

Test concentrations: Undiluted sample plus a negative control

Test replicates: One replicate per treatment; 10 fish per replicate

Feeding: Fish are not fed 24 hours before test initiation and no feeding during test

Measurements: pH, conductivity, dissolved oxygen and temperature measured daily

Aeration: All treatments aerated at 6.5 \pm 1 mL/min/L by oil-free compressed air
passed through airline tubes connected to disposable air stones

Lighting: Overhead full spectrum fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 15 \pm 1°C

Endpoint: Mortality, % mortality at 96-h

Test validity: The control had 100% survival (must $\geq 90\%$)

The control had 0 percent (%) stressed behaviour (must $\leq 10\%$)

Reference toxicant: 96-h test with Phenol ($\text{C}_6\text{H}_5\text{OH}$) initiated June 15, 2015; current results
(96-h LC50 and 95% confidence limits) = 0.54 (na-na) log (mg/L Phenol)

Note: Outlined sections are protocol deviations explained on the comment page; v/v, volume per volume

Test Data

Client: TAI109
Reference: 15-0711-01-TRS

Test Log:

Date	Day	Time	Technician
2015/06/20	0	1335	ML
2015/06/21	1	0930	JP
2015/06/22	2	0930	DS/CQ
2015/06/23	3	0920	JK
2015/06/24	4	0910	HKS

Chemistry:

Conc. (%)	control	100						
-----------	---------	-----	--	--	--	--	--	--

Day	pH (units)							
0	7.4	7.4						
1	8.1	7.9						
2	8.1	7.8						
3	8.1	7.8						
4	8.1	7.8						

	Conductivity ($\mu\text{S/cm @ } 25^\circ\text{C}$)							
0	362	234						
1	355	240						
2	361	240						
3	369	242						
4	371	246						

	Dissolved Oxygen (mg/L)							
0	7.6	8.4						
1	8.9	8.9						
2	8.5	8.6						
3	8.5	8.8						
4	8.7	8.8						

	Temperature ($^\circ\text{C}$)							
0	15	15						
1	15	15						
2	15	15						
3	15	15						
4	16	15						

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.

Test Data

Client: TAI109
Reference: 15-0711-01-TRS

Number Alive (In brackets number stressed):

Conc. (%)	control	100						
-----------	---------	-----	--	--	--	--	--	--

Day

0	10	10						
1	10	10						
2	10	10						
3	10	10						
4	10	10						

Mortality (%)

4	0	0						
---	---	---	--	--	--	--	--	--

Stressed (%)

4	0	0						
---	---	---	--	--	--	--	--	--

Biology Summary Tables:

Control Fish	Length (cm)	Wet Weight(g)
1	3.0	0.4
2	2.8	0.3
3	3.4	0.6
4	3.4	0.6
5	3.1	0.4
6	3.8	0.5
7	3.8	0.7
8	3.4	0.5
9	3.0	0.4
10	2.9	0.3

Sample	Group Wet Weight (g)
control	4.7
100	4.8

average	3.3	0.5
sd	0.4	0.1
cv(%)	10.9	28.6

Notes: nd, not done; na, not applicable;
 sd, standard deviation; cv(%), coefficient of variation

Comments/Statistics

Client: TAI109 Reference: 15-0711-01-TRS

Test Result Comments:
None

Data Analysis:
None

Protocol Deviations:
None

Test Method: Trout 96h Static Acute Test. (LC50, 5 treatments plus a control)
 HydroQual Test Method: WTR-ME-042

Reference: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. including May 1996 and December 2000 amendments.

Test Organism:

test species: *Oncorhynchus mykiss*
 culture source: Miracle Springs
 temperature (°C): 15 ± 1
 dissolved oxygen: 70-100% saturation
 stock mortality (last 7d): 0.94%
 batch number: 20150527TR

Test Design:

vol. of test vessel (L): 20
 test volume depth: >15 cm
 replicates per treatment: 1
 fish per replicate: 10
 loading (g fish/L): ≤0.5
 temperature (°C): 15 ± 1
 photoperiod: 16h light: 8h dark
 light level (water surface): 100-500 lux (full-spectrum)
 control/dilution water: dechlorinated tap water

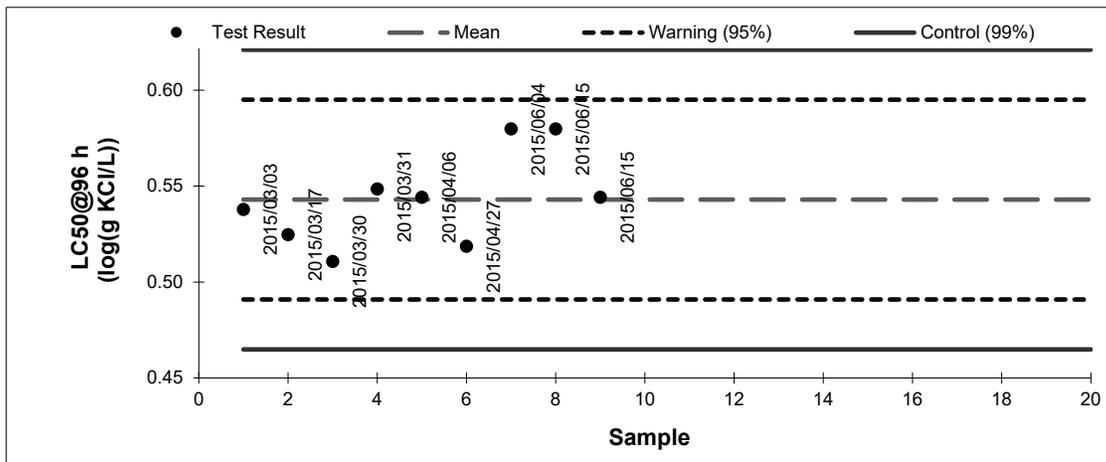
Current Test

toxicant Potassium Chloride (KCl)			
started on	2015/06/15	ended on	2015/06/19
Result (LC50 @ 96h)	0.54	log (g KCl/L); geometric mean	
Confidence Limits (95%)	lower	na	upper na

Historical Values

mean	0.54	sd	0.03	cv(%):	4.0
	lower	upper			
warning limits (±2 sd)	0.49	0.60	(95% confidence limits)		
control limits (±3 sd)	0.46	0.62	(99% confidence limits)		

notes: sd, standard deviation; cv, coefficient of variance



Comments: None

The test data and results are authorized and verified correct.



Senior Verifier

Our liability is limited to the cost of the test requested on the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results in part or in whole.

HydroQual Laboratories Ltd., #4, 6125 12th Street SE, Calgary, Alberta, Canada T2H 2K1
 tel (403) 253-7121 fax (403) 252-9363 www.hydroqual.ca

TR Ref. Tox

Result Summary

Client: TAI109 Reference: 15-0711-01-DAS

Client: Taiga Environmental Laboratory; operation Yellowknife

Sample: 150385-002 (F3)

Collection: collected on 2015/06/17 at 0945 by not given

Receipt: received on 2015/06/19 at 1345 by HKS

Containers: received 5 x 5 L pails at 18 °C, in good condition with no seals and no initials

Description: type: water, collection method: not given

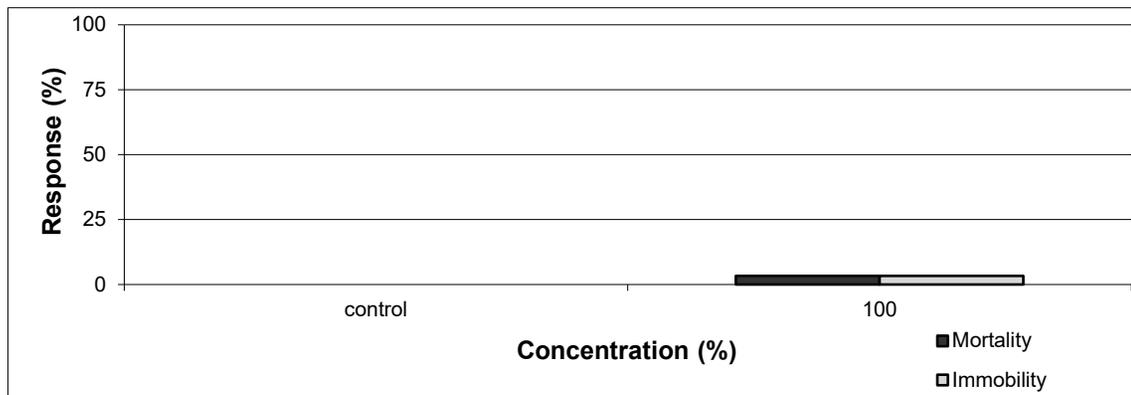
Test: started on 2015/06/19 ; ended on 2015/06/21

Contents	
Result Summary.....	1
Test Conditions.....	2
Test Data.....	4
Comments/Statistics...	5
QA/QC.....	6

Result:

Sample	Client Code	Average Mortality (%)	Average Immobility (%)	Comment
control	lab control	0	0	
100	150385-002 (F3)	3	3	none

Notes: sd, sample standard deviation; cv, coefficient of variation; nd, not done; na, not applicable;



The test data and results are authorized and verified correct.



Senior Verifier

Test Conditions

Client: TAI109
Reference: 15-0711-01-DAS

Method: Biological Test method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*, 2000. Environ. Can., EPS 1/RM/14. Second Edition.

Test type: *Daphnia* 48-h Static Acute Test (WTR-ME-015)

Species: *Daphnia magna*

Age: < 24 hours old

Organism source: in-house culture

Stock mortality: 0%

Culture brood data: 9 days to first brood
15 neonates per average brood

Sample initial chemistry: pH: 7.1; EC: 226 ($\mu\text{S}/\text{cm}$ @ 25°C); DO: 8.2 (mg/L); temperature: 17 °C
hardness (mg CaCO₃/L): 76; colour: yellow; odour: odourless

Sample holding time: 2 days (must be \leq 5 days)

Sample storage: 4 \pm 2°C in darkness

Test vessel: 385 mL plastic vessels

Test volume: 150 mL

Sample pre-treatment: The sample was filtered with a 110 μm nitrex screen prior to testing
The sample was not pH adjusted prior to or during testing
The sample was pre-aerated for 20 minutes (rate of 37.5 \pm 12.5 mL/min.L-1)
The hardness of the sample was not adjusted (mg CaCO₃/L) prior to or during testing

Loading density: One daphnid/15 mL (must \leq 1 organism/15 mL)

Control water: Moderately hard reconstituted water (1.92 g NaHCO₃, 1.20 g CaSO₄·2H₂O, 1.20 g MgSO₄, 0.08 g KCl per 20L) supplemented with vitamin B₁₂ (2 $\mu\text{g}/\text{L}$), Na₂SeO₃ (5 $\mu\text{g}/\text{L}$) and 10% (v/v) Perrier water.
The hardness of the control/dilution water was 93 mg CaCO₃/L

Test concentrations: Undiluted sample plus a negative control

Test replicates: Three replicates per treatment, 10 daphnids per replicate

Feeding: None

Aeration: None

Measurements: pH, conductivity, dissolved oxygen and temperature at test initiation and termination

Lighting: Cool white fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 20 \pm 2°C

Note: Outlined sections are protocol deviations explained on the comment page

Test Conditions

Client: TAI109 Reference: 15-0711-01-DAS

Endpoint: Mortality, % mortality at 48-h
Immobility, % immobility at 48-h

Test validity: The control had 100% survival (must \geq 90%)
Control had 0% abnormal behaviour (must \leq 10%), e.g. immobility

Reference toxicant: 48-h test with NaCl initiated June 8, 2015; current results
(48-h LC50 and 95% confidence limits) = 0.75 (0.71-0.78) log (g/L NaCl)

Note: Outlined sections are protocol deviations explained on the comment page

Test Data

 Client: TAI109
 Reference: 15-0711-01-DAS

Test Log:

Date	Day	Time	Technician
2015/06/19	0	1535	HKS/JK
2015/06/20	1	0845	JK
2015/06/21	2	1030	DS

Chemistry:

Conc (%)	control			100		
replicate	a	b	c	a	b	c

Day	pH (units)					
0	7.9	8.0	8.0	7.6	7.6	7.6
2	8.1	8.1	8.1	8.0	8.0	8.0

Day	Conductivity ($\mu\text{S}/\text{cm}$ @ 25°C)					
0	323	333	335	231	225	224
2	333	355	352	243	237	227

Day	Dissolved Oxygen (mg/L)					
0	8.2	8.2	8.2	8.1	8.1	8.1
2	8.2	8.2	8.2	8.2	8.1	8.1

Day	Temperature (°C)					
0	19	19	19	20	20	20
2	19	19	19	19	19	19

Biology:

Conc (%)	control			100		
replicate	a	b	c	a	b	c

Day	Number Alive and Behavior (behavior is in brackets)					
1	10	10	10	10	10	10
2	10	10	10	10	10	9

Notes: F, floating; I, immobile; B, stuck on bubble; D, caught in debris

Day	Mortality (%)					
2	0	0	0	0	0	10

Day	Immobility (%)					
2	0	0	0	0	0	10

Comments/Statistics

Client: TAI109 Reference: 15-0711-01-DAS

Test Result Comments:

None

Data Analysis:

None

Protocol Deviations:

None

Quality Assurance Information

Test Method: *Daphnia* Static Acute Test (LC50, 5 treatments plus a control)

HydroQual Test Method: WTR-ME-016

Reference: Biological Test Method: Reference Method for Determining the Acute Lethality of Effluents to *Daphnia magna*, 1990. Environment Canada, EPS 1/RM/14.

including May 1996 and December 2000 amendments.

Test Organism:

test species: *Daphnia magna*
 culture source: in-house
 original culture source: Aquatic Biosystems
 days to first brood: 9
 mean brood size: 15
 ephippia in stock culture: no
 age of test organisms: <24 hours old
 culture mortality (%): 0%
 dissolved oxygen: 40-100% saturation
 light level (water surface): 400-800 lux (cool white)
 control/dilution water: Moderately hard reconstituted water supplemented with vitamin B₁₂ (2 µg/L), Na₂SeO₃ (5 µg/L) and 10% (v/v) Perrier water.

Test Design:

vol. of test vessel (mL): 500
 toxicant: sodium chloride
 test volume (mL): 150
 replicates per treatment: 1
 neonates per replicate: 10
 volume per neonate (mL): 15
 samples preaerated: no
 hardness adjustment: no
 temperature (°C): 20
 photoperiod: 16h light:8h dark

Current Test

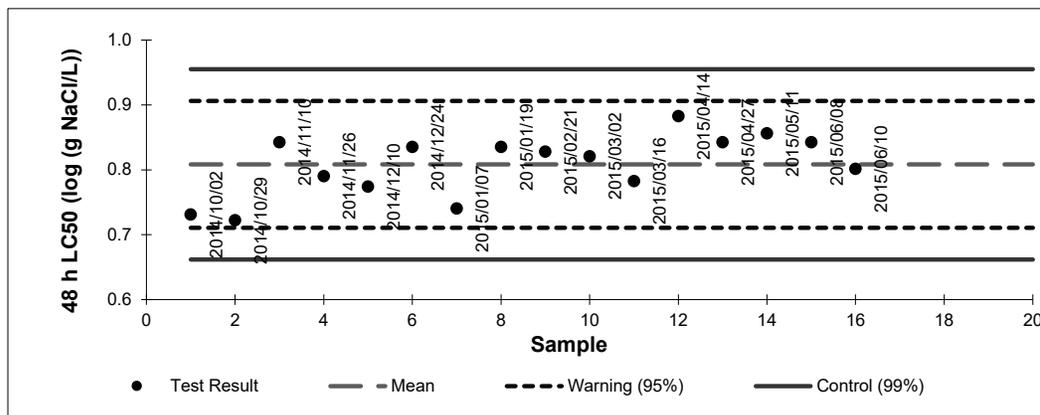
toxicant Sodium chloride (NaCl)
 started on 2015/06/08 ended on 2015/06/10
 Result (LC50 @ 48h) 0.75 log (g NaCl/L); geometric mean
 Confidence Limits (95%) lower 0.71 upper 0.78

Historical Values

mean	0.76	sd	0.05	cv(%):	7.4
	lower	upper			
warning limits (±2 sd)	0.66	0.86	(95% confidence limits)		
control limits (±3 sd)	0.61	0.91	(99% confidence limits)		

notes: sd, standard deviation; cv, coefficient of variance

Comments: None.



The test data and results are authorized and verified correct.



Senior Verifier

Our liability is limited to the cost of the test requested on the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results in part or in whole.

HydroQual Laboratories Ltd., #4, 6125 12th Street SE, Calgary, Alberta, Canada T2H 2K1
 tel (403) 253-7121 fax (403) 252-9363 www.hydroqual.ca

DA Ref. Tox.

GENERAL TERMS AND CONDITIONS:

These terms and conditions are incorporated into and form part of the Chain of Custody between HydroQual Laboratories Ltd. ("HydroQual") and the party named in the Chain of Custody (the "Client").

1. **Definitions:** Capitalized terms shall have the definition ascribed as such in these General Terms and Conditions and the Chain of Custody.
2. **The Services:** HydroQual will provide the Services to the Client as listed and described in the Chain of Custody.
3. **Prices:** HydroQual may review and change all prices, fees, surcharges or other charges as set out in proposals and/or price quotations if there are changes to HydroQual's cost beyond HydroQual's control, including changes in legislative requirements, Client variations of sample numbers and Client requests for changes to standard reporting requirements. Notwithstanding condition 3, all quotations are reviewed and updated on a yearly basis.
4. **Payment Terms:** The Client shall pay HydroQual within 30 days of the invoice date as provided by HydroQual. HydroQual may, for reasonable business reasons, require the Client to arrange for payment in advance.
5. **Quotation Numbers:** The Client shall provide the proposal and/or price quotation number to HydroQual (where applicable) to ensure correct pricing.
6. **Taxes:** Applicable taxes are not included in prices, surcharges and additional fees and will be added at the time of invoicing.
7. **No Guarantee of Results:** The Client is responsible for informing itself on the limitation of the results and acknowledges that the results are not guaranteed.
8. **Standard of Care:** HydroQual will use reasonable care and diligence as required by the laws of the province or territory where the sample is tested, subject to that level of care and skill ordinarily exercised by other laboratories currently practicing under similar conditions in the same locality, subject to the time limits and financial, physical or other constraints applicable to the Services. No warranty, express or implied, is made.
9. **Storage:** Where possible, HydroQual will store samples until a final report is issued to the Client, after which time HydroQual may discard the sample.
10. **Holds:** If the Client requests a sample be placed on hold, HydroQual will store the sample for the mutually agreed upon written time and price, after which HydroQual will invoice the Client and discard the sample.
11. **Archives:** If the Client requests a sample be archived, HydroQual will store the sample for a mutually agreed upon written time frame and price, after which HydroQual will invoice the Client and discard the sample.
12. **Handling Protocol:** Legal sample handling protocol must be arranged, and provided in writing, before samples are collected. HydroQual will provide a price quotation for legal sample protocol. Samples processed under legal protocol are stored indefinitely, subject to a storage charge as advised by HydroQual.
13. **Samples:** The quality, condition, content and source of samples stored and tested are not known to HydroQual except as declared and described on the Chain of Custody completed and submitted by the Client and accompanying the sample.
14. **Risk of Loss:** HydroQual will use reasonable care to protect samples during storage, however, all samples are stored at the Client's risk and the Client is responsible for obtaining appropriate insurance, if desired. The Client acknowledges that during the performance of the Services samples may be altered, lost, damaged or destroyed and the client forever releases HydroQual from any and all claims the Client may have for any loss or damage to the sample.
15. **Environmental:** the Client must comply with all applicable environmental legislation, including labeling all hazardous samples to comply with Canada's *Workplace Hazardous Materials Information System* and the Alberta *Transfer of Dangerous Goods* regulations, and must provide appropriate material safety data sheets that include the nature of the hazard and a contact name and phone number to call for information. The Client shall defend, indemnify and hold harmless HydroQual for all loss or damages, including any fine or cost of complying with an order of any government authority, resulting from the Client's breach of this paragraph.
16. **Hazardous Materials Disposal:** HydroQual may return, at the Client's cost, hazardous material to the Client for disposal.
17. **Hazardous Materials Surcharge:** HydroQual may apply an additional surcharge for handling of hazardous samples or samples with Naturally Occurring Radioactive Materials ("NORM"), such as and including without limitation, H₂S and CN.
18. **Sample Containers:** HydroQual may ship sample containers to the Client's location by the most cost effective means using HydroQual's preferred courier suppliers, within the specified project timeline. Shipping will be charged back to the Client.
19. **Additional Charges:** HydroQual may charge the Client:
 - (a) for pick-up and delivery services when provided subject in each instance to a minimum charge of \$50.00; and,
 - (b) for rush service (processing samples and/or reporting).
20. **Large Bottle Orders:** The Client shall provide HydroQual with not less than 24 hours' notice for large bottle orders.
21. **Re-Tests:** HydroQual reserves the right to re-test any samples that remain in HydroQual's possession. Re-tests requested by the Client may be charged to Client and Client agrees to pay for such charges.
22. **Waiver:** The Client is responsible for making any assessment regarding the suitability of the Services and the intended results for the Client's purposes and waives any and all claims against HydroQual that the Client may have against HydroQual as a result of the interpretation of the results provided to the Client. The Client shall defend, indemnify and save harmless HydroQual for any and all claims made by any third party against HydroQual in respect of all losses however arising from the performance of the Services or the use of any report provided in the performance of the Services.
23. **LIMITATION OF LIABILITY:** IN NO EVENT SHALL HYDROQUAL BE RESPONSIBLE FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY OR PUNITIVE DAMAGES, WHETHER FORESEEABLE OR UNFORESEEABLE (INCLUDING CLAIMS FOR LOSS OF PROFITS OR REVENUE OR LOSSES CAUSED BY STOPPAGE OF OTHER WORK OR IMPAIRMENT OF OTHER ASSETS) INCURRED BY THE CLIENT ARISING OUT OF BREACH OR FAILURE OF EXPRESS OR IMPLIED WARRANTY, BREACH OF CONTRACT, BREACH OF WARRANTY, MISREPRESENTATION, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE. IN ANY EVENT, THE LIABILITY OF HYDROQUAL TO THE CLIENT SHALL BE LIMITED TO THE COST OF TESTING THE SAMPLE AS REQUESTED IN THE CHAIN OF CUSTODY UNDER WHICH THE SAMPLE WAS ORIGINALLY DEPOSITED. FOR THE PURPOSES OF THIS PARAGRAPH AND PARAGRAPHS 7, 14, 15, 22, AND 24, AS APPLICABLE, "HYDROQUAL" INCLUDES WITHOUT LIMITATIONS ITS DIRECTORS, OFFICERS, EMPLOYEES AND AFFILIATES AND THE "CLIENT" INCLUDES WITHOUT LIMITATION ANY THIRD PARTY THAT MAY HAVE A CLAIM AGAINST HYDROQUAL THROUGH THE CLIENT.
24. **Notice of Liability:** Notwithstanding paragraph 23, HydroQual shall not be liable to the Client unless the Client provides notice in writing to HydroQual of such loss or damage, together with full particulars thereof, within 30 days of the Client's receipt of the report of the analysis of the sample giving rise to such liability. The provisions of this paragraph allocate the risk between the Client and HydroQual, and the fees to be paid by the Client to HydroQual reflect this allocation of any such risks and the limitations of liability in these General Terms and Conditions.
25. **Entire Agreement:** These General Terms and Conditions, the Chain of Custody and price quotations constitute the entire agreement between the parties and supersede and take precedence over any terms and conditions contained in any documentation provided by the Client. HydroQual's execution of any subsequent documentation from the Client only acknowledges receipt and not acceptance of any terms or conditions therein unless expressly stipulated otherwise by HydroQual. If there is a conflict between these General Terms and Conditions and any other document, these General Terms and Conditions prevail.



ATTN: Judy Mah
Taiga Environmental Laboratory
Box 1320 4601- 52 Ave.
Yellowknife, NT
Canada X1A 2L9

Received: 2015/10/23
Report Date: 2015/11/04
Version: FINAL

HydroQual Test Report

Client: TAI109
Reference: 15-1447
Billing: not given

A handwritten signature in cursive script that reads "Jacquyn Poole".

Senior Verifier

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.

HydroQual Laboratories Ltd., #4, 6125 12th Street SE, Calgary, Alberta, Canada T2H 2K1
Tel (403) 253-7121 fax (403) 252-9363 www.hydroqual.ca

Result Summary

Client: TAI109
Reference: 15-1447-01-TRS

Client: Taiga Environmental Laboratory; operation Yellowknife

Sample: 1501020-002 (F3)

Collection: collected on 2015/10/21 at 1100 by not given

Receipt: received on 2015/10/23 at 0900 by MC

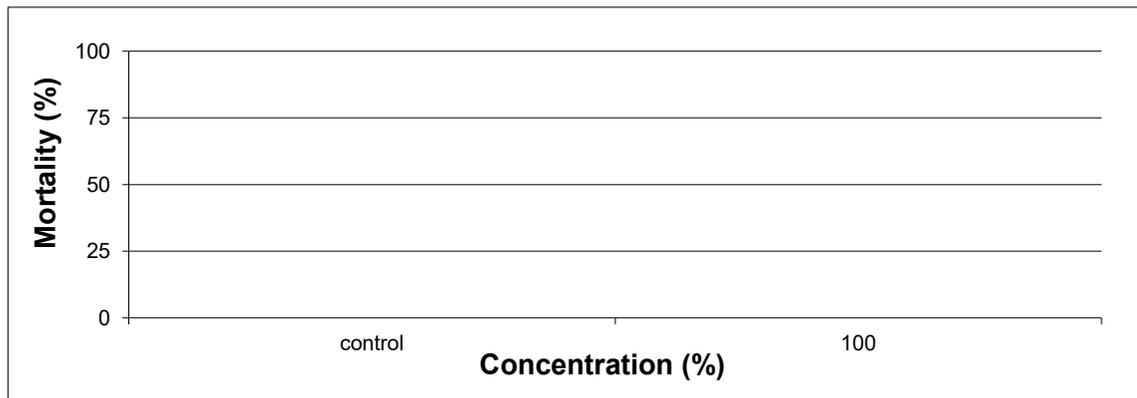
Containers: received 5 x 10 L pails at 8 °C, in good condition with seals and no initials

Description: type: water, collection method: not given

Test: started on 2015/10/24 ; ended on 2015/10/28

Result:

Sample	Client Code	Mortality (%)	Comment
control	lab control	0	
100%	1501020-002 (F3)	0	none



The test data and results are authorized and verified correct.



Senior Verifier

Test Conditions

Client: TAI109
Reference: 15-1447-01-TRS

Method: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 2000. Environment Canada, EPS 1/RM/13. Second Edition (amended 2007).

Test type: Trout 96-h Static Acute Test (WTR-ME-041)

Species: *Oncorhynchus mykiss*

Organism source: Sam Livingston (Batch 20151009TR)

Acclimation: 15 days (must be \geq 2 weeks)

Stock mortality: 0.16% (seven days preceding testing)

Sample initial chemistry: pH: 7.6; EC: 343 ($\mu\text{S}/\text{cm}$ @ 25°C); DO: 8.9 (mg/L); temperature: 16 °C
hardness (mg CaCO₃/L): 92; colour: dark yellow; odour: odourless

Sample holding time: 3 days (must be \leq 5 days)

Sample storage: 4 \pm 2°C in darkness

Test vessel: The test was conducted in 22 L plastic pails with polyethylene liners

Test volume: 20 Litres (depth of solution in each test vessel \geq 15cm)

Sample pre-treatment: All test solutions and controls were pre-aerated for 30 minutes at 6.5 \pm 1 mL/min/L
Dissolved oxygen in full strength sample was 8.7 mg/L after pre-aeration
The sample was not filtered or pH adjusted prior to or during testing

Loading density: 0.19 g/Litre (must be \leq 0.5 g/Litre)

Control water: Dechlorinated City of Calgary water acclimated to test conditions

Test concentrations: Undiluted sample plus a negative control

Test replicates: One replicate per treatment; 10 fish per replicate

Feeding: Fish are not fed 24 hours before test initiation and no feeding during test

Measurements: pH, conductivity, dissolved oxygen and temperature measured at test initiation and termination

Aeration: All treatments aerated at 6.5 \pm 1 mL/min/L by oil-free compressed air passed through airline tubes connected to disposable air stones

Lighting: Overhead full spectrum fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 15 \pm 1°C

Endpoint: Mortality, % mortality at 96-h

Test validity: The control had 100% survival (must \geq 90%)

The control had 0 percent (%) stressed behaviour (must \leq 10%)

Reference toxicant: 96-h test with Potassium Chloride (KCl) initiated October 26, 2015; current results (96-h LC50 and 95% confidence limits) = 0.58 (0.50-0.63) log (g/L KCl)
historical results:
(96-h LC50 and 95% confidence limits) = 0.57 (0.50-0.64) log (g/L KCl)

Note: Outlined sections are protocol deviations explained on the comment page; v/v, volume per volume

Test Data

Client: TAI109
Reference: 15-1447-01-TRS

Test Log:

Date	Day	Time	Technician
2015/10/24	0	1430	CQ
2015/10/25	1	0930	NM
2015/10/26	2	0945	HKS
2015/10/27	3	0910	ML/HKS
2015/10/28	4	0930	NM/HKS

Chemistry:

Conc. (%)	control	100
-----------	---------	-----

Day

pH (units)

0	7.7	7.7
4	8.0	8.0

Conductivity ($\mu\text{S}/\text{cm}$ @ 25°C)

0	460	349
4	465	345

Dissolved Oxygen (mg/L)

0	8.7	8.7
4	8.8	8.7

Temperature (°C)

0	15	15
4	15	15

Number Alive (In brackets number stressed):

Conc. (%)	control	100
-----------	---------	-----

Day

0	10	10
1	10	10
2	10	10
3	10	10
4	10	10

Mortality (%)

4	0	0
---	---	---

Stressed (%)

4	0	0
---	---	---

Client: TAI109
Reference: 15-1447-01-TRS

Test Data

Biology Summary Tables:

Control Fish	Length (cm)	Wet Weight(g)
1	3.0	0.3
2	3.0	0.3
3	3.8	0.6
4	3.0	0.3
5	3.5	0.4
6	3.0	0.4
7	3.3	0.4
8	3.5	0.5
9	3.0	0.3
10	3.0	0.3

Sample	Group Wet Weight (g)
control	3.8
100	2.8

average	3.2	0.4
sd	0.3	0.1
cv(%)	9.2	27.2

Notes: nd, not done; na, not applicable;
 sd, standard deviation; cv(%), coefficient of variation

Comments/Statistics

Test Result Comments:

None

Data Analysis:

None

Protocol Deviations:

None

Result Summary

Client: TAI109 Reference: 15-1447-01-DAS

Client: Taiga Environmental Laboratory; operation Yellowknife

Sample: 1501020-002 (F3)

Collection: collected on 2015/10/21 at 1100 by not given

Receipt: received on 2015/10/23 at 0900 by MC

Containers: received 5 x 10 L pails at 8 °C, in good condition with seals and no initials

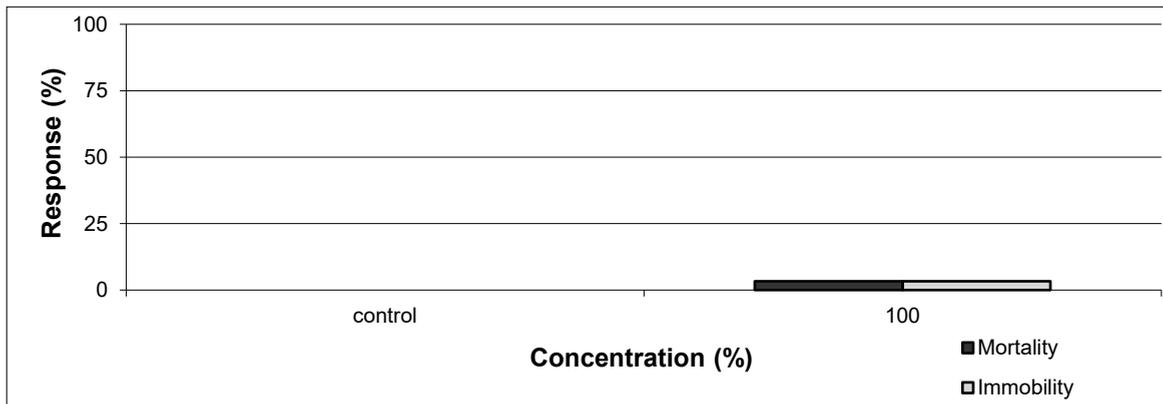
Description: type: water, collection method: not given

Test: started on 2015/10/24 ; ended on 2015/10/26

Result:

Sample	Client Code	Average Mortality (%)	Average Immobility (%)	Comment
control	lab control	0	0	
100	1501020-002 (F3)	3	3	none

Notes: sd, sample standard deviation; cv, coefficient of variation; nd, not done; na, not applicable;



The test data and results are authorized and verified correct.



Senior Verifier

Test Conditions

Client: TAI109 Reference: 15-1447-01-DAS

Method: Biological Test method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*, 2000. Environ. Can., EPS 1/RM/14. Second Edition.

Test type: *Daphnia* 48-h Static Acute Test (WTR-ME-015)

Species: *Daphnia magna*

Age: < 24 hours old

Organism source: in-house culture

Stock mortality: 0%

Culture brood data: 12 days to first brood
16 neonates per average brood

Sample initial chemistry: pH: 7.6; EC: 343 ($\mu\text{S}/\text{cm}$ @ 25°C); DO: 8.9 (mg/L); temperature: 16 °C
hardness (mg CaCO₃/L): 92; colour: dark yellow; odour: odourless

Sample holding time: 3 days (must be \leq 5 days)

Sample storage: 4 \pm 2°C in darkness

Test vessel: 385 mL plastic vessels

Test volume: 150 mL

Sample pre-treatment: The sample was filtered with a 110 μm nitrex screen prior to testing
The sample was not pH adjusted prior to or during testing
The sample was pre-aerated for 0 minutes (rate of 37.5 \pm 12.5 mL/min.L-1)
The hardness of the sample was not adjusted (mg CaCO₃/L) prior to or during testing

Loading density: One daphnid/15 mL (must \leq 1 organism/15 mL)

Control water: Moderately hard reconstituted water supplemented with vitamin B12 (2 $\mu\text{g}/\text{L}$)
and Na₂SeO₃ (5 $\mu\text{g}/\text{L}$)

The hardness of the control/dilution water was 83 mg CaCO₃/L

Test concentrations: Undiluted sample plus a negative control

Test replicates: Three replicates per treatment, 10 daphnids per replicate

Feeding: None

Aeration: None

Measurements: pH, conductivity, dissolved oxygen and temperature at test initiation and termination

Lighting: Cool white fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 20 \pm 2°C

Note: Outlined sections are protocol deviations explained on the comment page

Test Conditions

Client: TAI109 Reference: 15-1447-01-DAS

Endpoint: Mortality, % mortality at 48-h
Immobility, % immobility at 48-h

Test validity: The control had 100% survival (must \geq 90%)
Control had 0% abnormal behaviour (must \leq 10%), e.g. immobility

Reference toxicant: 48-h test with NaCl initiated October 23, 2015; current results
(48-h LC50 and 95% confidence limits) = 0.78 (0.76-0.81) log (g/L NaCl)
historical results:
(48-h LC50 and 95% confidence limits) = 0.77 (0.70-0.84) log (g/L NaCl)

Note: Outlined sections are protocol deviations explained on the comment page

Test Data

Client: TAI109
Reference: 15-1447-01-DAS

Test Log:

Date	Day	Time	Technician
2015/10/24	0	1550	JK/CQ
2015/10/25	1	1130	NM
2015/10/26	2	1105	NM

Chemistry:

Conc (%)	control			100		
replicate	a	b	c	a	b	c

Day	pH (units)					
0	8.0	8.0	8.0	7.8	7.8	7.8
2	8.2	8.2	8.2	8.0	8.0	8.0

Day	Conductivity ($\mu\text{S}/\text{cm}$ @ 25°C)					
0	230	235	236	345	353	355
2	278	263	252	366	374	375

Day	Dissolved Oxygen (mg/L)					
0	8.0	8.0	8.1	8.0	8.0	8.0
2	8.0	8.0	8.1	8.0	8.0	7.9

Day	Temperature (°C)					
0	19	19	19	19	19	19
2	19	19	20	20	20	20

Biology:

Conc (%)	control			100		
replicate	a	b	c	a	b	c

Day	Number Alive and Behavior (behavior is in brackets)					
1	10	10	10	10	10	10
2	10	10	10	10	9	10

Notes: F, floating; I, immobile; B, stuck on bubble; D, caught in debris

Day	Mortality (%)					
2	0	0	0	0	10	0

Day	Immobility (%)					
2	0	0	0	0	10	0

Comments/Statistics

Client: TAI109 Reference: 15-1447-01-DAS

Test Result Comments:

None

Data Analysis:

None

Protocol Deviations:

None

GENERAL TERMS AND CONDITIONS:

These terms and conditions are incorporated into and form part of the Chain of Custody between HydroQual Laboratories Ltd. ("HydroQual") and the party named in the Chain of Custody (the "Client").

1. **Definitions:** Capitalized terms shall have the definition ascribed as such in these General Terms and Conditions and the Chain of Custody.
2. **The Services:** HydroQual will provide the Services to the Client as listed and described in the Chain of Custody.
3. **Prices:** HydroQual may review and change all prices, fees, surcharges or other charges as set out in proposals and/or price quotations if there are changes to HydroQual's cost beyond HydroQual's control, including changes in legislative requirements, Client variations of sample numbers and Client requests for changes to standard reporting requirements. Notwithstanding condition 3, all quotations are reviewed and updated on a yearly basis.
4. **Payment Terms:** The Client shall pay HydroQual within 30 days of the invoice date as provided by HydroQual. HydroQual may, for reasonable business reasons, require the Client to arrange for payment in advance.
5. **Quotation Numbers:** The Client shall provide the proposal and/or price quotation number to HydroQual (where applicable) to ensure correct pricing.
6. **Taxes:** Applicable taxes are not included in prices, surcharges and additional fees and will be added at the time of invoicing.
7. **No Guarantee of Results:** The Client is responsible for informing itself on the limitation of the results and acknowledges that the results are not guaranteed.
8. **Standard of Care:** HydroQual will use reasonable care and diligence as required by the laws of the province or territory where the sample is tested, subject to that level of care and skill ordinarily exercised by other laboratories currently practicing under similar conditions in the same locality, subject to the time limits and financial, physical or other constraints applicable to the Services. No warranty, express or implied, is made.
9. **Storage:** Where possible, HydroQual will store samples until a final report is issued to the Client, after which time HydroQual may discard the sample.
10. **Holds:** If the Client requests a sample be placed on hold, HydroQual will store the sample for the mutually agreed upon written time and price, after which HydroQual will invoice the Client and discard the sample.
11. **Archives:** If the Client requests a sample be archived, HydroQual will store the sample for a mutually agreed upon written time frame and price, after which HydroQual will invoice the Client and discard the sample.
12. **Handling Protocol:** Legal sample handling protocol must be arranged, and provided in writing, before samples are collected. HydroQual will provide a price quotation for legal sample protocol. Samples processed under legal protocol are stored indefinitely, subject to a storage charge as advised by HydroQual.
13. **Samples:** The quality, condition, content and source of samples stored and tested are not known to HydroQual except as declared and described on the Chain of Custody completed and submitted by the Client and accompanying the sample.
14. **Risk of Loss:** HydroQual will use reasonable care to protect samples during storage, however, all samples are stored at the Client's risk and the Client is responsible for obtaining appropriate insurance, if desired. The Client acknowledges that during the performance of the Services samples may be altered, lost, damaged or destroyed and the client forever releases HydroQual from any and all claims the Client may have for any loss or damage to the sample.
15. **Environmental:** the Client must comply with all applicable environmental legislation, including labeling all hazardous samples to comply with Canada's *Workplace Hazardous Materials Information System* and the Alberta *Transfer of Dangerous Goods* regulations, and must provide appropriate material safety data sheets that include the nature of the hazard and a contact name and phone number to call for information. The Client shall defend, indemnify and hold harmless HydroQual for all loss or damages, including any fine or cost of complying with an order of any government authority, resulting from the Client's breach of this paragraph.
16. **Hazardous Materials Disposal:** HydroQual may return, at the Client's cost, hazardous material to the Client for disposal.
17. **Hazardous Materials Surcharge:** HydroQual may apply an additional surcharge for handling of hazardous samples or samples with Naturally Occurring Radioactive Materials ("NORM"), such as and including without limitation, H₂S and CN.
18. **Sample Containers:** HydroQual may ship sample containers to the Client's location by the most cost effective means using HydroQual's preferred courier suppliers, within the specified project timeline. Shipping will be charged back to the Client.
19. **Additional Charges:** HydroQual may charge the Client:
 - (a) for pick-up and delivery services when provided subject in each instance to a minimum charge of \$50.00; and,
 - (b) for rush service (processing samples and/or reporting).
20. **Large Bottle Orders:** The Client shall provide HydroQual with not less than 24 hours' notice for large bottle orders.
21. **Re-Tests:** HydroQual reserves the right to re-test any samples that remain in HydroQual's possession. Re-tests requested by the Client may be charged to Client and Client agrees to pay for such charges.
22. **Waiver:** The Client is responsible for making any assessment regarding the suitability of the Services and the intended results for the Client's purposes and waives any and all claims against HydroQual that the Client may have against HydroQual as a result of the interpretation of the results provided to the Client. The Client shall defend, indemnify and save harmless HydroQual for any and all claims made by any third party against HydroQual in respect of all losses however arising from the performance of the Services or the use of any report provided in the performance of the Services.
23. **LIMITATION OF LIABILITY:** IN NO EVENT SHALL HYDROQUAL BE RESPONSIBLE FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY OR PUNITIVE DAMAGES, WHETHER FORESEEABLE OR UNFORESEEABLE (INCLUDING CLAIMS FOR LOSS OF PROFITS OR REVENUE OR LOSSES CAUSED BY STOPPAGE OF OTHER WORK OR IMPAIRMENT OF OTHER ASSETS) INCURRED BY THE CLIENT ARISING OUT OF BREACH OR FAILURE OF EXPRESS OR IMPLIED WARRANTY, BREACH OF CONTRACT, BREACH OF WARRANTY, MISREPRESENTATION, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE. IN ANY EVENT, THE LIABILITY OF HYDROQUAL TO THE CLIENT SHALL BE LIMITED TO THE COST OF TESTING THE SAMPLE AS REQUESTED IN THE CHAIN OF CUSTODY UNDER WHICH THE SAMPLE WAS ORIGINALLY DEPOSITED. FOR THE PURPOSES OF THIS PARAGRAPH AND PARAGRAPHS 7, 14, 15, 22, AND 24, AS APPLICABLE, "HYDROQUAL" INCLUDES WITHOUT LIMITATIONS ITS DIRECTORS, OFFICERS, EMPLOYEES AND AFFILIATES AND THE "CLIENT" INCLUDES WITHOUT LIMITATION ANY THIRD PARTY THAT MAY HAVE A CLAIM AGAINST HYDROQUAL THROUGH THE CLIENT.
24. **Notice of Liability:** Notwithstanding paragraph 23, HydroQual shall not be liable to the Client unless the Client provides notice in writing to HydroQual of such loss or damage, together with full particulars thereof, within 30 days of the Client's receipt of the report of the analysis of the sample giving rise to such liability. The provisions of this paragraph allocate the risk between the Client and HydroQual, and the fees to be paid by the Client to HydroQual reflect this allocation of any such risks and the limitations of liability in these General Terms and Conditions.
25. **Entire Agreement:** These General Terms and Conditions, the Chain of Custody and price quotations constitute the entire agreement between the parties and supersede and take precedence over any terms and conditions contained in any documentation provided by the Client. HydroQual's execution of any subsequent documentation from the Client only acknowledges receipt and not acceptance of any terms or conditions therein unless expressly stipulated otherwise by HydroQual. If there is a conflict between these General Terms and Conditions and any other document, these General Terms and Conditions prevail.