

2020 NON-TECHNICAL ANNUAL REPORT IQUALUIT MARINE INFRASTRUCTURE – NRI LICENCE #01-002-20R-M

1 Project Overview

Construction of two marine facility infrastructure projects in Iqaluit have been underway since 2018. Construction of these facilities is ongoing and will continue in 2021. Led by the Government of Nunavut (GN) - Community and Government Services (CGS), ownership and responsibility will transfer to the GN - Economic Development and Transportation (EDT) once operational.

Iqaluit is located on southern Baffin Island, Frobisher Bay, Koojesse Inlet (see Figure 1 in Attachment 1). The marine facility infrastructure projects include the Deep Sea Port (DSP) and the Small Craft Harbour (SCH), which occupy both the western and eastern shores of Koojesse Inlet. Along the western shore is the development of a new DSP, and three of the SCH facilities which are: the improvements to the existing causeway, construction of a snowmobile ramp, and a parking area for the causeway. Along the eastern shore, also considered part of the SCH project, there will be improvements to the municipal breakwater and to the Northmart breakwater. Collectively the DSP and SCH Projects are referred to as the Iqaluit Project. Schematics of the DSP and SCH facilities are available on the Nunavut Planning Commission (NPC) or Nunavut Impact Review Board (NIRB) registry.

Iqaluit Project field work, as permitted initially through the Nunavut Research Institute (NRI) research license , #01-034-16N-M , has been ongoing since 2016 (Table 1-1). The initial field work included the collection of baseline environmental and geotechnical data to support permitting and engineering design. In 2018 and continuing through 2026 the field work includes monitoring and research programs to meet the Offsetting Plan requirements from the *Fisheries Act* Authorizations (FAAs) issued by Fisheries and Oceans Canada – Fish and Fish Habitat Protection Program (DFO-FFHPP) (termed the Iqaluit Project Field Study). Section 4 outlines the field work initiated in 2018 and carrying on through to 2026.

This document provides a summary of the 2020 field activities that were conducted as part of a multi-year program and presents the plans for the 2021 field season. The information presented in this report is preliminary and has not been analyzed in its entirety. Data collected as a part of the field activities for the Offsetting Plan may be shared with interested parties upon request. NRI will be notified of publications resulting from the data collected.

Table 1-1 NRI Research Permit History

Year	Activities	Regulatory requirement for field program	NRI Permit No.
2016	Environmental and geotechnical study to support baseline report for territorial and federal permitting	Nunavut Planning Commission (NPC) Project application, federal regulators (e.g. DFO); Inform engineering from geotechnical study	01-034-16N-M
2017	No field work	--	--
2018	Pre-construction monitoring and Pilot Study Research Program 1 for the DFO FAA	DFO FAA	01-024-18R-M

Year	Activities	Regulatory requirement for field program	NRI Permit No.
2019	Pilot Study Research Program 1 for the DFO FAA	DFO FAA	01-011-19R-M
2020	Pilot Study Research Program 1 for the DFO FAA Preparation for Year 1 of Arctic Char diet study (Research Program 1, see Section 4.1.2.1)	DFO FAA	01-002-20R-M
2021	Year 1 for Arctic Char diet study (Research Program 1) Inuit Qaujimagatuqangit (IQ) Program for Research Program 2	DFO FAA	--
2022	Year 2 for Arctic Char diet study (Research Program 1) Year 1 for Seaweed Habitat Study (Research Program 2) IQ Program for Research Programs 1 and 2	DFO FAA	--

2 Program Name

Iqaluit Project Field Study

3 Proponent and Representative Details

Contact information for the proponent and representative are provided in Table 3-1 and for the field team are provided in Table 3-2.

Table 3-1 Proponent and Contact Information

Contact Category	Details
Name of Business / Company	Government of Nunavut – Community and Government Services (CGS)
Name of Proponent	Justin McDonell, Project Manager – Capital Projects Division
Proponent Mailing Address	PO Box 1000, Station 200 Iqaluit, Nunavut X0A 0H0 Phone: 867-975-5441 Email: JMcDonell@GOV.NU.CA
Name of Consultant / Primary Contact	Victoria Burdett-Coutts, Marine Biologist, M.Sc., R.P.Bio.
Consultant Mailing Address	Suite 200 – 2930 Virtual Way Vancouver, British Columbia V5M 0A5 Office: 778-945-5501 Mobile: 778-839-2372 Fax: 604-298-1625 Email: Victoria.Coutts@advisian.com

Table 3-2 Iqaluit Offset Plan Field Program Research Team

Name	Title
Victoria Burdett-Coutts	Senior Marine Scientist, Offset Project Manager
Diane Pinto	Community Engagement and Indigenous Knowledge Facilitator
Cameron Knight	Field Technician
Petra Stastny	Field Technician
Laura Borden	Field Technician
Tanya Prinzing	Field Technician
Keila Stark	Graduate Student University of British Columbia (UBC)
Dr. Mary O'Connor	Graduate Advisor at UBC

4 Field Program

4.1 Program Scope

The Iqaluit Project Field Study consists of a Monitoring Program (MP) and a Research Program (RP). Within the RP, two questions will be addressed, hereafter referred to as RP1 and RP2.

The goal of the MP is to assess the performance of the rip rap boulder which forms the shoreline protection for the facilities in terms of how it functions as fish habitat. The goal of the RP is to contribute to the biological knowledge base for subjects to which there is little known at a localized level, that are important to Inuit and the scientific community. The topics will be addressed through a collaboration of science and IQ.

4.1.1 Monitoring Program

The goal of the MP is to confirm the ability of the rip rap boulder shoreline protection component of the facilities to function as fish habitat. Rocks provide multi-dimensional habitat where marine organisms can find refuge in the spaces between them or as attachment substrate for marine algae. Furthermore, it will provide foraging habitat for migratory fish including Arctic char.

The MP began in 2018 with a pre-construction survey, described in the 2018 NRI submission (Advisian 2019), and 2019 submission (Advisian 2020). The MP will begin post-construction monitoring following the completion of construction of the Iqaluit Project. The first post-construction monitoring event is currently planned for the open-water season of 2022. As the Iqaluit Project has been extended a year to be completed in 2021, the DFO FAA has been amended to account for this extension. Monitoring events will be conducted over three periods over five years post construction from 2022 to 2026.

4.1.2 Research Program

The RP will be undertaken as a collaboration between CGS, Advisian and UBC. RP1 seeks to understand the diet and habitat preferences of Arctic char and RP2 to understand the biomass and biodiversity of the seaweed bed in Koojesse Inlet. Both RP1 and RP2 are composed of a scientific study, where a graduate student will be onboarded at UBC, joined with an IQ study and collaboration with the Amaruq Hunters and Trappers Association (HTA). The IQ component will be a collaboration between local key knowledge holders, the HTA, and the research team facilitated by Advisian.

4.1.2.1 Research Program 1

The focus of RP1 is to investigate the trophic ecology and habitat requirements of anadromous Arctic char in Koojesse Inlet.

Scientific Study

Seventeen fish have been collected between 2018 to 2020, with another 118 planned for 2021 and 2022. Four of the 17 fish were collected in 2020. Fish have been purchased from local harvesters. A graduate student initiated their study at UBC in September 2019, with two years of field study planned. Year 1 was supposed to be the open-water season of 2020, however due to COVID-19 that was deferred to 2022. Fish collected to date have been collected by Advisian staff who were on site for project construction. If the current travel restrictions to Nunavut are still in place in 2021 all personnel travelling to Nunavut will undertake the GN mandatory isolation and comply with any other required COVID-19 measures. The HTA has been, and will continue to be, engaged to confirm that the timing planned is appropriate for peak season of Arctic char harvesting. The timing of the field seasons is expected to be the second to third week of July.

Primary prey species were collected from the pelagic, benthic and intertidal environments north of the causeway (western shore of Koojesse Inlet). While in Iqaluit, technicians collected biological data from each fish (length, weight, sex, maturity status) and collected biological materials (otoliths, section of white muscle, stomach). The biological material was preserved in an appropriate manner for the analysis required and shipped to Vancouver, BC for processing.

Diets of Arctic char will be assessed using a multi-pronged approach; analysis of stomach contents through deoxyribonucleic acid (DNA) barcoding for gut contents, and lipid/fatty acid analysis of muscle tissue. The biochemical analyses may also be conducted on the primary prey organism of Arctic char species.

Inuit Qaujimagatuqangit

The IQ component will use an ethnographic approach using a mix of established methods such as: scoping and research design meetings with the HTA; a workshop and individual interviews focused on Arctic char with key knowledge holders; archival research; and a verification meeting with the HTA and key knowledge holders. The mix of methods helps to cross-check information and increases the overall reliability of study results. The inclusion of IQ will allow for a more robust understanding of Arctic char that is scientifically sound and connected to local experience, values, and priorities. An IQ workshop was conducted in August 2018. The purpose was to integrate first-hand knowledge of local Inuit fishers—who have observed the environment and Arctic char on a continuing basis over decades—with scientific research (described in Advisian [2019]).

Results and Summary

There was no IQ conducted for RP1 in 2020.

Table 4-1 depicts a summary of the physical characteristics of the fish with a demonstrative photo in Photo 4-1. Two different species of amphipod, polychaete worms, and small fish fry (most likely capelin) were found in the Arctic char stomachs. DNA barcoding of 2018, 2019, and 2020 Arctic char stomach contents is currently underway. The results from this analysis will confirm the exact prey species found in Arctic char stomachs, including those that were partially digested and could not be identified visually.

We were able to confirm from the fatty acid laboratory analyses that Arctic char caught in Iqaluit have diets typical of anadromous fish. Interestingly, the total fatty acids were higher in Iqaluit fish than in Arctic char caught for a previous study in Qasigiyat and Iqalugaarjuit (Ulrich 2013). The amount of fatty acids in Iqaluit fish was similar to those caught in Pond Inlet at roughly the same time. These included omega-3 fatty acids DHA and EPA. Fatty acid analysis for the fish collected in 2020 is not yet available but may be provided to the NRI or to the HTA upon request.

Table 4-1 Summary Data for Physical Characteristics of Arctic char

Detail	All Years (2018 to 2019)		2020	
	Male	Female	Male	Female
Number of fish	9	5	2	2
Maximum Size (mm)	698.5	680	613	550
Minimum size (mm)	420	520	434	415
Maximum weight (g)	1909	2327	2600	1600
Minimum weight (g)	636	959	850	800



Photo 4-1 One of the Four Fish Processed in the 2020 sampling season

4.1.2.2 Research Program 2

The focus of RP2 is to identify the biodiversity of seaweeds and species associations with seaweed habitats in Koojesse Inlet.

Scientific Study

The primary field season for RP2 has been pushed back until 2022 as it will be conducted in conjunction with Post Construction Monitoring Year 1 of the MP. Field methodologies are described in the 2018 CGS NRI Summary (Advisian 2019). There will be just one field season for RP2. Seaweed samples will be collected for further identification of seaweed and associated invertebrates.

A drone survey was conducted by Arctic UAV on behalf of CGS on September 30, 2019 targeting low tide. This survey will be repeated in 2021 and will contribute to the habitat mapping exercise to be undertaken by the UBC graduate student.

Inuit Qaujimagatuqangit

RP2 will incorporate an IQ component consisting of a mix of ethnographic methods. The IQ Workshop planned for 2020 will now occur in 2021 and is expected to focus on knowledge of species diversity of the seaweed beds, whether spatial extent or diversity of the seaweed beds have changed over time, and document what is known about species dependencies on the seaweed.

IQ research in the following years may include individual interviews, field visits by key knowledge holders, archival research, and verification meetings with the HTA and key knowledge holders. Should connections between the research occurring for RP1 be made (e.g. species living on or near rockweed/kelp are diet of Arctic char), these will also be included in the knowledge exchange.

Results and Summary

There are no results to present for 2020.

4.2 Plans for the 2021 Season

- Year 1 of RP1 will consist of purchasing and processing 58 Arctic char caught by local harvesters in and around the causeway on the western shore of Koojesse Inlet.
- IQ Workshop for RP2 and follow up on laboratory results of RP1 and IQ verification with the HTA. The graduate student will also meet with the HTA to share results from the laboratory analysis.

5 References

Advisian. (2019). Re: Permit Summary – Pond Inlet Marine Infrastructure Project (Government of Nunavut) Permit Number #01-047-16N-M. Doc. No. 307071-01148-00-EN-LET-0001. Rev. 0. 16 January 2019.

Advisian. (2020). 2019 Non-Technical Annual Report: Nunavut Research Institute -License #02-060-20R-M, Iqaluit Marine Infrastructure. Prepared for Government of Nunavut. (*Document No. 307071-01148-00-EN-RPT-0001, Revision 0*) February 2020.

Ulrich. (2013). Trophic ecology of Arctic char (*Salvelinus alpinus* L.) in the Cumberland Sound region of the Canadian Arctic. M.Sc. Thesis, University of Manitoba, Manitoba, Canada. 224p. Available at: <https://mspace.lib.umanitoba.ca/handle/1993/21693>.

6 Conclusion

We trust that this correspondence provides the necessary details required for our annual summary. To reiterate, any data collected over the course of this program will be available upon request for interested parties. Publications on the subject, as they become available, will be provided to the NRI. If you have any questions or require further details, contact information for Victoria Burdett-Coutts at Advisian is provided in Table 3-1.

Prepared by:



Caitlin Belz, B.Sc.
Marine Scientist



Keila Stark, Ph.D. (Candidate)
Marine Biologist

Reviewed by:



Victoria Burdett-Coutts, M.Sc., R.P.Bio
Senior Marine Scientist, Environmental Consultant
Planning, Monitoring, & Management

Environmental & Water
Advisian | North America West



Attachment 1

Figure

FILE LOCATION: U:\YVR\307071\1148_GON_NVM\Infra\10_Eng\16_Geomatics\01_Mxd\NRI_Permit\Figure1_2018-05-31_NRI_Permit_IQ_Project_Location.mxd



7068500 7068000 7067500 7067000 7066500 7066000 68°33'30"W 68°33'0"W 68°32'30"W 68°32'0"W 68°31'30"W 68°31'0"W 68°30'30"W 68°30'0"W 68°29'30"W 68°29'0"W 68°28'30"W 68°28'0"W 68°27'30"W 68°27'0"W 68°26'30"W

- Legend**
- Proposed DSP Project
 - Proposed SCH Project



Note:
 Coordinate System: NAD 1983 UTM Zone 19N
 Aerial Photo and Basedata from City of Iqaluit, 2016

B SHEET	CUSTOMER:
OneWay to zero harm	
DATE: 04/06/2018	
DRAWN: Y.M.	
EDITED: K.R.	
APPROVED: XX	
<small>*This drawing is prepared for the use of our customer as specified in the accompanying report. WorleyParsons Canada Ltd. assumes no liability to any other party for any representations contained in this drawing.*</small>	

 Worley Group		
IQALUIT MARINE INFRASTRUCTURE PROJECT LOCATIONS		
WORLEYPARSONS PROJECT No: 307071-01148	FIG No: 1	REV A