Iqaluit

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3AM-IQA1626 Application for Amendment – Supporting Submission

December 21, 2019

NUNAMI

STANTEC LIMITED

Table of Contents

1 INTRODUCTION

1.1 Purpose of this Document

The purpose of this document is to supplement the Application to Amend Type A Water Licence 3AM-IQA1626 for the City of Iqaluit. This document should be read in conjunction with and constitutes part of, that application.

2 DETAILS OF AMENDMENT APPLICATION

2.1 Purpose of Amendment

The City of Iqaluit (the “City”) obtains its potable water from Lake Geraldine. Lake Geraldine is an engineered reservoir designed to contain the volume of water necessary to satisfy the drinking water needs of the City (Figure 2-1). The reservoir is refilled annually during spring and summer by natural inflows from snowmelt and precipitation. In years when natural inflows or precipitation are low and the reservoir does not fill to full capacity, or, when seasonal demand has been high, there is a potential for a shortage of drinking water available to the City.

In 2018, following a spring with low recharge to the reservoir, the City applied for, and received, an amendment to its water licence on an emergency basis, to allow water to be withdrawn from the Niaqunguk (Apex) River to supplement the reservoir prior to freeze up in 2018. The “Supplementary Pumping Program” was completed in October 2018. The City is seeking approval to pump water from the Apex River to the Lake Geraldine Reservoir in future years, as needed, until a permanent solution to address the City’s water deficit is implemented.

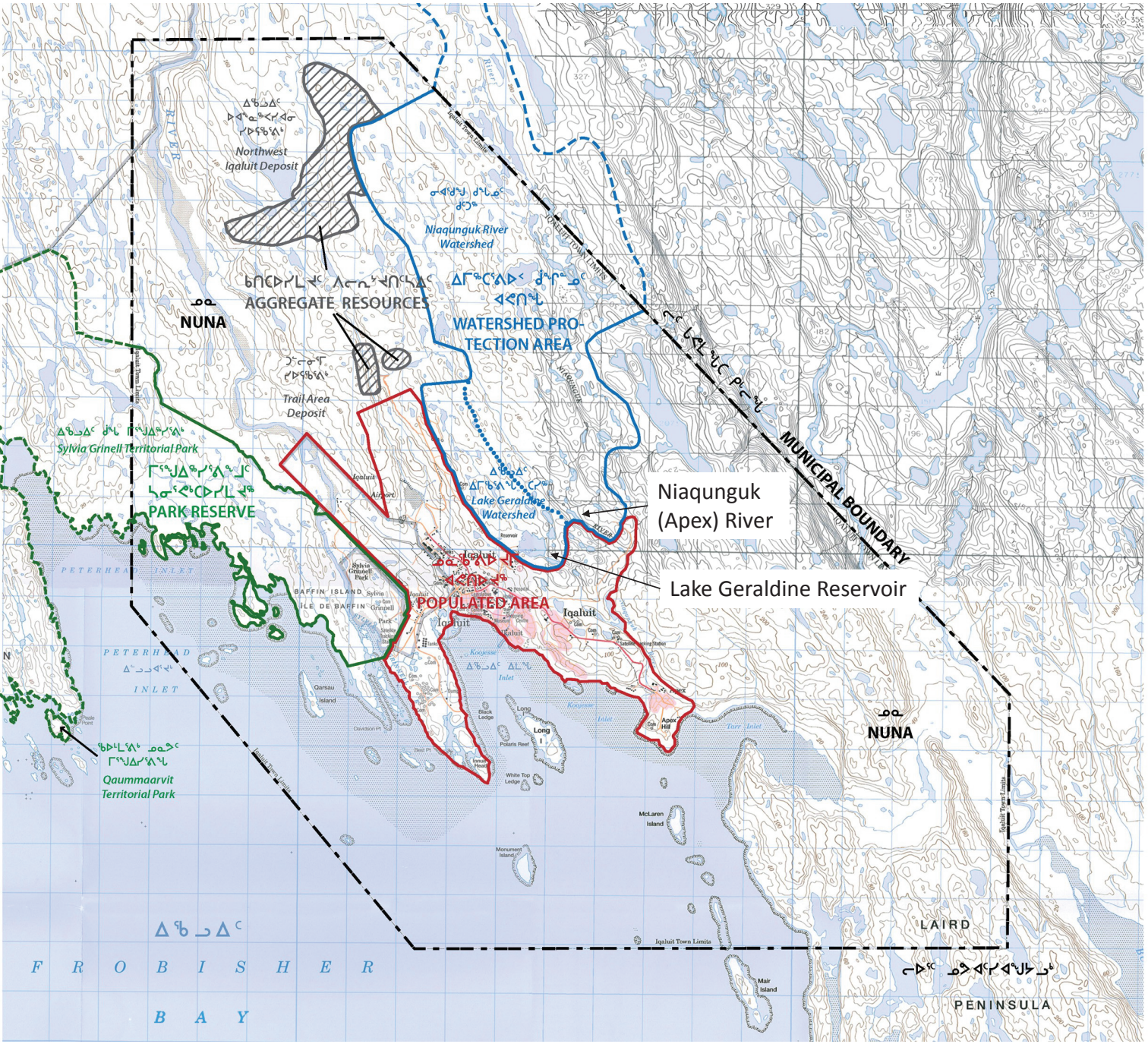

FIGURE A
GENERAL LAND USE
GENERAL PLAN

General Plan By-law No.703

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Figure 2-1: Location Overview

OFFICE CONSOLIDATION
OCTOBER 2015

Iqaluit
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2.2 Background

Lake Geraldine is estimated to contain approximately 1.8 million cubic metres of water at full capacity, with approximately 1.1 million cubic metres of this water available during winter months (November to June) (Nunami Stantec 2018). The remainder is unavailable during the winter months due to a portion being locked up as ice, and year-round due to the location of the water intake at depth. The City's water demands have been growing, and currently, approximately 73 to 78% of the available water in winter in Lake Geraldine is withdrawn to meet potable water demands (Figure 2-2). As recharge to the reservoir occurs only during open water months (July to October), the City's ability to supply water throughout the winter based on current demand, is based on having the full 1.1 million cubic metres of water in the Lake Geraldine Reservoir by the time of freeze-up.

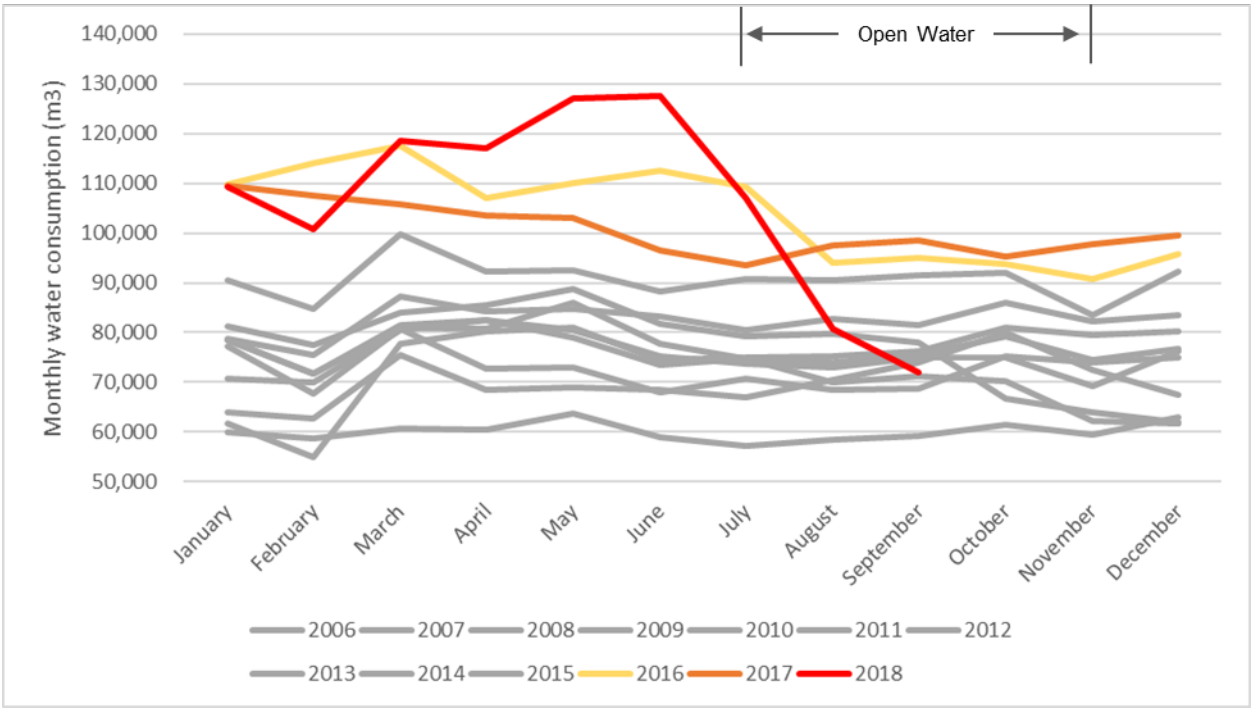

Figure 2-2: Iqaluit monthly water consumption 2006-2018

Since 2014, the City has been investigating long-term solutions to address potential drinking water shortage. These do not include other potential short-term solutions such as desalinization of sea water. Options being looked at include those that address supply, storage and demand:

1) Loss Control: identify and repair breaks and bleeds in the existing utilidor (fresh water distribution) system;
2) Conservation:

- actions that can be taken by residents and businesses to reduce drinking water consumption;
- conserving water within the water treatment plant

3) Alternate Water Sources:
   - Sylvia Grinnell River and Unnamed Lake
4) Demand Management:
   - Assessing planned and approved increases to water demand because of Development approvals
5) Water Storage
   - Capacity of Lake Geraldine Reservoir and accessibility of available water

None of these actions on their own will address the constraint of drinking water availability. The City continues to update residents on the progress of these studies. Regarding alternate water supply, the City expects to have feasibility-level studies complete in 2019, with final solutions designed in 2020. Temporary, alternate water supply from the Apex River may be required, as needed, until a final solution is commissioned in 2020 or later.

2.3 Scope of Amendment

The City is applying to:

- Withdraw up to 500,000 m^3 of water annually from the Apex River
- To increase the amount allowed to be withdrawn from Lake Geraldine, to 2,000,000 m^3

2.4 Description of Undertaking

2.4.1 Location of Undertaking

The City proposes to withdraw water annually from the Apex River, and to pump this water overland to the Lake Geraldine reservoir during open-water conditions, as needed until a permanent, long-term solution is implemented. Figure 2-3 shows the site plan for the proposed location of pumps within the Apex River and overland conveyance installation.

Up to three 35 kW submersible pumps equipped with fish screens will be placed within the Apex River at a location approximately 1.3 km upstream of the bridge on the Road to Nowhere. These submersible pumps will be powered by a diesel operated power generator with integrated fuel storage and containment system to be installed on shore. Flexible hoses or pipe will be connected to each of the pumps with a manifold and will be routed overland southwards to the reservoir.

The pump location is the same as the 2018 Supplementary Pumping Program. The pump location was selected based on the presence of deeper water at this location and on ease of access from the quarry at the end of the Road to Nowhere. The overland route from the pump

location to Lake Geraldine is has been re-routed along a portion of the route to optimize pumping efficiency.

Pumps and hose will be installed in association with the pumping program each year. Pumping equipment will be removed at the completion of the year's activities.

2.4.2 Withdrawal Rate

Water withdrawal from Apex River is proposed at up to 150 litres per second (L/s) (0.15 m^3/s) or 11,000 m^3/day over a 20 hour period, as flow conditions allow. Withdrawal may be ramped up or down so as to preferably not exceed 10% of the instantaneous flow of the Apex River when natural flow is above 30% of the mean annual discharge (MAD). Withdrawal within these parameters is accepted by DFO to have a low probability of impacts to fisheries (DFO 2013). Flows at the withdrawal site will be measured at a new hydrometric station to be installed upstream of the pump location, or can alternatively be calculated based on measured flows at Water Survey of Canada (WSC) Apex River at Apex hydrometric station (10UH002). MAD at the withdrawal location in 2017 was 0.717 m^3s and 30% of MAD was 0.215 m^3/s.

Should it be deemed necessary to withdraw water at a rate that exceeds 10% of instantaneous flow, or when natural flows are below 30% MAD in order to meet the City's water supply needs, additional monitoring will be triggered, as discussed in Section 5.0.

2.4.3 Timing of Activities

Flows in the Apex River, as measured by WSC, are highest in the spring and decline throughout the summer and fall. There are no flows during winter. The supplementary pumping of water, if required during a given year, will be completed during the open water period before flows cease and before hoses would otherwise freeze (July 15 to October 31).

In 2018, the City used a predictive model to forecast deficits in the City's water supply in Lake Geraldine under various consumption scenarios (Golder 2018; Golder 2013). From hydrological inputs based on historical data, and real-time measurements of water levels in Lake Geraldine, the City will be able to reasonably forecast from July onward of any given year, whether a deficit may be expected for the coming winter. The City will make a decision to implement supplementary pumping from the Apex River based on the outcomes of the predictive model.

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Legend
- Pump Location
- Water Conveyance
- Minor Road
- Local Road

0 200 400 metres
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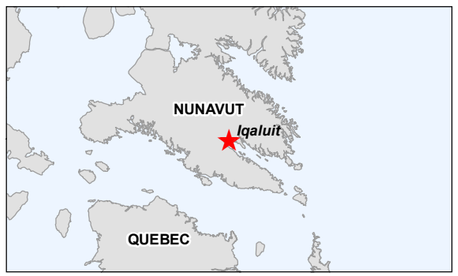
Notes
1. Coordinate System: NAD 1983 UTM Zone 19N
2. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation



Project Location
Iqaluit, NU

144902717

Prepared by ACampigotto on 2018-12-20
Technical Review by EBonhomme on 2018-12-20

Client/Project
CITY OF IQALUIT
Iqaluit Apex Water Supply
Iqaluit, NU

Figure No.
2-3a

Title
Project Layout

G:_GIS_Project Folders\144902717\ArcMaps\Figure 2-3 Project Layout 20181220.mxd Revised: 2018-12-20 By: ACampigotto

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3 ALTERNATIVES

The supplementation of Lake Geraldine by withdrawal from the Apex River can be implemented with existing equipment available in Iqaluit, and with negligible environmental impacts under certain conditions; however, it is not practical as a long term solution due to the variability of flow in the Apex River (exp 2014) and potential impacts to overwintering fish downstream within the Apex River, should the withdrawal rate need to exceed DFO's guidelines for water withdrawal in order to meet the City's needs (Nunami Stantec 2017).

The City recognizes that a permanent solution of a long-term supplemental water source to meet the City's demands is required, and continuous progress to identify and evaluate these potential sources is underway. A permanent solution is considered an alternative to the temporary supplementation from Apex River.

Preliminary studies ongoing by the City, have shown that the Sylvia Grinnell River has enough flow during summer to meet the City's needs for supplemental pumping. The City is continuing with field and desktop studies and engagement to evaluate the feasibility of a permanent withdrawal location and associated systems for this Sylvia Grinnell River option.

The City is also investigating the feasibility of using Unnamed Lake, a large lake approximately 3 km northeast of the City as a long-term water source. There is no substantive information available about the water balance or water quality of this lake. Studies underway will help to evaluate its suitability as a long-term water source. In the meantime, due to its distance from Lake Geraldine and lack of access, mobilizing pumping equipment to this location, and daily maintenance is deemed too costly and inefficient for a temporary solution, as compared to the Apex River option.

As a third, and short-term alternative only, the City is advancing concept designs for the use of a reverse osmosis treatment system to desalinate seawater from Koojesse Inlet for addition to the potable water system.

4 ENVIRONMENTAL EFFECTS

4.1 Existing Conditions – Aquatic Resources

The Apex River supports a resident population of Arctic charr (Salvelinus alpinus) (Nunami Stantec 2017). All fish sampled from this population were collected at one site immediately below what is locally known as Swimming Lake. Two other reaches further downstream were sampled but no fish were captured. One site upstream at the Road to Nowhere bridge was also sampled with no fish captured. A barrier to fish passage exists just above the mouth of the Apex River where it enters Koojesse Inlet (Nunami Stantec 2017). No fish were observed in the Upper Apex River during monitoring of the 2018 Supplementary Pumping Program.

The resident population of Arctic charr is not expected to be part of a commercial, recreational or Aboriginal (CRA) fishery; due to the small size of the individual fish within the population, which is common of resident populations. The Apex River is not known to have been a fishery in the past. It is unknown whether individuals of this population support a CRA fishery and would likely only occur during spring freshet if some individuals were flushed from the system into Koojesse Inlet. Due to the small size of this resident population it is unlikely they would be captured in the existing Arctic charr fishery. Any potential supporting contribution would be negligible to other fisheries.

4.2 Potential Impacts – Aquatic Resources

Potential Impacts to aquatic resources are summarized in Table 4-1.

Table 4-1: Potential impacts to aquatic resources from Apex water withdrawal

Activity	Water Quality	Hydrology	Fish and Fish Habitat
Installation, operation and removal of pumps and hoses	• Change in sediment concentrations • Deposit of deleterious substance		• Change in substrate composition • Increased potential for erosion or sedimentation
Water withdrawal		• Reduced flow	• Entrainment or impingement in pumps • Fish stranding • Reduction or loss of fish habitat

4.2.1 Water Quality

The placement of the water intake pumps using machinery, and the maintenance of the pumps, may cause bank and bed erosion leading to increased sediment entering the watercourse. Onshore activities, such as driving, or maintenance activities in work areas prone to erosion (e.g., on sand or fine materials), may also lead to increased sediment entering the watercourse. The use of machinery in water can lead to the deposit of deleterious substances (e.g., grease, oil) into the water which may affect fish health.

4.2.2 Fish and Fish Habitat

In a previous Authorization issued to the City for the 2018 Supplementary Pumping Program (18-HCAA-01025), Fisheries and Oceans Canada (DFO) advised that water withdrawal not exceeding 10% instantaneous flow when conditions are greater than 30% MAD represents a low risk of serious harm to fish (“low risk criteria”).

Serious harm to the resident population of charr may occur when withdrawal exceeds 10% of the instantaneous flow or when withdrawal is under conditions below 30% MAD. Potential effects are:

- reduction of fish habitat including overwintering habitat due to water withdrawal, and
- mortality of fish by stranding due to water withdrawal.

Impingement or entrainment of fish causing injury or death can occur when pumps are not fitted with fish screens meeting applicable guidelines.

4.3 Assessment of Residual Effects on Aquatic Resources

Residual environmental effects are those effects which remain after the application of mitigation. The classification of residual effects is presented in Table 4-2.

Table 4-2 Assessment Criteria for Potential Residual Environmental Effects

Criteria	Potential Outcomes			
Duration	**Short-Term:** Effect lasts for duration of Project Construction	**Medium-Term:** Effect lasts for up to 5 years after construction activity ceases	**Long-Term:** Effect lasts beyond final remediation of site	
Frequency	**Once:** Effect occurs once	**Intermittent:** Effect occurs intermittently	**Continuous:** Effect occurs continuously	
Seasonal Timing	**Season-Specific:** Effect is restricted to a particular season or seasons	**Non Season-Specific:** Effect could occur year round		
Geographic Extent	**Project Footprint** Within project footprint	**Project Area** 500m surrounding project footprint	**Regional** 25km buffer around the Project footprint	
Reversibility[1]	**Reversible or Irreversible**			
Magnitude of effect	**None/negligible**	**Low**[2]	**Moderate**[3]	**High**[4]

NOTES:

1 Reversibility: The likelihood that the environmental component will recover from an environmental effect.

2 Low: The predicted trend in the measurable parameter under projected levels of development may result in a decline in the environmental component in the study area during the life of the Project, but levels should recover to baseline after Project closure.

3 Moderate: The predicted trend in the measurable parameter under projected levels of development will likely result in a decline in the environmental component to lower than baseline, but stable levels in the study area after Project closure and into the foreseeable future.

4 High: The predicted trend in the measurable parameter under projected levels of development could threaten the sustainability of the environmental component in the study area, after Project closure, and into the foreseeable future.

4.3.1 Water Quality

The City will implement mitigations during all project activities to reduce the effects of project activities on the aquatic environment.

Table 4-3 lists mitigations to be applied to reduce effects to water quality during supplemental pumping.

Table 4-3: Mitigations for potential effects to water quality

Potential Effect	Mitigation
Potential release of deleterious substance due to operation of machinery in and around water	• Machinery is to arrive on site in a clean condition and maintained free of fluid leaks, invasive species and noxious weeds. Eco friendly (e.g., biodegradable vegetable oil) hydraulic fluid and lubrication is to be used on equipment, where feasible. • Develop and implement a Spill Contingency Plan (Appendix A) that minimizes risk of accidental spills or releases from entering a watercourse or water body during all phases of the pumping. • Whenever possible, operate machinery on land above the high water mark (HWM), to minimize disturbance to the banks and bed of the water body. • Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water. • Remove all construction materials from site upon project completion.
Potential increase in erosion and sedimentation from operation of machinery in and around water	• Install effective erosion and sediment control measures before starting work to prevent sediment from entering the water body. • Avoid areas of steep banks or slopes when entering or exiting water body. • Inspect and maintain erosion and sediment control measures and structures during the course of construction. • Repair erosion and sediment control measures and structures, if damage occurs. • Remove non-biodegradable erosion and sediment control materials once site is stabilized. • Minimize in-water works • Adhere to measures provided in the Erosion and Sedimentation Control Plan (Appendix B)

With the application of measures to reduce the potential for, and effects of sediments entering the Apex River and release of deleterious substance, the residual effects to water quality will be short-term, restricted to open-water season, limited to the project area and will be reversible. The residual effect to water quality is predicted to be negligible.

4.3.2 Fish and Fish Habitat

If possible to meet water supplementation requirements of Lake Geraldine, water withdrawal from the Apex River at the proposed location will be at a rate less than 10% of the instantaneous flow, when natural flow is above 30% MAD. Flow and water levels are currently monitored at the Water Survey of Canada (WSC) Apex River at Apex hydrometric station (10UH002), located downstream of the proposed Upper Apex pumping location. Flows can be scaled to the pumping location on the upper Apex River using a simple drainage area ratio calculation: the upper Apex River location drains 60% of the drainage area measured at the WSC station. To more accurately reflect local conditions on the Upper Apex River, the City will install a new hydrometric station upstream of the withdrawal location.

Table 4-3 lists mitigations to be applied to reduce effects to fish and fish habitat.

Table 4-3: Mitigations for potential effects to fish and fish habitat

Potential Effect	• Mitigation
Potential fish entrapment or entrainment during pumping	• Screen water intakes pipes to prevent entrainment or impingement of fish in accordance with DFO's Freshwater Intake end-of-Pipe Fish Screen Guideline (1995). Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself. • Openings in the guides and seals are to be less than the opening criteria to make "fish tight". • Intakes are to be installed in a manner that prevents the uptake or entrainment of sediment and aquatic organisms associated with the bottom area. Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse. If the water depth is less than 300 mm (12 in.), additional measures may need to be implemented (e.g., using a screen basket with a solid bottom). • Structural support is to be provided to the screen panels to prevent sagging and collapse of the screen. • Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where there is debris loading (woody material, leaves, algae mats, etc.). A150 mm (6 in.) spacing between bars is typical. • Make provision for the removal, inspection, and cleaning of screens. • Implement regular maintenance and repair of cleaning apparatus, seals, and screens is carried out to prevent debris-fouling and impingement of fish. • Shut down pumps when fish screens are removed for inspection and cleaning.
Degradation or destruction of fish habitat	• It is preferable to adjust pumping rate as required such that withdrawal rate is less than 10% of instantaneous flow as measured or derived from hydrometric data, when flows are greater than 30% of mean annual discharge. • Should withdrawal rate need to exceed 10% instantaneous flow or when flows are less than 30% mean annual discharge, monitoring per the Fish and Fish Habitat Monitoring Plan will be implemented. • Fish and Fish Habitat Monitoring shall include: o Daily monitoring of water level, wetted width, habitat conditions, fish presence, fish stranding and fish mortality o Requirement for daily reporting

Potential Effect	• Mitigation
Fish stranding	• Fish rescue will be conducted where necessary, if stranded fish are observed during daily observations when such monitoring is required. Fish rescue will include; o Two personnel, including a qualified aquatic environmental specialist (QAES) will walk the river banks below the water withdrawal site daily, or as required to check for stranded or fish which will potentially stranded to rescue those fish. o Stranded fish will be dipped netted and placed in an oxygenated tub of water from the river. For fish at risk of being stranded and cannot be easily dip netted an electrofisher will be used to capture fish and placed into the oxygenated tub of water. o Stranded fish which may be observed by the community or others will be attempted to be rescued. o Fish rescue will be carried downstream to a suitable release area and released once fish have recovered from their capture. • All fish rescued will be counted and recorded. • Fish which are stranded but cannot be rescued will be retrieved, counted and frozen for later biological sampling to obtain a better understanding of this resident char population.

No fish were observed during 2018 pumping on the Apex River. Since it is unconfirmed whether Arctic charr are using the upper Apex River during their lifecycle, daily monitoring will by initiated when low-risk criteria are exceeded, in accordance with the Fish and Fish Habitat Monitoring Plan included in Appendix C.

In accordance with DFO guidance that water withdrawal below 10% instantaneous discharge where flows are greater than 30% MAD have a low probability of detectable impacts (DFO 2013), the residual effects of water withdrawal on fish and fish habitat under most conditions is considered to be negligible to low, without further assessment.

In the situation where withdrawal cannot be maintained below 10% instantaneous flow, or where flows are below 30% MAD to meet the City's needs, potential effects to fish and fish habitat may be short-term, singular, season-specific, limited to the project area and reversible. During monitoring conducted in 2018, no stranded fish or isolated pools were observed. With the application of measures to reduce the potential for effects on fish mortality and habitat loss or alternation from water withdrawal, including monitoring, it is predicted that the residual effects on fish and fish habitat are negligible.

5 MONITORING AND REPORTING

5.1.1 Monitoring

Monitoring will serve primarily to inform adjustments to the rate of water withdrawal, and to inform actions that may be required to protect fish and fish habitat. Monitoring activities include:

- Periodic inspection of effectiveness of erosion and sedimentation control measures
- Periodic inspection of performance and condition of fish screens
- Continuous metered monitoring of water withdrawal at the pumping location
- Daily recording of flows at Water Survey Canada Apex River station (10UH002)
- Daily recording of flows at a new hydrometric station to be established upstream of the pumping location.

The following monitoring will be implemented when/if withdrawal rates exceed 10% instantaneous flow or flows are below 30% MAD. Figure 5-1 shows locations of proposed monitoring stations as referenced in the Fish and Fish Habitat Monitoring Plan:

- Four locations downstream of the pumping locations will be monitored to assess the potential physical effects of pumping on fish and fish habitat. Cross-sections will be surveyed and rebar installed to represent the local reference datum against which to monitor water level and wetted perimeter. Daily measurements of the distance from the top of the rebar to the water surface will be recorded.
- Monitoring and response in accordance with the Fish and Fish Habitat Monitoring Plan
- Additional monitoring will be considered based on DFO recommendations

5.1.2 Reporting

The City will report on total monthly amounts withdrawn from the Apex River within the water licence Annual Report.

When daily monitoring is required, data from daily monitoring will be maintained for review and submission if requested by the regulator. A summary report of fish and fish habitat monitoring (if undertaken) will be provided by March 31 of the following calendar year.

The City will advise DFO and initiate daily monitoring for fish and fish habitat conditions when low risk criteria are exceeded.

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Legend

Monitoring Location

- Fish and Fish Habitat Monitoring Plan
- Surveillance Network Program
- Water Survey of Canada

- Water Conveyance
- Minor Road
- Local Road

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Notes

1. Coordinate System: NAD 1983 UTM Zone 19N
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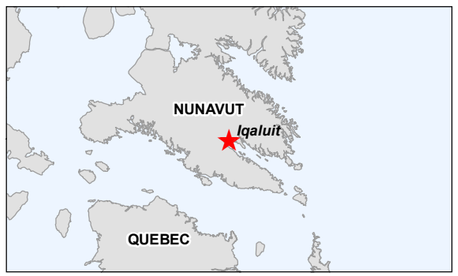

Project Location
Iqaluit, NU

144902717

Prepared by ACampigotto on 2018-12-20
Technical Review by EBonhomme on 2018-12-20

Client/Project
CITY OF IQALUIT
Iqaluit Apex Water Supply
Iqaluit, NU

Figure No.
5-1

Title
Fish and Fish Habitat Monitoring Locations

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6 REFERENCES

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Appendix A:
Spill Contingency Plan

APEX RIVER WATER WITHDRAWAL: SITE-SPECIFIC SPILL CONTINGENCY PLAN

1. INTRODUCTION

1.1 PURPOSE

The purpose of this Site-Specific Spill Contingency Plan (SCP) is to identify measures to reduce the possibility of occurrence of spills of contaminants associated specifically with City's withdrawal of water from the Apex (Niaqunguk) River for the purpose of supplementing the City's drinking water supply at Lake Geraldine, and to identify measures to be taken should a spill occur, in order to minimize impacts to the environment. This SCP is complementary to the City's Spill Contingency Plan.

1.2 REVISIONS

The SCP is to be reviewed annually prior to implementation of supplementary withdrawal with input from the contractor(s) conducting site activities for the City.

1.3 RESPONSIBILITIES

This Spill Contingency Plan Applies to the Prime contractor and its subcontractors during installation, operation and removal associated with water withdrawal at the Apex River.

Primary Contacts

Name	Role	Phone / Email
	City Project Manager	
	Alternate City Project Manager	
	Contractor Project Manager	
	Site Foreman	
	Media	

2.1 TRAINING

All project personnel will receive training on the purpose and procedures provided in this Spill Contingency Plan.

All personnel will receive training in safe work procedures related to handling of petroleum products and refueling equipment.

2. SPILL PREVENTION

2.1 MATERIALS AND EQUIPMENT STORAGE

The following substances/materials may be present at work sites:

- Diesel
- Engine Oil
- Lubricants

MSDS for substances to be stored on site are to be included with this Spill Contingency Plan.

APEX RIVER WATER WITHDRAWAL: SITE-SPECIFIC SPILL CONTINGENCY PLAN

Equipment containing fuels and oils/lubricants must be located or stored more than 50 m from the bank of the Apex River. No fuels are to be stored on site. Fuel-fired equipment such as generators and pumps will have secondary containment installed capable of retaining 110% of the capacity of the tanks and fuel drips or leaks during operations and refueling.

Mobile equipment will be refueled at least 50 m away from the bank of a watercourse or waterbody.

2.2 MONITORING

Vehicles and equipment will be checked daily prior to operation for evidence of leaking hoses or tanks, and leaks will be repaired promptly.

Observations and actions taken will be recorded as part of daily pre-op check.

3. SPILL RESPONSE

3.1 RESPONSE EQUIPMENT

Emergency spill kits will be maintained at the following locations:

- Generator
- Designated refueling areas

Each kit contains the following items stored into a 55 gallon plastic drums:

- • 5 Tyveck coveralls
- • 10 pairs of disposable gloves
- • 2 x 100 absorbent pad packs
- • 1 x 20kg granular absorbent bag
- • 4 x 2” diam. Floating absorbent booms
- • 10 yellow storage bags
- • One shovel

Additionally, each vehicle will be equipped with a spill kit, to include:

- 4 pairs disposable gloves
- 20 absorbent pads
- 2 clear or yellow storage bags

3.2 GENERAL PROCEDURES IN CASE OF SPILL

The following are general procedures that apply immediately in the case of a spill of any size. Steps are listed in the order of importance; however, depending on the circumstances, conditions, and potential injuries, this order may need to be altered to meet specific needs. :

- Stop, look, assess and control site hazards and risks to personnel.
    - Is there a fire or explosion hazard?
    - Are there people nearby?
    - What is the spilled material? Is additional PPE needed?

- Eliminate all sources of ignition
- Stop the source of the spill if safe to do so
- Use material in spill kit or other available materials to contain spill
- Notify site foreman

3.3 SPECIFIC PROCEDURES IN CASE OF SPILL

Spill on Land

- Determine the likely movement of the spill overland and into the ground.
- Prevent spilled material from entering water using booms, creating berms or using absorbents
- Use absorbents to collect free product
- Excavate affected soil into empty drum or lined container, while minimizing destruction of root zone

Spill on or Near Water

- Block entry into water using booms and absorbent pads or other barriers
- Contain a spill in water with absorbent boom or other barrier.
- Remove minor spills with sorbent pads.
- Major spill in water will require pumping and disposal of contaminated water and other actions as determined in discussion with regulatory authorities.

Spill on Ice

- Evaluate ice conditions before proceeding
- Use snow or ice berms to prevent spill from spreading
- Use booms to contain free product
- Manually remove contaminated snow and ice from surface

3.4 REPORTING

All spills must be reported to the Site Foreman, and to the Designated Representative for the City. Additional reporting may be required.

For every spill exceeding the quantity specified in Table 3-1, the form “NWT-NU Spill Report” (Appendix A) must be completed and transmitted within 12 h of the incident to spills@gov.nt.ca. Pictures must be taken during and after the cleanup progress. The GPS coordinates of the spill location must be recorded. All information and pictures will be used for the spill report.

The person preparing the spill report shall give as much of the following information as possible. Reportable information includes but is not limited to the following:

- Date and time of spill
- Direction spill is moving (or if it has stopped)
- Name and phone number of persons close to the location of the spill
- Type of contaminant spilled and quantity spilled
- Cause of spill
- Whether the spill is continuing or has stopped

- Description of the existing containment
- Actions taken to recover, clean-up and dispose of spilled contaminant
- Name, address and phone number of person reporting the spill
- Name of person in charge of management or control at time of spill

Table 3-1: Reportable Spill Quantities

Substance	Reportable Quantity
Fuel	≥100 L
Toxic substances (for example, cleaners, solvents, glycol)	≥ 5 L or 5 kg
Releases or potential releases of deleterious substances, of any size that: • are near or in an open water body • Pose an imminent threat to human health or safety	Any amount

4. EMERGENCY CONTACT CALL-DOWN LIST IN CASE OF SPILL

Name	Company	Emergency Phone
tbd	Contractor Site Foreman	
Tbd	City Representative	
Above to confirm if spill is reportable prior to continuing with call-down		
Tbd	City Project Manager	
NWT/NU Spill Reporting Line		867-920-8130
tbd	Environmental Inspector	

Appendix A: NWT-NU Spill Report Form

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

Government of Northwest Territories | Nunavut | Canada | Inuvialuit Land Administration

NT-NU 24-HOUR SPILL REPORT LINE
Tel: (867) 920-8130 • Fax: (867) 873-6924 • Email: spills@gov.nt.ca

REPORT LINE USE ONLY

A	Report Date: MM DD YY	Report Time:	☐ Original Spill Report **OR** ☐ Update # _____ to the Original Spill Report	**Report Number:**
B	Occurrence Date: MM DD YY	Occurrence Time:		
C	Land Use Permit Number (if applicable):		Water Licence Number (if applicable):	
D	Geographic Place Name or Distance and Direction from the Named Location:		Region: ☐ NT ☐ Nunavut ☐ Adjacent Jurisdiction or Ocean	
E	Latitude: _____ Degrees _____ Minutes _____ Seconds		Longitude: _____ Degrees _____ Minutes _____ Seconds	
F	Responsible Party or Vessel Name:		Responsible Party Address or Office Location:	
G	Any Contractor Involved:		Contractor Address or Office Location:	
H	Product Spilled: ☐ Potential Spill	Quantity in Litres, Kilograms or Cubic Metres:	U.N. Number:	
I	Spill Source:	Spill Cause:	Area of Contamination in Square Metres:	
J	Factors Affecting Spill or Recovery:	Describe Any Assistance Required:	Hazards to Persons, Property or Environment:	
K	Additional Information, Comments, Actions Proposed or Taken to Contain, Recover or Dispose of Spilled Product and Contaminated Materials:			

L	Reported to Spill Line by:	Position:	Employer:	Location Calling From:	Telephone:
M	Any Alternate Contact:	Position:	Employer:	Alternate Contact Location:	Alternate Telephone:

REPORT LINE USE ONLY

N	Received at Spill Line by:	Position:	Employer:	Location Called:	Report Line Number:

Lead Agency: ☐ EC ☐ CCG/TCMSS ☐ GNWT ☐ GN ☐ ILA ☐ AANDC ☐ NEB ☐ Other: _____

Significance: ☐ Minor ☐ Major ☐ Unknown

File Status: ☐ Open ☐ Closed

Agency:	**Contact Name:**	**Contact Time:**	**Remarks:**
Lead Agency:			
First Support Agency:			
Second Support Agency:			
Third Support Agency:			

Appendix B: Erosion and Sedimentation Control Plan

APEX RIVER WATER WITHDRAWAL: EROSION AND SEDIMENTATION CONTROL PLAN

PURPOSE

This Erosion and Sedimentation Control Plan (ESCP) provides guidance and mitigation to the City of Iqaluit (the City) and its contractor to avoid or minimize erosion or sedimentation from activities related to the City's withdrawal of water from the Apex (Niaqunguk) River for the purpose of supplementing the City's drinking water supply at Lake Geraldine. It is to be applied in conjunction with the Fish and Fish Habitat Protection Plan and Spill Contingency Plan and applicable authorizations.

APPROACH

The ESCP is to be updated prior to project implementation by the City and reviewed annually with input from the contractor(s) conducting site activities for the City.

This plan uses DFO pathways of effects, measures to avoid or mitigate against serious harm to fish, and professional judgement to determine where effects from erosion and sedimentation might occur and the appropriate mitigation measures to avoid or reduce these effects. This ESCP is in effect during all phases of withdrawal from the Apex River in any single year, from the start of project set-up (including mobilization of equipment), through to the demobilization of project equipment.

TRAINING

The ESCP will be reviewed with the contractor that will be undertaking project installation, maintenance and removal. All project personnel are to be trained by the contractor in the purpose and requirements of the plan

MITIGATIONS

On-site activities, subsequent potential effects from these, and proposed mitigations for these activities are outlined in Table 1.

Table 1: Project Activities, Potential Effects, and Proposed Mitigation Measures

Activity	Potential effect	Mitigation Measures
Placement, removal, and operation of pumps	The placement of the water intake pumps using machinery, and the maintenance of the pumps, may cause bank and bed erosion leading to increased sediment entering the watercourse.	1. Disturbance to the riparian vegetation will be minimized. Use existing roads and trails wherever possible. Rig mats are to be used when ground is excessively wet and prone to erosion. 2. Equipment will avoid steep banks for entry and egress from water. 3. The removal of rocks, sand or other materials from the banks, the shore and shoreline, or the bed of the waterbody, below the ordinary high-water mark, will be minimized. If material is removed from the waterbody, it will be set aside and returned to the original location if practical to do so, once construction activities are completed. 4. Site isolation measures (e.g., silt boom, silt curtain, silt fencing) will be used for containing suspended sediment where in-water work is required, and downgradient of erosion-prone on-shore work areas.
On-shore activities in work areas that are prone to erosion	On-shore activities, such as driving or maintenance activities in work areas prone to erosion (e.g., on sand or fine materials), may cause erosion leading to increased sediment entering the watercourse	

Table 1: Project Activities, Potential Effects, and Proposed Mitigation Measures

Activity	Potential effect	Mitigation Measures
		5. Waste material (e.g., construction waste and materials, accumulated debris) will be contained and stabilized above the high-water mark of the Apex River to prevent re-entry. 6. Regular inspection and maintenance of effectiveness of erosion and sediment control measures and structures will be conducted during the course of operations. 7. If the shoreline or banks are destabilized, re-stabilize them immediately to prevent erosion and/or sedimentation. 8. If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, use appropriately-sized, clean rock. The rock will be installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment. 9. All pumping materials will be removed from site upon project completion.
Use of machinery in water	The use of machinery in water can lead to sedimentation and erosion which may affect fish health.	1. Machinery on-site will be in a clean condition and maintained free of fluid leaks, invasive species and noxious weeds. 2. Machinery used in the watercourse will be limited to placing and removing the intake pump. 3. Machinery will not be left in the watercourse. 4.

MONITORING AND REPORTING

The implementation of erosion and sedimentation control measures shall be recorded daily by the contractor. This report should note aspects such as performance of silt curtains, days of in-water works, etc.

Appendix C:
Fish and Fish Habitat Monitoring Plan

APEX RIVER SUPPLEMENTARY PUMPING 2018: FISH AND FISH HABITAT MONITORING PLAN

INTRODUCTION

The City of Iqaluit is applying to withdraw water from the Niaqunguk (Apex) River during unfrozen conditions (July to October) for the purpose of supplementing the City's drinking water supply at Lake Geraldine when required. The withdrawal of water from the Apex River may exceed DFO's low risk criteria for serious harm to fish: 10% of instantaneous flow when natural flow is at or above 30% of the mean annual discharge (MAD).

This Fish and Fish Habitat Monitoring Plan specifies monitoring that will initiate measures to mitigate serious harm to fish.

MONITORING REQUIREMENTS

Monitoring of fish and fish habitat will be undertaken when water withdrawals exceed the low risk criteria for serious harm to fish. Table 1 summarizes monitoring locations and parameters. Locations are shown in Appendix FFHMP-A

Table 1: Aquatic Monitoring Stations within the Apex River During Water Withdrawals

Station ID[1]	Station Description	UTM Coordinates		Monitoring Parameters[3,4,5]	Monitoring Frequency	Monitoring Rationale
		Easting	Northing			
Throughout Pumping Period						
SNP IQA-10 (Apex Pump Location)	At pumping location	525820	7070467	Pump flow rate Pump volume (daily and cumulative) Daily average discharge (measured at new hydrometric station)	Daily	Monitor daily pump rate and river flow/discharge in relation to DFO low risk criteria
10UH002	Water Survey of Canada station, downstream of pump location, upstream of Apex Road bridge	527087	7067694	Daily average discharge	Daily (remotely)	Monitor flow conditions at downstream end of Apex River; monitored remotely via online connection to WSC station
Hydro 1	Immediately Upstream of pump location	tbd	tbd	Daily average discharge	Daily	Monitor flow conditions at pump location Apex River
Exceedance of Low Risk Criteria						
SNP IQA-10 (Apex Pump Location)	At pumping location	525820	7070467	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence at pumping location

Table 1: Aquatic Monitoring Stations within the Apex River During Water Withdrawals

Station ID[1]	Station Description	UTM Coordinates		Monitoring Parameters[3,4,5]	Monitoring Frequency	Monitoring Rationale
		Easting	Northing			
AR-07	Immediately downstream (46 m) of pumping location	525850	7070428	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence immediately downstream of pumping location
A1	Downstream of pumping location, upstream of Road to Nowhere Bridge	526497	7070003	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence downstream of pumping location Continuity of monitoring location with 2016 fisheries program
A2	Downstream of pumping location, upstream of Swimming Lake	526299	7069247	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence downstream of pumping location Continuity of monitoring location with 2016 fisheries program (fish previously captured here)
AR-02	Downstream of pumping location and downstream of Swimming Lake	526592	7068573	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence downstream of pumping location and immediately downstream of Swimming Lake Continuity of monitoring location with 2016 fisheries program

Notes:

1. UTM coordinates (Zone 19V) provided for established stations, as of August 20, 2018.

MONITORING PROCEDURES

PRE-PUMPING MONITORING

Baseline channel and flow conditions at each of the above-noted stations were established in 2018. Measurements were completed as per the BC-MOE *Manual of British Columbia Hydrometric Standards* (2009), available here: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/science-data/man_bc_hydrometric_stand_v10.pdf. Specifically, per monitoring station/transect, there was a minimum of 20 measurements and no one measurement would account for more than 10% of the discharge. The program used a Marsh-McBirney Flo-Mate 2000 electromagnetic flow meter.

Fish and fish habitat conditions were also assessed at each of these stations in 2018, as well as fish presence via electro-fishing. No fish were caught at these monitoring stations via electrofisher.

Finally, a visual survey, along length of Apex River from AR-05 to AR-02, was also completed to identify locations where stranding potential for fish if high based on channel morphology (such as broad, shallow areas). No additional areas, other than the stations identified in Table 1, were considered at higher risk for stranding.

WATER WITHDRAWAL DAILY MONITORING

Throughout Pumping

During the water withdrawal period (i.e., throughout pumping), the following parameters will be monitored:

Withdrawal:	Measured at the pump location (SNP IQA-10) in accordance with Water Licence 3AM-IQA1626
Discharge:	Measured at the Water Survey of Canada Apex River station 10UH002 and a new hydrometric station to be established upstream of the pumping location (daily average)

At SNP IQA-10, the withdrawal rate and volume will be monitored daily and reported as a daily average. The daily average discharge at a new upstream hydrometric station will also be monitored daily to obtain river discharge at the IQA-10 pump location. These parameters are monitored for compliance with the water licence and to evaluate pump rate in relation to river discharge and the DFO low risk criteria.

Exceedance of Low Risk Criteria

Daily monitoring for fish and fish habitat parameters will commence when water withdrawals are close to exceeding the low risk criteria. The parameters to be collected during this daily monitoring include:

Water Level:	Measured as a distance between the top of the installed gauge stakes to the water surface, and to river bottom, on the upstream side of the gauge stakes, at monitoring locations in Table 1.
Wetted Width:	Measured as the wetted distance between the outermost gauge stakes established pre-pumping at monitoring locations in Table 1.
Habitat Conditions:	Descriptive observations of changes to pools, riffles, runs, or other habitat features at each monitoring locations.
Fish Presence:	Observations of fish presence at each monitoring location, with documentation of species and numbers, if available.
Fish stranding:	Location of, and numbers of stranded fish, along with documentation of fish rescue (if any) completed. Fish rescued or suffered serious injury or morality will be identified and counted.
Fish Mortality:	Location and number of dead fish.

REPORTING

DAILY REPORTING

Daily monitoring reports will be retained and made available for review if requested.

When exceedance of the low risk criteria is imminent, the City will advise DFO and initiate daily monitoring for fish and fish habitat conditions.

FINAL REPORT

A summary report of fish and fish habitat monitoring will be provided in the City's water licence Annual Report.

APPENDIX FFHMP-A: MONITORING STATION LOCATIONS

Stantec

Legend

Monitoring Location

- Fish and Fish Habitat Monitoring Plan
- Surveillance Network Program
- Water Survey of Canada

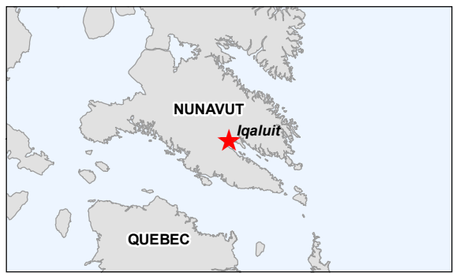
- Water Conveyance
- Minor Road
- Local Road

0 200 400 metres

1:15,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 19N
2. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation



Project Location
Iqaluit, NU

144902717

Prepared by ACampigotto on 2018-12-20
Technical Review by EBonhomme on 2018-12-20

Client/Project
CITY OF IQALUIT
Iqaluit Apex Water Supply
Iqaluit, NU

Figure No.
FFHMP APPENDIX-1

Title
Fish and Fish Habitat Monitoring Locations

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