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January 28, 2019

File: 19WA006

Attention: Jaida Ohokannoak
Technical Advisor II, Nunavut Impact Review Board
via email: johokannoak@nirb.ca

Attention: Jonathan Savoy
Manager, Nunavut Planning Commission
via email: jsavoy@nunavut.ca

Dear Ms. Ohokannoak and Mr. Savoy,

Reference: 19WA006 City of Iqaluit 2018 Temporary/Emergency Supplemental Water Supply

In 2018, the City of Iqaluit (the "City") received approval from the Nunavut Water Board to amend its water licence 3AM-IQA1626 to allow supplementation of its drinking water supply by withdrawing water from the Apex River.

This project was undertaken in response to an emergency, as indicated by Mr. Bennett in separate letters to the Nunavut Impact Review Board and Nunavut Planning Commission, and Nunavut Water Board on August 10, 2018, thus invoking the provisions of section 152 of the Nunavut Planning and Project Assessment Act (NUPPAA). The emergency supplementation project was completed on October 4, 2018. A total of 193,074 cubic metres of water were withdrawn from the Apex River and transferred to the Lake Geraldine water reservoir.

Section 152(2) of the NUPPAA requires the City to provide a report describing:
(a) All of the works or activities that have been undertaken or carried out in response the emergency referred to in paragraphs (1)(a), (b) or (c), as the case may be; and

(b) Any further works or activities required after the end of that emergency to complete the project or maintain a work referred to in paragraph (a).

The City is pleased to submit a report titled *"Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping – DFO Authorization Monitoring Report"* (Nunami Stantec 2019) in fulfillment of these requirements. It is further noted, that no further works or activities are required to completed or maintain the 2018 emergency supplementation project.

I trust this report will be conveyed to the Minister by the NPC or NIRB through an appropriate mechanism.

Regards,

Amy Elgersma
Acting Chief Administrative Officer
City of Iqaluit

Attachment: Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping – DFO Authorization Monitoring Report

cc. Josip Deronja, Colliers Project Leaders Erica Bonhomme, Nunami Stantec Ltc.

NUNAMI
STANTEC LIMITED

Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping – DFO Authorization Monitoring Report

January 2019

Prepared for:
City of Iqaluit
Iqaluit, Nunavut

Prepared by:
Nunami Stantec Limited
Rankin Inlet, Nunavut

Project Number: 144902717

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Abbreviations

m ..... metres
m^3/s ..... cubic metres per second
City ..... City of Iqaluit
DFO ..... Fisheries and Oceans Canada
MAD ..... Mean annual discharge
UTM ..... Universal Transverse Mercator
WSC ..... Water Survey of Canada

1 INTRODUCTION

In August/September 2018, the City of Iqaluit, Nunavut (the City) undertook an emergency water supply project whereby water from the Niaqunguk (Apex) River was withdrawn and conveyed to their Lake Geraldine reservoir to supplement the community's drinking water supply. Supplementation of the Lake Geraldine reservoir supply was considered necessary to provide sufficient water for the community through the 2018-2019 winter period, until spring freshet in 2019 replenishes the reservoir.

This report outlines the results of water withdrawal and environmental monitoring completed along the Niaqunguk River, during the supplementary pumping, to support the City's emergency *Fisheries Act* Authorization obtained from Fisheries and Oceans Canada (DFO) in advance of pumping.

1.1 Background

On August 16, 2018, Fisheries and Oceans Canada (DFO) issued to the City of Iqaluit (the City) a Paragraph 35(2)(b) *Fisheries Act* Authorization – Emergency Circumstances (DFO Authorization). The DFO Authorization was for the withdrawal of water from the Niaqunguk River for the purpose of supplementing the City's drinking water supply in the Lake Geraldine reservoir. At the time it was unknown whether withdrawal of water from the Niaqunguk River would exceed DFO's low risk criteria for Serious Harm: 10% of instantaneous flow when natural flow is at or above 30% of the mean annual discharge (MAD) and the likelihood of serious harm to fish. The emergency DFO Authorization included conditions for implementation of measures to avoid and mitigate serious harm to fish, monitoring and reporting.

Nunami Stantec Ltd. (Nunami) was contracted by the City to monitor and assess the potential risk for serious harm to Arctic charr (*Salvelinus alpinus*) related to the withdrawal of water from the Niaqunguk River. In particular, the potential existed for water levels in the Niaqunguk River, at and/or below the location of water withdrawal (herein referred to as the "study area"), to drop to a point where fish, if present, could become stranded or could lack sufficient water depth to overwinter. The Niaqunguk River is located approximately 1 km east of Iqaluit, Nunavut (Figure 1). The river is formed from numerous lower order streams and unnamed lakes to the north and east of Iqaluit, that combine into a main channel that flows from north to south, eventually draining into the Koojesse Inlet of Frobisher Bay.

A fish and fish habitat assessment conducted in 2016 (Nunami 2017) reported the presence of a resident population of Arctic charr in the Niaqunguk River study area, specifically the Swimming Lake area of the river. The presence of a permanent barrier at the outlet of the Niaqunguk River prevents anadromous Arctic charr from utilizing the river. This report provides results of the fall 2018 monitoring required under the emergency DFO Authorization.


Figure 1: Apex River Pumping Location (August/September 2018)
Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping - DFO Authorization Monitoring Report
Legend
IQA-10 SNP
Swimming Lake Area
WSC 10UH002
Lake Geraldine Reservoir
IQA-10 SNP
Iqaluit
Koojesse Inlet
WSC 10UH002
Apex
Google earth
© 2018 Google
Image © 2018 DigitalGlobe
N
1 km

2 NIAQUNGUK RIVER WATER WITHDRAWAL

Water withdrawal from the Niaqunguk River was conducted using two pumps (Pump A and Pump B) at the pumping location SNP IQA-10 (as per the City's Water Licence 3AM-IQA1626; UTM coordinates 525785 Easting, 7070476 Northing; see Figure 1). Pumps were housed in a screened cage to meet DFO's Freshwater Intake End-of-Pipe fish Screen Guidelines (DFO 1995).

3 FISH AND FISH HABITAT MONITORING PLAN

A Fish and Fish Habitat Monitoring Plan (Appendix A) was prepared to monitor the potential effects on fish and fish habitat due to the supplementary pumping of water from the Niaqunguk River in fall 2018. Monitoring included:

- Daily monitoring of pump rate, water withdrawal volumes and river discharge.
- Monitoring of potential fish stranding or mortality if water withdrawal (pump rate) exceeded 10% of instantaneous flow when natural flow is at or above 30% of the MAD.
- Fish rescue, if fish stranding was observed.
- Calculations of wetted width to be initiated at selected sites when water withdrawal exceeded 10% instantaneous flow.

4 PRE-PUMPING SURVEYS

Water level surveys were conducted on August 16 and 17, 2018, along the Niaqunguk River, before pumping began, to establish monitoring stations. Fish and fish habitat surveys were conducted along the Niaqunguk River between August 22 and 31, 2018 to further assess monitoring stations (Figure 2). Supplementary pumping from the Niaqunguk River began on August 19, 2018.

4.1 Water Level

Water level monitoring stations were established along the Niaqunguk River at six locations, including two stations upstream of the pumping location and four stations downstream of the pumping location (see Figure 2). At each station, stakes were installed to measure relative water levels before pumping began, and during pumping if the water withdrawal rate exceeded 10% of instantaneous flow. From the pre-pumping water levels, estimated water level at 30% of MAD were then calculated for each monitoring station. Pre-pumping water levels, and calculated 30% MAD water levels, relative to the top of installed stakes, are outlined in Table 1.

4.2 Fish Habitat

The fish habitat survey included wetted width, depth, substrate composition and general site description at nine sites along the Niaqunguk River, including the six water level stations. At the time of the fish habitat surveys, water levels in Niaqunguk River had been influenced by recent precipitation events that resulted in water overflowing the banks and extending into the vegetated riparian areas. Results of the survey are provided in Table 1.

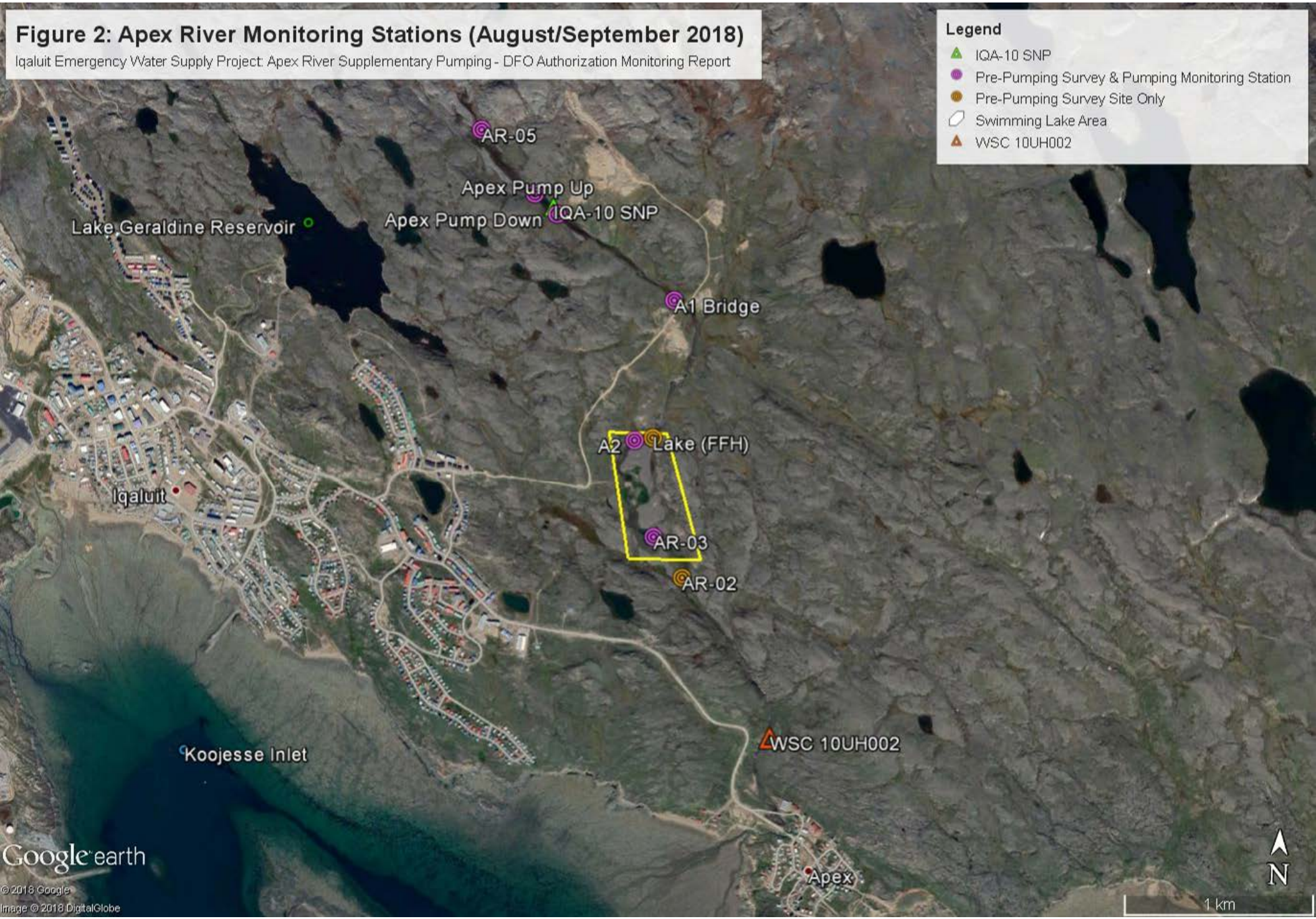
Figure 2: Apex River Monitoring Stations (August/September 2018)
Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping - DFO Authorization Monitoring Report
Legend
IQA-10 SNP
Pre-Pumping Survey & Pumping Monitoring Station
Pre-Pumping Survey Site Only
Swimming Lake Area
WSC 10UH002
AR-05
Apex Pump Up
Apex Pump Down
IQA-10 SNP
Lake Geraldine Reservoir
A1 Bridge
A2
Lake (FFH)
Iqaluit
AR-03
AR-02
WSC 10UH002
Koojesse Inlet
Apex
Google earth
© 2018 Google
Image © 2018 DigitalGlobe
N
1 km

Table 1: Pre-Pumping Water Levels and Fish and Fish Habitat Characteristics at Niaqunguk River Monitoring Stations[1]

Site ID	UTM Coordinates		Site Description and Channel Characteristics	Pre-Pumping Water Level (m)[2]	30% MAD Water Level (m)[2]	Channel Width (m)	Wetted Width (m)	Maximum Depth (m)	Substrate	Incidental Observations	Carried into Pumping Monitoring Program?
	Easting	Northing									
AR-05 (Hydro 1)	525421	7070859	Approximately 400 m above the pool where pumping will occur. Transition area from a riffle (upstream) to a run (downstream).	RS: 0.261 LS: 0.386	RS: 0.441 LS: 0.566	20	7.9	0.90	75% large angular boulders and rocks with deep interstitial spaces. 25% large rounded rocks with large interstitial spaces. There is 0% embeddedness, and the substrate is prone to movement.	Excellent water clarity. No fish observed. No aquatic invertebrates observed.	Yes
Apex Pump Up	525718	7070532	The head of the pool from which the water is being drawn. The site is immediately below a riffle.	RS: 0.456 LS: 0.302	RS: 0.536 LS: 0.382	40	28.6	0.45	80% large rounded rocks, with 20% large rounded boulders. 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.	Excellent water clarity. No fish observed. No aquatic invertebrates observed.	Yes
Apex Pump Location (SNP IQA-10)	525785	7070476	Approximately half-way between the head (Up) and the tail (Down) of the pool	—	—	55	—	≤ 2.0	Not assessed as this was an active construction site and water too deep to wade.	Not assessed as this was an active construction site and water too deep to wade.	No
Apex Pump Down	525841	7070429	The tail end of the pool from which the water is being drawn. The site is the transition zone at which the pool becomes a riffle.	RS: 0.358 LS: 0.380	RS: 0.478 LS: 0.500	49	32.5	0.40	95% large rounded rocks, with 5% large rounded boulders. 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.	Excellent water clarity. No fish observed. No aquatic invertebrates observed.	Yes
A1 Bridge	526480	7070000	The site is the transition zone at which a riffle (upstream) becomes a deeper run.	RS: 0.120 LS: 0.170	RS: 0.325 LS: 0.375	27	13.5	1.1	A mix of large angular boulders (25%), rounded boulders (25%), large rounded rocks (25%) and sand (25%). The sand is distributed equally across the channel and at such depth such there is ≥50% embeddedness of boulders and rocks and little to no interstitial spacing.	Excellent water clarity. No fish observed. No aquatic invertebrates observed.	Yes
Lake (FFH)	526397	7069268	Approximately 60 m upstream of A2. This is the deepest pool in the Study Area and is located immediately downstream of a 100 m stretch of cascades and falls carved through the bedrock in a narrow gorge.	—	—	40	—	> 2	Northern half of the pool is predominantly bedrock with rock, cobble, and gravel comprising the bottom substrate in the southern half and in the deeper areas.	Excellent water clarity. No fish observed. No aquatic invertebrates observed. Arctic charr were observed here in 2016. The cascades/falls upstream of the Swimming Lake may pose a barrier to the upstream passage of fish.	No
A2	526300	7069250	Riffle	RS: 0.279 LS: 0.328	RS: 0.484 LS: 0.533	24	14.8	0.42	95% rounded rocks, with 5% large rounded boulders. 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.	Excellent water clarity. No fish observed. No aquatic invertebrates observed. Arctic charr were captured here in 2016.	Yes
AR-03	526422	7068738	The tail end of a pool just upstream of where the river transitions into a run.	RS: 0.349 LS: 0.163	RS: 0.569 LS: 0.383	27	15.8	1.0	80% rounded rocks, 10% rounded cobble, and 10% sand. 25% embeddedness with little to no interstitial spaces.	Excellent water clarity. No fish observed. No aquatic invertebrates observed.	Yes
AR-02 (Lower Reach)	526869 (up) 527028 (down)	7068178 (up) 7067177 (down)	Predominantly a fast-flowing run through a narrow gorge with series of cascades.	—	—	8 to 35	—	1.4	80% bedrock, 20% large rock. Little to no interstitial spaces. There is a vertical drop of ≥1.5 m in height located just downstream of the bridge on Niaqunnusiariaq Road.	Excellent water clarity. No fish observed. No aquatic invertebrates observed. Vertical drop near outlet could pose barrier to upstream passage of fish.	No

NOTES:
1. — = not measured
2. Water levels provided as distance from top of stake to water level in metres for stake on right bank (RS) and stake on left bank (LS); pre-pumping water levels measured August 16 or 17, 2018

4.3 Fish Surveys

A Smith-Root LR-24 electrofisher was used to survey seven monitoring stations (see Table 2 and Figure 2) in the study area for the presence of fish on August 24, 2018. A small mesh (6 mm) dip net was used to allow for the capture of small-bodied fish (e.g., sticklebacks) that may also be present as well as invertebrates that may have been incidentally dislodged during electrofishing. Water clarity was excellent at each of the seven survey sites and overcast skies at the time of the survey reduced water surface glare that could otherwise impede the ability of the electrofisher operator to spot fish. Water levels were elevated on the day electrofishing was conducted due to recent precipitation events (e.g., 9.4 mm rain on August 23, 2018; ECCC 2018).

Table 2: Electrofishing results for Niaqunguk River, Iqaluit, Nunavut, August 24, 2018

Location	Start Time	Weather	Operator(s)	Voltage	Run Time (Seconds)	Results
AR-05	08h52	Overcast	T. Vickers I. Freda	585	194	No fish captured or observed No invertebrates captured or observed
Apex Pump Up	09h27	Overcast	T. Vickers I. Freda	585 to 600	184	No fish captured or observed No invertebrates captured or observed
Apex Pump Down	09h42	Overcast	T. Vickers I. Freda	640	129	No fish captured or observed No invertebrates captured or observed
A1 Bridge	10h04	Overcast	T. Vickers I. Freda	505	114	No fish captured or observed No invertebrates captured or observed
A2	10h23	Overcast	T. Vickers I. Freda	605	70	No fish captured or observed No invertebrates captured or observed
AR-03	10h41	Overcast	T. Vickers I. Freda	450	167	No fish captured or observed No invertebrates captured or observed
AR-02	10h52	Overcast	T. Vickers I. Freda	530	106	No fish captured or observed No invertebrates captured or observed

No fish or invertebrates were captured or observed at the seven sites surveyed. The highwater levels that followed recent rainfalls could have decreased the efficacy of electrofishing.

Sampling for environmental DNA (eDNA) was conducted on August 29 and 30, -2018 at six of the seven sites selected for electrofishing using a portable eDNA backpack sampler; site AR-03 was not sampled. A sample was also collected from the Sylvia Grinnell River (see Figure 2) to serve as a positive control since Arctic charr were known to be in the river at the time. A negative control and post-positive negative control were also sampled to assess the sampling protocols, including decontamination techniques.

Established protocols for the sampling of eDNA in the field were unsuccessful because the 5 µm pore filters that collect the eDNA were inadvertently discarded, and only the pre-filters were retained for analysis. Analyses of these pre-filters by Precision Biomonitoring (Guelph, ON) did not produce evidence of eDNA in the Niaqunguk River locations nor in the positive control from the Sylvia Grinnell River and results could not be relied upon. During the survey, a local Elder indicated that there are fish throughout the Niaqunguk River system (Mary Ellen Thomas, personal communication) although she did not specify the species.

5 WATER WITHDRAWAL MONITORING

Water withdrawal at SNP IQA-10 began on August 19, 2018, using Pump A while water withdrawal began on August 20, 2018, using Pump B. Pump A was shut down on September 12, 2018, and Pump B was shut down on September 16, 2018, and no water withdrawal occurred after this date. Water withdrawal from both pumps was continuous from start-up to shut down, though pump time varied daily. In total, there were 10 days where the cumulative water withdrawal rate (from both Pump A and Pump B) exceeded the 10% instantaneous flow threshold, which was measured as the scaled 24-hour discharge at the pumping location SNP IQA-10 (see Table 3). Water levels did not fall below the calculated 30% MAD water levels at five monitoring stations (one upstream and four downstream of the pump) over the pumping period. Water levels did fall below the calculated 30% MAD water level at one upstream monitoring station (Apex Pump Up, left bank only). Daily water withdrawal and environmental monitoring records are provided in Appendix B. Plots of monitoring station relative water levels with the 30% MAD water levels are provided in Appendix C.

Table 3: Pumping Days and Pump Rate that Exceeded the 10% Instantaneous Flow Threshold

Pumping Date (2018)	Estimated Average Pump Rate (m^3/s)[1]	24-hour Discharge at Pumping Site (SNP IQA-10) (m^3/s)[2]	% Average Pump Rate of 24-Hour Discharge at Pumping Site
August 30	0.092	0.814	11.34
August 31	0.092	0.736	12.55
September 6	0.093	0.828	11.19
September 7	0.090	0.745	12.12
September 8	0.091	0.670	13.62
September 9	0.093	0.623	14.87
September 10	0.093	0.658	14.06
September 11	0.092	0.591	15.62
September 12	0.093	0.529	17.64
September 15	0.050	0.481	10.38

NOTES:
1. Estimated average pump rate is the cumulative rate for Pump A and Pump B on each day, except September 15 which is for Pump B only (Pump A shut down September 12)
2. 24-hour discharge at the pumping site (SNP IQA-10) scaled from the Water Survey of Canada Station 10UH002 located near the Apex River mouth; scaled discharge accounts for daily withdrawals.

Monitoring for potential fish stranding of stations downstream of the pump location was conducted when there was an exceedance in water withdrawal rate above the 10% instantaneous flow and one week after pumping ceased (see Appendix B for daily monitoring records). Monitoring of stations occurred daily from September 1 to September 17, 2018, and a final time on September 24, 2018. No fish were observed during any of the daily monitoring, nor were any isolated pools where stranding would likely occur. Given the overall reduction in water levels at each monitoring station over the monitoring period.

At the six monitoring stations where the wetted width was calculated, a reduction in wetted width was observed both upstream and downstream of the pumping location during water withdrawal in September, except at the monitoring station immediately downstream of the pumping site (Table 4). Station AR-05 upstream o the pumping site had a loss of wetted width of 6-8%, likely due natural flow conditions during the fall. Stations downstream of the pumping site, except the station immediately downstream of the pumping site had approximate reductions in wetted width between 8 – 14%. This reduction can be likely be attributed to three factors; natural flow conditions as observed upstream of the pumping station, the low slope and shallow depth at the downstream stations and water withdrawal. Although wetted width was reduced at monitoring stations within the Swimming Lake area (i.e., A2 and AR-02; see Figure 2), where Arctic charr were previously observed, water levels remained relatively consistent from September 9 through to September 17, and on the final monitoring date of September 24 (see plots in Appendix C). Throughout the monitoring period water flows continued through the main channel of the Niaqunguk River.

Table 4: Wetted Widths Calculated at Monitoring Stations on the Niaqunguk River

Date	AR-05 (u/s pump) Wetted Width (m)	PUMP (u/s pump) Wetted Width (m)	PUMP (d/s pump) Wetted Width (m)	A1 (u/s bridge) Wetted Width (m)	A2 (u/s Swim Lk) Wetted Width (m)	AR-02 (d/s Swim Lk) Wetted Width (m)
8/16/2018	12.10	34.50	45.90	n/m	n/m	n/m
8/17/2018	n/m	n/m	n/m	24.40	22.30	25.50
9/1/2018	12.10	35.10	48.10	22.70	22.20	25.50
9/2/2018	12.60	36.00	49.30	24.20	22.30	25.90
9/3/2018	11.90	35.10	48.10	22.70	22.20	25.00
9/4/2018	11.50	34.80	48.10	22.60	21.90	24.20
9/5/2018	11.40	34.50	47.80	22.60	21.90	23.90
9/6/2018	11.40	34.30	47.10	22.50	20.70	23.50
9/7/2018	11.40	34.00	47.10	22.50	20.20	23.20
9/8/2018	11.30	33.70	46.80	22.50	20.20	22.90
9/9/2018	11.30	33.70	46.50	22.40	19.90	22.60
9/10/2018	11.30	33.50	46.80	22.40	20.20	22.90
9/11/2018	11.30	33.50	46.50	22.40	19.90	22.60
9/12/2018	11.30	33.50	46.50	22.40	19.90	22.60
9/13/2018	11.30	33.20	46.20	22.40	19.50	22.60
9/14/2018	11.10	33.20	45.90	22.40	19.50	22.60
9/15/2018	11.10	33.20	45.90	22.40	19.50	22.60
9/16/2018	11.10	32.90	45.90	22.40	19.50	22.60
9/17/2018	11.10	32.90	45.90	22.40	19.20	22.60
9/24/2018	11.40	34.50	47.40	22.40	19.20	22.90

NOTE:
n/m = no measurement

6 DISCUSSION

Supplemental water withdrawal from the Niaqunguk River was conducted over 29 days from August 19 to September 12, 2018. No fish were observed at the pumping location SNP IQA-10 over the pumping duration. There were 10 days in which water withdrawal rate exceeded the 10% threshold of instantaneous flow, measured as the scaled 24-hour discharge at SNP IQA-10. These water withdrawals ranged from 10.38 to 17.64% of instantaneous flow. Water levels did not fall below the calculated 30% MAD water levels at most monitoring stations over the pumping duration, with the exception of one station upstream of the pump location. This may be due to less flow inputs into the river further upstream.

A resident population of Arctic charr has been reported in the Niaqunguk River in the Swimming Lake area (Nunami 2017). A waterfall at the mouth of the Niaqunguk River provides a barrier for anadromous charr to use the river for upstream migration. Several pools downstream of the SNP IQA-10 pumping location, locally referred to as lakes (e.g., Swimming Lake), may provide overwintering habitat for this resident population of Arctic charr (Nunami 2017). It is unknown if water depth in these pools were ultimately decreased due to the supplemental water withdrawal, however. Flow in the Niaqunguk River would be expected to return to natural levels shortly after the cessation of water withdrawal and these pools/overwintering areas would be recharged.

Reductions in wetted width occurred both upstream and downstream of the pumping site. Changes in wetted width is a naturally occurring function related to many different parameters including precipitation events, seasonal cooler temperatures, bank slope, river bed morphology and water depth. It is unknown how much of wetted width was reduced through water withdrawal however at least a portion of this reduction would be due to natural conditions. The loss of wetted width at downstream station locations is unlikely to have significant effects on fish as ample and higher quality habitat still existed. Before freeze-up the Niaqunguk River would have resumed its natural flow and depth patters for that time of year.

No stranding or mortality of fish were observed during the pumping duration. Decreases in wetted width observed were near the shallow banks of the river likely provide marginal habitat for the resident population of charr due to a lack of cover. Flows continued in the main channel of the Niaqunguk River during the period of supplemental water withdrawal.

Potential effects to fish and fish habitat, if any, were temporary and of low magnitude. It is unlikely that water withdrawal from the Niaqunguk River resulted in serious harm to fish.

7 LIMITATIONS

This document titled Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping – DFO Authorization Monitoring Report was prepared by Nunami Stantec Ltd. ("Nunami") for the account of the City of Iqaluit (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Nunami's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Nunami 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 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 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 results from water withdrawal and environmental monitoring during the supplementary pumping from the Apex River in August/September 2018. The report was prepared to support the City's emergency *Fisheries Act* Authorization, obtained in advance of pumping. The report may not be relied upon by any other person or entity, other than for its intended purposes, with the express written consent of Nunami Stantec Ltd. and the City. Any use of this report by a third party, or any reliance on decisions made based upon it, are the responsibility of such third parties.

The information provided in this report was compiled from existing documents and data provided by the City, and by field data compiled by Nunami Stantec Ltd. This report represents the best professional judgement of our personnel available at the time of its preparation. Nunami Stantec Ltd. reserves the right to modify the contents of this report, in whole or in part, to reflect any new information that becomes available. If any conditions become apparent that differ significantly from our understanding of conditions presented in this report, we requested that we be notified immediately to reassess the conclusions provided herein.

Respectfully Submitted,

NUNAMI STANTEC LIMITED

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Mary Ellen Thomas, Arctic College, Nunavut Research Institute, personal communication, December 10, 2018.

Nunami Stantec Ltd. (Nunami). 2017. Fish and Fish Habitat Assessment of the Niaqunguk (Apex) River, Lake Geraldine, and the Lake Geraldine Draining Channel. Project No. 144930051.

APPENDIX A

Apex River Supplementary Pumping 2018:

Fish and Fish Habitat Monitoring Plan

NUNAMI STANTEC

APEX RIVER SUPPLEMENTARY PUMPING 2018: FISH AND FISH HABITAT MONITORING PLAN - Rev0

INTRODUCTION

On August 16, 2018, Fisheries and Oceans Canada issued a Paragraph 35(2)(b) Fisheries Act Authorization – Emergency Circumstances (DFO Authorization) to the City of Iqaluit (City). The DFO Authorization is for the emergency withdrawal of water from the Niaqunguk (Apex) River for the purpose of supplementing the City's drinking water supply at Lake Geraldine from August 14 to October 30, 2018. The withdrawal of water from the Apex River may exceed DFO's low risk criteria for Serious Harm: 10% of instantaneous flow when natural flow is at or above 30% of the mean annual discharge (MAD).

The DFO Authorization includes conditions for implementation of measures to avoid and mitigate serious harm to fish; monitoring and reporting; and, offsetting serious harm to fish.

MONITORING REQUIREMENTS

Monitoring of fish and fish habitat will be undertaken when water withdrawals exceed the low risk criteria as required in section 3.1.2 of the DFO Authorization. Table 1 summarizes monitoring locations and parameters. Locations are shown in Appendix 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 (scaled from 10UH002)	Daily	Monitor daily pump rate and river flow/discharge in relation to DFO low risk criteria, and in accordance with Water Licence 3AM-IQA1626
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
Exceedance of Low Risk Criteria						
AR-05	Upstream (540 m) of pump location	525408	7070814	Wetted width Water Level/Depth Habitat Conditions Fish Presence	Daily	Monitor natural inflowing conditions, upstream of pumping location
AR-06	Immediately upstream	525712	7070535	Wetted width Water Level/Depth	Daily	Monitor natural inflowing conditions,

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			
	(125 m) of pump location			Habitat Conditions Fish Presence		immediately upstream of pumping location
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
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-03	Downstream of pumping location, at the downstream end of a pool within the Swimming Lake area				Daily	Observe fish habitat conditions and fish presence downstream of pumping location and within the Swimming Lake area
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

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

A monitoring station for water level/depth, was also planned within the downstream-most pool of the Swimming Lake area (proposed as AR-03). During the pre-pumping survey, it was determined that this station was not a suitable location for fish habitat or flow data, and water depth at the station limited access. However, given the on-site conditions, monitoring at AR-02, immediately downstream of the Swimming Lake area, will provide an indication of potential changes in water level within the Swimming Lake area.

MONITORING PROCEDURES

PRE-PUMPING MONITORING

Prior to pumping, flow/discharge and water level measurements were collected, and channel profiles established, to identify pre-pumping baseline conditions at each of the above-noted stations in Table 1. 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. Pre-pumping flow measurements at each of these stations are provided in Appendix B.

Fish and fish habitat conditions were also assessed at each of these stations, as well as fish presence via electro-fishing. No fish were caught at these monitoring stations via electrofisher. Environmental DNA (eDNA) sampling is planned to be undertaken as a measure to confirm fish (Salvelinus alpinus) presence/absence. As of the date of this plan, eDNA sampling has not been completed. A summary of recorded pre-pumping habitat conditions is provided in Appendix C.

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 (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 the WSC station 10UH002 (Apex River) will also be monitored daily to scale river discharge to the IQA-10 pump location. These parameters are monitored for compliance with Water Licence

3AM-IQA1626 and to evaluate pump rate in relation to river discharge and the low risk criteria, as outlined in the DFO Authorization.

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

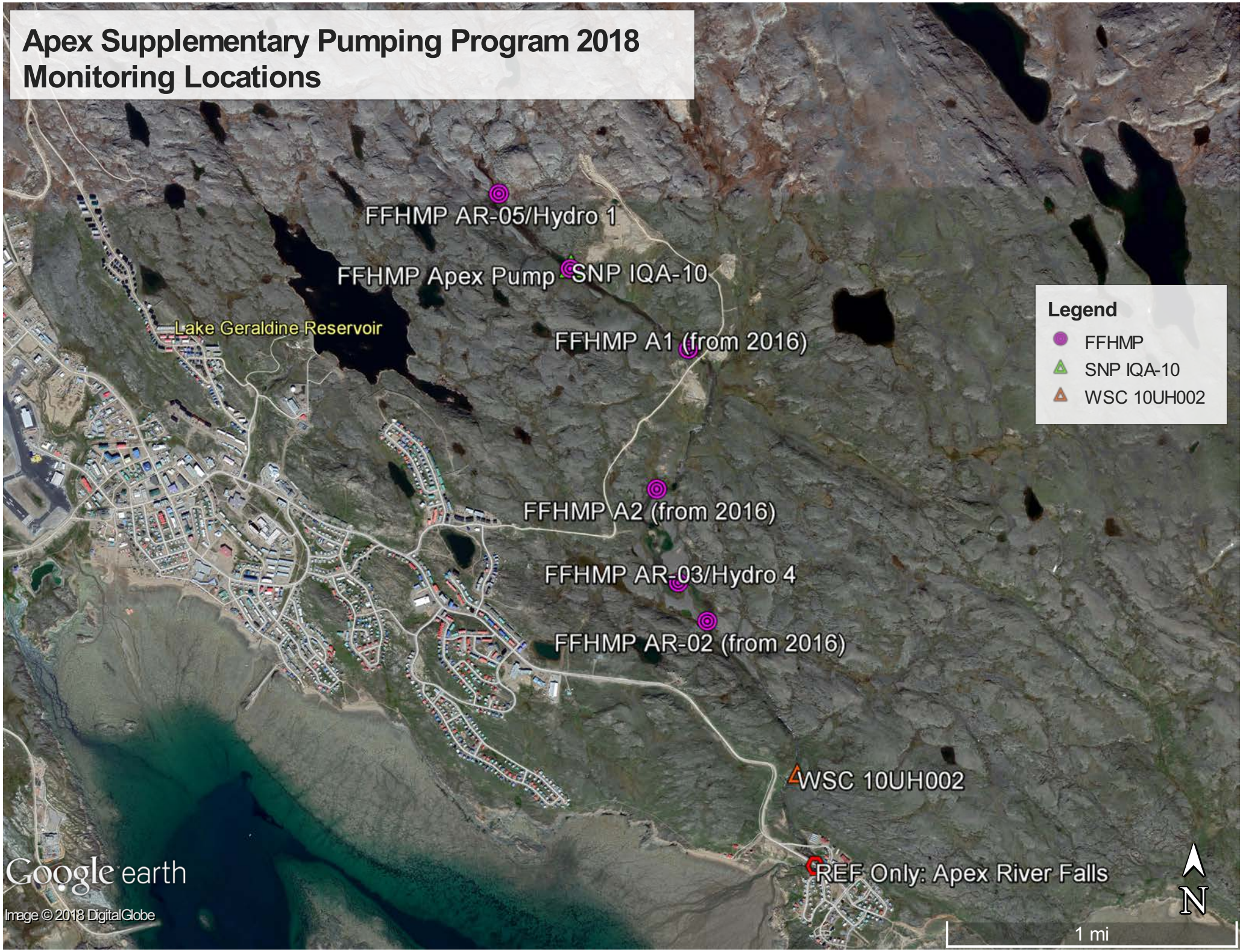
Daily monitoring reports will be prepared and uploaded to the secure Project FTP site, which will be made available for review.

When exceedance of the low risk criteria is near, Nunami 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 by December 31, 2018.

APPENDIX A: MONITORING STATION LOCATIONS


Apex Supplementary Pumping Program 2018
Monitoring Locations
FFHMP AR-05/Hydro 1
FFHMP Apex Pump
SNP IQA-10
Lake Geraldine Reservoir
FFHMP A1 (from 2016)
FFHMP A2 (from 2016)
FFHMP AR-03/Hydro 4
FFHMP AR-02 (from 2016)
WSC 10UH002
REF Only: Apex River Falls
Legend
FFHMP
SNP IQA-10
WSC 10UH002
Google earth
Image © 2018 DigitalGlobe
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APPENDIX B: PRE-PUMPING FLOW DATA FOR APEX RIVER MONITORING STATIONS

Table 2: Pre-pumping Flow Measurements at Apex River Monitoring Stations (August 2018)

Station ID	Date/Time	Measured Flow (Q) (m^3/s)	Flow (Q) at WSC 10UH002 (m^3/s)	Station-WSC 10UH002 Relation-ship (%)	Slope	30% Mean Annual Discharge (MAD)	Wetted Width (m)	Surveyed Water Level Elevation (m)	Top of Stake to Water Level (m)	30% MAD (Est.)[1]	
										Water Level Elevation (m)	Top of Stake to Water Level (m)
AR-05	16-Aug-18 12:00	0.307	1.56	20	0.0035	0.071	7.85	499.30	0.261	499.12	0.441
AR-06	16-Aug-18 17:00	1.168	1.53	76	0.0052	0.275	28.6	397.02	0.302	396.94	0.382
SNP IQA-10	—	—	—	73[a]	—	0.261	—	—	—	—	—
AR-07	16-Aug-18 18:30	1.101	1.60	69	0.0054	0.248	32.5	396.92	0.380	396.80	0.500
A1	17-Aug-18 9:00	1.572	2.37	66	0.0015	0.239	13.5	299.79	0.170	299.59	0.375
A2	17-Aug-18 12:00	2.463	2.4	103	0.0067	0.369	14.8	599.86	0.328	599.66	0.533
AR-02	17-Aug-18 19:00	2.410	2.42	100	0.0046	0.358	15.8	699.76	0.163	699.54	0.383

Notes:

a. Relationship of monitoring station SNP IQA-10 (Apex Pump Location) to WSC Station 10UH002 is average of relationship at AR-06 (immediately upstream of pump) and AR-07 (immediately downstream of pump)

1. Estimates provided for water level elevation and distance from top of gauge stake to water level at 30% mean annual discharge (MAD)

NUNAMI STANTEC

APPENDIX C: PRE-PUMPING FISH HABITAT DATA FOR APEX RIVER MONITORING STATIONS

Table 3: Pre-pumping Fish Habitat Conditions at Apex River Monitoring Stations (August 2018)

Station ID	Maximum Water Depth (m)	Watercourse Characteristics	Substrate Characteristics
AR-05	0.90	Immediately downstream end of a riffle as it transitions into a run. Water has high clarity even after 24 hours of rainfall.	75% large angular boulders and rocks with deep interstitial spaces 25% large rounded rocks with large interstitial spaces 0% embeddedness, and the substrate is prone to movement
AR-06	0.45	The head of the pool from which the supplemental water is being drawn. The station is immediately below a riffle. Water has high clarity even after 24 hours of rainfall.	80% large rounded rocks, with 20% large rounded boulders 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.
AR-07	0.40	The tail end of the pool from which the supplemental water is being drawn. The station is the transition zone at which the pool becomes a riffle. Water has high clarity even after 24 hours of rainfall. No indication of sediment from construction or pumping activities.	95% large rounded rocks, with 5% large rounded boulders 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.
A1	1.1	At the transition zone at which a riffle (upstream) becomes a deeper run. Water has high clarity even after 24 hours of rainfall.	A mix of large angular boulders (25%), rounded boulders (25%), large rounded rocks (25%) and sand (25%). The sand is distributed equally across the channel and at such depth that there is ≥50% embeddedness of boulders and rocks with little to no interstitial spacing.
A2	0.40	This location is a riffle. Water had elevated levels of suspended solids after 24 hours of rainfall. Suspended solids were entering Apex River from two tributaries that join with Apex approximately 130 m downstream of Site A1.	95% rounded rocks, with 5% large rounded boulders 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.
AR-03	1.0	The tail end of a Swimming Lake pool just upstream of where the river transitions into a run. Water had elevated levels of suspended solids after 24 hours of rainfall.	80% rounded rocks, 10% rounded cobble, and 10% sand 25% embeddedness with little to no interstitial spaces.
AR-02	0.50	The tail end of a run just upstream of where the river transitions into a riffle. Water had elevated levels of suspended solids after 24 hours of rainfall.	40% rounded boulders, 40% large rounded rocks, 10% cobble, and 10% sand 10% embeddedness with small interstitial spacing.

APPENDIX B

Daily Monitoring Records

UPPER APEX IQA-10 - Daily Pumping Record
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	20-Aug-18	[enter value]
Time Completed	1:18 PM	[enter value]
Prepared by	Andrea Kneale	[enter name]
Date of Pumping Record Summary	19-Aug-18	[enter value]
Date and Time Updated	27-Aug-18	[enter value]

Pump Rate

Average Estimated Pump Rate for Pump A (L/s)	45	[enter value]
Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
Total Averaged Estimated Pump Rate (m3/s)	0.094	

Pump Volume

Pumping Time for Pump A (minutes)	540	[enter value]
Pumping Time for Pump B (minutes)	0	[enter value]
Daily Pump Volume Withdrawn (m3)	1,472	
Cumulative Pump Volume Withdrawn (m3)	1,472	

**Cumulative Volume (m3) Withdrawn Before 19-Aug-18 = 0

Lake Geraldine

24hrs level at WSC 10UH013 (m)	110.29	[enter value]
Estimated volume available (m3)	308,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)

7.64

24hrs flow at WSC 10UH002 (m3/s)	1.61	[enter value]
24hrs flow at Apex IQA-10 (m3/s)	1.24	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump rate verified August 23, 2018, following testing to confirm flow meter functionality
- pumping times verified August 27, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed (UPDATE)	27-Aug-18
Time Completed	1:18 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	19-Aug-18

% IF: 7.64 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.235 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	21-Aug-18	[enter value]	
Time Completed	3:53 PM	[enter value]	
Prepared by	Andrea Kneale	[enter name]	
Date of Pumping Record Summary	20-Aug-18	[enter value]	
Date and Time Updated	27-Aug-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	45	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.095	
Pump Volume	Pumping Time for Pump A (minutes)	1,140	[enter value]
	Pumping Time for Pump B (minutes)	360	[enter value]
	Daily Pump Volume Withdrawn (m3)	4,178	
	Cumulative Pump Volume Withdrawn (m3)	5,650	

**Cumulative Volume (m3) Withdrawn Before 20-Aug-18 = 1,472

Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.32	[enter value]
	Estimated volume available (m3)	308,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.82	[enter value]
6.84	24hrs flow at Apex IQA-10 (m3/s)	1.39	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump rate verified August 23, 2018, following testing to confirm flow meter functionality
- pumping times verified August 27, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed (UPDATE)	27-Aug-18
Time Completed	3:53 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	20-Aug-18

% IF: 6.84 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.39 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	22-Aug-18	[enter value]	
Time Completed	8:27 AM	[enter value]	
Prepared by	Andrea Kneale	[enter name]	
Date of Pumping Record Summary	21-Aug-18	[enter value]	
Date and Time Updated	27-Aug-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	45	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.095	
Pump Volume	Pumping Time for Pump A (minutes)	750	[enter value]
	Pumping Time for Pump B (minutes)	810	[enter value]
	Daily Pump Volume Withdrawn (m3)	4,454	
	Cumulative Pump Volume Withdrawn (m3)	10,104	

**Cumulative Volume (m3) Withdrawn Before 21-Aug-18 = 5,650

Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.35	[enter value]
	Estimated volume available (m3)	294,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.83	[enter value]
6.79	24hrs flow at Apex IQA-10 (m3/s)	1.40	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump rate verified August 23, 2018, following testing to confirm flow meter functionality
- pumping times verified August 27, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed (UPDATE)	27-Aug-18
Time Completed	8:27 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	21-Aug-18

% IF: 6.79 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.40 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	23-Aug-18	[enter value]	
Time Completed	2:12 PM	[enter value]	
Prepared by	Andrea Kneale	[enter name]	
Date of Pumping Record Summary	23-Aug-18	[enter value]	
Date and Time Updated	27-Aug-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	45	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.095	
Pump Volume	Pumping Time for Pump A (minutes)	645	[enter value]
	Pumping Time for Pump B (minutes)	1,380	[enter value]
	Daily Pump Volume Withdrawn (m3)	5,864	
	Cumulative Pump Volume Withdrawn (m3)	23,278	

**Cumulative Volume (m3) Withdrawn Before 23-Aug-18 = 17,414

Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.42	[enter value]
	Estimated volume available (m3)	280,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.65	[enter value]
7.48	24hrs flow at Apex IQA-10 (m3/s)	1.27	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump rate verified August 23, 2018, following testing to confirm flow meter functionality
- pumping times verified August 27, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed (UPDATE)	27-Aug-18
Time Completed	2:12 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	23-Aug-18

% IF: 7.48 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.27 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	23-Aug-18	[enter value]	
Time Completed	9:08 AM	[enter value]	
Prepared by	Andrea Kneale	[enter name]	
Date of Pumping Record Summary	22-Aug-18	[enter value]	
Date and Time Updated	27-Aug-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	45	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.095	

Pump Volume	Pumping Time for Pump A (minutes)	1,110	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,310	
	Cumulative Pump Volume Withdrawn (m3)	17,414	

**Cumulative Volume (m3) Withdrawn Before 22-Aug-18 = 10,104

Lake Geraldine	24hrs level at WSC 10UH013 (m)	10.39	[enter value]
	Estimated volume available (m3)	280,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.59	[enter value]
7.72	24hrs flow at Apex IQA-10 (m3/s)	1.23	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump rate verified August 23, 2018, following testing to confirm flow meter functionality
- pumping times verified August 27, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed (UPDATE)	27-Aug-18
Time Completed	9:08 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	22-Aug-18

% IF: 7.72 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.23 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		27-Aug-18	[enter value]
Time Completed		9:00 AM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		24-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.093	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,992	
	Cumulative Pump Volume Withdrawn (m3)	31,270	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.49	[enter value]
	Estimated volume available (m3)	250,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	3.09	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	2.31	[enter value]

**Cumulative Volume (m3) Withdrawn Before 24-Aug-18 = 23,278

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
4.00

IF > 10 → **NOTIFY STANTEC** [enter name]
PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	27-Aug-18
Time Completed	9:00 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	24-Aug-18

% IF: 4.00 **24-hr Flow at IQA-10 (vs. 30% MAD):** 2.31 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		27-Aug-18	[enter value]
Time Completed		9:42 AM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		25-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.093	
Pump Volume	Pumping Time for Pump A (minutes)	1,380	[enter value]
	Pumping Time for Pump B (minutes)	1,380	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,659	
	Cumulative Pump Volume Withdrawn (m3)	38,929	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.56	[enter value]
	Estimated volume available (m3)	230,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	2.80	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	2.10	[enter value]
4.40			
IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 25-Aug-18 = 31,270

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	27-Aug-18
Time Completed	9:42 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	25-Aug-18

% IF: 4.40 **24-hr Flow at IQA-10 (vs. 30% MAD):** 2.10 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		27-Aug-18	[enter value]
Time Completed		9:49 AM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		26-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.093	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,992	
	Cumulative Pump Volume Withdrawn (m3)	46,921	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.61	[enter value]
	Estimated volume available (m3)	210,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	2.18	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	1.65	[enter value]

**Cumulative Volume (m3) Withdrawn Before 26-Aug-18 = 38,929

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
5.61

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	27-Aug-18
Time Completed	9:49 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	26-Aug-18

% IF: 5.61 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.65 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		28-Aug-18	[enter value]
Time Completed		1:53 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		27-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	48	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,954	
	Cumulative Pump Volume Withdrawn (m3)	54,875	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.66	[enter value]
	Estimated volume available (m3)	200,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	1.68	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	1.29	[enter value]

**Cumulative Volume (m3) Withdrawn Before 27-Aug-18 = 46,921

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
7.16

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	28-Aug-18
Time Completed	1:53 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	27-Aug-18

% IF: 7.16 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.29 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		30-Aug-18	[enter value]
Time Completed		9:25 AM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		28-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	48	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,972	
	Cumulative Pump Volume Withdrawn (m3)	62,847	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.70	[enter value]
	Estimated volume available (m3)	190,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	1.45	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	1.05	[enter value]

**Cumulative Volume (m3) Withdrawn Before 28-Aug-18 = 54,875

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
8.79

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	30-Aug-18
Time Completed	9:25 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	28-Aug-18

% IF: 8.79 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.05 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	31-Aug-18	[enter value]	
Time Completed	2:25 PM	[enter value]	
Prepared by	Andrea Kneale	[enter name]	
Date of Pumping Record Summary	29-Aug-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	48	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	

Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,961	
	Cumulative Pump Volume Withdrawn (m3)	70,807	

**Cumulative Volume (m3) Withdrawn Before 29-Aug-18 = 62,847

Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.73	[enter value]
	Estimated volume available (m3)	180,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	1.19	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.94	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
9.85

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	31-Aug-18
Time Completed	2:25 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	29-Aug-18

% IF: 9.85 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.94 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Sep-18	[enter value]
Time Completed		4:24 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		31-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,974	
	Cumulative Pump Volume Withdrawn (m3)	86,424	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.78	[enter value]
	Estimated volume available (m3)	160,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	0.92	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.74	[enter value]

% Instantaneous Flow (IF) — 12.55

IF > 10 → **NOTIFY STANTEC** — Andrea Kneale [enter name]; **PUMP RATE REDUCED (IF APPLICABLE)** — [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10 — 0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** — [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

**Cumulative Volume (m3) Withdrawn Before 31-Aug-18 = 78,449

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
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Date Completed	4-Sep-18
Time Completed	4:24 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	31-Aug-18

% IF: 12.55 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.74 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☑ NO, Other (provide reason): monitoring started 01-Sep-18

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS								
u/s pump	LS								
PUMP	RS								
u/s pump	LS								
PUMP	RS								
d/s pump	LS								
A1	RS								
u/s bridge	LS								
A2	RS								
u/s Swim. Lk	LS								
AR-02	RS								
d/s Swim. Lk	LS								

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Sep-18	[enter value]
Time Completed		4:20 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		30-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,380	[enter value]
	Pumping Time for Pump B (minutes)	1,380	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,642	
	Cumulative Pump Volume Withdrawn (m3)	78,449	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.76	[enter value]
	Estimated volume available (m3)	166,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	1.03	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.81	[enter value]

% Instantaneous Flow (IF)
11.34

IF > 10 → **NOTIFY STANTEC** Andrea Kneale [enter name]
PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

**Cumulative Volume (m3) Withdrawn Before 30-Aug-18 = 70,807

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Sep-18
Time Completed	4:20 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	30-Aug-18

% IF: 11.34 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.81 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☑ NO, Other (provide reason): monitoring started 01-Sep-18

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS								
u/s pump	LS								
PUMP	RS								
u/s pump	LS								
PUMP	RS								
d/s pump	LS								
A1	RS								
u/s bridge	LS								
A2	RS								
u/s Swim. Lk	LS								
AR-02	RS								
d/s Swim. Lk	LS								

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Sep-18	[enter value]
Time Completed		4:26 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		1-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,974	
	Cumulative Pump Volume Withdrawn (m3)	94,398	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.83	[enter value]
	Estimated volume available (m3)	145,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.98	[enter value]
6.13	24hrs flow at Apex IQA-10 (m3/s)	1.51	[enter value]
IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 1-Sep-18 = 86,424

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Sep-18
Time Completed	4:26 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	1-Sep-18

% IF: 6.13 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.51 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): withdrawal >10% IF 30-Aug-18 and 31-Aug-18
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason):

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.38	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.27							
PUMP	RS	0.30	Run	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.42							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.32							
A1	RS	0.17	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.20							
A2	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.36							
AR-02	RS	0.36	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.16							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Sep-18	[enter value]
Time Completed		4:30 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		2-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,974	
	Cumulative Pump Volume Withdrawn (m3)	102,372	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.90	[enter value]
	Estimated volume available (m3)	145,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	2.38	[enter value]
5.13	24hrs flow at Apex IQA-10 (m3/s)	1.80	[enter value]
IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 2-Sep-18 = 94,398

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Sep-18
Time Completed	4:30 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	2-Sep-18

% IF: 5.13 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.80 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): withdrawal >10% IF 30-Aug-18 and 31-Aug-18
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason):

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.34	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.23							
PUMP	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.40							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.28							
A1	RS	0.14	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.17							
A2	RS	0.25	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.34							
AR-02	RS	0.33	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.14							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Sep-18	[enter value]
Time Completed		4:31 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		3-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	43	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.091	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,893	
	Cumulative Pump Volume Withdrawn (m3)	110,265	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.94	[enter value]
	Estimated volume available (m3)	111,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.69	[enter value]
7.43	24hrs flow at Apex IQA-10 (m3/s)	1.23	[enter value]
IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 3-Sep-18 = 102,372

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Sep-18
Time Completed	4:31 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	3-Sep-18

% IF: 7.43 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.23 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): withdrawal >10% IF 30-Aug-18 and 31-Aug-18
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason):

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.37	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.26							
PUMP	RS	0.29	Run	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.42							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.31							
A1	RS	0.18	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.21							
A2	RS	0.28	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.37							
AR-02	RS	0.37	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.17							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	5-Sep-18	[enter value]	
Time Completed	4:05 PM	[enter value]	
Prepared by	Andrea Kneale	[enter name]	
Date of Pumping Record Summary	4-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	43	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.091	

Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,897	
	Cumulative Pump Volume Withdrawn (m3)	118,162	

**Cumulative Volume (m3) Withdrawn Before 4-Sep-18 = 110,265

Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.98	[enter value]
	Estimated volume available (m3)	98,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	1.41	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	1.09	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
8.42

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	5-Sep-18
Time Completed	4:05 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	4-Sep-18

% IF: 8.42 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.09 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): withdrawal >10% IF 30-Aug-18 and 31-Aug-18
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.39	Run	No fish	N/A	N/A	N/A	IMG_8216	N/A
u/s pump	LS	0.28							
PUMP	RS	0.31	Run	No fish	N/A	N/A	N/A	IMG_8217	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.43							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.31							
A1	RS	0.20	Run	No fish	N/A	N/A	N/A	IMG_8218	N/A
u/s bridge	LS	0.22							
A2	RS	0.29	Run	No fish	N/A	N/A	N/A	IMG_8219	N/A
u/s Swim. Lk	LS	0.39							
AR-02	RS	0.38	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.19							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		6-Sep-18	[enter value]
Time Completed		1:09 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		5-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	43	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.091	
Pump Volume	Pumping Time for Pump A (minutes)	1,170	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,206	
	Cumulative Pump Volume Withdrawn (m3)	125,368	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.01	[enter value]
	Estimated volume available (m3)	88,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.19	[enter value]
9.87	24hrs flow at Apex IQA-10 (m3/s)	0.93	[enter value]
IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 5-Sep-18 = 118,162

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	6-Sep-18
Time Completed	1:09 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	5-Sep-18

% IF: 9.87 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.93 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): flow decreased to potentially have withdrawal > 10% IF
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason):

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.40	Run	No fish	N/A	N/A	N/A	IMG_8227	N/A
u/s pump	LS	0.30							
PUMP	RS	0.32	Run/Riffle	No fish	N/A	N/A	N/A	IMG_8228	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.44							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	IMG_8229	N/A
d/s pump	LS	0.33							
A1	RS	0.21	Run	No fish	N/A	N/A	N/A	IMG_8230	N/A
u/s bridge	LS	0.23							
A2	RS	0.30	Run	No fish	N/A	N/A	N/A	IMG_8231	N/A
u/s Swim. Lk	LS	0.39							
AR-02	RS	0.40	Run	No fish	N/A	N/A	N/A	IMG_8232	N/A
d/s Swim. Lk	LS	0.20							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		7-Sep-18	[enter value]
Time Completed		9:46 AM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		6-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.093	
Pump Volume	Pumping Time for Pump A (minutes)	930	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	6,659	
	Cumulative Pump Volume Withdrawn (m3)	132,028	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.04	[enter value]
	Estimated volume available (m3)	81,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	1.05	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.83	[enter value]

% Instantaneous Flow (IF)
11.19

IF > 10 → **NOTIFY STANTEC** Andrea Kneale [enter name]
PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

**Cumulative Volume (m3) Withdrawn Before 6-Sep-18 = 125,368

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	7-Sep-18
Time Completed	9:46 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	6-Sep-18

% IF: 11.19 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.83 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.41	Run	No fish	N/A	N/A	N/A	IMG_8233	N/A
u/s pump	LS	0.31							
PUMP	RS	0.33	Riffle	No fish	N/A	N/A	N/A	IMG_8234	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.45							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	IMG_8236	N/A
d/s pump	LS	0.34							
A1	RS	0.23	Run	No fish	N/A	N/A	N/A	IMG_8241	N/A
u/s bridge	LS	0.25							
A2	RS	0.32	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.41							
AR-02	RS	0.41	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.21							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	12-Sep-18	[enter value]	
Time Completed	12:170:00 AM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	9-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.093		
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]	This report revised to reflect pump operation for 24hrs instead of the assume 15.5.
	Pumping Time for Pump B (minutes)	1,440	[enter value]	
	Daily Pump Volume Withdrawn (m3)	8,001		
	Cumulative Pump Volume Withdrawn (m3)	155,715		**Cumulative Volume (m3) Withdrawn Before 9-Sep-18 = 147,714
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.12	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	57,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.76	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
	24hrs flow at Apex IQA-10 (m3/s)	0.62	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
14.87

IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	12-Sep-18
Time Completed	12:170:00 AM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	9-Sep-18

% IF: 14.87 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.62 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.45	Run	No fish	N/A	N/A	N/A	IMG_8271.jpg	N/A
u/s pump	LS	0.34							
PUMP	RS	0.35	Riffle	No fish	N/A	N/A	N/A	IMG_8272.jpg	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.48							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	IMG_8273.jpg	N/A
d/s pump	LS	0.36							
A1	RS	0.25	Run	No fish	N/A	N/A	N/A	IMG_8274.jpg	N/A
u/s bridge	LS	0.28							
A2	RS	0.34	Run	No fish	N/A	N/A	N/A	IMG_8275.jpg	N/A
u/s Swim. Lk	LS	0.43							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	IMG_8276.jpg	N/A
d/s Swim. Lk	LS	0.24							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	9-Sep-18	[enter value]	
Time Completed	9:33 AM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	7-Sep-18	[enter value]	
Pump Rate			
Average Estimated Pump Rate for Pump A (L/s)	42	[enter value]	
Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]	
Total Averaged Estimated Pump Rate (m3/s)	0.090		
Pump Volume			
Pumping Time for Pump A (minutes)	1,440	[enter value]	
Pumping Time for Pump B (minutes)	1,440	[enter value]	
Daily Pump Volume Withdrawn (m3)	7,803		
Cumulative Pump Volume Withdrawn (m3)	139,830		**Cumulative Volume (m3) Withdrawn Before 7-Sep-18 = 132,028
Lake Geraldine			
24hrs level at WSC 10UH013 (m)	111.07	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
Estimated volume available (m3)	72,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)
24hrs flow at WSC 10UH002 (m3/s)	0.94	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
24hrs flow at Apex IQA-10 (m3/s)	0.74	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
12.12

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]
PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]
24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	9-Sep-18
Time Completed	9:33 AM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	7-Sep-18

% IF: 12.12 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.74 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.43	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.32							
PUMP	RS	0.33	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.46							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.34							
A1	RS	0.24	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.25							
A2	RS	0.33	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.42							
AR-02	RS	0.42	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.21							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	12-Sep-18	[enter value]
Time Completed	12:30:00PM	[enter value]
Prepared by	Alice Kruchten	[enter name]
Date of Pumping Record Summary	10-Sep-18	[enter value]

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.093	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,993	
	Cumulative Pump Volume Withdrawn (m3)	163,707	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.14	[enter value]
	Estimated volume available (m3)	49,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 10-Sep-18 = 155,715

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

24hrs flow at WSC 10UH002 (m3/s)	0.81	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
24hrs flow at Apex IQA-10 (m3/s)	0.66	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
14.06

IF > 10 →

NOTIFY STANTEC	Alice Kruchten	[enter name]
PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261 → NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	12-Sep-18
Time Completed	12:30:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	10-Sep-18

% IF: 14.06 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.66 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.45	Run	No fish	N/A	N/A	N/A	IMG_8280.jpg	N/A
u/s pump	LS	0.35							
PUMP	RS	0.35	Riffle	No fish	N/A	N/A	N/A	IMG_8281.jpg	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.49							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	IMG_8282.jpg	N/A
d/s pump	LS	0.36							
A1	RS	0.25	Run	No fish	N/A	N/A	N/A	IMG_8283.jpg	N/A
u/s bridge	LS	0.27							
A2	RS	0.33	Run	No fish	N/A	N/A	N/A	IMG_8284.jpg	N/A
u/s Swim. Lk	LS	0.42							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	IMG_8279.jpg	N/A
d/s Swim. Lk	LS	0.23							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		12-Sep-18	[enter value]
Time Completed		4:25:00PM	[enter value]
Prepared by		Alice Kruchten	[enter name]
Date of Pumping Record Summary		11-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,981	
	Cumulative Pump Volume Withdrawn (m3)	171,689	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.16	[enter value]
	Estimated volume available (m3)	42,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 11-Sep-18 = 163,707

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

24hrs flow at WSC 10UH002 (m3/s)		0.72	[enter value]
24hrs flow at Apex IQA-10 (m3/s)		0.59	[enter value]
% Instantaneous Flow (IF) = 15.62			
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10 = 0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	12-Sep-18
Time Completed	4:25:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	11-Sep-18

% IF: 15.62 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.59 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.45	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.35							
PUMP	RS	0.35	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.49							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.37							
A1	RS	0.26	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.27							
A2	RS	0.34	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.43							
AR-02	RS	0.44	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.23							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	13-Sep-18	[enter value]	
Time Completed	4:48:00PM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	12-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.069		
Pump Volume	Pumping Time for Pump A (minutes)	630	[enter value]	Pump A shut off after approximately 10.5 hours of operation on September 12th
	Pumping Time for Pump B (minutes)	1,440	[enter value]	
	Daily Pump Volume Withdrawn (m3)	5,929		
	Cumulative Pump Volume Withdrawn (m3)	177,618		**Cumulative Volume (m3) Withdrawn Before 12-Sep-18 = 171,689
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.18	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	36,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.66	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
	24hrs flow at Apex IQA-10 (m3/s)	0.53	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station
% Instantaneous Flow (IF) 12.97				
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]	
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]	
IF < 10	NO ACTION			
30% MAD at Apex IQA-10 0.261				
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]	
24-hr Flow > 0.261	NO ACTION			

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	13-Sep-18
Time Completed	4:48:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	12-Sep-18

% IF: 12.97 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.53 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.45	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.35							
PUMP	RS	0.35	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.49							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.37							
A1	RS	0.26	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.27							
A2	RS	0.34	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.43							
AR-02	RS	0.44	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.23							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	14-Sep-18	[enter value]	
Time Completed	1:40:00PM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	13-Sep-18	[enter value]	

Pump Rate

Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]
Total Averaged Estimated Pump Rate (m3/s)	0.050	

Pump Volume

Pumping Time for Pump A (minutes)	0	[enter value]	Pump A shut off on September 12th
Pumping Time for Pump B (minutes)	1,440	[enter value]	
Daily Pump Volume Withdrawn (m3)	4,328		
Cumulative Pump Volume Withdrawn (m3)	181,946		**Cumulative Volume (m3) Withdrawn Before 13-Sep-18 = 177,618

Lake Geraldine

24hrs level at WSC 10UH013 (m)	111.20	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
Estimated volume available (m3)	30,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)

8.96

24hrs flow at WSC 10UH002 (m3/s)	0.72	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
24hrs flow at Apex IQA-10 (m3/s)	0.56	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	14-Sep-18
Time Completed	1:40:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	13-Sep-18

% IF: 8.96 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.56 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): monitoring triggered on previous days
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.47	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.36							
PUMP	RS	0.36	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.49							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.38							
A1	RS	0.26	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.27							
A2	RS	0.35	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.44							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.24							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	15-Sep-18	[enter value]	
Time Completed	1:00:00PM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	14-Sep-18	[enter value]	

Pump Rate

Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]
Total Averaged Estimated Pump Rate (m3/s)	0.050	

Pump Volume

Pumping Time for Pump A (minutes)	0	[enter value]	Pump A shut off on September 12th
Pumping Time for Pump B (minutes)	1,440	[enter value]	
Daily Pump Volume Withdrawn (m3)	4,309		
Cumulative Pump Volume Withdrawn (m3)	186,255		**Cumulative Volume (m3) Withdrawn Before 14-Sep-18 = 181,946

Lake Geraldine

24hrs level at WSC 10UH013 (m)	111.21	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
Estimated volume available (m3)	26,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)

9.91

24hrs flow at WSC 10UH002 (m3/s)	0.64	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
24hrs flow at Apex IQA-10 (m3/s)	0.50	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	15-Sep-18
Time Completed	1:00:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	14-Sep-18

% IF: 9.91 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.50 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): monitoring triggered on previous days
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.47	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.37							
PUMP	RS	0.36	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.50							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.38							
A1	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.29							
A2	RS	0.35	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.44							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.24							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	16-Sep-18	[enter value]	
Time Completed	12:05:00PM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	15-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.050		
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]	Pump A shut off on September 12th
	Pumping Time for Pump B (minutes)	1,440	[enter value]	
	Daily Pump Volume Withdrawn (m3)	4,314		
	Cumulative Pump Volume Withdrawn (m3)	190,569		**Cumulative Volume (m3) Withdrawn Before 15-Sep-18 = 186,255
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.23	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	22,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF) = **10.38**	24hrs flow at WSC 10UH002 (m3/s)	0.61	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
	24hrs flow at Apex IQA-10 (m3/s)	0.48	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]	
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]	
IF < 10	NO ACTION			
30% MAD at Apex IQA-10 = **0.261**				
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]	
24-hr Flow > 0.261	NO ACTION			

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	16-Sep-18
Time Completed	12:05:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	15-Sep-18

% IF: 10.38 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.48 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.47	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.37							
PUMP	RS	0.36	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.50							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.38							
A1	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.29							
A2	RS	0.35	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.44							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.24							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	18-Sep-18	[enter value]
Time Completed	9:15:00AM	[enter value]
Prepared by	Alice Kruchten	[enter name]
Date of Pumping Record Summary	17-Sep-18	[enter value]

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	0	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.000	

Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]
	Pumping Time for Pump B (minutes)	0	[enter value]
	Daily Pump Volume Withdrawn (m3)	0	
	Cumulative Pump Volume Withdrawn (m3)	193,074	

Pump A shut off on September 12th

Pump B shut off on September 16th

**Cumulative Volume (m3) Withdrawn Before 17-Sep-18 = 193,074

Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.25	[enter value]
	Estimated volume available (m3)	15,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.66	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.48	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)

0.00

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	17-Sep-18	[enter value]	
Time Completed	9:45:00AM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	16-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.029		
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]	Pump A shut off on September 12th
	Pumping Time for Pump B (minutes)	840	[enter value]	Pump B shut off on September 16th (approximately 2pm)
	Daily Pump Volume Withdrawn (m3)	2,505		
	Cumulative Pump Volume Withdrawn (m3)	193,074		**Cumulative Volume (m3) Withdrawn Before 16-Sep-18 = 190,569
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.25	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	16,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.66	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
	24hrs flow at Apex IQA-10 (m3/s)	0.51	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
5.65

IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	17-Sep-18
Time Completed	9:45:00AM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	16-Sep-18

% IF: 5.65 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.51 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): monitoring triggered on previous days
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.47	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.37							
PUMP	RS	0.37	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.50							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.38							
A1	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.29							
A2	RS	0.35	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.45							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.24							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		19-Sep-18	[enter value]
Time Completed		9:25:00AM	[enter value]
Prepared by		Alice Kruchten	[enter name]
Date of Pumping Record Summary		18-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	0	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.000	
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]
	Pumping Time for Pump B (minutes)	0	[enter value]
	Daily Pump Volume Withdrawn (m3)	0	
	Cumulative Pump Volume Withdrawn (m3)	193,074	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.25	[enter value]
	Estimated volume available (m3)	16,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 18-Sep-18 = 193,074

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	0.61	[enter value]
0.00	24hrs flow at Apex IQA-10 (m3/s)	0.44	[enter value]
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump A shut off September 12th, 2018
- pump B shut off September 16th, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	20-Sep-18	[enter value]
Time Completed	9:10:00AM	[enter value]
Prepared by	Alice Kruchten	[enter name]
Date of Pumping Record Summary	19-Sep-18	[enter value]

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	0	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.000	
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]
	Pumping Time for Pump B (minutes)	0	[enter value]
	Daily Pump Volume Withdrawn (m3)	0	
	Cumulative Pump Volume Withdrawn (m3)	193,074	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.25	[enter value]
	Estimated volume available (m3)	16,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 19-Sep-18 = 193,074

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.57	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.41	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)

0.00

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump A shut off September 12th, 2018
- pump B shut off September 16th, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	21-Sep-18	[enter value]
Time Completed	6:30:00AM	[enter value]
Prepared by	Alice Kruchten	[enter name]
Date of Pumping Record Summary	20-Sep-18	[enter value]

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	0	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.000	
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]
	Pumping Time for Pump B (minutes)	0	[enter value]
	Daily Pump Volume Withdrawn (m3)	0	
	Cumulative Pump Volume Withdrawn (m3)	193,074	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.25	[enter value]
	Estimated volume available (m3)	16,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 20-Sep-18 = 193,074

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.52	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.37	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)

0.00

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump A shut off September 12th, 2018
- pump B shut off September 16th, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Oct-18	[enter value]
Time Completed		9:00:00AM	[enter value]
Prepared by		Alice Kruchten	[enter name]
Date of Pumping Record Summary		24-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	0	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.000	
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]
	Pumping Time for Pump B (minutes)	0	[enter value]
	Daily Pump Volume Withdrawn (m3)	0	
	Cumulative Pump Volume Withdrawn (m3)	193,074	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.24	[enter value]
	Estimated volume available (m3)	17,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 24-Sep-18 = 193,074

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	N/A	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	N/A	[enter value]
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump A shut off September 12th, 2018
- pump B shut off September 16th, 2018
- hydrometric station 10UH002 did not have recorded flow for September 22nd to 24th, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Oct-18
Time Completed	9:00:00AM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	24-Sep-18

% IF: 0.00 **24-hr Flow at IQA-10 (vs. 30% MAD):** N/A

Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

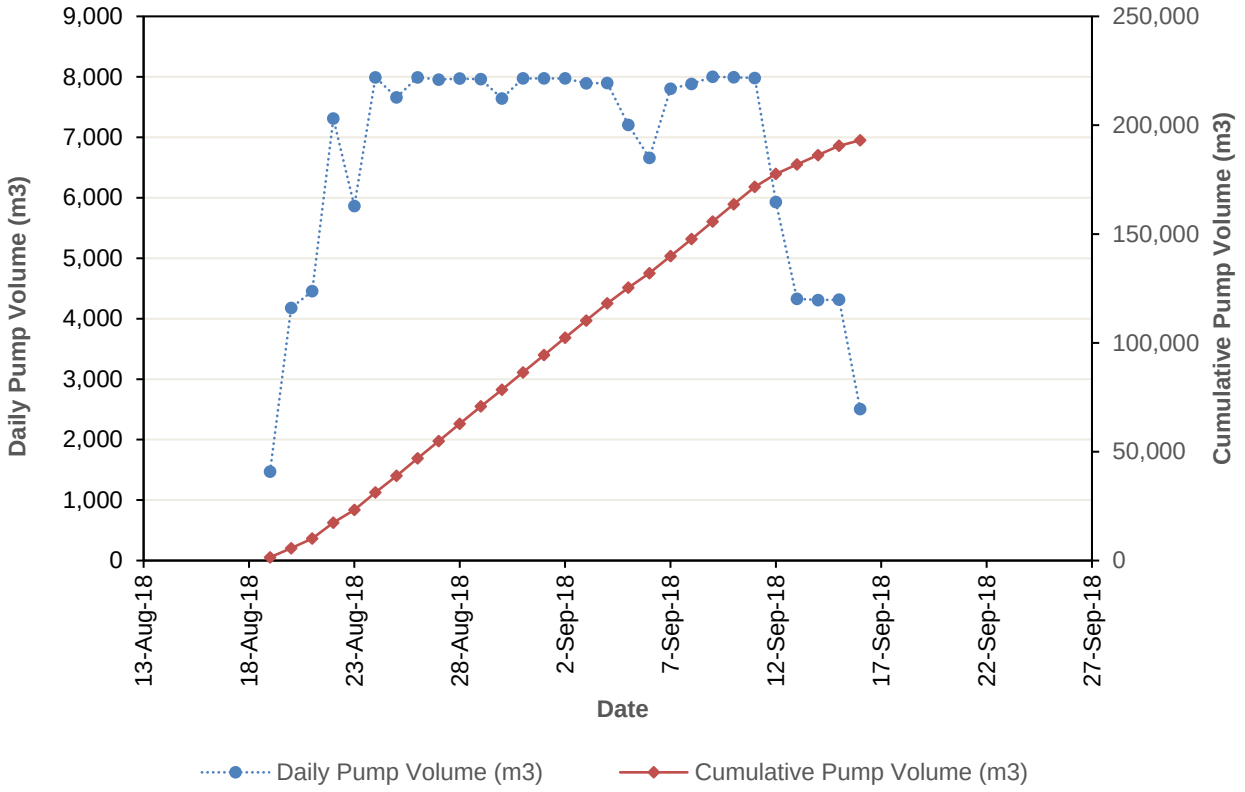
- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): monitoring one week post pump shutoff
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

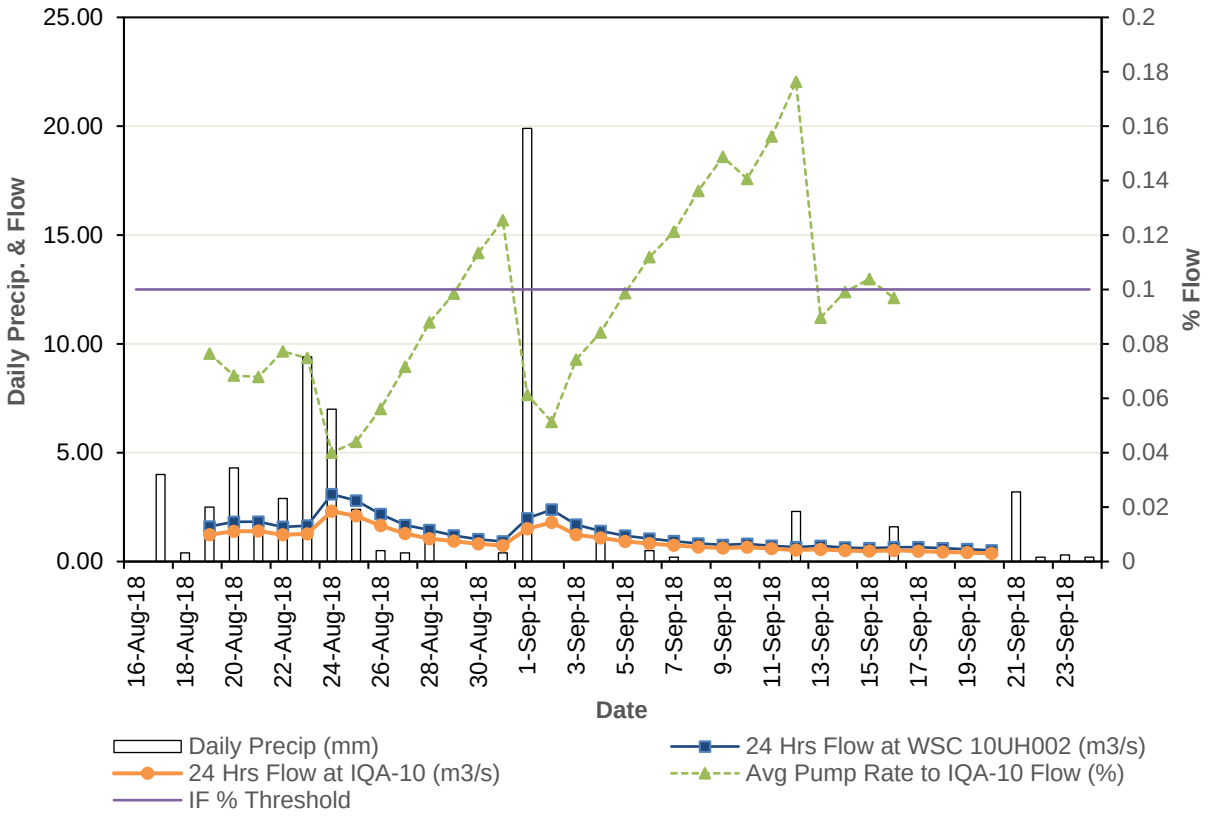
Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.42	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.32							
PUMP	RS	0.32	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. Pumping shut off for several days.
u/s pump	LS	0.43							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.33							
A1	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.29							
A2	RS	0.35	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.45							
AR-02	RS	0.42	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.24							

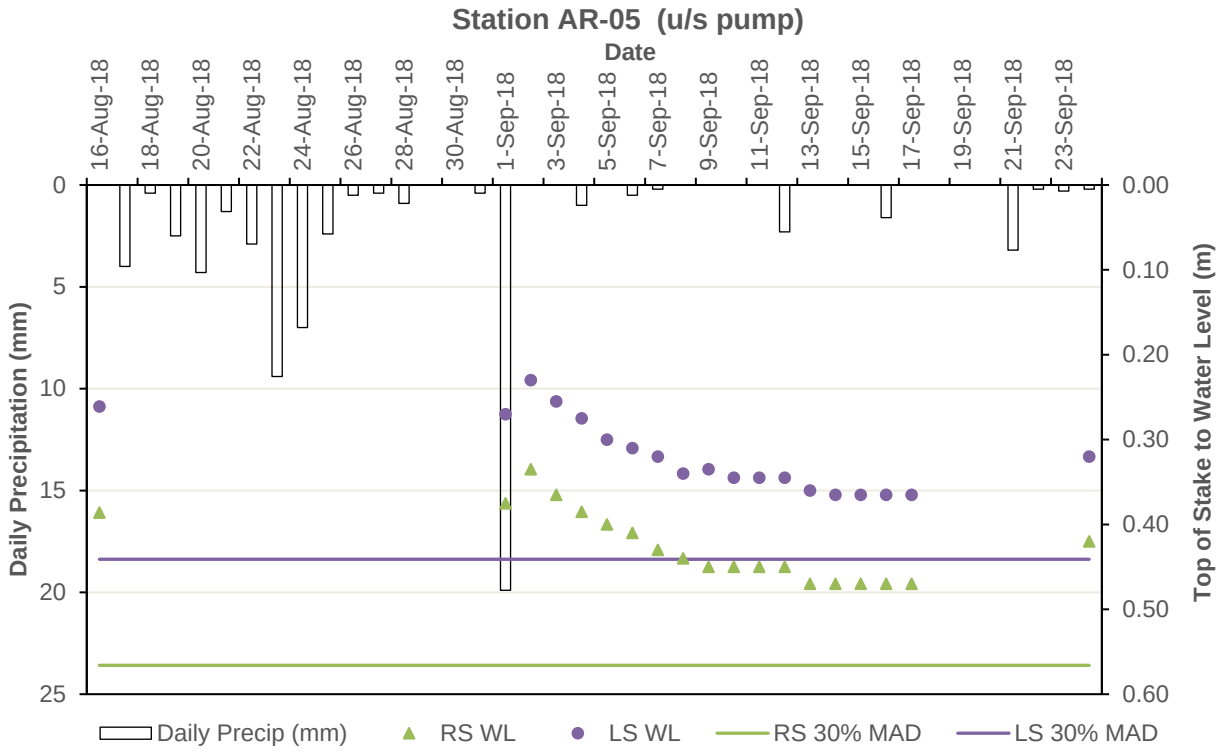
Notes:
- RS: right stake
- LS: left stake

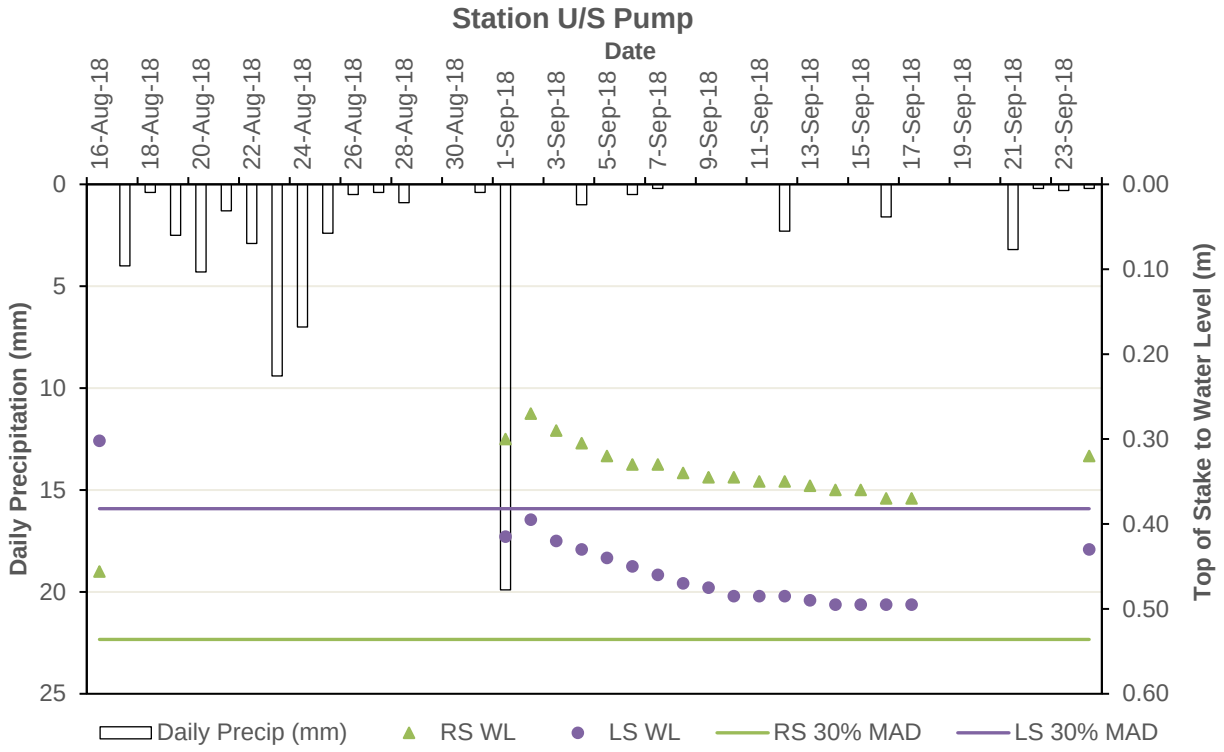
APPENDIX C

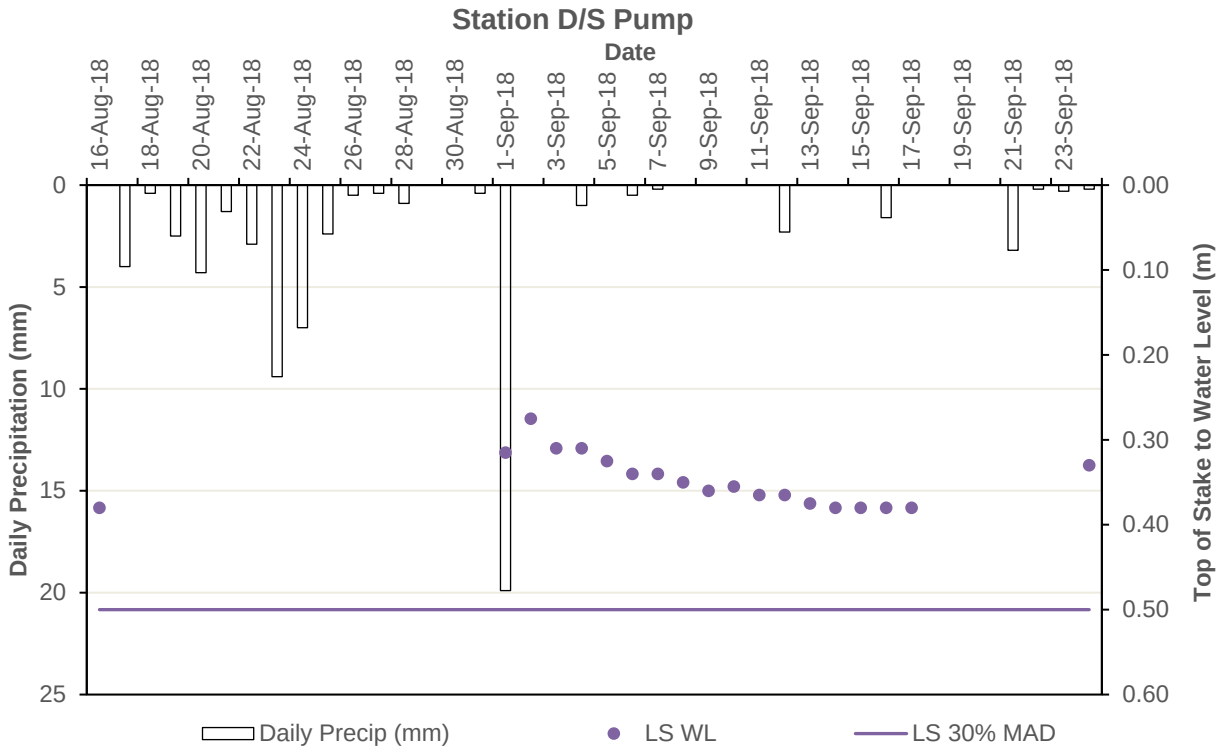
Station Relative Water Level with 30% MAD Level Plots

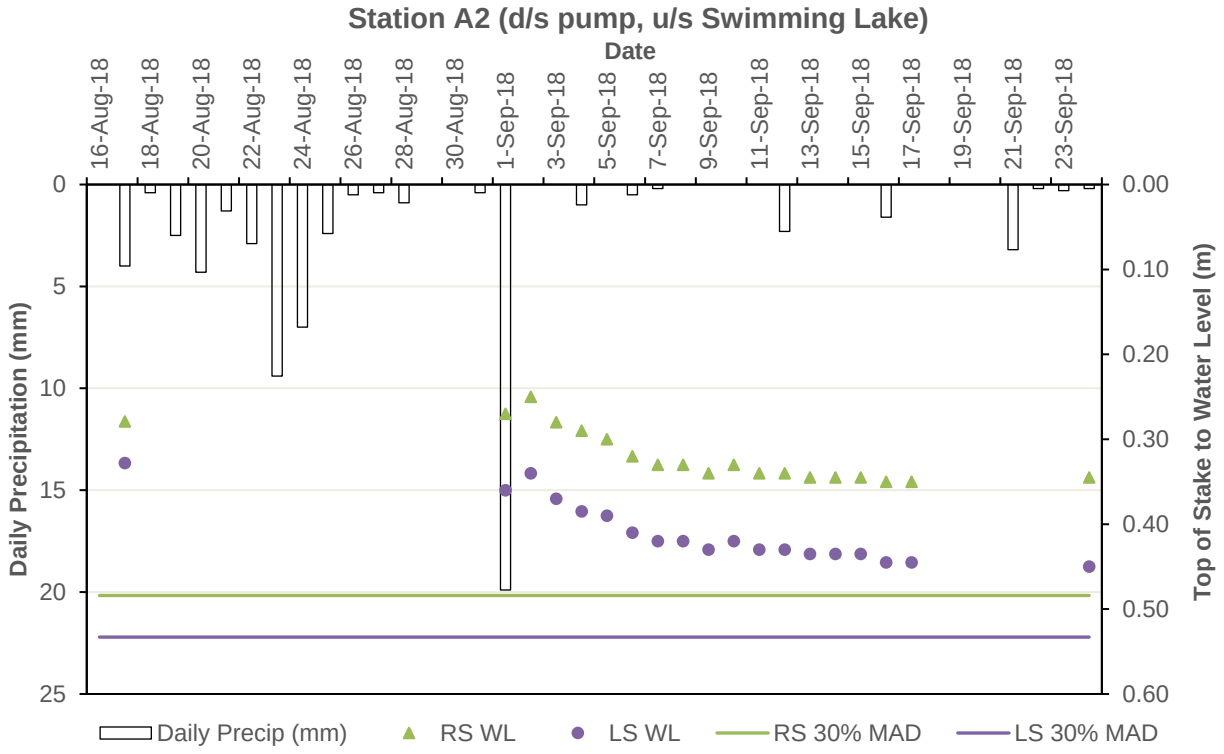

9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Daily Pump Volume (m3)
250,000
200,000
150,000
100,000
50,000
0
Cumulative Pump Volume (m3)
13-Aug-18
18-Aug-18
23-Aug-18
28-Aug-18
2-Sep-18
7-Sep-18
12-Sep-18
17-Sep-18
22-Sep-18
27-Sep-18
Date
Daily Pump Volume (m3)
Cumulative Pump Volume (m3)

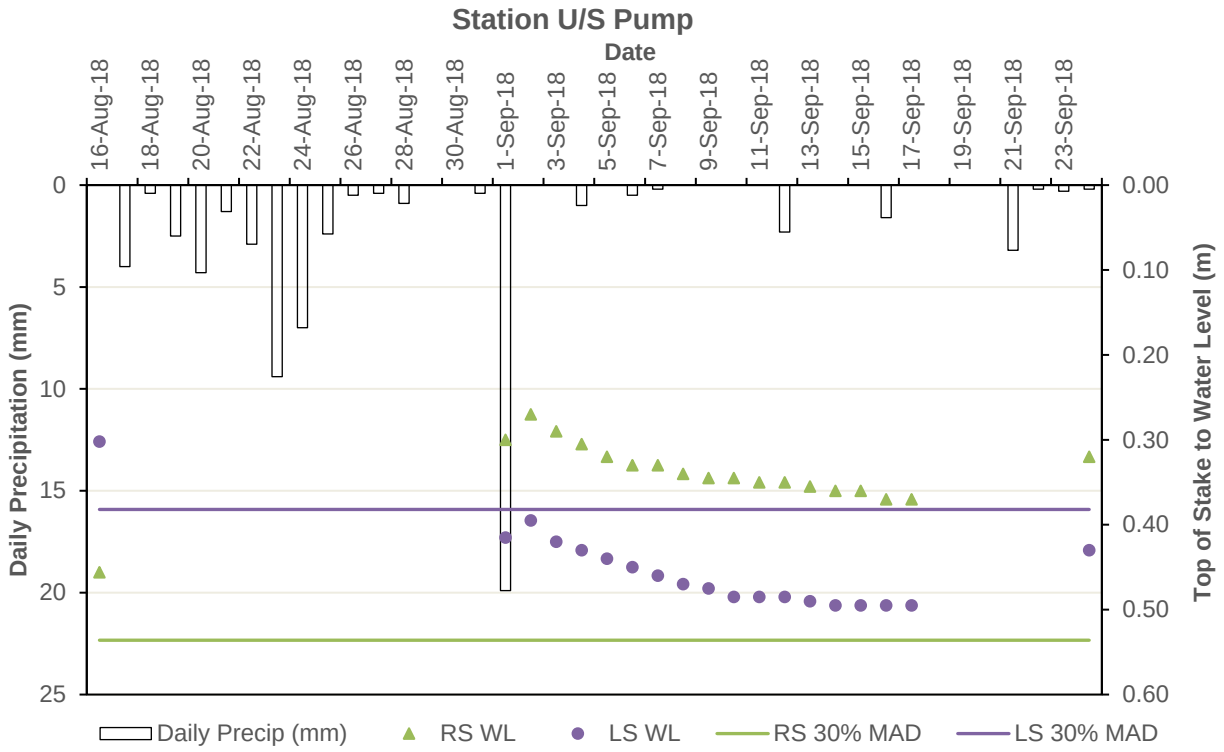

25.00
20.00
15.00
10.00
5.00
0.00
Daily Precip. & Flow
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
% Flow
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Date
Daily Precip (mm)
24 Hrs Flow at WSC 10UH002 (m3/s)
24 Hrs Flow at IQA-10 (m3/s)
Avg Pump Rate to IQA-10 Flow (%)
IF % Threshold


Station AR-05 (u/s pump)
Date
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Daily Precipitation (mm)
0
5
10
15
20
25
Top of Stake to Water Level (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Daily Precip (mm)
RS WL
LS WL
RS 30% MAD
LS 30% MAD


Station U/S Pump
Date
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Daily Precipitation (mm)
0
5
10
15
20
25
Top of Stake to Water Level (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Daily Precip (mm)
RS WL
LS WL
RS 30% MAD
LS 30% MAD


Station D/S Pump
Date
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Daily Precipitation (mm)
0
5
10
15
20
25
Top of Stake to Water Level (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Daily Precip (mm)
LS WL
LS 30% MAD


Station A2 (d/s pump, u/s Swimming Lake)
Date
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Daily Precipitation (mm)
0
5
10
15
20
25
Top of Stake to Water Level (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Daily Precip (mm)
RS WL
LS WL
RS 30% MAD
LS 30% MAD


Station U/S Pump
Date
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Daily Precipitation (mm)
0
5
10
15
20
25
Top of Stake to Water Level (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Daily Precip (mm)
RS WL
LS WL
RS 30% MAD
LS 30% MAD