28 March 2025

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References:

CIRNAC Land Use Licence	N2021N0007	NPC File No.	150276, 150448, 150463
NWB Water Use Licence	8WLC-NWT2425	NIRB File No.	08DN056, 22DA050
NTI Research Licence	2 025 24R-M NRI	QIA Certificate	QX-2436

Dear Representative,

Re: DRDC 2024 Annual Report for Northern Watch Technology Demonstration Operations at Nunavut

This letter report is being submitted on behalf of Defence Research and Development Canada (DRDC) and presents the activities completed in 2024 as part of DRDC's Northern Watch Technology Demonstration Project (Project).

This letter report summarizes the land-use, water-use, and/or research activities completed in 2024 as part of the Project, as required by the applicable land, water, and/or research licences referenced above. It also provides an outline of planned activities for the Project in 2025.

This letter report is organized into the following sections:

- Background
- Summary of 2024 Activities
- Site Photolog
- Summary of Wildlife Monitoring Activities
- Summary of Planned 2025 Activities

Background

The DRDC Northern Watch Technology Demonstration Project was developed to demonstrate and improve Arctic maritime surveillance capabilities to the Department of National Defence (DND) and other concerned federal departments.

This multi-year undertaking began in 2008 and is based out of the Gascoyne Inlet Camp (GIC). Annual research and logistical (maintenance and supply) activities include collection of directional underwater ambient noise; testing of acoustic (sound) communications; deployment of autonomous (unpiloted), semi-autonomous, or remotely-piloted surveillance systems; studies relating to behavioral impacts from use of SONAR, and ongoing maintenance, testing, and improvements to the equipment at the GIC. Some activities under this permit are also conducted from Royal Canadian Navy (RCN) ships as a separate operation embedded within annual operations organised in the North by the Canadian Armed Forces (CAF).

Summary of 2024 Activities

The following Project activities were attempted and/or completed in 2024:

- Gascoyne Inlet Camp and Northern Array Activities
- Recovery of Northern Watch Array
- Seabed Survey of Gascoyne Inlet for Long-Term Arctic Infrastructure
- Sonobuoys Deployment
- Oceans Network Canada Ocean Observatory Upgrade
- Slocum Glider Trial
- Arctic Marine Mammal Behavioral Response Study (BRS) Trial
- Arctic Acoustic Recorders (AAR) Trial

A summary of each Project activity completed in 2024 is provided in the following section.

Gascoyne Inlet Camp Activities

Activities at the GIC ran from 31 July to 28 August 2024. There were up to 20 persons at the GIC at one time. A map of the GIC and nearby points of interest including the local airstrip, observed fuel caches (unrelated to camp activities), and other activities is presented in Figure 1 below:

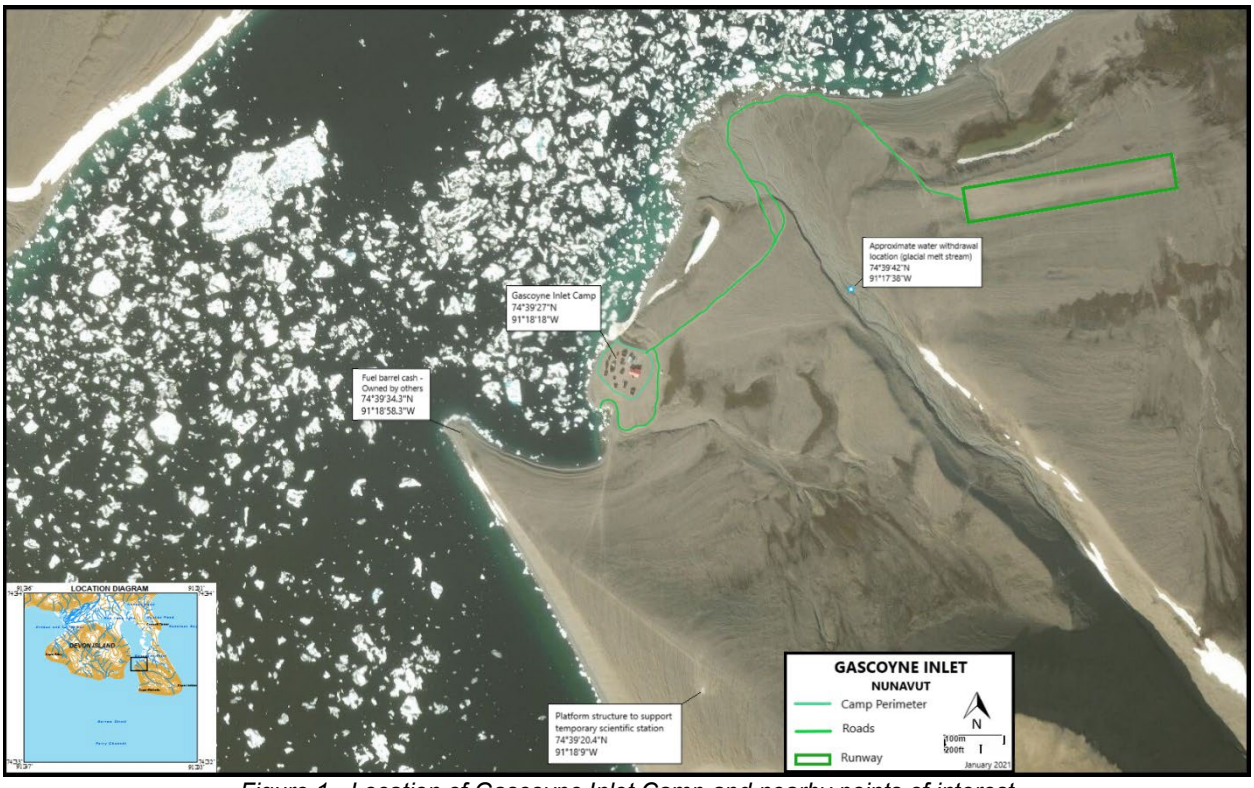


Figure 1 - Location of Gascoyne Inlet Camp and nearby points of interest

Personnel at the camp included DRDC staff, participants from CanmetENERGY (Natural Resources Canada), international guests, CAF divers, and a contracted cook (Jebeaux Catering).

Planned small-boat operations were cancelled early due to equipment issues. Activities scheduled for 15 to 22 August 2024 aboard the Canadian Coast Guard Ship (CCGS) Pierre-Radisson were also cancelled due to a COVID-19 outbreak near the scheduled embarkation date. Additional logistics support for the camp was coordinated through the Polar Continental Shelf Project (PCSP) based out of Resolute and was not directly retained by DRDC. The pickup of an observer (Gatherers & Hunters Association) from Arctic Bay failed as the contracted at-sea transport was canceled due to ship availability. No other local hires and/or initiatives were completed as part of the Project in 2024.

Logistical activities included:

- Opening and inspection of the camp following a year's inactivity;
- Repair, maintenance of the camp's buildings, equipment, and utilities;
- Replacement of the workshop building with a larger structure;
- Testing of a reverse-osmosis (RO) unit for potential future use to provide drinking water;
- Upgrading communications equipment;
- Performance of a safety inspection including water testing; and
- Closing of the camp.

Research activities support or completed included:

- Replacement and maintenance of the wind turbine;
- Upgrade and maintenance of the methanol fuel cell;
- Recovery of the Ocean Networks Canada (ONC) seabed sensor;
- Deployment of stainless and titanium split pipe sections (shore cable protection);
- Installation of a remote weather station (Qikiqtani Inuit Association [QIA] Certificate QX-2436);
- Camera reinstallations to better observe the camp; and
- Installation of snow ablation stakes (to record snow fall and melt).

A reverse-osmosis system was temporarily installed and tested for feasibility as an alternative means of obtaining potable water for the GIC. The test involved drawing salt water from the inlet into the GIC, converting it to potable water, and then plumbing it into the camp's Wash Hut filtration system. The results looked promising however a single unit is unlikely to keep up with camp demand on its own. It was determined that a second unit would be required to meet GIC needs. Planning for a future, permanent installation suitable for use in cold weather was completed.

Erosion was observed at the GIC and along certain access roads from the delta to the camp. Significant erosion was identified much closer to the runway than in previous years. Some repairs were made to the road from the delta and alternative placement of the access road is being considered for next year.

Recovery of the Northern Watch Array

One of two Project acoustic arrays located on the seabed just outside of Gascoyne Inlet were intended to be recovered by DRDC. The recovery of this array was to be supported by the CCGS *Pierre Radisson* using a remotely-operated vehicle (ROV). Due to an illness outbreak aboard the CCGS *Pierre Radisson*, this activity was not completed this year. Approximate bounding coordinates where the activity was planned to take place included (latitude and longitude): 74.580278, -86.966389; 74.580278, -88.196667; 74.702222, -86.966389; and 74.702222, -88.196667. An attempt is planned for next year.

An ROV inspection of the seabed cables within the inlet was also completed. Known and unknown cables were identified, including several which appeared to be tangled up. Future recovery efforts will likely be complicated by this circumstance.

Seabed Survey of Gascoyne Inlet for Long-Term Arctic Infrastructure Monitoring

DRDC had planned to operate an autonomous underwater vehicle (AUV) and a remotely operated (piloted) vehicle (ROV) in the area around the GIC to complete a seabed survey. The seabed survey was to be completed over a period of 12 days, using a side scan sonar and collecting passive magnetic

measurements of the seafloor, supported by the CCGS *Pierre Radisson*. Due to an illness outbreak aboard the CCGS *Pierre Radisson*, this activity was not completed this year. Approximate bounding coordinates where the activity was planned to take place included (latitude and longitude): 74.659594, -91.330392.

Sonobuoys Deployment

DRDC had planned to deploy a series of active and passive sonobuoys along with a passive reflector called the Passive Acoustic Target System (PATS). The deployment was to be supported by the CCGS *Pierre Radisson* using a remotely-operated vehicle (ROV). Due to an illness outbreak aboard the CCGS *Pierre Radisson*, this activity was not completed this year. Approximate bounding coordinates where the activity was planned to take place included (latitude and longitude): 74.580278, -86.966389; 74.580278, -88.196667; 74.702222, -86.966389; and 74.702222, -88.196667. An attempt is planned for next year.

Oceans Network Canada Ocean Observatory Upgrade

DRDC recovered the ONC mini-observatory from the Gascoyne Inlet for the purposes of upgrading the hardware. The recovery was completed with support from the CAF dive team. Approximate bounding coordinates where the activity took place included (latitude and longitude): 74.659883,-91.3104. The activity was completed in August 2024.

Slocum Glider Trial

DRDC had planned to deploy and recover an autonomous glider to collect scientific data on autonomous operations and marine conditions within the Gascoyne Inlet and Barrow Strait. The glider recovery was not completed due to a lack of equipment and personnel. This activity is not planned to continue next season.

Arctic Marine Mammal Behavioral Response Study (BRS) Trial

The 2024 iteration of the Arctic Marine Mammal Behavioural Response Study (BRS) was completed, led by Dr. Sarah Fortune of Dalhousie University. DRDC did not directly participate in this year's iteration and RCN support was not engaged, only commercial vessels.

It is the DRDC's understanding that the BRS Trial was again conducted the Davis Strait between Baffin Island and Greenland. Approximate coordinates where the activity took place include (latitude and longitude): 77°00, -61°00; 67°00, -58°00; 67°00, -61°00; 68°40, -65°27; 69°15, -66°00; and 70°00, -66°00. The research period is understood to be within the usual August to September/October field season.

Arctic Acoustic Recorders (AAR) Trial

During OPERATION NANOOK 2022, the DRDC Atlantic Research Centre deployed three (3) Arctic Acoustic Recorders (AARs) in Baffin Bay in the NSR. These AARs were designed to measure directional ambient noise in the Canadian Arctic in one-year increments. These were recovered in September 2023 from the merchant R/V LeeWay Odyssey. In 2024, two AARs, a cube-like "autonomous multi-channel acoustic" (AMAR)-type lander, and Broadband Ocean Bottom Seismometers (BOBS) were deployed during the August to September period from the merchant vessel the *Mersey Venture*. The units were deployed in areas off the east coast of Baffin Island (AAR2) or inside Greenlandic waters at the coordinates provided in Table 1 below.

Table 1 - AAR Deployments Status in 2024

Mooring	Date	Latitude ºN	Longitude ºW	Approximate Water Depth
AAR1	05-Sep-2024	76.581717	70.968867	403 m
AAR2	03-Sep-2024	71.117667	67.725667	750 m
AMAR	05-Sep-2024	67.763483	62.272067	245 m
BOBS	17-Sep-2024	76.592298	71.017562	203 m

Site Photolog

Photos documenting the site conditions and/or activities involved as part of the 2024 Project activities are provided in the following section.

Photo 1 - Aerial view of Gascoyne Inlet Camp on day of exit

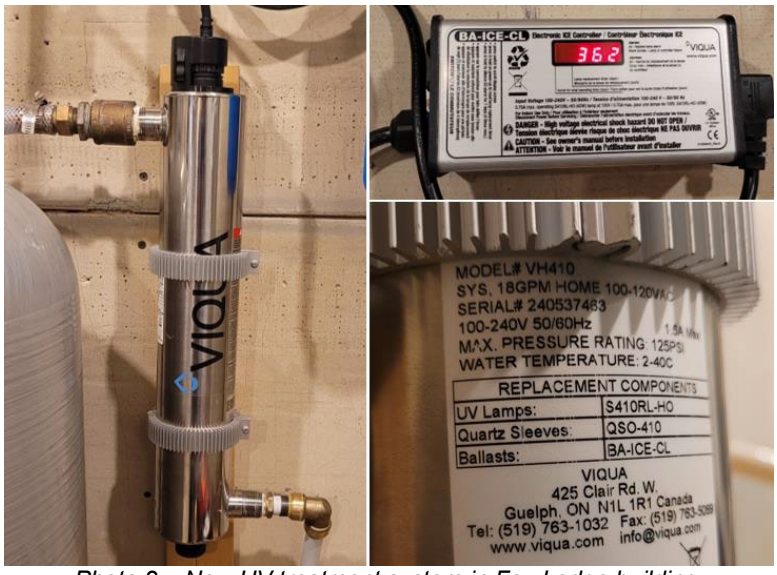


Photo 2 – New UV treatment system in Fox Lodge building.

Photo 3 – Reverse-osmosis trial unit.

Photo 4 – Status of fuel storage onsite a day of exit.

Photo 5 - Drone image of a polar bear that spent considerable time around the camp.

Photo 6 – Top left: Teardown of workshop. Top right: Rebuild of workshop. Bottom: New workshop with steel roofing.

Photo 7 - Drone photo of glacial water source (2023).

Photo 8 – Reinstalled cameras.

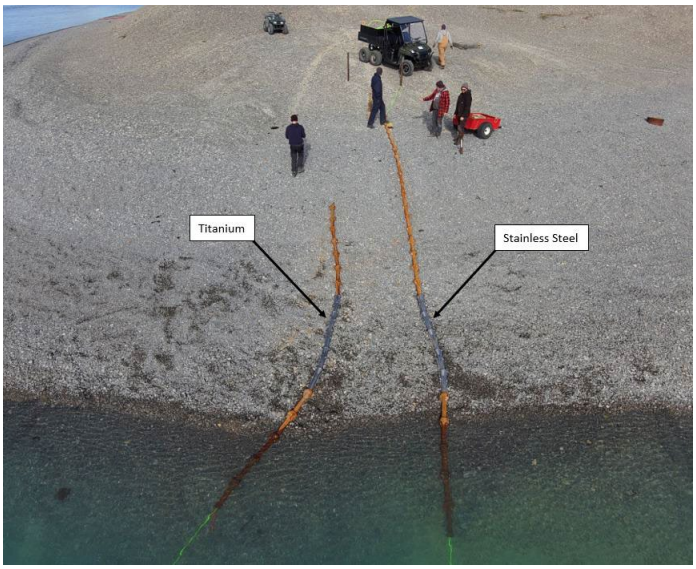


Photo 9 – Steel and titanium split line deployment along the shore.


Photo 10 – Small (support) work boat for AUV operations (2023)

Photo 11 – Top: Example loop of NWTD cables within the inlet. Bottom: Unknown structure found entangled with NWTD cables.

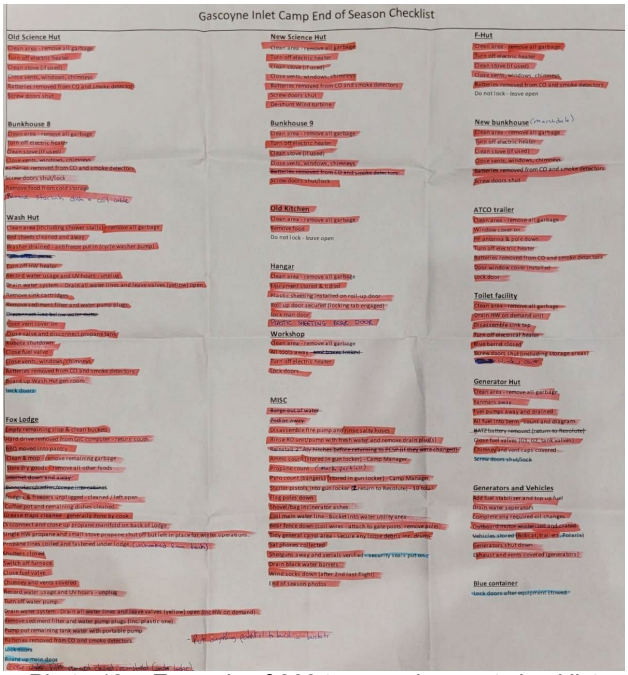


Photo 12 – Example of 2024 camp close out checklist.

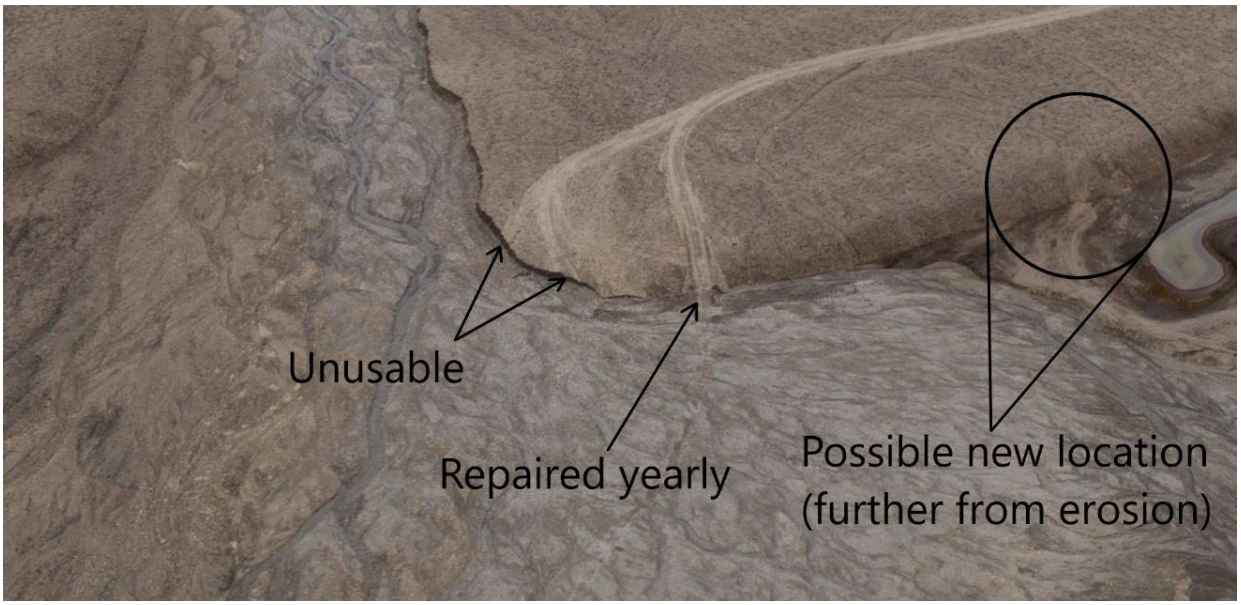


Photo 13 – Erosion of access road from delta to GIC and proposed new location.

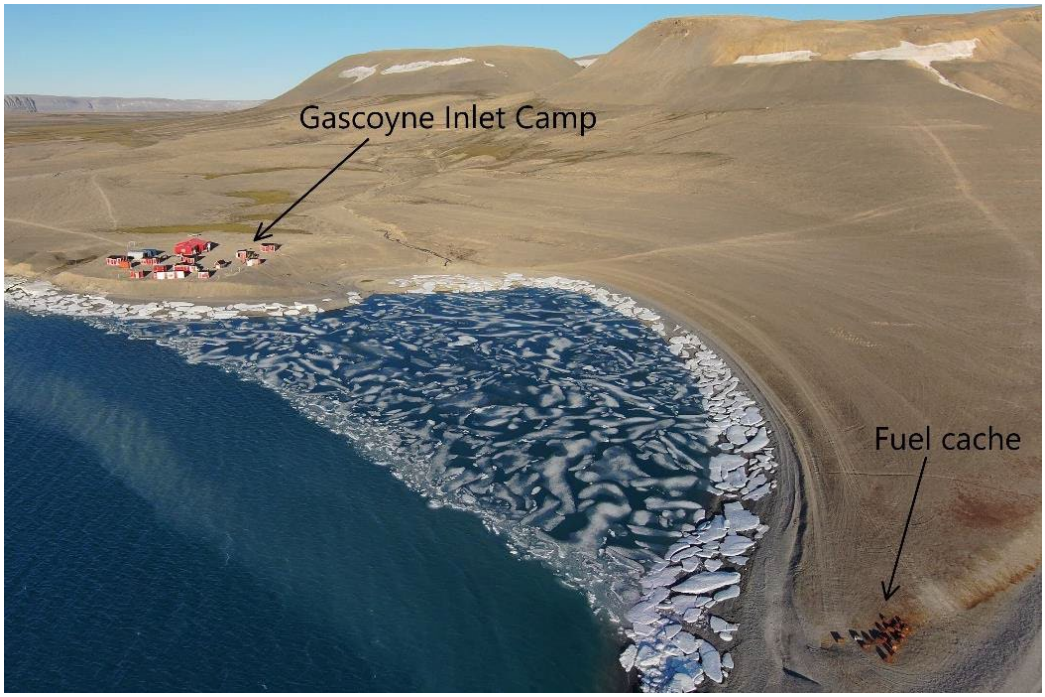


Photo 14 –Non DRDC fuel cache in proximity to GIC.

Summary of Wildlife Monitoring Activities

Wildlife spotted in the area this year included polar bear, muskox, seal, fox, and beluga.

Polar bear activity was noted to be high this year, with sightings on 17 days recorded. Based on size and demeanour, it is presumed to be the same bear in each sighting. It is further presumed to be the same bear that was on site for several days last year.

Deterrents (e.g., bear bangers, wooden clappers, loud noises) were used multiple times this season, when the bear was close to, or approaching the camp. Deterrents were temporarily effective in steering it away, however it continued to later return to the area. The bear was often observed laying down and spending the nights cliff-side, approximately 600 metres southeast of the GIC.

Investigating alternative means of deterrence such as non-lethal rounds (rubber bullets) is being considered, where possible, in accordance with the Government of Nunavut document: *Bear Safety – Reducing Bear-People Conflicts in Nunavut*[1]. Scare cartridges (i.e., "bear bangers") were noted to be of limited effectiveness in permanently deterring the bear from the area.

The bear fence remained activated throughout much of the GIC season. Only necessary work was permitted to be conducted outside of the bear fence, using deterrents and a designated spotter. As a result of frequent bear sightings, excursions had to be restricted for most of the Project. The fence remained installed until the last morning as the bear was still within sight during seasonal close-out of the GIC.

A summary of wildlife observations for 2024 for this Project is provided in Table 3 below. It is emphasized that the scope and resources of the Project do not necessarily provide for explicit monitoring and evaluation of critical life history events (e.g., calving, mating, denning, nesting, migration) for each activity, beyond those observations recorded during the primary research activities or camp operation. Further, the DRDC field team does not generally include a trained or certificate biologist (except as required for a specific research activity) and therefore the observations noted below should be considered descriptive and not definitive.

[1] Ross, T., Medill, S. and Hansen, B. (2022), Bear Safety: Reducing Bear-People Conflicts in Nunavut. (Department of Environment Avatiliqiyikkut website), https://www.gov.nu.ca/sites/default/files/publications/2022-01/bear_safety_-_reducing_bear-people_conflicts_in_nunavut_0.pdf (Accessed: 01 October 2024).

Table 3 - Summary of Wildlife Observations in 2024

Date	Wildlife and Quantity	Location
30-July	1 polar bear	Laying down 300 m NE of runway
31-July	1 polar bear	Laying down W of camp across inlet
01-Aug	1 polar bear	Returned, laying down W of camp across inlet
02-Aug	1 polar bear	Returned, W of camp across inlet
02-Aug	1 fox	Walrus point (250 m SW of camp)
04-Aug	2 beluga	Gascoyne Inlet (spotted via plane)
04-Aug	1 polar bear	Near beachy island (spotted via plane)
08-Aug	1 polar bear	Travelling E along shore at Cape Ricketts (spotted via boat)
12-Aug	1 polar bear	~100 m NE of camp headed toward camp. Deterred and continued heading S toward Cape Ricketts.
12-Aug	1 fox	Near camp
13-Aug	1 polar bear	Walrus point (250 m SW of camp). Headed S along shore.
13-Aug	1 polar bear	200 m E of camp. Headed SE.
14-Aug	1 polar bear	At NE corner of camp. Deterred and headed N.
15-Aug	1 polar bear	Walrus point (250 m SW of camp).
15-Aug	1 fox	Within camp. Deterred.
16-Aug	1 polar bear	Walrus point (250 m SW of camp). Deterred and headed S.
16-Aug	1 polar bear	~400m SE of camp.
17-Aug	1 polar bear	Sleeping ~400-500 m SE of camp.
18-Aug	1 polar bear	Laying down 250 m S of camp.
18-Aug	1 muskox	Across Inlet to W. Moving NE along shore.
19-Aug	1 polar bear	~400 m SE of camp. Headed E.
19-Aug	1 seal	Gascoyne Inlet
20-Aug	1 fox	Near camp
21-Aug	1 seal	Gascoyne Inlet
22-Aug	1 muskox	NE of camp
24-Aug	1 fox	Near camp
25-Aug	1 polar bear	~400 m SE of camp. Headed S.
25-Aug	1 polar bear	Walrus point (250 m SW of camp). Heading E towards camp. Deterred and headed S.
27-Aug	1 polar bear	At SW corner of camp. Deterred and headed S.
28-Aug	1 polar bear	~250 m NE of camp near road. Deterred and headed ESE where it laid down until we departed camp.

Impact Assessment

In several instances, polar bears were identified approaching the camp and which required use of deterrents. Specific causes for animal encroachment were not identified beyond simple curiosity or a return to previously-visited areas. Deterrents including electric fences and/or scare cartridges (i.e., “bear bangers”) were used to deter the animals from approaching any further. As noted previously, bear bangers were of limited effectiveness. Visual observations of the bears did not indicate any obvious health concerns.

The Project stakeholders have endeavored to comply with all the terms and conditions required by applicable permits and Acts, Regulations and Guidelines. Specific procedures and mitigation measures used to minimize or mitigate potential impacts from Project activities included:

- briefing DRDC staff on all the terms and conditions of licencing including the archaeological and palaeontology requirements;
- forbidding hunting or fishing without a Nunavut fishing licence;
- managing and securing all food and food waste to mitigate detection and access by local wildlife;
- ensuring vehicle refueling and lubrication processes were handled with care, including use of drip trays as appropriate;
- stacking all camp building materials neatly at the conclusion of the activities;
- identification and communication of observed wildlife and making efforts to avoid those areas where possible;
- limiting use and areas of travel for vehicles;
- providing pre-travel training to camp team leads on wildlife interactions (notably for bears); and
- following a safety plan for polar bears sighted close to camp; plan details included verification and maintenance of bear fences and other deterrence to ensure they are in good condition, procedures to cease work and/or bring staff indoors, and procedures for use and escalation of deterrence methods to be used, if any and as appropriate.

Overall mitigation measures described above are understood to have been reasonably effective in 2024 and will be included, and refined, as part of future camping planning activities.

Fuel Drums

DRDC notes there is a longstanding fuel cache located south of the GIC at Walrus Point. The cache has been present for over 10 years and is not owned by DRDC. The cache has been reported several times; however, it has remained untouched. Further, it is unclear who the drums belong to. The coordinates of the cache are (latitude and longitude): 74.659444, -91.316111. The cache is understood to consist of twenty (20) drums containing unleaded gasoline and Jet B aircraft fuel. The drums are in poor condition.

DRDC has concerns that the proximity of the cache to the shoreline and their rusting condition represents an environmental concern. There is a further concern that any such spill event could become unfairly associated with the GIC and DRDC’s operations and/or corporate character due to the proximity of the cache to the camp (~250 metres). DRDC strongly recommends regulators and land-owner stakeholders undertake the required actions to address the deficiencies at the cache as soon as possible.

Summary of Planned 2025 Activities

The following Project activities are planned for 2025:

- Gascoyne Inlet Camp and Northern Array Activities
- Canadian Coast Guard Bathymetry Survey
- Recovery of Northern Watch Array
- Sonobuoys Deployments and Experiments
- Acoustic Project Tow
- Arctic Acoustic Recorders (AAR) Trial
- Removal and Reinstallation of an Automated Temporary Weather Station

A summary of each Project activity planned for completion in 2025 is provided in the following section.

Gascoyne Inlet Camp

Description: DRDC will continue general maintenance and repair activities to camp facilities in support ongoing scientific research based out of the camp. Planned logistical activities include opening and repair/maintenance of the camp's buildings and equipment, performance of a safety inspection, and closing of the camp. Planned research activities include setting up camp and research continued through CCGV or commercially supported activities. Further, a study of the site's generator and electrical systems will be completed to determine the baseline energy needs of the camp and inform decision-making on future improvements to the camp's electrical supply.
Location: Gascoyne Inlet Camp.
Duration: Up to eight (8) weeks beginning in August 2025 (start of field season).
Support Platform: Gascoyne Inlet Camp, supported by Resolute Bay Polar Continental Shelf Program.
Environmental Assessment: Completed in 2024 and being reviewed for 2025.

Canadian Coast Guard Bathymetry Survey

Description: DRDC will perform bathymetric measurements of the seabed using multi-beam echo sounding techniques in the area surrounding the Gascoyne Inlet and the Barrow Strait real-time acoustic ocean observatory. This activity was previously planned under the "Seabed Survey of Gascoyne Inlet for Long-Term Arctic Infrastructure Monitoring" heading.
Location: Barrow Strait, as shown in Figure 2 below, with bounding coordinates as follows (latitude and longitude): 74.675278, -91.553333, 74.076111, -91.583889, 74.671389, -90.929722; and 74.069722, -90.945.
Duration: Fifteen (15) days during the August-September 2025 field season.
Support Platform: Canadian Cost Guard's Pierre Radisson-class icebreakers, Gascoyne Inlet Camp.
Environmental Assessment: Underway.

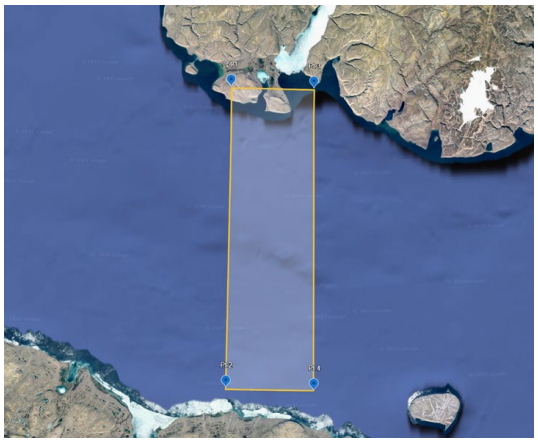


Figure 2 - Bathymetry Survey Box

Recovery Of Northern Watch Array

Description: DRDC will continue its recovery efforts of the Northern Watch Array. The Northern Watch system consists of two arrays that were deployed approximately a decade ago. Both arrays need to be recovered. One array was recovered in 2023 and the second was planned to be recovered in 2024 but was unsuccessful due to availability of CCGV. The remaining array cable, which is approximately 9 kilometres (km) long and 15 millimetres (mm) in diameter, will be recovered with the support of a CCGV in 2025. A visual and acoustic (audio) inspection of the main array elements (e.g., array receiver controller, repeaters, the array itself) was completed in 2023 using a remotely operated vehicle (ROV); this data will be used to aid in the recovery of the remaining array.
Location: Lancaster Sound, with bounding coordinates as follows (latitude and longitude):
74.580278, -86.966389; 74.580278, -88.196667; 74.702222, -86.966389; and 74.702222, -88.196667.
Duration: Five (5) days during the August-September 2025 field season.
Support Platform: Gascoyne Inlet Camp, CCG Support Vessel.
Environmental Assessment: Completed in 2023 and updated in 2024 and 2025.

Sonobuoys Deployments and Experiments

Description: DRDC will using sonobuoys to assess the suitability of the arctic marine environment for multi-static (i.e., multiple, fixed, and location-diverse), anti-submarine warfare techniques and to assess the propagation (transmission) conditions for passive sonar.
Location: Lancaster Sound, as shown in Figure 3 below, with bounding coordinates as follows (latitude and longitude):
74.580278, -86.966389; 74.580278, -88.196667; 74.702222, -86.966389; and 74.702222, -88.196667.
Duration: Two (2) days during the August-September 2025 field season.
Support Platform: Gascoyne Inlet camp, Canadian Coast Guard Vessel.
Environmental Assessment: Underway.

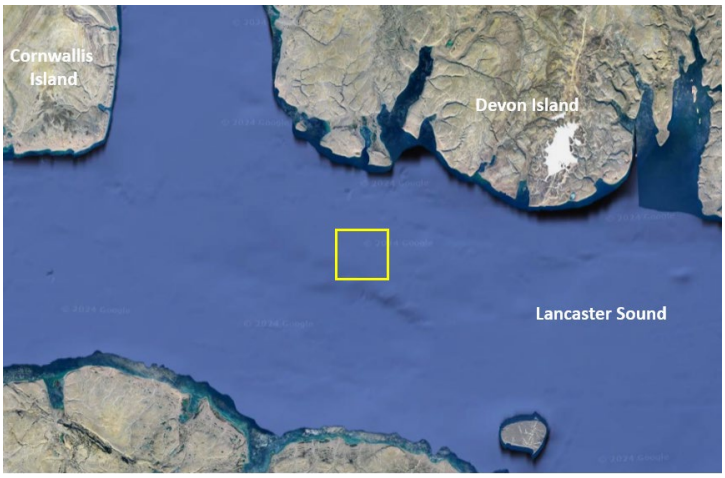


Figure 3 – Sonobuoys Deployment Box

Acoustic Projector Tow

Description: DRDC will be testing the output response of an acoustic projector (i.e., a loudspeaker designed to be used underwater) to produce a range of individual tones within the 10 Hertz (Hz; cycles per second) to 3000 Hz (or 3 kiloHertz [KHz]) range. The projector is expected to produce an acoustic signal (a "sound") less than 200 decibals (dB) relative to the standard reference of 1 microPascal (1 µPa), measured at 1 m from the projector. The volume of the projector is approximately 2 cubic metres (m^3) with a mass no greater than 1250 kilograms (kg). The projector will be towed at depths ranging from 60 to 400 m.
Location: Between Universal Transverse Mercator (UTM) zones 15 to 19. The exact location cannot be provided due to the project's security classification.
Duration: The exact duration cannot be provided via this document due to the project's security classification. It is expected to be completed during the August-September 2025 field season.
Support Platform: Gascoyne Inlet camp, Canadian Coast Guard Vessel.
Environmental Assessment: Underway.

Arctic Acoustic Recorder (AAR) Trial

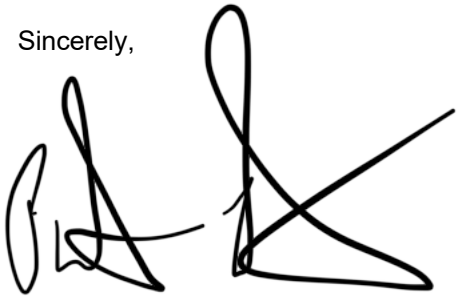
Description: DRDC plans to continue the AAR trial in 2025. The trial will involve the recovery of one AAR moored to the seafloor from the offshore area near Clyde River, and redeployment of two AARs (one moored, one bottomed) in two areas. The moored unit will be installed at approximately 800 m in depth, while the bottomed unit will be installed at approximately 300 m in depth. The moored unit consists of a set of four (4) hydrophones with recorder, acoustic release, float, and anchor weight, and about 550 m of cable. The bottomed unit is a 1.5 m cube-like AMAR-type lander; the AMAR unit has four (4) hydrophones and an acoustic recorder, with an acoustic release.
Location: The AARs & AMAR will be deployed in the offshore area near Clyde River, outside the NSR, with coordinates as follows (latitude and longitude): 71.117667, -67.725667.
Duration: Two (2) weeks during the August-September 2025 field season.
Support Platform: Small boat, Canadian Coast Guard Vessel or commercial vessel,
Environmental Assessment: Underway.

Removal and Reinstallation of an Automated Temporary Weather Station

Description: DRDC will be removing and reinstalling an uncrewed (automated) temporary weather station located approximately 2.5 km southeast of the camp. This station was installed in accordance with QIA certificate QX-2436 in August 2024. It is intended to be operated until the end of August 2026. The removal and reinstallation activities are related to a lack of communication with the unit.
Location: The weather station is located southwest of the camp, with coordinates as follows (latitude and longitude): 74.647916, -91.364063.
Duration: Two (2) days during the August-September 2025 field season.
Support Platform: Contracted helicopter, Gascoyne Inlet Camp.
Environmental Assessment: Underway.

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,



Patrick Sangster

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