15 March 2023

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Nunavut Impact Review Board
PO Box 1360
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Re: DRDC 2022 Annual Report for Northern Watch Technology Demonstration Operations at Nunavut

References:
A. Land Use Permit N2021N0007
B. Water Use Licence 8WLC-NWT2122
C. NIRB 08DN056

The DRDC Northern Watch Technology Demonstration Project (TDP) – Canadian Arctic Underwater Sentinel Experimentation (CAUSE) will demonstrate an Arctic maritime surveillance capability to the Department of National Defence and other concerned federal departments.

This multi-year undertaking which commenced in 2008 is primarily based at Gascoyne Inlet. Some research activities under this permit are conducted from the Royal Canadian Navy ships, as a separate operation embedded within annual operations organised in the North by the Canadian Armed Forces (CAF). The surveillance demonstration system is unmanned, semi-autonomous, and remotely controlled through a satellite system connection from one of the DRDC centres.

Defence Construction Canada is providing the following annual report, which summarizes the activities in 2022 and outlines the planned activities for 2023. This information is being submitted on behalf of Defence Research and Development Canada (DRDC Atlantic).

Summary of 2022 Activities:

1) Gascoyne Inlet Camp and Northern Watch Array Activities
   a) The camp season this year ran from 02 August to 29 August. There were 18 persons at the camp including DRDC staff, participants from CanmetENERGY (Natural Resources Canada), Omnitech Electronics and a contracted Cook (Jebeaux Catering).
   b) The priority of this trip was to assess and repair infrastructure damage remaining from 2019 and those that occurred during DRDC's three-year absence. The camp was successfully brought to a fully operational capacity and left as such for future use.
   c) Some of the research activities included installation of a wind turbine, weather station, re-installation of a DSLR camera, Northern Watch (NW) array troubleshooting, and an infrasonics experiment. There was originally a four-day ship trial planned, involving an MCDV, DUSN nodes, and the DACS towbody but unfortunately this portion of the trial was cancelled last minute due to permitting and logistical issues.

2) Long Range Underwater Acoustic Communications Experiment
   a) This experiment was cancelled.

3) Maritime Autonomous and Remotely Piloted Systems
   a) This experiment was reduced in scope from the initial plans. A surface autonomous vehicle was operated off a Navy Arctic Offshore Patrol Vessel (Margaret Brook).
   b) DRDC deployed an uncrewed surface vehicle (USV), which is a platform capable of station-keeping and patrolling a given area autonomously. During the trial, the USV continuously patrolled an area near Imillit Island and collected AIS data from its zone of detection.
   c) Coordinates of the location where the USV was deployed: 72.46391, -80.03690 (Eclipse Sound, near Ragged Island, Qikiqtaaluk Region, NU). DRDC operated within 2 km of this location.

4) Towed Reelable Active Passive Sonar (TRAPS) Trial
   a) This experiment was cancelled.

5) Marine Mammal Behavioural Response Study (BRS) Trial
   a) This experiment was cancelled.

6) Arctic Acoustic Recorders Trial (AAR) Trial
   a) An opportunity was available for Defence Research and Development Canada (DRDC) – Atlantic Research Centre to deploy three (3) Arctic Acoustic Recorders (AARs). These AARs were designed to measure directional ambient noise in the Canadian Arctic for one year. They were deployed during August–September 2022 from a Royal Canadian Navy (RCN) vessel, His Majesty's Canadian Ship (HMCS) Goose Bay, in areas near the East Coast of Baffin Island, outside of the Nunavut Settlement Area. The AARs were deployed at the coordinates provided below.

Table 1 – AAR Deployments 2022

Mooring	**Date**	**Latitude °N**	**Longitude °W**	**Approximate Water Depth (m)**
AAR1	28 August 2023	72.175367	72.822933	350
AAR2	29 August 2023	70.451450	65.746000	1,000
AAR3	31 August 2023	67.763483	62.272067	950

<u>Wildlife Log 2022:</u>

Wildlife spotted in the Gascoyne Inlet camp area included polar bear, muskox, seals, flocks of gulls, walrus, and beluga whales. In two instances, polar bear were spotted approaching camp, the electric fence was turned on and bear bangers used to deter each bear from coming any closer. Both bears appeared healthy.

Many birds were observed while in transit for the MARPS trial, these were mostly Northern Fulmar and Black Guillemot throughout the transit to Pond Inlet. Some of the crew reported that they saw a polar bear and two cubs on the ice during transit through the Davis Strait.

Table 2: Wildlife Log

When	What	Where
02-Aug	1 polar bear	~30km West of camp (from plane)
03-Aug	1 polar bear	Headed NW near Caswell Tower (from plane)
03-Aug	1 seal	Inlet
05-Aug	2 ravens	
06-Aug	1 fox	Shoreline near camp
	~6 seals	Inlet
07-Aug	~24 seals	Inlet
	2 beluga	Inlet
	100's of arctic cod	Inlet
08-Aug	1 polar bear	Near camp. Headed South along shore line
10-Aug	1 polar bear (different)	Near camp. Headed North along shoreline
13-Aug	1 musk ox	West across inlet
14-Aug	~12 beluga	Inlet
16-Aug	~12 seals	Inlet
17-Aug	~60 seals	Inlet
18-Aug	~60 seals (same)	Inlet
21-Aug	9 beluga	Inlet
	1 seal	Inlet
22-Aug	7 beluga	Inlet
	6 seals	Inlet
	1 fox	Along ridge north of camp

Work Plan for 2023

1) Gascoyne Inlet Camp Activities
2) Recovery of Northern Watch Array
3) Long Range Acoustic Transmission Experiment
4) Maritime Autonomous and Remotely Piloted Systems (MARPS)
5) Towed Reelable Active Passive Sonar (TRAPS) Trial
6) Marine Mammal Behavioural Response Study (BRS) Trial
7) Arctic Acoustic Recorders Trial (AAR) Trial

1) Gascoyne Inlet Camp Activities

- Description: This work is a continuation of the work under research license 02-36-22R-M. The work activities this year include:
    - Camp Activities – opening camp, maintenance of camp buildings and equipment, safety inspection of camp, closing camp

  - Research Activities – Refurbishment and reset of green power and energy systems, installation of infrasonic equipment, refurbishment and reset of onsite camera system, recovery and redeployment of oceanographic sensors in Gascoyne Inlet, data collection and system check of subsea acoustic array.
- Location: Gascoyne Inlet Camp
- Duration: Estimated duration 5 weeks
- Support Platform: Gascoyne Inlet Camp, supported from Resolute Bay
- Environmental Assessment: Completed in 2022 and being reviewed for 2023.

2) Recovery of Northern Watch Array

- Description: Under the Northern Watch Project (research license 02-036-22R-M) two acoustic arrays were deployed on the seabed outside Gascoyne Inlet. The two arrays are cabled back to the Gascoyne Inlet Camp. One of these arrays is planned to be recovered in 2023. The recovery will be supported by a Canadian Coast Guard vessel, potentially using a remotely operated vehicle.
- Location: Gascoyne Inlet
- Duration: Estimated duration 2 days
- Support Platform: Canadian Coast Guard Vessel
- Environmental Assessment: A due diligence environmental assessment is being completed by DRDC for recovery of equipment from the seabed, including the potential use of a remotely operated vehicle to support the recovery.

3) Long Range Acoustic Transmission

- Description: This experiment is being done to test long-range underwater acoustic communication schemes in an Arctic environment. This experiment will require deployment of one or two underwater acoustic listening nodes and deployment of a transmitting node.
- Location: Lancaster Sound / Barrow Strait.
- Duration: Estimated duration 4 days
- Support Platform: Canadian Coast Guard Vessel, small boat,
- Note: This experiment was planned for 2022 under NRI license 02-049-22N-M, however it was not completed.
- Environmental Assessment: Completed in 2022 and being updated for 2023.

4) Maritime Autonomous and Remotely Piloted Systems

- Description: DRDC will be operating an autonomous underwater vehicle (AUV) and potentially a remotely piloted vehicle (ROV) in the area around Gascoyne Inlet Camp. The primary objective will be a survey of the seabed in the area around the mouth of Gascoyne Inlet near the camp.
- Location: Gascoyne Inlet
- Duration: Estimated duration 10 days
- Support Platform: Small boat, Gascoyne Inlet Camp, potentially Canadian Coast Guard vessel
- Environmental Assessment: A due diligence environmental assessment is being prepared by DRDC for use of the vehicles, including the use of the side scan sonar (which emits sound in the water).

5) Towed Reelable Active Passive Sonar (TRAPS) Trial

- Description: The aim of this trial is to evaluate a type of sonar technology that could be embarked on the RCN Arctic Offshore Patrol vessels (AOPV) (Harry DeWolf-class) and will involve a reverberation trial. Active sonar signals will be transmitted in an area without any whales present to listen to the echoes from the seafloor and/or ice.
- Location: The trial will occur in Baffin Bay in waters greater than 1,000m deep, within the following coordinates: 66N, 58W; 74.4N, 70W; 74.2N, 76.8W; 70.6N, 66.5W; 68.4N, 64.2W and 66N, 60.5W
- Duration: Estimated duration 4 days
- Support Platform: The trial will take place directly off a RCN AOPV
- Environmental Assessment: Completed in 2022 and being updated for 2023.
    - Compliance with Issued Permit Terms and Conditions: The Harry Dewolf-class vessels have a ship class Safety and Environmental Management System (SEMS), to ensure environmental impacts from the ship and its activities, including sonar operations, are kept to a minimum. In addition, the ship will be supplied with Environmental Support Instructions, which will include terms and conditions prescribed in the NIRB Screening Decision Report File No. 22DA050 not already covered by the SEMS.
    - Any additional mitigation measures identified in the environmental assessment will be included in the Environmental Support Instructions mentioned in the preceding paragraph.

6) Marine Mammal Behavioural Response Study (BRS) Trial

- Description: The Marine Mammal Behavioural Response Study (BRS) involves a Controlled Exposure Experiment (CEE) with the purpose of studying the response of whales to active sonar.
  Two types of whales will be included in the study – northern bottlenose whales (Davis-Strait-Baffin Bay-Labrador Sea population) and sperm whales, neither of which are listed in the Species at Risk Act.
- Location: The trial will occur in the deep offshore waters of Baffin Bay, within the following coordinates: 77°00N, 61°00W; 67°00N, 58°00W; 67°00N, 61°00W;68°40N, 65°27W; 69°15N, 66°00W and 70°00N, 66°00W
- Duration: Estimated duration 3 days – 2 weeks
- Support Platform: The trial will take place using a RCN AOPV and a commercial vessel. If an RCN vessel is not available, two (2) commercial vessels will be used.
- Environmental Assessment: Completed in 2022 and being updated for 2023.
    - Compliance with Issued Permit Terms and Conditions: The ship will be supplied with Environmental Support Instructions which will include terms and conditions of the NIRB Screening Decision Report File No. 22DA050 not already covered by the SEMS.
    - Any additional mitigation measures identified in the environmental assessment will be included in the Environmental Support Instructions

7) Arctic Acoustic Recorders Trial (AAR) Trial

- Description: The purpose of the Arctic Acoustic Recorders (AAR) trial was to collect an underwater ambient noise record in the Eastern Arctic. This dataset will provide background information to support future plans for underwater navigation and communications for gliders, provide data for use in RCN marine mammal mitigation strategies, and provide input to ambient noise databases and verification and validation for ambient noise modelling.
  The trial involves the deployment of three (3) AARs into the ocean from HMCS Goose Bay (1 on the ocean bottom, 2 in the water column) for a period of one year.
- Location: The AARs will be deployed at the locations provided in Table 3.
- Duration: The deployment of each AAR will take approximately 1 day.
- Support Platform: The trial will take place directly off a RCN AOPV
- Environmental Assessment: Completed in 2022 and being updated for 2023.
  - Compliance with Issued Permit Terms and Conditions: The ship will be supplied with Environmental Support Instructions which included terms and conditions of the NIRB Screening Decision Report File No. 22DA050 not already covered by the SEMS.
  - Any additional mitigation measures identified in the environmental assessment will be included in the Environmental Support Instructions mentioned in the preceding paragraph

Table 3 – Planned AAR Deployments 2023

Recorder	Latitude °N	Longitude °W
AAR 1	67.763483	62.27206
AAR 2	72.175367	72.822933
AAR 3	73.8	85.25
AAR3 Alternate	70.45145	65.746

The DRDC Northern Watch project has endeavored to comply with all the terms and conditions required by the land use permit and all applicable Acts, Regulations and Guidelines.

- Any vehicle refueling processes were handled with care and drip trays were used.
- All camp building material was left neatly stacked.
- DRDC staff was briefed on all of the terms and conditions of licencing including the archaeological and palaeontology requirements.
- No hunting or fishing was conducted without a Nunavut fishing licence.
- All food and food waste were protected from access by local wildlife.

We trust the information provided is sufficient for your records. Please feel free to contact the undersigned if you have any questions or comments.

Sincerely,

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DCC CDC

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