2022 NON-TECHNICAL ANNUAL REPORT POND INLET MARINE INFRASTRUCTURE – NUNAVUT RESEARCH INSTITUTE LICENCE #02-007-21R-M

1 Project Overview

Construction of the Pond Inlet Small Craft Harbour (SCH) began in 2018 and was substantially completed in October 2021. Led by the Government of Nunavut (GN) - Community and Government Services (CGS), ownership and responsibility is being transferred to the GN - Economic Development and Transportation (EDT) as the facility is now operational.

Pond Inlet is located on the northern shore of Baffin Island in Eclipse Sound, Nunavut (72° 42.125'N°, 77° 57.766'W) (see Figure 1 in Attachment 1). The permanent components of the Project include two new breakwaters, a fixed wharf, a boat launch ramp (existing), small craft floating docks, a sealift landing ramp, and a laydown area to be used for sealift storage, boat storage, and parking (the Pond Inlet Project). Schematics of the SCH are available on the Nunavut Planning Commission (NPC) or Nunavut Impact Review Board (NIRB) registry.

Pond Inlet Project field work has been permitted through Nunavut Research Institute (NRI) since 2016 and is summarized in Table 1-1. The initial field program was to support the existing conditions study for the collection of environmental and geotechnical data to support permitting and engineering design. A Field programs in support of the offset plan requirements for the Fisheries Act Authorization (FAA) issued by Fisheries and Oceans Canada – Fish and Fish Habitat Protection Program (DFO-FFHPP) (termed the Pond Inlet Offset Field Program) have been conducted since 2018 and will continue until 2026. In 2022, a sediment quality program was undertaken to support requirements for disposal or re-use of dredged material for additional dredging required to occur in the open water season of 2023 (termed the Pond Inlet Sediment Quality Program). The Pond Inlet Offset Field Program and the Pond Inlet Sediment Quality Program will collectively be referred to as the Pond Inlet Field Program.

This document provides a summary of the 2022 Pond Inlet Field Program and presents the plans for the 2023 field season. Data collected as a part of the 2022 Pond Inlet Field Program may be shared with interested parties upon request. NRI will be notified of publications resulting from the data collected.

Table 1-1 Nunavut Research Institute Research Permit History

Year	Program Intention	Activities	Regulatory requirement for field program	NRI Permit No.
2016	Existing Conditions to support permitting and engineering	Environmental and geotechnical study to support baseline report for territorial and federal permitting	Nunavut Planning Commission (NPC), Nunavut Impact Review Board (NIRB), DFO	02-047-16N-M
2017	--	No field work	--	--
2018	Offset Plan for FAA	Pre-construction monitoring and Pilot Study Research Program 1 for the DFO FAA	DFO	02-056-18R-M
2019	Offset Plan for FAA	Continuation of Pilot Study Research Program 1 for the DFO FAA	DFO	02-019-19R-M
2020	Offset Plan for FAA	Continuation of Pilot Study Research Program 1 for the DFO FAA Preparation for Year 1 of Arctic char diet study	DFO	02-060-20R-M
2021	--	No field work	--	02-007-21R-M
2022	Offset Plan for FAA	Year 1 for Intertidal and Subtidal surveys. Subtidal with Remotely Operated Vehicle (ROV) and Self-Contained Underwater Breathing Apparatus (SCUBA) (Monitoring Program)	DFO	02-011-22R-M
		Year 1 for Arctic char diet study (Research Program 1)		
		Year 1 for seaweed habitat study (Research Program 2)		
	Dredge Program	Sediment sampling for dredge requirements		

Year	Program Intention	Activities	Regulatory requirement for field program	NRI Permit No.
2023	Offset Plan for FAA	Year 2 for Arctic char diet study (Research Program 1) Inuit Qaujimajatuqangit (IQ) Program (Research Programs 1 and 2)	DFO FAA	TBD
	Dredge Program	Potential for other field programs to support 2023 dredge program	To be determined based on plans for dredged material. The Project team will engage with NPC as required to confirm the existing conformity determination and NIRB SDR are applicable	
2024	Offset Plan for FAA	Year 3 Continuation of Post-construction monitoring	DFO FAA	TBD
2026	Offset Plan for FAA	Year 5 Continuation of Post-construction monitoring	DFO FAA	TBD

2 Program Name

Pond Inlet 2022 Field Program

3 Proponent and Representative Details

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

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	Dynamic Ocean Consulting Ltd 1490 Union Street Port Moody, British Columbia V3H 3X5 Mobile: 778-839-2372 Email: victoria@dynamicocean.ca

4 Field Program

4.1 Offset Program Scope

The Pond Inlet Offset Field Program consists of a Monitoring Program (MP) and a Research Program (RP). The RP consists of two programs hereafter referred to as RP1 and RP2.

The objective of the MP is to assess the performance of the SCH shoreline protection (rip rap boulders) for how it functions as fish habitat. Rip rap boulders provide multi-dimensional habitat where marine organisms can find refuge in the spaces between them and as an attachment substrate for marine vegetation. Furthermore, it provides foraging habitat for fish such as migrating Arctic char and resident sculpin.

The RP is being undertaken as a collaboration between CGS, Advisian, Dynamic Ocean Consulting Ltd (Dynamic Ocean) and the University of British Columbia (UBC). The objective of RP1 is to understand the diet and habitat preferences of important fish species in Nunavut such as Arctic char and sculpin. The objective of RP2 is to understand the biomass and biodiversity of the seaweed bed fronting Pond Inlet.

RP1 and RP2 are composed of a scientific study, where a graduate student has been onboarded at UBC, joined with an Inuit Qaujimajatuqangit study and engagement with the Mittimatalik Hunters and Trappers Organization (HTO). The RPs will be accomplished through a collaboration of science and IQ. The IQ component will be facilitated by Advisian's engagement lead.

4.1.1 Methods

An Intertidal survey was conducted on the shoreline fronting the hamlet, and subtidal surveys were conducted within and outside of the SCH facility. A georeferenced map of the 2018 intertidal and subtidal transects was developed in advance and used in the field using the Avenza Program on an iPad. Methodology and the dates of field activities to support the Pond Inlet Offset Program are provided in Table 4-1.

Table 4-1 2022 Pond Inlet Offset Field Program Components

Component	Activity	Methods	Survey Date 2022
Offset Field Program			
Monitoring Program	Intertidal surveys conducted at low tide in the footprint of the SCH and at a nearby reference site.	• Intertidal surveys were conducted at low tide, with a Transect Survey and a Quadrat Survey. • Transect Survey: Nine transects were conducted • Field personnel documented habitat characteristics (substrate, organisms) and took GPS positions for future reference.	September 15
	Subtidal surveys were conducted at low tide in the footprint of the SCH and at a nearby reference site.	• A local boat operator was subcontracted. The field team operated a remote operated vehicle (ROV) to provide video documentation of the habitat characteristics.	September 15, 16, 17, 18
		• A local boat operator was subcontracted. The field team conducted SCUBA surveys to document the fish and fish habitat characteristics.	September 19, 20
Research Program 1	The plan had been to purchase 15 Arctic char from local harvesters in proximity to the proposed SCH. However, Arctic char were not available to catch and thus 29 sculpin (*Myoxacephalus spp.*) were collected instead.	• There is no field work associated with this component, as fish were purchased from local harvesters. • In the laboratory technicians will collected biological data from each fish (length, weight, sex, maturity status) and collect 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, British Columbia (BC) for processing.	September 20
Research Program 2	Seaweed was collected during subtidal surveys within the footprint of the SCH.	• There was no seaweed available for collection in the intertidal, thus seaweed samples were collected by divers during subtidal SCUBA surveys.	September 19, 20
Sediment Quality Field Program			
Sediment Quality	Sediment samples were collected within the dredge footprint of the SCH.	• Sediment samples were collected with cores by SCUBA divers. Divers used a hand corer to collect sediment, capped it and brought it to the surface for storage in labeled bags.	September 20

4.1.2 Results and Summary

4.1.2.1 Monitoring Program

Habitat characteristics within the intertidal zone was homogenous throughout and primarily consisted of sand with some gravel areas. Species observations were limited to marine vegetation including, rockweed (*Fucus sp.*), unidentified red algae and kelp (Poss. Sugar kelp [*Saccharina latissima]*).

Subtidal habitat characteristics within and surrounding the SCH predominantly consisted of sand and gravel, similar to that in the intertidal. The exception to this was regularly distributed boulder patches, which had varying densities of seaweed. Seaweeds observed were largely rockweed, several kelp species (sugar kelp, sieve kelp [*Agarum clathratum*], ribbon kelp [*Alaria marginata*]), sea lettuce (*Ulva sp.*), bladed red algae and filamentous brown and green algae. Invertebrate observations during subtidal SCUBA surveys included mussels, tunicates, brittle stars, limpets, snails, shrimp, nudibranchs, clams and anemones. Three fish, all sculpins, were observed during SCUBA surveys.

Representative photos of the intertidal, ROV subtidal and SCUBA subtidal surveys are provided in Photo 4-1, Photo 4-2 and Photo 4-3. An aerial overview of the intertidal is provided in Photo 4-4.

Photo 4-1 Intertidal Photo Panel: a) Transect 1 looking seaward; b) Transect 4 looking landward; c) Transect 9, quadrat 4; and d) Transect 4, quadrat 2

Photo 4-2 ROV Subtidal Photo Panel: a) Rocky Habitat, Transect 2; b) Seaweed Bed, Transect 4; c) Overview, Transect 6; and d) Fish, Transect 6b

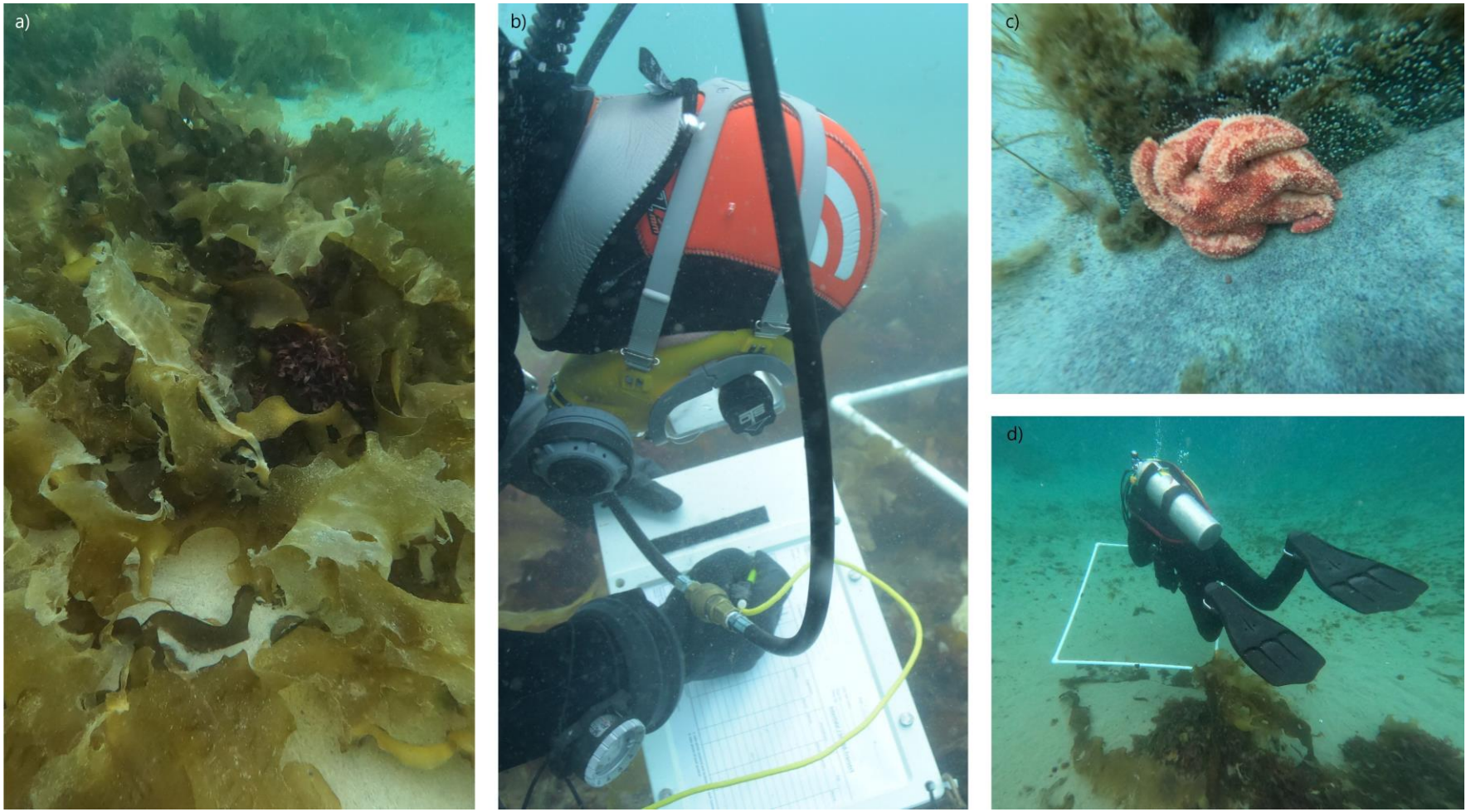

Photo 4-3 SCUBA Subtidal Photo Panel: a) Kelp Bed; b) Documenting Species Observations; c) Polar Sea Star (Leptasterias polaris); and d) Diver Survey

Photo 4-4 Drone Imagery Depicting the Pond Inlet Small Craft Harbour and Surrounding Seaweed

4.1.2.2 Research Program

Research Program 1 – Scientific Study

Twenty-nine sculpin were collected and samples were frozen and shipped to Vancouver, BC for processing by UBC. Fish collected in 2022 were assessed for condition and size, and tissue was sampled to test for evidence of consuming the types of prey associated with shallow benthic macroalgal meadows (e.g., amphipods). Sculpin species will be identified, and dissected fish have been sent for genetic and gut contents analysis.

Results of RP1 are not yet available at the time of this NRI report.

Research Program 1 - Inuit Qaujimajatuqangit

No IQ component was undertaken in 2022. An IQ program is planned for 2023.

Research Program 2- Scientific Study

Field collections for RP2 were undertaken during the intertidal and SCUBA field surveys for the MP. Seaweed samples were frozen and returned to Vancouver, BC for processing by UBC. Samples collected in 2022 will be identified, along with associated invertebrates, and will be analyzed for carbon content to generate length-weight and length-carbon correlations that will allow for estimation of total biomass and carbon for vegetation in Pond Inlet.

A drone survey was conducted by Arctic UAV Inc. on behalf of CGS in September 2022, targeting slack tide. This survey will contribute to the habitat mapping exercise being undertaken by UBC.

Results from the drone imagery and the UBC laboratory analysis are not yet available at the time of this NRI report.

Research Program 2 - Inuit Qaujimajatuqangit

No IQ component was undertaken in 2022. An IQ program is planned for 2023.

4.2 Sediment Quality Program Scope

A sediment quality program was undertaken in 2022 to confirm the sediment characteristics within the 2023 proposed dredged footprint. This information will be required to support permitting and planning if the dredged material is disposed (at sea, on land) or re-used (on land).

4.2.1 Methods

For the Sediment Quality Field Program, nine sediment samples were collected within the SCH dredge pocket. A georeferenced map of the dredge pocket was developed in advance and used in the field using the Avenza Program on an iPad. Methodology and the dates for field activities to support the Pond Inlet Sediment Quality Program are provided in Table 4-1.

4.2.2 Sediment Quality

Sediment quality samples were collected in Pond Inlet as grab samples using SCUBA divers. In total nine samples were collected. Samples were submitted to ALS Laboratory for conventional variables (i.e. particle size, organic content, moisture, etc.), metals, polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs).

Samples were generally comprised of sandy sediments with low percentages of organic and inorganic carbon and low to moderate moisture. Polycyclic aromatic hydrocarbons and PCBs were below reportable detection limits (RDL) in almost all samples; where detectable concentrations were observed, they did not exceed relevant guideline limits.

Only chromium (3 samples) and copper (2 samples) were observed in concentrations that exceeded Canadian Council of Ministers of the Environment (CCME) interim sediment quality guidelines (ISQG) for marine sediment; none of these measurements exceeded the probable effects limits (PEL).

5 Plans for the 2023 Season

A 2023 field program is expected to be undertaken. We will confirm that the components of the field program are aligned with the NPC Conformity Determination and will otherwise engage NPC to confirm if the NIRB SDR is aligned with the Scope of Work (SoW). The 2023 field program will likely include:

- Year 2 of RP1 will consist of purchasing and processing up to 60 sculpin caught by local harvesters in and around the SCH in the waters fronting Pond Inlet.
- Inuit Qaujimajatuqangit will be undertaken to support RP1 and RP2.
- Sediment collections (potential) may be undertaken to support additional dredging work required within the SCH footprint.

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 Dynamic Ocean is provided in Table 3-1.

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Attachment 1 Figure

Legend

——— Proposed SCH Project

0 100 200 400
Metres

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Note:
- Coordinate System: NAD 1983 UTM Zone 18N

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DATE:	04/06/2018
DRAWN:	Y.M.
EDITED:	K.R.
APPROVED:	XX

CUSTOMER: Nunavut

Advisian Worley Group

POND INLET MARINE INFRASTRUCTURE

PROJECT LOCATION

WORLEYPARSONS PROJECT No:	FIG No:	REV
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USER NAME: kenneth.w.ritchie
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