



Water Resources Division
Resource Management Directorate
Nunavut Regional Office
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Your file - Votre référence
3AM-IQA1626
Our file - Notre référence
GCDOCS#116430675

August 22, 2023

Robert Hunter
Licensing Administrator
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0
E-mail: licensing@nwb-oen.ca

Re: Crown-Indigenous Relations and Northern Affairs Canada's review of the City of Iqaluit 2022 Annual Report for Type A Water Licence No. 3AM-IQA1626 in the Qikiqtani Region of Nunavut

Dear Mr. Hunter,

Thank you for the May 8, 2023 invitation to review the referenced City of Iqaluit 2022 Annual Report for Type A Water Licence No. 3AM-IQA1626.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) reviewed the 2022 annual report pursuant to its mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Crown-Indigenous Relations and Northern Affairs Act*. Please find CIRNAC comments and recommendations in the attached Technical Memorandum. The annual report, and its corresponding reporting requirements, is a term and condition of the water license. Opting not to fulfill all the terms and conditions of the water licence places the City of Iqaluit in noncompliance.

If there are any questions or concerns, please contact me at michelle.blade@rcaanc-cirnac.gc.ca or Andrew Keim at andrew.keim@rcaanc-cirnac.gc.ca.

Sincerely,

Michelle Blade,
Regional Water Coordinator



Technical Review Memorandum

Date: August 22, 2023

To: Robert Hunter, Licensing Administrator, Nunavut Water Board

From: Michelle Blade, Regional Water Coordinator, CIRNAC

Subject: Crown-Indigenous Relations and Northern Affairs Canada's review of the City of Iqaluit 2022 Annual Report for Type A Water Licence No. 3AM-IQA1626 in the Qikiqtani Region of Nunavut

Region: ☐ Kitikmeot ☐ Kivalliq ☒ Qikiqtani

A. BACKGROUND

The City of Iqaluit (City) maintains an existing Type "A" Water Licence No. 3AM-IQA1626 that has undergone 7 amendments over the course of the last 6 years. Through the amendments, the quantity of water permitted for extraction from the environment has increased from 1,100,000 cubic metres (m³) to 2,000,000 m³ annually from Lake Geraldine Reservoir. In addition, 600,000 m³ is pumped annually from Unnamed Lake to Niaqunguk (Apex) River, 900,000 m³ is pumped annually from Apex River to Lake Geraldine Reservoir, and 2,500 m³ removed annually from Imiqtarviviniq (Dead Dog) Lake. Permitted discharges to the environment under Type "A" Water Licence No. 3AM-IQA1626 include:

- landfill run-off from the West 40 Landfill; and
- wastewater from the West 40 Wastewater Treatment Plant and backup Sewage Lagoon.

The following amendments are relevant to the period covered by the City of Iqaluit's 2022 Annual Water Licence Report:

- ❖ Amendment No. 4
 - effective April 1, 2020
 - allows seasonal replenishment of Lake Geraldine Reservoir from the Niaqunguk River (Apex River)
- ❖ Amendment No. 5
 - effective March 15, 2021
 - allows for construction and operation of new solid waste management facilities and water use from Imiqtarviviniq Lake (Dead Dog Lake)
- ❖ Amendment No. 6
 - effective October 15, 2021
 - allows for construction, operation, and removal of temporary facilities to truck water from the Sylvia Grinnell River



- expires upon resolution of the state of emergency

The water treatment plant returned to normal operation on April 25, 2023. Amendment #6 is therefore in effect for all of the 2022 Annual report and a portion of the 2023 Annual report.

❖ Amendment No. 7

- effective August 22, 2022
- allows replenishment of the Lake Geraldine Reservoir through withdrawal of water from an unnamed lake to the Niaqunguk (Apex) River and an increase in withdrawal from the Apex River
- expires upon completion of the temporary withdrawals required to replenish the Lake Geraldine Reservoir in 2022

In the 2022 Annual Report, the City of Iqaluit reports that Amendment No. 7 has not been implemented.

The following annual reporting requirements are listed in **Schedule B** of Water Licence No. 3AM-IQA1626 issued on June 17, 2016:

- a. The monthly and annual quantities in cubic metres of fresh Water withdrawn from the Lake Geraldine Reservoir at Monitoring Station No. IQA-01
- b. The monthly and annual quantities in cubic metres of any Discharges from the Wastewater Treatment Facilities at Monitoring Stations IQA-02, IQA-04, and IQA-08
- c. Copy of reports generated from Dam Safety Inspections and Dam Safety Reviews along with the Licensee's proposed actions to address issues identified and/or updates on continuing actions to address issues
- d. The monthly and annual quantities in cubic metres of sludge removed from the Wastewater Treatment Facilities
- e. The monthly and annual quantities of Wastes disposed of at the West 40 landfill
- f. A summary report which includes all data and information generated under the Monitoring Program, including the QA/QC program, in electronic and printed formats acceptable to the Board
- g. A summary of all construction activities carried out for facilities under the Licence
- h. A summary of modifications and/or major maintenance work carried out on the potable Water Treatment and Waste Treatment Facilities, including all associated structures
- i. A progress report and revisions (if applicable) to any studies requested by the Board that relate to Waste management, Water use or reclamation and a brief description of any future studies planned by the Licensee including, a non-technical executive summary for the general public, translated into Inuktitut
- j. Any revisions required, in the form of addenda, to Plans, Manuals and Reports approved under the Licence
- k. A list and description, including volumes and Spill Report Line Identification Number, of all un-authorized discharges, spills and summaries of follow-up action taken
- l. A summary of any closure and reclamation work undertaken and an outline of any work anticipated for the next year, including any changes to implementation and scheduling
- m. A summary of actions taken to address concerns or deficiencies listed in the inspection



reports and/or compliance reports filed by an Inspector

- n. A brief update on the implementation plan of all facilities within the scope of this Licence including changes projected implementation and status of the Upgraded Wastewater Treatment Plant
- o. A summary of any studies, reports and plans requested by the Board that relate to Waste disposal, Water use or reclamation and a brief description of any future studies planned
- p. Any other details on the use of Water or Waste disposal requested by the Board by November 1st of the year being reported

Amendment No. 4 added the following annual reporting requirements to Schedule B of Water Licence No. 3AM-IQA1626:

- q. The 2019 Annual Report referred to in Part B, Item 1, shall provide the following information about the Supplementary Pumping Program (SPP) including:
 - 1. A summary of the SPP program, including lessons learned, based on monitoring and mitigation efforts.
 - 2. GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) and datum for the locations of all water withdrawals.
 - 3. The daily and monthly quantities in cubic metres of freshwater withdrawn from the Niaqunguk River (Apex River) watershed at Monitoring Station No. IQA-10.
 - 4. The daily water levels and/or flow rates in the Niaqunguk River when withdrawals are occurring at Monitoring Station No. IQA-10.
 - 5. All other monitoring conducted to meet the Fisheries and Oceans Canada requirements.
 - 6. Discussion of any observed trends, exceedances, or unanticipated impacts.

Amendment No. 5 added the following annual reporting requirements to Schedule B of Water Licence No. 3AM-IQA1626:

- r. The monthly and annual quantities in cubic metres of fresh Water withdrawn from Imiqtarviviniq Lake (Dead Dog Lake) at Monitoring Station No. IQA-14
- s. The monthly and annual quantities, and general types of Wastes brought to the Waste Transfer Station and disposed of at the New North Landfill
- t. A review of procedures for packaging, storage, and shipment of harmful hazardous Waste
- u. An update on the capacity of the landfill cell currently in use, including the installation timing calculation (inputs and results), including discussion on the required actions/schedule for the design and installation of the next lined disposal area in the sequence

Amendment No. 6 added the following annual reporting requirements to Schedule B of Water Licence No. 3AM-IQA1626:

- v. The 2021 Annual Report referred to in Part B, Item 1, shall provide the following information:



1. A summary of the investigation of the petroleum hydrocarbon contamination in the City's water supply system, including lessons learned, based on monitoring and mitigation efforts
2. GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) and datum for the locations of all water withdrawals
3. The daily and monthly quantities in cubic metres of fresh Water withdrawn from the Sylvia Grinnel River at Monitoring Station No. IQA-17
4. Discussion of any observed trends, exceedances, or unanticipated impacts

The water treatment plant returned to normal operation on April 25, 2023. Amendment #6 is therefore in effect for all of the 2022 Annual report and a portion of the 2023 Annual report.

Amendment No. 7 added the following annual reporting requirements to Schedule B of Water Licence No. 3AM-IQA1626:

- v. The 2022 Annual Report referred to in Part B, Item 1, shall provide the following information:
1. GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) and datum for the locations of all water withdrawals
 2. The daily and monthly quantities in cubic metres of fresh Water withdrawn from the Unnamed Lake at Monitoring Station No. IQA-13
 3. All other monitoring conducted to meet DFO requirements
 4. Discussion of any observed trends, exceedances, or unanticipated impacts

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) reviewed the 2022 Annual Report pursuant to its mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Crown-Indigenous Relations and Northern Affairs Act*. A summary of the subjects of CIRNAC's comments and recommendations regarding the renewal application can be found in Table 1. Documents reviewed as part of this submission can be found in Table 2 of Section B. Detailed technical review comments are in Section C.



Table 1: Summary of Comments and Recommendations

Recommendation Number	Subject
R-01	Sludge removed from Wastewater Treatment Facility
R-02	Quantities of wastes disposed of at the West 40 landfill
R-03a to R-03e	Sampling for the monitoring and QA/QC program
R-04	Construction activities and maintenance work
R-05	Updated plans, manuals, and reports in 2022
R-06a and R-06b	Un-authorized discharges and spills
R-07	Procedures for hazardous waste
R-08a to R-08c	Withdrawals from Niaqunguk (Apex) River
R-09a and R-09b	Supplementary Lake Geraldine Water Balance Modelling for 2022
R-10a and R-10b	Water Treatment Plant 2021 Spill

B. DOCUMENTS REVIEWED AND REFERENCED

The following table (Table 2) provides a list of the documents reviewed under the submission and reference during the review.

Table 2: Documents Reviewed and Referenced

Document Title	Author, File No., Rev., Date
Water Licence 3AM-IQA1626 2022 Annual Water Licence Report and attached Appendices A to E	City of Iqaluit, April 28, 2023
Water Licence 3AM-IQA1626 2021 Annual Water Licence Report and attached Appendices A to G	City of Iqaluit, June 24, 2022
Water Licence 3AM-IQA1626	Nunavut Water Board, June 17, 2016
Water Licence 3AM-IQA1626, Amendment	Nunavut Water Board, August 14, 2018
Water Licence 3AM-IQA1626, Amendment #2	Nunavut Water Board, August 1, 2019
Water Licence 3AM-IQA1626, Amendment #3	Nunavut Water Board, August 2, 2019
Water Licence 3AM-IQA1626, Amendment #4	Nunavut Water Board, April 1, 2020
Water Licence 3AM-IQA1626, Amendment #5	Nunavut Water Board, March 15, 2021
Water Licence 3AM-IQA1626, Amendment #6	Nunavut Water Board, October 15, 2021
Water Licence 3AM-IQA1626, Amendment #7	Nunavut Water Board, August 22, 2022
General Site Information and Guide for the Iqaluit Water Treatment Plant	City of Iqaluit, June 2022
Iqaluit Water Treatment Plant Operation and Maintenance Manual	City of Iqaluit, March 2022
Landfill and Waste Transfer Station Operations and Maintenance Manual	City of Iqaluit, August 2022, Version 6.0
Wastewater Treatment Plant Operation and Maintenance Manual	Updated document not received following substantial completion/commissioning



Document Title	Author, File No., Rev., Date
Sewage Lagoon Operation and Maintenance Manual	City of Iqaluit, March 2020
Spill Contingency Plan	City of Iqaluit, November 30, 2016
Supplementary Lake Geraldine Water Balance Modelling for 2022	WSP Golder, April 25, 2022
Phase II Environmental Site Assessment, City of Iqaluit, Potable Water Treatment Plant, Iqaluit, Nunavut, Final Report	Qikiqtaaluk Environmental, November 22, 2021
Environmental Support for the Removal of Hydrocarbon-Contaminated Water at the City's Potable Water Treatment Plant, Iqaluit, Nunavut	Qikiqtaaluk Environmental, December 8, 2021
Surface Soil Remediation at the Iqaluit Water Treatment Plant Located in Iqaluit, Nunavut, Final Report	Qikiqtaaluk Environmental, July 21, 2021

C. RESULTS OF REVIEW

1. Sludge removed from Wastewater Treatment Facility

Comment:

Schedule B item d of Water Licence No. 3AM-IQA1626 requires that the annual report provide “*the monthly and annual quantities in cubic metres of sludge removed from the Wastewater Treatment Facilities.*”

The monthly quantities and annual total included in Table 3 of the 2022 Annual Report do not match the description following Table 3. The annual total is reported as 424 m³ in Table 3, while the text says 1,248 m³ was removed. The monthly volumes reported are the same for each month (35.3 m³). It appears an average value of 424 m³ per 12 months is being reported rather than the measured monthly quantities.

Recommendation:

(R-01) CIRNAC recommends the City of Iqaluit confirm the annual volume of sludge removed from the Wastewater Treatment Facility and update the monthly volumes of sludge removed with the measured quantities in the 2022 Annual Report.

2. Quantities of wastes disposed of at the West 40 landfill

Comment:

Schedule B item e of Water Licence No. 3AM-IQA1626 requires that the annual report provide “*the monthly and annual quantities of Wastes disposed of at the West 40 landfill.*”



The monthly quantities of wastes reported in Table 4 of the 2022 Annual Report are the same for each month (1,460 m³). It appears an average value of 17,520 m³ per 12 months is being reported rather than the measured monthly quantities.

Recommendation:

(R-02) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with the measured monthly quantities of wastes disposed of at the West 40 landfill.

3. Sampling for the monitoring and QA/QC program

Comment:

Schedule B item f of Water Licence No. 3AM-IQA1626 requires that the annual report provide *“a summary report which includes all data and information generated under the Monitoring Program, including the QA/QC program, in electronic and printed formats acceptable to the Board.”*

Schedule I of the City of Iqaluit Water Licence No. 3AM-1QA1626 outlines the conditions applying to Monitoring, which includes Water Quality Parameters and Water Quality Monitoring Criteria. Additional station IDs were added in Amendment No.5. Table 5 (Summary of 2022 Sampling Conducted) of the 2022 Annual Report does not reference samples collected at the following stations included in Schedule I of the Water License, Amendment No. 4 and Amendment No.5:

- IQA-06 (Sludge from Waste Water Treatment Plant (WWTP))
- IQA-15 (Waste Transfer Station Runoff/ Leachate Discharge Point)
- IQA-16 (Landfill Runoff/ Leachate Discharge Point)
- SW1, SW2, SW3 (Waste Transfer Station surface water monitoring)
- WS-100, WS-101, WS-102 (New North Landfill surface water monitoring)
- 19MW-01, 19MW-02, 19MW-03, 19MW-04, 19MW-05 (Waste Transfer Station ground water monitoring)
- W-107, W-108, W-109, W-110, W-111 (New North Landfill ground water monitoring)

In addition, the following samples are missing from the monthly sampling that was reported for the Water Treatment Plant (WTP) and WWTP:

- June 2023 WWTP (IQA-04, IQA-05)
- June 2023 WTP (IQA-01)
- July 2023 WTP (IQA-01)
- July 2023 WWTP (IQA-04, IQA-05)
- Aug 2023 WTP (IQA-01)
- Sept 2023 WTP (IQA-01)
- Acute toxicity testing for IQA-04 (annual sampling)
- Decant effluent results from IQA-02 and IQA-08



Included in the criteria is sampling of the effluent during lagoon discharge for the Sewage Lagoon (IQA-02) and the West 40 Landfill Discharge (IQA-08). The testing frequency outlined in Schedule I is “*once prior to discharge; once during discharge; and once prior to the completion of discharge*” for each station ID. Referring to the Water Quality Sampling Results and Summary of 2022 Sampling Conducted (Table 5 of 2022 Annual Report), there was only one sample collected at IQA-02 and two collected at IQA-08.

Schedule I requires annual acute toxicity testing annually following the commissioning of the WWTP on the WWTP effluent (IQA-04). The 2022 Annual Report and Appendix B Water Quality Sampling Results does not indicate that the acute toxicity testing was completed in 2022.

The frequency of sampling required for the WWTP Influent (IQA-05) is listed as “*no testing requirements following commissioning of the WWTP*”. The 2022 Annual Report states “*the final completion certificate was presented to the City in March 2022 for construction related to the WWTP Upgrades project. The WWTP has been in operation; however, with outstanding deficiency and troubleshooting items still ongoing.*” The City of Iqaluit continues to sample and report influent results.

2022 Potable WTP pH results (monthly laboratory samples) do not meet the Canadian Drinking Water Quality Guidelines (CDWQG) of 7-10.5.

Recommendation:

(R-03a) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with the monitoring and sampling analytical results in accordance with Schedule I of the Water Licence.

(R-03b) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with the sample results from S::CAN monitoring device located at the water treatment plant in the 2022 Annual Report.

(R-03c) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with the chlorine and bacteria sample results from the distribution system sampling in the 2022 Annual Report.

(R-03d) CIRNAC recommends the City of Iqaluit clarify the commissioning date of the Wastewater Treatment Plant in the 2022 Annual Report.

(R-03e) CIRNAC recommends the City of Iqaluit review and update operating procedures for pH control in the treated water entering the treated water reservoir to meet CDWQG.



4. Construction activities and maintenance work

Comment:

Schedule B items g and h of Water Licence No. 3AM-IQA1626 requires that the annual report provide “*a summary of all construction activities carried out for facilities under the Licence*” and “*a summary of modifications and/or major maintenance work carried out on the potable Water Treatment and Waste Treatment Facilities, including all associated structures.*”

The 2021 Annual Report (p. 15 of 27) states “*substantial completion of the [Wastewater Treatment] Plant’s secondary treatment system was achieved on March 15, 2021. At which point, operations of the facility was handed over to the City. The City continued to work through outstanding deficiencies and operational issues with the Plant’s primary and secondary treatment systems following substantial completion. This work is anticipated to continue into 2022*” and “*following the water contamination event at the WTP in October 2021, the City applied for a modification to the Licence in order to construct an internal by-pass within the WTP, which would by-pass all tankage systems, while the City develops a plan for required remediation and repairs. The construction of the by-pass was completed in February 2022, and is currently in operation.*”

In the 2022 Annual Report, there is no reference nor update on addressing the outstanding deficiencies and operational issues with the WWTP’s primary and secondary treatment systems following substantial completion. Furthermore, construction of the WTP bypass (completed in February 2022) was not included in the 2022 Annual Report as a modification nor major maintenance item.

Recommendation:

(R-04) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with the information to address Schedule B items g and h of the Water Licence.

5. Updated plans, manuals, and reports in 2022

Comment:

Schedule B item j of Water Licence No. 3AM-IQA1626 requires that the annual report provide “*any revisions required, in the form of addenda, to Plans, Manuals and Reports approved under the Licence.*”

Review of available documentation identified revisions to the following documents in 2022 that were not captured in the 2022 Annual Water Licence Report:

- General Site Information and Guide for the Iqaluit Water Treatment Plant (220726 3AM-IQA 1626 2022-07-21 Iqaluit General O&M-IMLE) (revisions in March, May, and June 2022),
- Iqaluit Water Treatment Plant Operation and Maintenance Manual (220331 3AM-IQA 1626 Water Treatment Plant O&M Manual 2022 Update -IMLE) (revisions in March



2022 for Process O&M Manual not included). Furthermore, the O&M manual was not updated to reflect the modifications of the filters to Granular Activated Carbon (GAC) media.

- City of Iqaluit Operations and Maintenance Manual Landfill and Waste Transfer Station (Aug 2022 Version 6.0) (220907 3AM-IQA1626 Appendix A – WTS and Landfill O&M Manual August 2022)
- Updates to WWTP O&M Manual following substantial completion/commissioning (did not receive document to review).

Recommendation:

(R-05) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report and corresponding documents to address Schedule B item j of the Water Licence. The plans, manuals, and reports to be addressed include, but are not limited to, the following:

- March, May, and June 2022 revisions to the General Site Information and Guide for the Iqaluit Water Treatment Plant,
- March 2022 Iqaluit Water Treatment Plant Operation and Maintenance Manual,
- City of Iqaluit Operations and Maintenance Manual Landfill and Waste Transfer Station (Aug 2022 Version 6.0),
- Updates to WWTP Operations and Maintenance Manual following substantial completion/commissioning, and
- Updates to the Iqaluit Water Treatment Plant Operation and Maintenance Manual to reflect the modifications of the filters to GAC media.

6. Un-authorized discharges and spills

Comment:

Schedule B item k of Water Licence No. 3AM-IQA1626 requires that the annual report provide *“a list and description, including volumes and Spill Report Line Identification Numbers, of all un-authorized discharges, spills and summaries of follow-up action taken.”*

In the City of Iqaluit’s 2022 Annual Report, there is a discrepancy in the reporting on the year that the reported spills occurred on pages 16 and 17 of 24; the year is stated as 2021 in the text, 2020 in the table heading, and 2022 in the table. For clarity in the report, the correct year should be used consistently.

Only wastewater spills were reported in Table 6 of the 2022 Annual Report. Table 6 of the 2021 Annual Report reported sewage, fuel and glycol spills.

Table 6 of the 2022 Annual Report summarizes the reported spills or un-authorized discharges, but the volumes of spills or unauthorized discharges are reported as unknown. CIRNAC made the same comment regarding Table 6 of the 2021 Annual Report.



The City of Iqaluit Sewage Lagoon Operation and Maintenance Manual was updated in March 2020 (200506 3AMIQA1626 WWTP Sewage Lagoon O&M Manual-IMLE) and includes a reference to “*Spill Contingency Plan (Ref. No. XXX, dated 20XX)*” to be followed in the event of an accidental or unauthorized discharge of waste. It is unclear if the City of Iqaluit’s Spill Contingency Plan has been updated since the May 2016 version.

Recommendation:

(R-06a) CIRNAC recommends that the City of Iqaluit update the 2022 Annual Report with the information to address Schedule B items k of the Water Licence including:

- the year the spills took place,
- all spills and unauthorized discharges in addition to wastewater and
- estimates of each volume spilled included in Table 6.

(R-06b) CIRNAC recommends the City of Iqaluit specify the most common causes of spills and unauthorized discharges in the 2022 Annual Report, and submit an updated Spill Contingency Plan that addresses these causes.

7. Procedures for hazardous waste

Comment:

Schedule B item t of Water Licence No. 3AM-IQA1626 requires that the annual report provide “*a review of procedures for packaging, storage, and shipment of harmful hazardous waste.*”

A review was not included in the 2021 Annual Report nor the 2022 Annual Report.

Recommendation:

(R-07) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with:

- the review information to address Schedule B items t of the Water Licence including details on current procedures for packaging, storage, and shipment of harmful hazardous waste, and
- the anticipated date when the City of Iqaluit Landfill and Waste Transfer Station Operations and Maintenance Manual updated for the new solid waste landfill site and transfer station will be submitted for review, including procedures for packaging and shipping hazardous waste.

8. Withdrawals from Niaqunguk (Apex) River

Comment:

Amendment No. 4 inserts the following condition into Water Licence No. 3AM-IQA1626: “*withdrawals from the Niaqunguk River (Apex River) at Monitoring Station No.: IQA-10 only occur when the natural flow in the Niaqunguk River (Apex River) is above 30% of the mean*



annual discharge (MAD) and the withdrawals will not exceed 10% of the instantaneous flow of the Niaqunguk River (Apex River)."

Schedule B item q no. 4 of Water Licence No. 3AM-IQA1626 requires that the annual report provide *"the daily water levels and/or flow rates in the Niaqunguk River when withdrawals are occurring at Monitoring Station No. IQA-10."*

Table 4.1 provides *"Relative Water Level and Wetted Width Measured at Monitoring Stations from September 13 to September 19, 2022."* However, this is not quite the same as daily water levels and/or flow rates. Figures 4.1 to 4.3 show graphs of daily flows, but the precise numbers are not available from the graphs. Table 4.2 provides daily flows for period 2 (September 13, 2022, to September 19, 2022), but not period 1 (between June 12 and September 12, 2022). This reporting requirement is therefore incomplete.

Schedule B item q no. 6 of Water Licence No. 3AM-IQA1626 requires that the annual report provide *"discussion of any observed trends, exceedances, or unanticipated impacts."* No trends were discussed, other than the mention of *"observed water levels in the reservoir and hydrologic trends in the Iqaluit area"* in the report. Exceedances were reported, but not commented on, and no unanticipated impacts were discussed. This reporting requirement is therefore incomplete.

Recommendation:

(R-08a) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with the daily water levels and/or flow rates in the Niaqunguk River when withdrawals occurred at Monitoring Station IQA-10 for Period 1 (between June 12 and September 12, 2022).

(R-08b) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with discussion of observed trends, exceedances, and unanticipated impacts – especially when the natural flow in the Niaqunguk River (Apex River) is below 30% of the mean annual discharge (MAD) and withdrawals exceeded 10% of the instantaneous flow of the Niaqunguk River (Apex River).

(R-08c) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with a discussion of observed trends comparing the 2021 and 2022 volume pumped from the Niaqunguk River (Apex River) and the corresponding water levels in Lake Geraldine. This could provide an insight to potential trends of both usage and natural conditions that could change over time.

9. Supplementary Lake Geraldine Water Balance Modelling for 2022

Comment:

The *Supplementary Lake Geraldine Water Balance Modelling for 2022* (WSP, 2023) provides relevant information. The calibration model validation period is short (a little more than one year) given that several years of data is available for model calibration. The 2023 Water Balance Model report, page 5, notes that model adjustments were tested for the



validation period (October 1, 2021 to February 17, 2023). Model calibration needs to be restarted when model parameters are modified and additional processes are included (in this case, snow sublimation and “new adjustments”). Calibration for one year of data is not considered representative of model validation.

Page 3 of the *Supplementary Lake Geraldine Water Balance Modelling for 2022* states that “it should be noted that communications with Nunami Stantec (June 2, 2019) suggest that relative to the digital elevation model representation derived using survey data received from Natural Resources Canada (2008), Lake’s Geraldine’s active stage-storage capacity may have been reduced by up to 195,000 m³ (from 1,875,000 m³ estimated by Golder to 1,680,000 m³ estimated by Nunami Stantec). Formal validation of this change in physiography has not been presented at the time of reporting.” Since this could have potentially significant repercussions on the available volume of water for withdrawal from Lake Geraldine, and that the importance of Lake Geraldine as a water source is growing with population growth, more detail on Lake Geraldine bathymetry is considered important information to obtain.

Recommendation:

(R-09a) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with the model calibrated for the entire period of record, a comparison of updated modelled results with the daily water level measurements, and any model discrepancies discussed.

(R-09b) CIRNAC recommends the City of Iqaluit conduct a bathymetric survey in 2023, and include a comparison of it to the bathymetry used for the Lake Geraldine Water Balance modelling in the 2023 Annual Report.

10. Water Treatment Plant 2021 Spill

Comment:

On October 12, 2021, the City of Iqaluit declared a state of emergency after analytical results revealed that the city’s drinking water supply may be contaminated with petroleum products. A supplementary letter provided by Qikiqtaaluk Environmental (QE) (December 8, 2021) indicates that an underground storage tank (UST) was uncovered during inspection of the void space beneath the North and South clear wells of the Water Treatment Plant. Information pertaining to the contents, condition, and depth of the UST tank is not provided nor the location of the UST in any site figure. QE removed the UST along with 69,300 litres of contaminated water from the void and “a lot of sediments that seemed contaminated” (QE, December 8, 2021). QE conducted a Phase II Environmental Site Assessment (ESA) that consisted of 4 boreholes drilled to bedrock to the north, northwest, south, and southeast of the Iqaluit Water Treatment Plant. QE (November 22, 2021) state runoff is towards the southwest. None of the boreholes are on the downstream southwest side of the Iqaluit Water Treatment Plant. Groundwater was not encountered during the borehole investigation,



therefore no analysis of groundwater was completed. Depth to permafrost is not reported. Details regarding the condition of an above ground storage tank (AST) located southeast of the Iqaluit Water Treatment Plant were not provided.

From the 4 boreholes, 32 soil samples total were analyzed for petroleum hydrocarbons (PHC) (C₁₀ to C₅₀), volatile organic compounds, polycyclic aromatic hydrocarbons, and glycols. Analytical results were compared to Canadian Council of Ministers of the Environment (CCME) “Canadian Soil Quality Guidelines for the Protection of the Environmental and Human Health” criteria for commercial land use and coarse grain conditions. Analytical results indicate PHC F2 impacted soils from 0.5 to 1.0 metres below ground surface (bgs) in borehole 3 (BH3). Borehole 3 is located downstream (southwest) of the AST, and south of the Water Treatment Plant. The report does not specify if the impacted soils correspond to the contents of the UST or AST.

In June 2022, approximately 10 m³ of soil was removed in the vicinity of BH3 between 0.5 and 1.0 m bgs. Five confirmatory samples were collected corresponding to the base and each wall of the excavation. Four of the five samples exceeded PHC F2 guidelines - the northwest, northeast, and southwest walls, and the base of the excavation. On June 22, 2022, Mr. Simon Ghosh approved a complementary ESA should be conducted. *“A remediation plan will be developed with a more accurate estimate of the lateral and vertical PHC-impacted soils to be remediated in the fall of 2022, when the existing AST serving the Iqaluit Water Treatment Plant is scheduled to be replaced and relocated, allowing the soil remediation work to be performed securely over the entire contaminated area.”* (QE, July 21, 2022).

Recommendation:

(R-10a) CIRNAC recommends the City of Iqaluit update the 2022 Annual Report with the results of the fall 2022 remediation activities and include:

- the AST and UST tank details (i.e. container type, contents, condition, etc.) in the report,
- the location of both the AST and UST on figures, and
- the depth bgs of the void space lower limit beneath the North and South clear wells of the Water Treatment Plant.

(R-10b) CIRNAC recommends the City of Iqaluit conduct a Phase III ESA that:

- assesses potentially impacted soils downstream (southwest) of the water treatment plant. Depth of the downstream assessment should be to bedrock and/or deeper than the void space depth bgs;
- defines the extent of impacts (delineation) in soil both vertically and horizontally in the vicinity of BH3,
- clarifies if the impacts in the vicinity of BH3 are attributed to the AST, UST, or both, and
- determines the potential for off-site migration.

It is recommended the Phase III ESA is included in the 2023 Annual Report.