

GASCOYNE INLET GEOSCIENCE PROJECT

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The Gascoyne Inlet Geoscience Project is a collaborative effort led by the Geological Survey of Canada in partnership with Defence Research and Development Canada (DRDC) to better understand the land, coast, and seafloor around the Gascoyne Inlet Camp (GIC) on southwest Devon Island. The project brings together three areas of research: marine seabed geology and natural underwater noise, coastal dynamics and nearshore ice, and surficial geology and permafrost conditions to support safe operations, long-term planning, and environmental awareness in this region of the Arctic.

As sea ice conditions change, and the GIC considers future expansion and possible year-round use, there is a growing need for detailed information about the seabed, coastline, and surficial geology, and permafrost. The proposed research aims to answer several key questions:

- What does the seabed look like in Gascoyne Inlet and in nearby bays?
- How do natural geological processes create underwater noise that may affect acoustic monitoring?
- How have the coastline, beaches, and nearshore ice changed over time?
- How do waves and ice interact to move sediment along the coast?
- What types of surficial materials and landforms exist around the camp?
- How stable is the permafrost beneath these landforms?

Understanding these conditions will help identify natural hazards such as erosion, underwater landslides, and ground ice that could affect infrastructure, including submarine cables and future camp facilities. The work will also improve the ability to distinguish natural underwater noise from human-made signals, supporting safer marine operations and better situational awareness. Fieldwork will take place in August 2026 and 2027 in Gascoyne Inlet and the surrounding region, including Radstock Bay, Cape Ricketts, Beechey Island, and nearby coastal and offshore areas. Each field season will last several weeks, with logistical support provided by PCSP and DRDC.

Marine Research

The marine research will focus on creating a detailed picture of the seafloor in the study area. The research team will use sonar sensors that emit sound waves through the water to map the shape of the seabed and the uppermost geological layers just below it. The team will also collect core samples of seabed sediments to understand their composition. Instruments placed in the water will record natural underwater movements, such as shifting sediments or freezing and thawing near the seabed. Together, these tools help identify places where the seafloor may be unstable, including those that could experience underwater landslides, fast-moving sediment flows, and seasonal freezing and thawing of the seabed.

Coastal Research

The coastal research will examine how the shoreline and nearshore ice have changed over time. Historical air photographs, modern satellite images, and drone surveys will be used to compare past and present conditions. Ground-based tools, including ground penetrating radar, timelapse cameras, and wave radar, will also be used to observe how waves and ice interact, and how these processes move sediment along the coast.

Surficial Geology and Permafrost Research

The surficial geology and permafrost studies will be focused on the land around the GIC and in the region surrounding Gascoyne Inlet. Air photos, satellite images, and DInSAR (a remote sensing method that measures ground movement) will be used to map landforms and identify areas where the ground may be unstable. Fieldwork will include collecting soil and stream sediment samples, drilling shallow cores into the permafrost, and installing instruments that record ground temperatures. This information will help inform planning of new infrastructure. The work will also support broader studies of the region's geological history, including potential mineral occurrences, sea level changes, glacial activity, and the movement of sediments across the landscape.

Together, these activities will produce detailed maps and observations that improve terrain awareness, support safe infrastructure development, and deepen scientific and geological understanding of the region.

Research results will be shared with the community of Resolute Bay, and any others interested through plain-language summaries and in-person presentations. We would propose to hold in-person meetings or events in Resolute Bay to present the results to all interested people in the community.