NUNAMI
STANTEC LIMITED

Project Summary Report:

Iqaluit 2024 Lake Geraldine Resupply (Apex River Supplementary Pumping Program): Report of Activities 3AM-IQA1626

November 29, 2024

Prepared for:
City of Iqaluit
Iqaluit, Nunavut

Prepared by:
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Project Number: 144903520

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Executive Summary

This report presents results of monitoring undertaken pursuant to Water License 3AM-IQA1626 Amendment No. 4 issued to the City of Iqaluit. The report addresses the reporting requirements of the Amendment No. 4 as they pertain to the 2024 Apex River Supplementary Pumping Program (SPP).

New to this year's program, the City of Iqaluit received a Letter of Advice from Fisheries and Oceans Canada (DFO) (file reference 23-HCAA-02636) indicating that water withdrawals could be increased from 10% to 20% of the instantaneous flow when the flows are above 0.156 m^3/s in the Apex River.

The 2024 SPP was completed between June 26 and July 5, 2024. The kickoff meeting occurred on May 30, 2024 and demobilization occurred October 28, 2024 (demobilization). Works and activities completed include:

- Mobilization of equipment and infrastructure to Apex River pumping sites
- Coordination with territorial electrical Authority Having Jurisdiction (AHJ, May 2024 site visit) for issuance of the Permission to Connect (received June 25, 2024
- Order of new Sulzer J604HD pump (arrived in Iqaluit on May 24, 2024)
- Placement of pumps, screens, and connection to manifolds at Apex River following ice melt
- Installation and operation of pumps in Apex River (operations began on June 26, 2024)
- Conveyance of water from Apex River to Lake Geraldine
- Supporting activities such as power supply, maintenance, refueling, and daily monitoring
- Demobilization of equipment and infrastructure (except semi-permanent pipeline)
  Note that the demobilization did not include removal of Bender (electrical) components for placement in heated storage. Recommendation was given to the City and Tower Arctic Ltd. (TAL) to keep those components in heated storage.

A total of 137,650 m^3 of water were transferred to Lake Geraldine Reservoir during the SPP. The maximum daily pumped volume was 15,769 m^3 on June 28, 2024. Pumping records were maintained by the contractor at the pumping site and were provided to the City's representative (Nunami Stantec Limited) for review and tabulation throughout the program.

On June 25, 2024, the TAL informed the City and Nunami Stantec that the Government of Nunavut Electrical AHJ had provided them with a "Permission to Connect" the system, following their satisfactory review in late May and on June 20, 2024. Substantial electrical upgrades were completed in 2023, remained valid in 2024, and will remain valid for subsequent pumping programs. The Permission to Connect will be required annually prior to energizing the system and represents the annual notice to proceed with pumping operations.

Abbreviations

AHJ ..... the Government of Nunavut Electrical Authority Having Jurisdiction
Apex River ..... Niaqunguk River
City ..... City of Iqaluit
DFO ..... Fisheries and Oceans Canada
FAA ..... *Fisheries Act* Authorization
GPS ..... Global Positioning System
km ..... kilometre
m ..... metre
m^3 ..... cubic metres
m^3/s ..... cubic metres per second
MAD ..... Mean annual discharge
mg/L ..... milligram per litre
SPP ..... Supplementary Pumping Program
TAL ..... Tower Arctic Ltd.
UTM ..... Universal Transverse Mercator
WSC ..... Water Survey of Canada

1 INTRODUCTION

The City of Iqaluit (City) obtains and distributes potable water from Lake Geraldine, an engineered reservoir located approximately one kilometre (km) north of the City center. Owing to the need to supplement the reservoir in 2018 and 2019 on an emergency basis from the nearby Apex River, the City applied to the Nunavut Water Board to amend its Type A Water License 3AM-IQA1626 to permit supplementation of the Lake Geraldine Reservoir from the Niaqunguk (Apex) River during the open water season on an annual basis until 2026 (the term of the license). In September 2019, the City received an amendment (Amendment No. 4) to its Water License. Amendment No. 4 of the City's Type A Water License 3AM-IQA1626, permits an annual maximum of 500,000 cubic meters (m^3) of water to be extracted from Apex River for transfer to Lake Geraldine. The water withdrawals from Apex River can occur when flows exceed 30% of the mean annual discharge (MAD), and when withdrawal rates do not exceed 10% of the instantaneous flow of the river, except if otherwise authorized by Fisheries and Oceans Canada (DFO). In April 2023, Stantec submitted an application to DFO to exceed the 10% withdrawal limit. A report titled "Analysis of Fisheries and Hydrologic Information of Apex" (Stantec, 2023) was attached to the application which contained a two dimensional hydraulic model to analyze the impact of water withdrawals in exceedance of 10% on fish and fish habitat. In March 2024, the City received a Letter of Advice from DFO that accepted the application, (file reference 23-HCAA-02636) indicating that water withdrawals could be increased from 10% to 20% of the instantaneous flow when the flows are above 0.156 m^3/s in the Apex River. 0.156 m^3/s represents the 30% MAD (0.130 m^3/s) plus 20% so that withdrawals do not cause flows within the Apex River to decrease below 30% MAD.

The Supplementary Pumping Program (SPP) was facilitated by a semi-permanent pipeline from the Apex River to Lake Geraldine that was installed in 2019. Temporary pumping infrastructure was required to be installed and operated annually within the Apex River to withdraw water. Supplementary pumping (non-emergency) was previously completed during the 2020, 2021 and 2023 open water seasons. Emergency pumping under *Fisheries Act* Authorization 22-HCAA-02043 occurred in September 2022 to address the potential potable water shortage in Iqaluit due to low water levels in Lake Geraldine.

Tower Arctic Ltd. (TAL; the contractor) were retained by the City to complete the SPP during the open water season of 2024. Oversight was provided by Nunami Stantec, also under contract to the City. The Government of Nunavut Electrical Authority Having Jurisdiction (AHJ) had provided the City with a notice to proceed with pumping operations, following their satisfactory review on June 25, 2024.

The objective of the SPP, as with previous resupply programs, was to increase the volume of water in the reservoir prior to the onset of freezing conditions in compliance with Amendment No. 4. Water levels in the Lake Geraldine Reservoir were monitored throughout the 2024 SPP using data from the Water Survey of Canada (WSC) Station 10UH013 (Lake Geraldine Near Iqaluit) (GoC 2024a).

1.1 Climate, Demand and Water Levels in Lake Geraldine

Lake Geraldine water levels for 2020 – 2024 as well as the historical minimum and maximum (2007 to 2018) are illustrated in Figure 1.1. As shown in Figure 1.1, the 2024 reservoir levels prior to freshet were typical when compared to the last four years. Spill elevation (111.30 m) in Lake Geraldine was reached on July 24, 2024 which was earlier on in the year than in 2020 and 2022. By November 27, 2024 water levels in Lake Geraldine were higher than the previous four years.

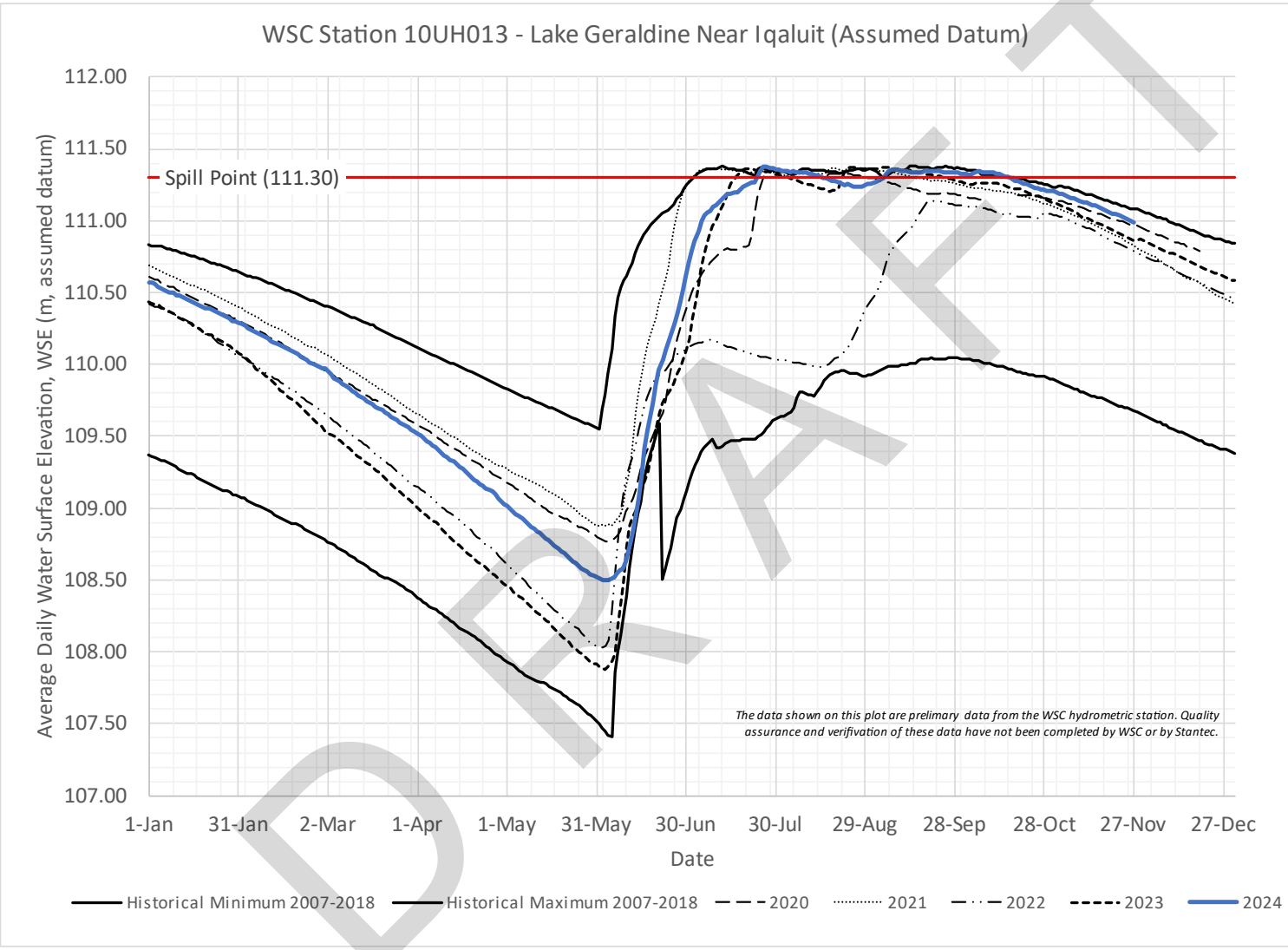


Figure 1.1 WSC Station 10UH013 – Lake Geraldine Near Iqaluit (Assumed Datum)

Inflows to Lake Geraldine throughout the SPP are monitored via a small creek that flows directly into the reservoir. WSC maintains an operates a station on this creek called 10UH012 (Inflow to Lake Geraldine near Iqaluit) (GOC 2024b). This station along with pumping rates provided by TAL provides Nunami Stantec with insight on the daily inflows into Lake Geraldine throughout the SPP. WSC Station 10UH012 began reporting flow data on July 6, 2024, thereby missing freshet (snowmelt driven runoff).

It is understood that inflows into Lake Geraldine are heavily influenced by freshet and precipitation. Daily climate data from the Iqaluit Climate weather station operated by the Government of Canada (GOC) (GOC 2024c) was used to compare 2024, 2023, 2022 and 2021 total monthly precipitation to the 1991 to 2020 climate normal for Iqaluit. The 1991-2020 climate normal for Iqaluit is a composite station comprised of five different weather stations throughout Iqaluit including the Iqaluit Climate station. The Iqaluit Climate weather station was used because it was the only weather station that reported precipitation values in 2024 in Iqaluit. In June 2024, the total monthly precipitation was higher than the climate normals (GoC 2024d) (Figure 1.2). The increased precipitation in June 2024 resulted in increased flow into the Lake Geraldine in June and early July. These above average inflows from precipitation coupled with the additional inflows from pumping of the Apex River helped water levels within Lake Geraldine reach spill elevation by July 24, 2024 (Figure 1.1). For the rest of the summer months (July, August and September) the total monthly precipitation was below the climate normals (Figure 1.2).

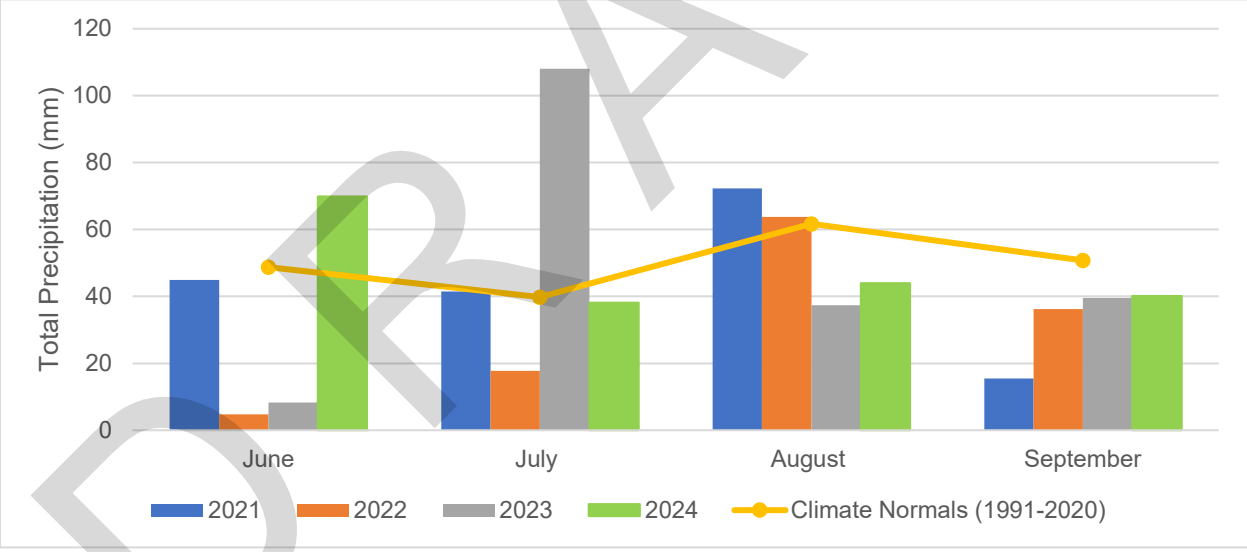


Figure 1.2 Total Precipitation recorded at Iqaluit Climate Weather Station in 2021, 2022, 2023 and 2024 and the Iqaluit Climate Normals (1991-2020)

Opposing natural inflows such as precipitation and freshet, water demands from the City directly lower the water level in Lake Geraldine. Though an assessment of the City's demands are outside the scope of this project, an analysis of the reports compiled by Colliers Project Leaders (project managers hired by the City) on water demand was completed (R. Sithole, personal communication, March 5 2024). Monthly water

demands for the City of Iqaluit over the past four years (2021, 2022, 2023 and 2024) are summarized in Figure 1.3.

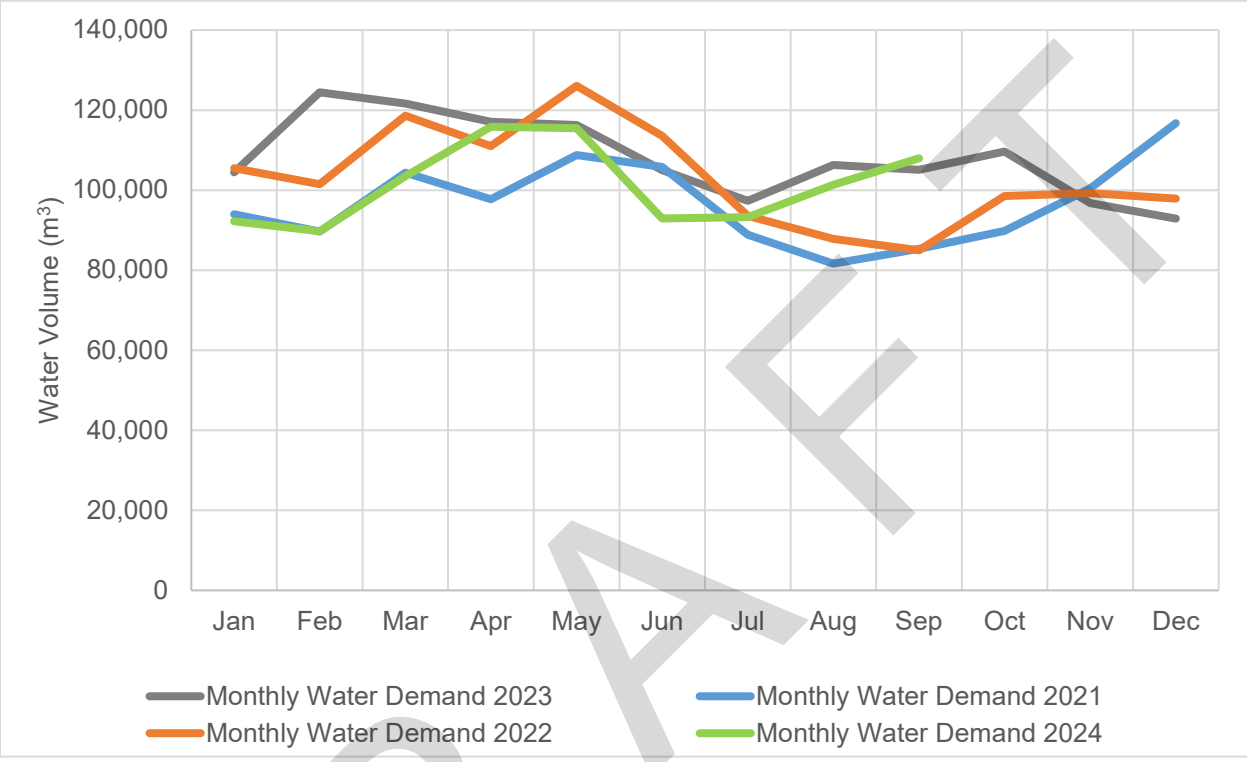


Figure 1.3 Monthly Water Demand for the City of Iqaluit in 2021, 2022, 2023 and 2024

As shown in Figure 1.3, monthly water demands in 2024 were generally lower than the demands over the past 4 years except for the water demand in September 2024 which was higher than the previous 3 years (2023, 2022 and 2021).

April had the highest total demand in 2024, with a monthly total of 115,839 m^3. Averaging this value over 30 days equates to a daily average of 3,861 m^3/day. Assuming the number of people connected to the distribution system in Iqaluit is 7,750 people, the daily consumption rate in April 2024 was 498 L/person/day. The City uses 400 L/person/day as an estimate for daily consumption. As such, this shows that in April 2024 demands were approximately 25% higher than expected.

2 PROJECT WORKS AND ACTIVITIES

The 2024 SPP was completed between May 30, 2024 (kickoff meeting) and October 28, 2024 (demobilization). Pumping activities started on June 26 and continued through to July 5.

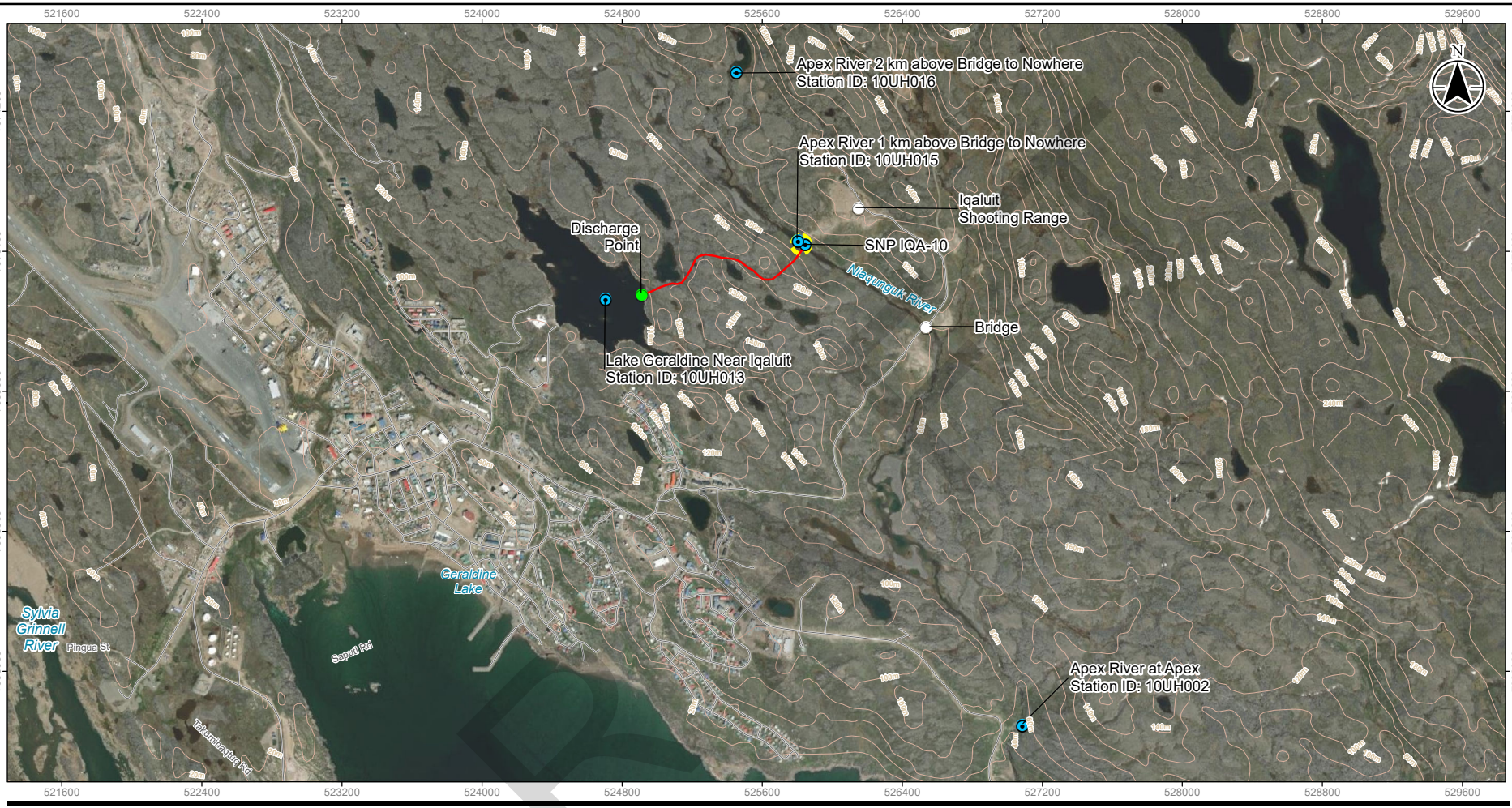
Works and activities completed included:

- Mobilization of equipment and infrastructure to Apex River pumping sites
- Coordination with territorial electrical Authority Having Jurisdiction (AHJ, May 2024 site visit) for issuance of the Permission to Connect (received June 25, 2024)
- Order of new Sulzer J604HD pump (arrived in Iqaluit on May 24, 2024)
- Placement of pumps, screens, and connection to manifolds at Apex River following ice melt
- Installation and operation of pumps in Apex River (operations began on June 26, 2024)
- Conveyance of water from Apex River to Lake Geraldine
- Supporting activities such as power supply, maintenance, refueling, and daily monitoring
- Demobilization of equipment and infrastructure (except semi-permanent pipeline)

Note that the demobilization did not include removal of Bender (electrical) components for placement in heated storage. Recommendation was given to the City and Tower Arctic Ltd. (TAL) to keep those components in heated storage.

The location of works and activities are shown in Figure 2.1. The Apex River pumping site was established at this location in 2018. The pumping location was fixed by the need to connect to a semi-permanent pipeline installed in 2019 as well as the location of WSC station 10UH015 (Apex River 1km Above Bridge to Nowhere) (GOC 2024e) immediately upstream of the pumping site. The 2024 SPP followed the same protocol and operation as in previous years (2020, 2021, 2022 and 2023).

Water was pumped from the Apex River using three high-head 94 horsepower (Hp) submersible pumps and conveyed overland to Lake Geraldine. Pumps were housed in a screened cage, where mesh sizes met the DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines (DFO 2020). Pumping took place between June 26, 2024 and July 5, 2024. Approximately 137,650 m^3 of water was transferred to Lake Geraldine from the Apex River in 2024. This volume is less than what was pumped in 2023 (222,784 m^3, Nunami Stantec 2024). An access trail and semi-permanent pipeline between the Apex River and Lake Geraldine have remained in place for future pumping requirements.



Road
Topographic Contour

WSC or SNP Station
Point of Interest
Discharge Point
Pipeline
Pumping Site

0 200 400 600 800 1,000
m

1:35,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 19N
2. Data Sources: Canvec NU, Canvec CA, Water Survey of Canada.
3. Orthoimagery: ESRI World Imagery

Stantec

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Iqaluit

Project Location:
Iqaluit, NU

Project Number: 144903395
Prepared by TOSBERG on 20231103
Requested by EKELLY on 20231030
Checked by TCARDINAL on 20231103

Client/Project/Report
City of Iqaluit
Iqaluit Water Supply
Iqlauit 2023 Apex Pumping Project Site Overview

Figure No.
2-1

Title
Iqlauit 2024 Apex Pumping Project Site Overview

3 OPERATIONAL MONITORING PLAN

The objective of the operational monitoring plan was to observe hydrologic conditions in the Apex River during pumping operations and to inform changes in pumping rates that were varied daily throughout the program. In accordance to the Letter of Advice from DFO (file reference 23-HCAA-02636), water withdrawals of no greater than 20% of instantaneous flow were permitted when natural flows in the Apex River were above 0.156 m^3/s. Nunami Stantec used WSC Station 10UH015 data to advise TAL on when pumping operations could begin and when pumping rates needed to be changed based on river flows. Each day water levels in Lake Geraldine and flows in Apex River were obtained from their respective WSC stations and were compared to pumping logs provided by TAL. Daily scheduled emails were sent to TAL to advise on the maximum pumping rates to remain within withdrawal limits. Emails were sent more frequently if notable flow changes were observed that necessitated additional communication.

A summary of monitoring locations and activities completed during the program to satisfy the applicable criteria to the operational monitoring plan are presented in Table 3.1.

Table 3.1 Monitoring Location and Monitoring Parameter (per Water Licence Requirements)

Monitoring Location ID	UTM Coordinates (Zone 19V)		Monitoring Parameter	Method	Data Source (Contractor or WSC Location)
	Easting (m)	Northing (m)			
SNP IQA-10 (Pumping location)	525802	7070474	Pumped Flow and Volume	Volumetric Flow Meter	Contractor
Apex River at Apex	527087	7067694	Water level and flow data for Apex River approximately 4 km downstream of pump site	Access data online	WSC Station 10UH002
Apex River 1km Above Bridge to Nowhere	525802	7070531	Water level and flow data for immediately upstream of Apex pump site	Access data online	WSC Station 10UH015
Lake Geraldine Near Iqaluit	524463	7069963	Water level in Lake Geraldine	Access data online	WSC Station 10UH012
Apex River 2km Above Bridge to Nowhere	525451	7071425	Water level and flow data for upstream of Apex pump site	Access data online	WSC Station 10UH016

4 2024 SUPPLEMENTAL PUMPING PROGRAM RESULTS

The intent of the 2024 SPP monitoring program was to maintain compliance with the requirements of the water licence (Amendment No.4) and the Letter of Advice from DFO. Pumping operations took place between June 26, 2024 and July 5, 2024 under the conditions that annual maximum withdrawal from the Apex River was not to exceed 500,000 m^3 and that a maximum withdrawal rate of 20% of instantaneous flow was permitted as long as flows were above 30% MAD plus a 20% buffer (0.156 m^3/s).

4.1 Operational Challenges

4.1.1 Pumping Operations

Operationally, the system performed as per the design. Based upon experience from previous years, emergency supplementation programs completed in 2018 and 2019, and the non-emergency operation of the Apex River semi-permanent infrastructure in 2020 to 2022, Nunami Stantec and the City understood the challenges with operation and the importance of daily monitoring for compliance to Amendment No. 4. As in 2020, 2021, 2022 and 2023 the system began operations during spring melt.

In the 2022 pumping summary report (Nunami Stantec 2023), Nunami Stantec identified that pumping from the Apex River has an impact on recorded flows at WSC station 10UH015, which is immediately upstream of the pump site. It is likely that the WSC station is under reporting flows compared to measured flows upstream of the pump site.

For purposes of the SPP and to apply conservatism to the protection of fish and fish habitat, Nunami Stantec assumed that flows recorded at WSC station 10UH015 were representative of flows directly upstream of the pumping location within the Apex River. In June 2023, an additional WSC station was installed 1 km upstream of the pumping location called, Apex River 2km Above Bridge to Nowhere (WSC 10UH016) (GOC 2024f). WSC station 10UH016 is an upstream pool from WSC station 10UH015 and is therefore not impacted by pumping activities. Throughout the 2024 pumping program this station was reporting both water level and discharge, but the reliability of the data could not be confirmed and was not relied upon during the current pumping program. The intent is to use flows from WSC station 10UH016 and WSC station 10UH015 to guide future pumping programs.

4.1.2 Electrical & Mechanical Discussion

On June 25, 2024, the TAL informed the City and Nunami Stantec that the Government of Nunavut Electrical AHJ had provided them with a “Permission to Connect” the system, following their satisfactory review in late May and on June 20, 2024 (Appendix A). Substantial electrical upgrades were completed in 2023. These upgrades remained valid in 2024 and will remain valid for subsequent pumping programs. The Permission to Connect will be required annually prior to energizing the system and represents the annual

notice to proceed with pumping operations. Coordination between the contractor and electrical AHJ should begin in early April to ensure adequate time is given for this approval.

Water is pumped from the Apex River using three high-head 94 horsepower (Hp) submersible pumps and conveyed overland to Lake Geraldine. These are all Sulzer J604HD pumps. TAL and the City made the decision to send one of the original pumps from 2019 back to the supplier for servicing and also purchase a new pump as redundancy for the system. The new pump was received in Iqaluit on May 24, 2024 and utilized in the 2024 pumping operations. The original pump was returned to Iqaluit and the City and TAL have been making plans to refurbish the remaining pumps in advance of the 2025 pumping season.

4.1.2.1 2023 Electrical Upgrades & Mechanical Considerations (Record Discussion)

As mentioned, substantial electrical upgrades were completed on the system in the spring of 2023. The remainder of this section will remain in the 2024 summary report for record purposes only.

TAL submitted a plan and proposal to complete electrical modifications to the Apex system to address 2022 deficiencies identified by the Government of Nunavut Electrical AHJ. TAL were retained by the City to complete the SPP during the open water season of 2023, with the contract (CO No. 1 to SC1207) was fully executed on May 15, 2023. Oversight was provided by Nunami Stantec, also under contract to the City.

Nunami Stantec submitted a supplementary scope of work in November 2022 to complete a feasibility review of non-submersible pumping system at the Apex River pumping location and an on-site review of the existing electrical equipment to be used in the 2023 Apex SPP, including a meeting with the AHJ in Iqaluit. The scope of work was fully executed under SC1207 on January 26, 2023. The work was divided into three parts:

1. Feasibility review of new pumping system (non-submersible) and conceptual planning;
2. Site visit for senior electrical engineer to review equipment and generators and meet with the AHJ (February 28 – March 1); and
3. Site observation report and recommendations for electrical system upgrades.

Both the electrical site visit and recommendation and the new pumping system feasibility study reports were submitted to the City on March 27, 2023.

On March 27, 2023, Nunami Stantec completed an additional scope of work to provide some oversite and coordination throughout the construction (modification) period with TAL and during the Electrical AHJ review. This contract was fully executed on May 1, 2023. Electrical upgrades were completed between May to June 24, 2023 by TAL and subcontractors, followed by a final inspection by Mat Abram (Electrical Inspector – Qikiqtaaluk Region, Government of Nunavut Safety Services Division) from the GN AHJ on June 25, 2023. A senior electrical engineer from Nunami Stantec provided an on-site review of the upgrades completed on the electrical system and, on June 24, 2023, provided the following list of outstanding items in advance of the AHJ inspection.

4.1.2.1.1 Initial Electrical Deficiencies (December 2022)

A summary of the December 2022 electrical inspection deficiencies are listed below:

1. 600-480V (Generator) disconnect requires reconfiguration of feeder cables;
2. Generator (600V) ground requires rerouting;
3. Clearances around 600V generator need to be adjusted;
4. Fuel oil line requires bonding;
5. 480V pumps:
    a. Voltage supplying pumps shall not exceed 150 volts-to-ground;
    b. Pump motor bonded to ground by a bonding conductor that is sized in accordance Rule10-614 and is integral with the supply cable or within the same protective enclosure as the power supply cables if single-conductor cables used;
    c. Has the same type of insulation as the supply conductors; and
    d. Terminates adjacent to the location where the branch circuit conductors receive their supply.
6. Ground fault protection required for submersible pumps.

All details pertaining to the electrical deficiencies identified in 2022, including work completed to March 2023 were appended in the 2023 Report of Activities.

4.1.2.1.2 Remaining Electrical Deficiencies (June 24-25, 2023)

1. Due to the orientation of the generator enclosure, the conductors ended up in front of the enclosure. In addition, the fuel tanks ended up behind the conductors. These factors warrant significant increase in protection of the conductors, with consideration for the refueling procedure. At a minimum:
    a. A ramp needs to be constructed over the conductors, to allow access to fuel tanks without stepping over the conductors.
    b. Measures need to be put in place (such as a clearly marked concrete barricade at the corner pallet) to ensure that a vehicle cannot come in contact with the pallets supporting the cables.
2. Support needs to be provided for the conductors connecting the generator to the splitter at the generator lugs. Connecting the cables to the pallets at this location is insufficient due to the associated forces (the cables would effectively be supporting the pallets).
    a. One option discussed on site was to weld additional strut channel to the strut channel already attached to the generator, then assemble a “ladder” from the existing strut channel

on the generator to the nearest pallet, and clip the cables to the ladder, providing the required support.

4.1.2.1.3 Minor Electrical Deficiencies

1. Routing of cables via Bender CTs does not correspond to the installation manual. Wiring needs to be pulled back and reinstalled.
2. Bonding of conduit couplings on Eaton soft starter enclosures needs to be completed.
3. Termination of control wires needs to be completed at all Eaton soft start enclosures, Bender CT enclosure and at the Bender controller enclosure. The wires are in place, the terminals were discussed on site. Further clarification will be provided by Hinad to the Ryfan crew tonight.
4. Teck cable powering bender enclosure needs to be installed and terminated. (the cable has been pulled, but not terminated)

4.1.2.1.4 Items for Discussion with the AHJ:

1. Termination of 750MCM cables at the generator enclosure: will need to review with the AHJ.
2. Grounding plates were placed in water but were left exposed. Grounding plates were not covered or trenched. 600mm cover required by code, but code recognizes variance in site conditions.

On June 26, 2023, the City informed Nunami Stantec that the AHJ had provided them with a notice to proceed with pumping operations, following their satisfactory review on June 25, 2023.

4.2 Pumping Rates and Volumes

Nunami Stantec provided guidance on permitted pumping rates each day for TAL's pumping operations based on the flow recorded at WSC station 10UH015. The data available from the WSC station for 2024 are preliminary data. Quality assurance and verification of these data have not been completed by WSC or by Nunami Stantec.

Figure 4.1 illustrates the available flow and stage data in the Apex River at WSC station 10UH015 throughout the 2024 pumping period. WSC Station 10UH015 began reporting flow data on July 2, 2024 while stage data was available throughout the SPP. 30% MAD (0.130 m^3/s) is also included on the graph for reference purposes.

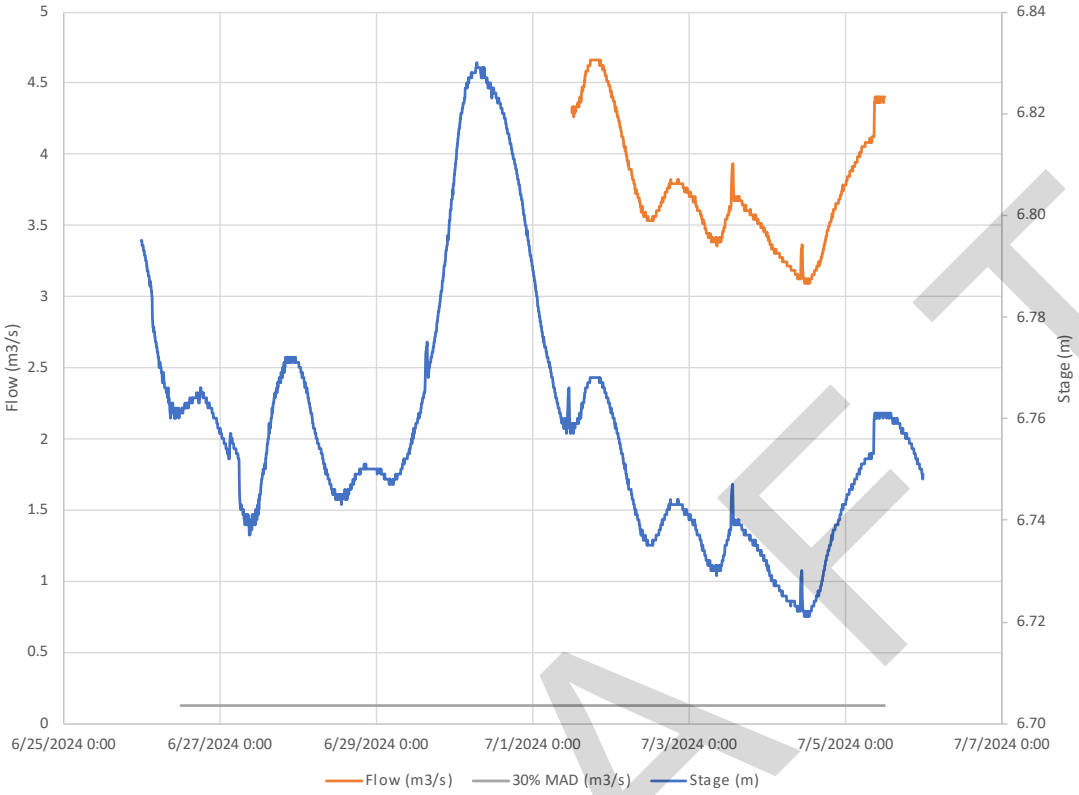

Figure 4.1 Flow and Stage at WSC Station 10UH015 Compared to 30% MAD

From June 26 to July 1, 2024 Stantec used the water levels recorded at WSC Station 10UH015 to guide TAL's pumping (Figure 4.2). During this time, the water levels varied between 6.75 and 6.82 m. On July 4, the water level was measured at 6.73 m, which corresponded to a flow rate of 3.33 m³/s. Consequently, it was inferred that the flow at WSC Station 10UH015 was greater than 3.33 m³/s from June 26 to July 1, 2024 as the recorded water levels were above 6.73 m.

At the end of each day, TAL provided Nunami Stantec with the daily pump volumes at the pumping location (SNP IQA-10). Nunami Stantec converted the pumping volumes into an average daily pumping rate. Figure 4.2 illustrates the average daily pumping rate compared to the 20% instantaneous flow criteria and stage recorded at WSC station 10UH015. A summary of daily pumping volumes during the SPP is provided in Appendix B.

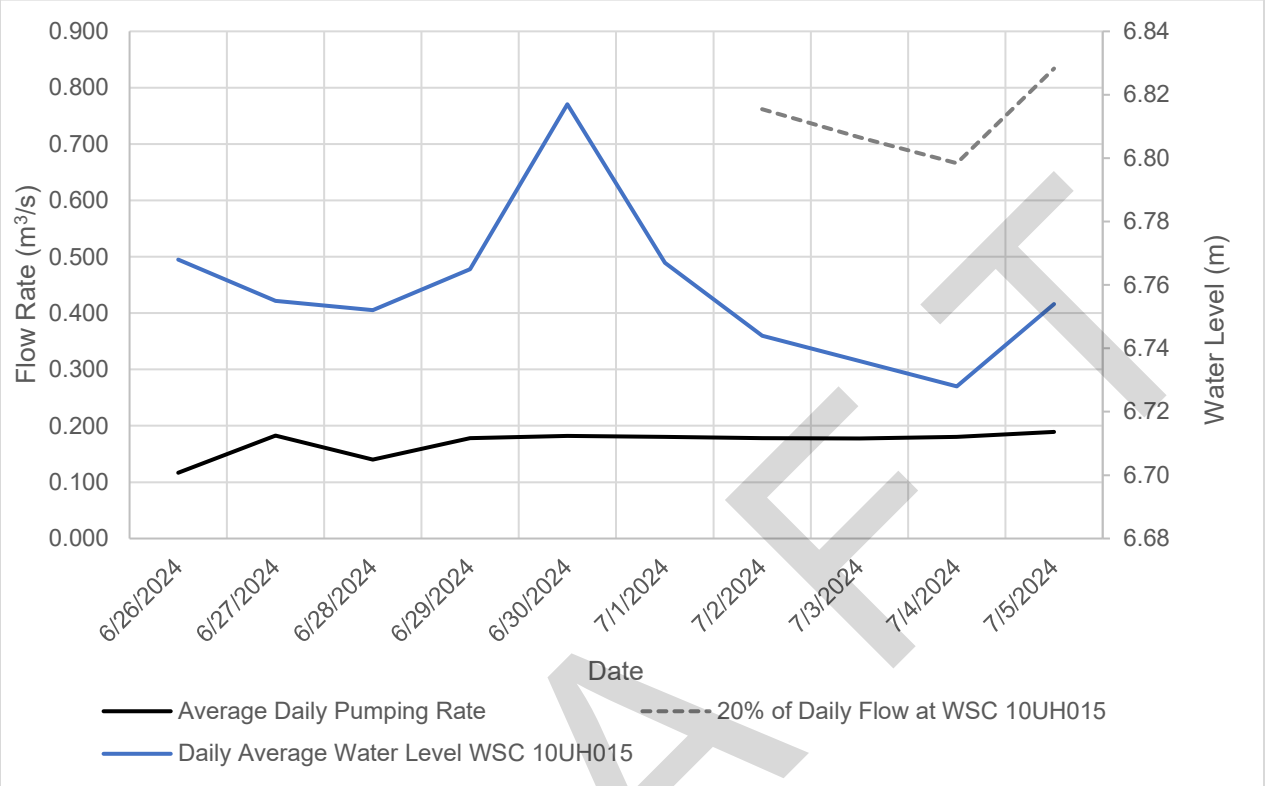

Figure 4.2 20% of Flow at WSC Station 10UH015 and Daily Average Pumping Rate

As shown in Figure 4.2 the daily average pumping rate did not exceed 20% of the instantaneous flow at WSC station 10UH015 during the pumping period. A summary of daily average flow at WSC station 10UH015 and average daily pumping rate are provided in Appendix B.

A total of 137,650 m^3 was pumped from the Apex River to Lake Geraldine during pumping operation in 2024. The maximum daily pumped volume was approximately 15,769 m^3 on June 28, 2024.

It is Nunami Stantec's opinion that no unanticipated impacts including: harmful alteration, disruption and destruction of fish habitat resulted from the withdrawals and reduction of flow during the 2024 pumping program.

5 DEMOBILIZATION

As mentioned, pumping operations ended on July 5, 2024. The City requested all equipment remain mobilized and serviced continue with regular monitoring of both the Apex River and Lake Geraldine Reservoir until a later date in September. During a project meeting on Thursday, September 12, 2024, the City advised that the demobilization process could begin. Due to scheduling constraints with the contractor in mid-September, demobilization began on October 10, 2024 and was completed on October 28, 2024. Cold sensitive equipment (i.e., pumps that were in the Apex River) were prioritized and returned to the City first. All other items were demobilized and returned by the end of October. The equipment handover from TAL to the City throughout the demobilization period. Equipment manifest signoff was completed by TAL on October 28, 2024, completing the administrative requirements of the formal equipment handover. The manifest from this handover can be found in Appendix C.

Note that the demobilization did not include removal of Bender (electrical) components for placement in heated storage. Recommendation was given to the City and Tower Arctic Ltd. (TAL) to keep those components in heated storage; however, that was not included in the demobilization manifest signoff.

Note that the demobilization did not include removal of Bender (electrical) components for placement in heated storage. Recommendation was given to the City and Tower Arctic Ltd. (TAL) to keep those components in heated storage.

6 CONCLUSION

On June 25, 2024, the TAL informed the City and Nunami Stantec that the Government of Nunavut Electrical AHJ had provided them with a "Permission to Connect" the system, following their satisfactory review in late May and on June 20, 2024. Substantial electrical upgrades were completed in 2023. These upgrades remained valid in 2024, and will remain valid for subsequent pumping programs. The Permission to Connect will be required annually prior to energizing the system and represents the annual notice to proceed with pumping operations.

Pumping from the Apex River to the Lake Geraldine Reservoir was completed in accordance with Water Licence 3AM-IQA1626 Amendment No. 4 and the letter of advice from DFO (up to 20% of observed flow when flows are more than 0.156 m^3/s) between June 26 to July 5, 2024. A total of 137,650 m^3 were pumped with a maximum daily pumped volume of approximately 15,769 m^3. The total volume pumped was less than the maximum allowable pumped volume from the Apex River of 500,000 m^3 as defined in Amendment No. 4.

Pumping records were maintained by the contractor at the pumping site. Spill elevation within the Lake Geraldine reservoir was reached on July 24th, 19 days after the pumping program concluded.

It is Nunami Stantec's opinion that no unanticipated impacts including: harmful alteration, disruption and destruction of fish habitat resulted from the withdrawals and subsequent reduction of flow during the 2024 pumping program.

7 LIMITATIONS

This document titled Final Report: Iqaluit 2024 Lake Geraldine Resupply (Apex Pumping): Report of Activities was prepared by Nunami Stantec Ltd. ("Nunami Stantec") for the account of the City of Iqaluit (the "Client"). This report is intended solely for the use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the expressed written consent of Stantec, which may be withheld at Stantec's discretion. The material in this document reflects Nunami Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Nunami Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Nunami Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Nunami Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

8 CLOSURE

Nunami Stantec Ltd. has prepared this report for the sole benefit of the City of Iqaluit (the City) for the purpose of summarizing the program set up and results from water withdrawal during the supplementary pumping from the Apex River in 2024.

Nunami Stantec trusts the contents of this report meet your expectations at this time. If you have any questions, please do not hesitate to contact the undersigned

Respectfully Submitted,

NUNAMI STANTEC LIMITED

Approved and Written by:

DRAFT

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APPENDIX A
Electrical Inspection Report

25-Jun-2024

Government of Nunavut

Department of Community and Government Services

Baffin Region	Kivalliq Region	Kitikmeot Region
P.O. Box 1000 Station 610 Iqaluit, NU X0A 0H0 Phone: (867) 975-5423 Fax: (867) 975-5453	Bag 002 Rankin Inlet, NU X0C 0G0 Phone: (867) 645-8179 Fax: (867) 645-8196	Bag 200 Cambridge Bay, NU X0B 0C0 Phone: (867) 983-4157 Fax: (867) 983-4152

ELECTRICAL INSPECTION REPORT

PERMIT: 240156

INSTALLATION

Location

Community: Apex
Street: River Pumping Station
Lot: Block:
Owner: CITY OF IQALUIT
Phone: (867) 979-5600 ext:
Fax:

Permit

PermitType: multi/commercial/industrial
Amperes: 800
Voltage: 347/600

Contractor

Name: Bryan Bertin
E-2181
Company: Ryfan Inc.
Address: 252 Morton Rd, Wheaton Settlement, NB
Postal: E4Z 3V4

INSPECTION

Date: 25-Jun-2024
Type: Rough in
Corrections Due By:
Inspector: Gary Boshoer
Outcome: Not Complete
Fee: NO

DEFICIENCIES

CEC Section	Details	Status	Date
3-002	Power connection approval is granted	Corrected	

Please sign and return corrected deficiencies by the date listed above _____

Contractor Signature

APPENDIX B

Daily Withdrawals from the Apex River and Daily Flow Recorded at WSC Station 10UH015

Table A Summary of Pumping Activities and Average Daily Flow at WSC Station 10UH015

Date	Daily Average Flow WSC 10UH015	Daily Average Water Level WSC 10UH015	20% of Daily Flow at WSC 10UH015	Average Daily Pumping Rate	Average Percent Flow Taken
	(m^3/s)	(m)	(m^3/s)	(m^3/s)	
6/26/2024		6.77		0.117	
6/27/2024		6.76		0.182	
6/28/2024		6.75		0.140	
6/29/2024		6.77		0.178	
6/30/2024		6.82		0.182	
7/1/2024		6.77		0.180	
7/2/2024	3.81	6.74	0.762	0.178	5%
7/3/2024	3.56	6.74	0.712	0.178	5%
7/4/2024	3.33	6.73	0.666	0.181	5%
7/5/2024	4.17	6.75	0.834	0.189	5%

APPENDIX C

Apex Pumping 2024
Substantial Completion,
Demobilization, &
Equipment Manifest
November 15, 2024

NUNAMI STANTEC LIMITED

Equipment Manifest (Demobilization)

To:	Shane Turner Superintendent of Public Works/Water Works City of Iqaluit Eric Jacobsen President Tower Arctic Ltd.	From:	Matt Follett, M.A.Sc., P.Eng. Associate Civil Engineer Nunami Stantec Ltd.
File:	144903395	Date:	October 28, 2024

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

The following list summarizes a list of equipment that is to be returned to the City of Iqaluit (City) by Tower Arctic Ltd. (TAL) following the Apex River 2024 pumping season. The intention of this manifest is assure items are documented as returned and received by the City.

The City confirmed that the site could be demobilized based upon the water levels in Lake Geraldine and overflow conditions at the spillway.

Note: Pumps must be stored in a heated storage area by the City. The City must advise TAL on the drop off location. The location of these is still pending City confirmation.

Item	Description	Signoff (Initials)			
		City of Iqaluit	Nunami Stantec	TAL	Notes
Apex Pumps	The City owns the three (3) pumps that were used in the Apex Pumping project. Pumps: Sulzer ABS submersible drainage pump (J604, spec sheet attached for records)	S.T.	IF		All three pumps are at the heated Apex Warehouse. Heated.
Apex Fish Screens	Fish screens that contain the pumps.	S.T.	IF		These are at the heated Apex Warehouse with the pumps. Heated.
Operator Shack	Seacan for onsite office (grey).	S.T.	IF		The operator shack has been delivered to the **City Laydown Lot** at the end of Federal Road. Heated. — NOT Heated S.T.
Manifolds	Pipe manifold for 3 hose lines to connect to.	S.T.	IF		City Laydown lot on top of the seacans. Not heated.

Reference: **Apex Pumping 2024 _ Equipment Manifest (Demobilization)**

Flow Meters	Measuring device to determine flow to Lake Geraldine	S.t.	IF		City Laydown lot on top of the seacans. Not heated.
Hoses	Flexible hoses used for connection from pumps to manifold.	S.t.	IF		Are in the green electrical component seacan. Not heated.
Electrical Cable and Equipment (Panels, Soft Starts)	Container (green) for electrical equipment and pump panels	S.t.	IF		Delivered to the City Laydown Lot. Not heated.
Apex Generator	The City-owned generator (beige seacan) was used in the 2024 resupply program. This has been modified in accordance with the Government of Nunavut Chief Electrical Inspector.	S.t.	IF		At the City Laydown Lot. Not heated.
Fuel Tanks	The City owns two fuel tanks for the system. At the City Laydown Lot.	S.t.	IF		At the City Laydown Lot. Not heated.
Additional Electrical Equipment from Upgrades	Electrical wiring for the pumps themselves.	S.t.	IF		With the pumps at the heated Apex Warehouse. Heated.
Outhouse	Tower's.	S.t.	IF		At the Tower lot.
Additional Fuel in Tanks		S.t.	IF		Tanks currently have fuel in them (roughly ¼ full).

Nunami Stantec Ltd.

Matt Follett, M.A.Sc., P.Eng.
Associate Civil Engineer - Nunavut

Phone: 613-223-1569
Matt.Follett@stantec.com

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 1: 3 pumps in fish screens. Pump not in fish screen is the backup 4th pump. At Apex Warehouse.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 2: 3 pumps at the Apex Warehouse.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

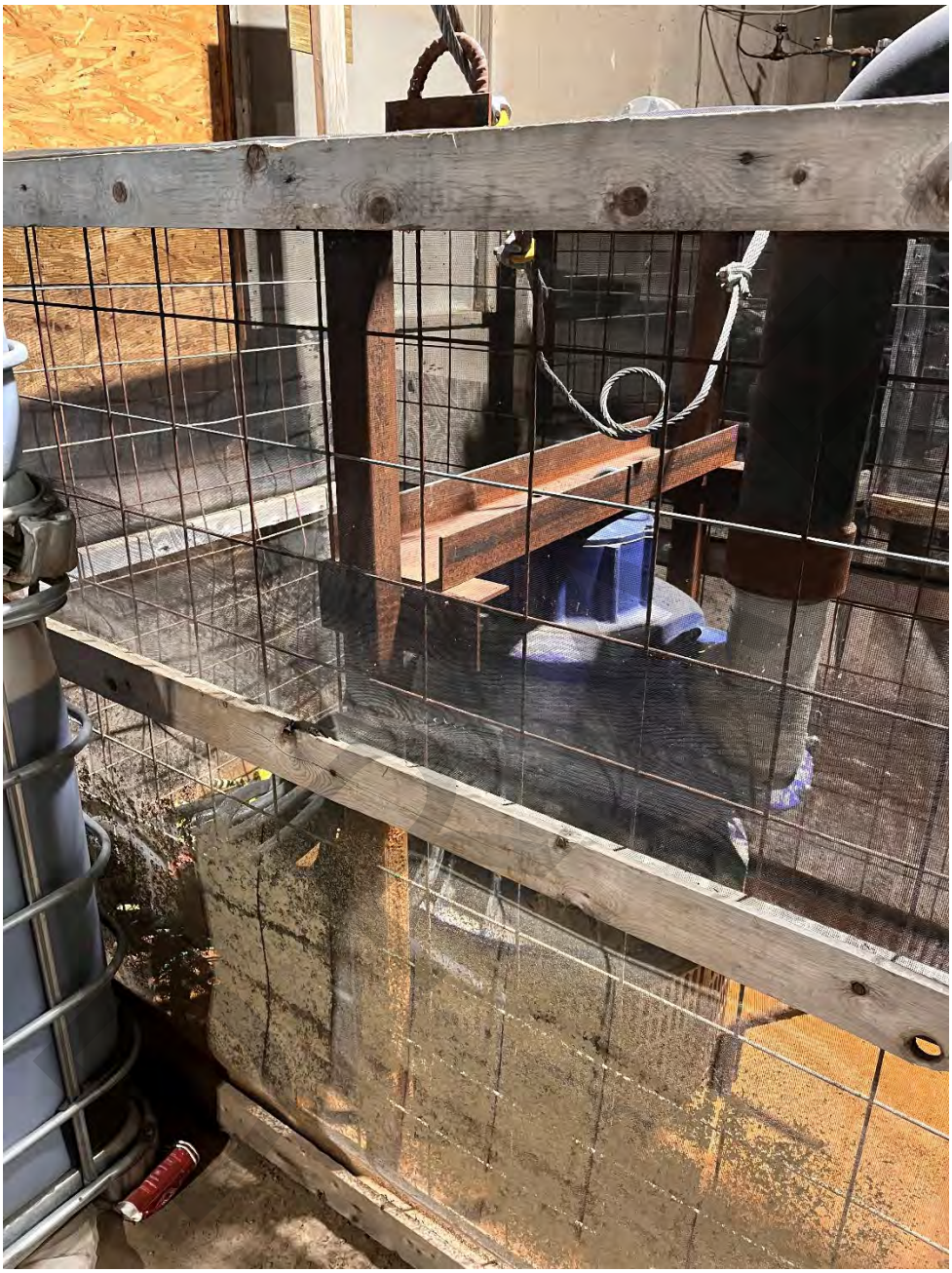

Figure 3: No obvious damage to pump or screens.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 4: Wiring for each pump is contained in the fish screen.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 5: City Laydown Lot. 2 fuel tank. Float reads that they are roughly 1/4 full.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 6: Elec (green) seacan, and generator (beige) seacan.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 7: Fuel tanks and office seacan (grey).

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 8: Manifold and flow meters stored on top of the 3 seacans at the City Laydown Lot.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 9: Between office and electrical seacans.

Figure 10: Backside of generator seacan.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 11: Inside elec (green) seacan.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 12: Inside elec (green) seacan (view 2).

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 13: Inside elec (green) seacan (view 2). Shows 3 hoses and large electrical cabling.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 14: Inside generator seacan.

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 15: Inside generator seacan (view 2).

Reference: Apex Pumping 2024 _ Equipment Manifest (Demobilization)

Figure 16: Apex pumping site is now empty. Other than a few pallets and the HDPE line that remains over the course of the year.

Figure 17: Apex pumping site is now empty (view 2).