



## **Demande de la CNER faisant l'objet d'un examen préalable #126201**

### **Monitoring the movement, habitat use, and overall health and function of Arctic fishes across freshwater and marine ecosystems in the Cambridge Bay area**

**Type de demande :** New

**Type de projet:** Scientific Research

**Date de la demande :** Monday, July 7, 2025

**Period of operation:** from 2025-03-19 to 2035-05-19

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# DÉTAILS

## Description non technique de la proposition de projet

Anglais: Aquatic resources - notably many fish species - are central to Inuit health, culture, and economic development. Understanding the environmental drivers of fish availability and quality in the context of a rapidly changing Arctic is essential to ensure their continued sustainability and availability. Our long-term (>15 years) research program in Cambridge Bay has documented spatial, temporal, and physiological aspects of habitat use and migrations of Arctic Char. We've used cutting-edge approaches, incorporating acoustic telemetry, genomics, ecological physiology, contaminant monitoring, and oceanography. Here, we aim to build upon these ongoing research efforts but also significantly extend the reach of our program by expanding acoustic tracking, physiological, and ecotoxicological investigations into several ecologically and culturally important fish species such as lake trout, cod (ogac) and sculpins (kanayok). Acoustic tracking will be used to monitor the movement, behaviour, and habitat use, and to identify critical habitats such as those used for spawning and overwintering in several species of importance. This method involves the implantation of small acoustic tags into the body cavity of the fish that can then be "heard" by acoustic receivers that will be deployed throughout the marine and freshwater environments. Physiological measurements will be used to characterize the influence of temperature and oxygen changes (both seasonal and rapid changes) on the health and function of fishes. This work will involve measuring several parameters related to fish health such as heart function, metabolism, and energy balance. Acoustic tracking data will also provide information on temperatures experienced by fishes in the area which can be integrated with information regarding their physiology. Ecotoxicological work will be used to investigate the types and abundance of emerging contaminants, including plastics, ship- / oil-based pollution, and PFAS, in key habitats in the region in addition to the sources, fates, and transport of these contaminants. Aquatic passive samplers will be used to track sources and transport of these contaminants in the environment and biological sampling to track the fate and transport of contaminants through the ecosystem. These aquatic passive samplers complement decades long aquatic passive sampler deployments in Nunavut through the AQUA-GAPS network and Environment and Climate Change Canada. Sampling of surface water, aquatic and thawed surface sediments, and Arctic char tissues will also be used to answer questions and concerns from the EHTO and community partners on the release of contaminants via permafrost thaw into critical fish and their habitats. Water samples will be obtained by filling 1L stainless steel, glass, and/or polyethylene water bottles (40L/year). Sediment samples will be taken by scooping sediment into 100-500ml whirl-pak bags and/or stainless steel/glass jars (20L/yr). By taking paired water and sediment samples, we will begin to understand the of contaminants that are entering critical fish habitats, and through contaminant pattern assessments begin to pin-point potential sources (e.g., permafrost thaw, wastewater effluent, shipping); thus, informing priority contaminants to monitor as the Arctic experiences rapid warming. Further, new collaborations will be built to explore the biological drivers of fish habitat quality in both freshwater and in the oceans. In lakes, we will explore how juvenile fish habitat use is linked to seasonal and diel patterns of plankton vertical migrations and abundance. Using our acoustic array in the marine environment, we will assess if kelp forests in the Cambridge Bay area are important marine summer feeding habitats for Arctic Char and other fish species. Finally, we will use environmental DNA (eDNA) methods to help characterize seasonal and spatial variation in the distribution and abundance of these fish species. Most work will be based out of the community of Cambridge Bay with personnel residing on site at the Canadian High Arctic Research Station (CHARS) except for two 5-10 day camps on the land per year. Camps will consist of 4 people with a total of 80-person camp days per year. The team has been working in close collaboration with the Ekaluktutiak Hunters & Trappers Organization (EHTO) for > 16 years and the board has provided support and will be a key partner on the project, assisting with sampling logistics (including the hiring of local experts) and in the organization of annual community outreach events. Overall, the proposed project will contribute significantly to our understanding of climate change impacts on fish and the fisheries they support. It will do so through extended long-term monitoring of contaminant trends, fish behavior and performance in relations with physicochemical habitats characteristics. Furthermore, by bridging data on lower food web and aquatic habitats, this project will also lay the foundations for an ecosystem-based management approach of culturally and economically important Arctic fish species.

Français: N/A

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Inuinnaqtun: atugakkhaliurnirmullu – pidjutit illittirnaqtut amigaittunik iqalukhiaktukhanik nirjutinik – akunnganik Inuit inuuhirinnatqumiglu, pitquhiqtuqpaktunik, uvuunalu havaakhaliurnirmullu aullaqtirutikhanik. Kangiqhigiami avatinganik aquttut iqalungnik piinariaalaqininga qanurittaakhaaniglu pipluni qilaminnuaq aallannguqtuq Ukiuqtaqtumi ihariagijaujuq naunairiami pihimmaaqtuq nungulaittumut piinariaalaqiningalu. Hivitujumik (> 15nik ukiunik) ihivriurnikkut pinahuarutit Iqaluktuuttiimi titiraqtut najugait, atukaffaaqtut, uvvalu iqaijarnikkut pidjutit najugait aturningit uvvalu nuutirniit Ukiuqtaqtumi Iqalukpit. Atuqtugut kibluhiqhimajunik upautidjutit, ilaliutiblugit uuktuutinirnunut nirjutit ingilraliningit, ingattaqhimailinirnut, nunami iqaijarnikkut, halumailrunik munaridjutinik, uvvalu tarjutigut iqaijarnikkut. Hamani, piniaqtugut nappaqtigijaangat ukuninga aulahimmaaqkunik ihivriudjutikharnik pidjutikharnik kihimi anginirmik tikiutijaangat havaakhangit taimaa angigliuumerutikharnik auladjutikharnik, iqaijaliqinikkut, unalu nunami ihivriurutikharnik qaffiujunik pitquhiliqinikkut akhuurnaqtunik iqalungnik huradjanik taimaittunik tahirmi ihuug, uugak (ogac) halumailrungillu kanajuq (kanayok). Naunaijainikkut naunaijainiq atuqtauniaqtuq munarigiami ingilraninga, pitquhinga, najugangillu aturninga, ilitarigiamilu hivitujut najugangit ukunatitut tahapkuat atuqtaujut akhuraaluk amihuuniglu huradjanik akhuurninganik. Una pidjuhiq ilalik naunaipkutat mikijut atatit timingat ilulia iqalungnut tamnaunia "turaangajut" tapkunanga apjaqturnit pidjutaunia pijauniat ihumani tarjumi halumajut imaqt avatait. Iqaijarnikkut aktilaangit atuqtauniaqtut naunaijarianganik uunarniit uvvalu aniqhaarut aallanngurningit (tamarnik ukiutigut uvvalu qilamik aallannguqtirningit) aanniaqtailinikkut uvvalu auladjutainun iqalukhiuqtut. Una havaakhaq ilauqarniaqtuq qaffiujunik atuqtakharnik aulahimajut talvuuna iqalungnik inuuhirinnikkut taimaittunik uummatiliqinikkut auladjutikharnik, auladjutikharniglu, unalu qullirutikharnik. Naunaijaqhugit naunaijautit tunihiniaqtut kangiqhidjutinik uunarniitigut atuqtaujut iqalukhiuqtunit kitut ilaujut kangiqhidjutinik mikhaagut iqaijarnikkut. Havagvik nalunaqtuliqinikkut taapkua pidjutigijait idjuhiit, hulaqutit, ilauqatigiingnirmullu hunat taapkua hivuuranaqtut avatiptingnut havaktaujuqhat ihivriurianganik qanurittut amigainingilu halumailrut, ukualu palaastiit, umiat/uqhurjuat halumailrut, PFAS-lu, nunagijainit nunami ilagiarutini ihuaqtutini, uqhurnik, aullaqtittijaanganilu ukuninga halumailrunik. Naluuyaqtut naunaiyagakhat atuqtauniaqtut naunaiyagianganik ikayuutit uvalu akyaqlugit hapkua halumailgut avatingini uvalu huradjat ihivgiugutit naunaiyagianganik halumailgut avatingitigut. Hapkuat imarmiutanik qangiutivaktun ihivriudjutikharnik nan'ngaridjutit 10-nik ukiunganik aulahimaanginaqtun ihivriudjutikharnik aulatitivakhimayut Nunavunmi talvuuna Naluuyaqtut Nunarjuami Aitturinnikkut Uuktuutit (AQUA-GAPS) qaritaujalidjutitigun Avatiliqijitkullu Hilaup Aallannguqtirninga Kanatami. Ihivriudjutikhangit qaanganitunik imarnik, imarmiuttanik mahaktiqhimajuniglu qaanganitunik nunangit, Unalu Iqalukpiit kakijautikhangit atuqtauniaqtun kiujaangat apiqquutignik ihumagijauhimajuniglu talvannga Ekaluktutiak Anguniaqtit Naniriaqtunullu Katimajit EHTO-mit nunallaanilu ilaqatigiiktunik talvuuna halumaittunik talvuuna nunap qiqauamaninga mahaktiqpallianiaqtun akhuurnaqtunik iqalungnik nunagijainiglu. Imarmik naunaiyagakhat pijauniaqqut 1 L qipliqut haviit, hikuliat, uvvalu/uvvaluniit ajurnaqqiaktut, qullirmik, ihuaqhiujuminaqtumik maniktuq halumailrut piliuqtauhimajuq qiplariktunnuat halumailrut, atuqtaujuq palaastik puukhanik, niqinik puukhanik, aallaniglu puuqhimajunik imarmik hikuliat (40 L/ukiuq). Nunavallit naunaiyagakhat pijauniaqtut 100-500 ml whirl-pak puukattaq taamnalulu/uvvaluniit qipliqut haviit/hikuliaq puukhangit (20 L/ukiuq). Piplugit imait nunalu naunaiyagakhat, kangiqhilirniaqtugut halumailrut itilijut ihariagijaujunik iqaluit najugainik, halumailruniglu atuqtaujuq naunaijaijut piniqhalihaliqhutik (ilaa, nunap qiqumaninga auktuqpallianinganik, kuvigarvikhat, uhidjutit); talvuuna, illittuqhajaangat pijumalluaqtanik halumaittunik munaridjutikharnik Ukiuktaqtuni atuqpakhimajainik qilaminnuaq. Imaalulu, nutaat havaqatigiingningit havaktauniaqtut qiniqhialutik akhaluutunik iqalungnik huradjanik qanuriningit tamarnik imap uvvalu tarjumi. Tattit iluani, qiniqhianiaqtugut qanuq iqalugait najugait atuqtaujuq atadjutiqaqtut ukiutigut uvvalu uqhurjuanik auladjutainik upalungaijautini aulaningit uvvalu amigainingit. Aturlutik nivjaujanik tarjumi avatingnit, ihivriurniaqtugut tarjum natqua nauttiat Iqaluktuuttiimi najugaani akhuurnaqtun tarjumi aujami nirijaangat najugaingit talvani Iqalukpiit aallaniglu iqalungnik huradjanik. Kingulliqpamik, aturniaqtugut avatiliqinikkut DNA (eDNA) hanaqidjutikharnik ikajurianganik naunaijaijaangat ukiunganik najugaanilu naunairutiaqtun

talvani nunamiittunik amigaitilaangillu ukuninga iqalungnik huradjanik. Amigainiqhat havaat pijutiqaqniaqtut nunagiyauyumi Iqaluktuuttiami havaktunik igluqaqtunik talvani Kanatamiut Qutiktumi Ilituqhaivikmi Havakviuyumi (CHARS) kihiani malruuknik 5-nit 10-ni ubluni aulaaqtitiyuni maniqami atuni ukiumi. Tangmarviit piqarniaqtut 4-nik inungnik atauttimut 80-inungnik katimajaqturviujuni ubluni atauhirmi ukiumi. Ikajuqtigiit havaqatigaqtut qaniniqhanik havaqatigiingninginik Ekaluktutiak Angunahuaqtit Timiujuni (EHTO) > 16-ni ukiuni katimajinilu pipkaijut ikajuutunik ikajuqtigiilluarninginik havaami, ikajuqhutik naunaijagakhanik aulaninginik (ilaujullu havaktikhaqhiuriangani nunagijaujumi ajunngittut) timiujullu aippaagutuaraangat nunagijaujumi uqaqatigiigutunik huliviujunik. Tamainnit, atulirumajaujuq havaaq ikajuutauniaqtuq angijumik kangiqhidjuptingnik hilap aallanngurninganik akturnniginik iqalukhiuqtuni iqalukhiuqtulu ikajurninginik. Taimailiurniaqtuq hivitujumik munaridjutinik halumailrunik aulaningit, iqaluit idjuhiit uvvalu havauhiit ilaujut iqaijarnikkut najugait idjuhiit. Taimaalu, katitiqhugit naunaijautit mikitqiatigut niqitigut pidjutait uvvalu imarmiuttanik najugait, una havaaq tunngaviqarniaqtuq nunami-pihimajut munaridjutikkut upautiniq pitquhikkut uvvalu maniliurnikkut akhuurnaqtut Ukiuqtaqtumi iqalukhiuqtut huradjat.

## **Personnel**

Personnel on site: 7

Days on site: 21

Total Person days: 147

Operations Phase: from 2025-03-19 to 2035-05-19

## Activités

Emplacement	Type d'activité	Statut des terres	Historique du site	Site à valeur archéologique ou paléontologique	Proximité des collectivités les plus proches et de toute zone protégée
Jayko (Jayco) River commercial fishery study site	Sampling sites	Inuit Owned Surface Lands	N/A	N/A	Approximately 40 km from the community of Cambridge Bay
Subsistence waters near Cambridge Bay	Sampling sites	Inuit Owned Surface Lands	N/A	N/A	In proximity to the community of Cambridge Bay (0-30 km)
Greiner and Anderson Bay watersheds	Sampling sites	Inuit Owned Surface Lands	N/A	N/A	In proximity to the community of Cambridge Bay (10-40 km)
Greiner and Anderson Bay watersheds	Camp	Inuit Owned Surface Lands	N/A	N/A	In proximity to the community of Cambridge Bay (20km). A small, 4-person camp will be set up in the Greiner watershed at Inuhuktok. The camp will include one 10'x12' wall tent, and four personal tents. All garbage will be brought back to the community and disposed of in the local dump. Water for drinking and cooking will be taken directly from the lake. When out on the land, waste will be buried at least 100m from any water sources or brought back to the community for disposal.

### Engagement de la collectivité et avantages pour la région

Collectivité	Nom	Organisme	Date de la prise de contact
Cambridge Bay	Beverly Maksagak (Manager - EHTO)	Ekaluktutiak HTO	2024-08-15
Cambridge Bay	Beverly Maksagak (Manager - EHTO)	Ekaluktutiak HTO	2024-10-23
Cambridge Bay	Beverly Maksagak	Ekaluktutiak HTO	2025-01-10

	(Manager - EHTO)		
Cambridge Bay	Rose Maksagak (Manager - EHTO)	Ekaluktutiak HTO	2025-05-06
Cambridge Bay	Rose Maksagak (Manager - EHTO)	Ekaluktutiak HTO	2025-05-21

# Autorisations

Indiquez les zones dans lesquelles le projet est situé:

Autorisations

Organisme de régulation	Description des autorisations	État actuel	Date de l'émission/de la demande	Date d'échéance
Hunters and Trappers Associations/Organizations	The Ekauktukiak Hunters and Trappers Organization supported all our proposed research in Cambridge Bay	Active	2024-12-03	2026-03-31
Hunters and Trappers Associations/Organizations	The Ekauktukiak Hunters and Trappers Organization supported all our proposed contaminants research in Cambridge Bay	Active	2024-12-03	2026-03-31
Pêches et Océans Canada	License to fish for scientific purposes issued by DFO	Active	2025-04-30	2026-03-31
Pêches et Océans Canada	Animal use protocol license issued by DFO	Active	2025-04-30	2026-03-31
Autre	Nunavut Planning Commission decision.	Active	2025-05-05	2035-06-01

## Project transportation types

Transportation Type	Utilisation proposée	Length of Use
Water	We will be travelling via boat to multiple sampling sites in and around Cambridge Bay.	
Land	We will be travelling via ATV to multiple sampling sites in and around Cambridge Bay.	

## Project accomodation types

Temporary Camp

Collectivité



# Utilisation de matériel

Équipement à utiliser (y compris les perceuses, les pompes, les aéronefs, les véhicules, etc.)

Type d'équipement	Quantité	Taille – Dimensions	Utilisation proposée
ATV	7	Single rider and 2-ups	Up to 7 used at a time for transportation of personnel, equipment and fish between/within sampling location and hamlet
Snowmachine	4	Single rider and 2-ups	Up to 4 used at a time for transportation of personnel, equipment and fish between/within sampling location and hamlet
Pickup truck	1	4x4	Pickup truck will be rented for transportation of personnel, equipment and fish between sampling locations and hamlet
Boat	1	unknown	Locals will be contracted through the EHTO to use their boats to access receiver locations throughout the marine environments
Trail cameras	Up to 8	14x11.5x6.4cm	Trail cameras will be deployed on wooden tripods, as done in projects in surrounding communities (such as NPC 150208)
VR2-AR acoustic receiver	40	401x81mm	Receivers deployed in freshwater and/or marine environments throughout the study area
VR2-Tx acoustic receiver	6	308x73mm	Receivers deployed in freshwater and/or marine environments throughout the study area
Acoustic tags	60	Varying dimensions V7: 7x23mm V13: 13x39mm V16:16x71mm	Tags will be implanted into the aforementioned fish species (e.g. Arctic char, lake trout, cod, and sculpin), allowing them to be tracked via the acoustic receivers
Aquatic passive contaminants sampler	8	91.4x2.5cm	Aquatic samplers will be attached to a subset of the deployed receiver moorings throughout the freshwater and marine environments

Décrivez l'utilisation du carburant et des marchandises dangereuses

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Décrivez l'utilisation de carburant :	Type de carburant	Nombre de conteneurs	Capacité du conteneur	Quantité totale	Unités	Utilisation proposée
Gasoline	fuel	15	20	300	Liters	Jerry cans Storage at one time
Gasoline	fuel	1	1000	1000	Liters	Total summer fuel use for fuel for ATVs or snowmachines, rented local boats, and small generators

#### Consommation d'eau

Quantité quotidienne (m3)	Méthodes de récupération de l'eau proposées	Emplacement de récupération de l'eau proposé
1	Manual transport of water (buckets).	River/lakes and main bay.

# Déchets

## Gestion des déchets

Activités du projet	Type des déchets	Quantité prévue	Méthode d'élimination	Procédures de traitement supplémentaires
Other	Eaux grises	160L/day	Stored and disposed of in daily municipal waste water system through the Canadian High Arctic Research Station	Municipal treatment
Camp	Eaux usées (matières de vidange)	4L/day	When out on the land, waste will be buried at least 100m from any water sources or brought back to the community for disposal (in winter)	N/A

## Répercussions environnementales :

The predicted environmental impacts of undertaking our scientific research in Cambridge Bay are all positive. All of our proposed scientific research assists in the management, conservation, and understanding of marine species such as fish and invertebrates.

# **Additional Information**

**SECTION A1: Project Info**

**SECTION A2: Allweather Road**

**SECTION A3: Winter Road**

**SECTION B1: Project Info**

**SECTION B2: Exploration Activity**

**SECTION B3: Geosciences**

**SECTION B4: Drilling**

**SECTION B5: Stripping**

**SECTION B6: Underground Activity**

**SECTION B7: Waste Rock**

**SECTION B8: Stockpiles**

**SECTION B9: Mine Development**

**SECTION B10: Geology**

**SECTION B11: Mine**

**SECTION B12: Mill**

**SECTION C1: Pits**

**SECTION D1: Facility**

**SECTION D2: Facility Construction**

**SECTION D3: Facility Operation**

**SECTION D4: Vessel Use**

**SECTION E1: Offshore Survey**

**SECTION E2: Nearshore Survey**

**SECTION E3: Vessel Use**

## **SECTION F1: Site Cleanup**

## **SECTION G1: Well Authorization**

## **SECTION G2: Onland Exploration**

## **SECTION G3: Offshore Exploration**

## **SECTION G4: Rig**

## **SECTION H1: Vessel Use**

## **SECTION H2: Disposal At Sea**

## **SECTION I1: Municipal Development**

### **Description de l'environnement existant : Environnement physique**

In both Cambridge Bay, there are trails from the community to our locations of sampling. These trails are maintained by the local municipalities for use to access subsistence harvesting locations near the communities.

### **Description de l'environnement existant : Environnement biologique**

Typical Arctic species (caribou, seals, muskox, fish, birds, small mammals, medium mammals, mosses, lichens, flowers) can be found in proximity to all of our sampling sites.

### **Description de l'environnement existant : Environnement socio-économique**

Our locations of sampling in each community are areas of local importance for subsistence and economic harvesting of fish species (majority being for Arctic char). These locations have been selected by the HTO and community members to learn more about the wildlife species they harvest and consume through the examination of movement patterns, diet, and contaminant loads. Our research project will hire up to seven local individuals from the respective communities to assist with all field-related work.

### **Miscellaneous Project Information**

Our scientific research is developed and guided alongside co-management partners (HTO/HTA/RWOs). We DO NOT conduct any research that these bodies have not been in support of, nor at locations that they have not been supportive of. We are in constant communication with the respective local bodies throughout the year, providing dates research will occur, research plans (that have already been approved), providing updates on work completed to date and results when available in the form of plain language summaries and reports shared to local HTO/HTA/RWOs and the communities as a whole. Letters of support have been provided by the EHTO. No NRI license is required for this work. All biological samples will be inventoried/stored at the FWI before being handed over to specific team members or consultants for processing/analyses. Physical samples will be organized, inventoried, maintained, and tracked using the partial time of two biologists. Data will be stored on a DFO laptop, a government secure server (P: or I: Drive), and backed up on an external hard drive. The backing up of all data will occur when new data are added/collected for the overall project and will be done multiple times per field season or when lab-derived data are generated. Acoustic telemetry data will be provided to OTN to be entered into their database which we have contributed to since 2013. We will work with the Regional Data Manager to enter metadata data/raw data on the Enterprise Data HUB and the Gov Can Open Data Portal. All data and analysis scripts will be made publicly available through DRYAD. No chemicals or hazardous materials are being used while sampling or while at camp.

### **Identification des répercussions et mesures d'atténuation proposées**

There are no foreseeable impacts of this research that are negative - all impacts of our scientific research are positive as they assist in the conservation, management, and understanding of marine species such as fish and invertebrates. There will be no (or minimal) land or water disturbance.

### **Répercussions cumulatives**

There are no foreseeable cumulative effects of this research that are negative - all effects of our scientific research are positive as they assist in the conservation, management, and understanding of marine species such as fish and invertebrates. There will be no (or minimal) land or water disturbance.

Impacts

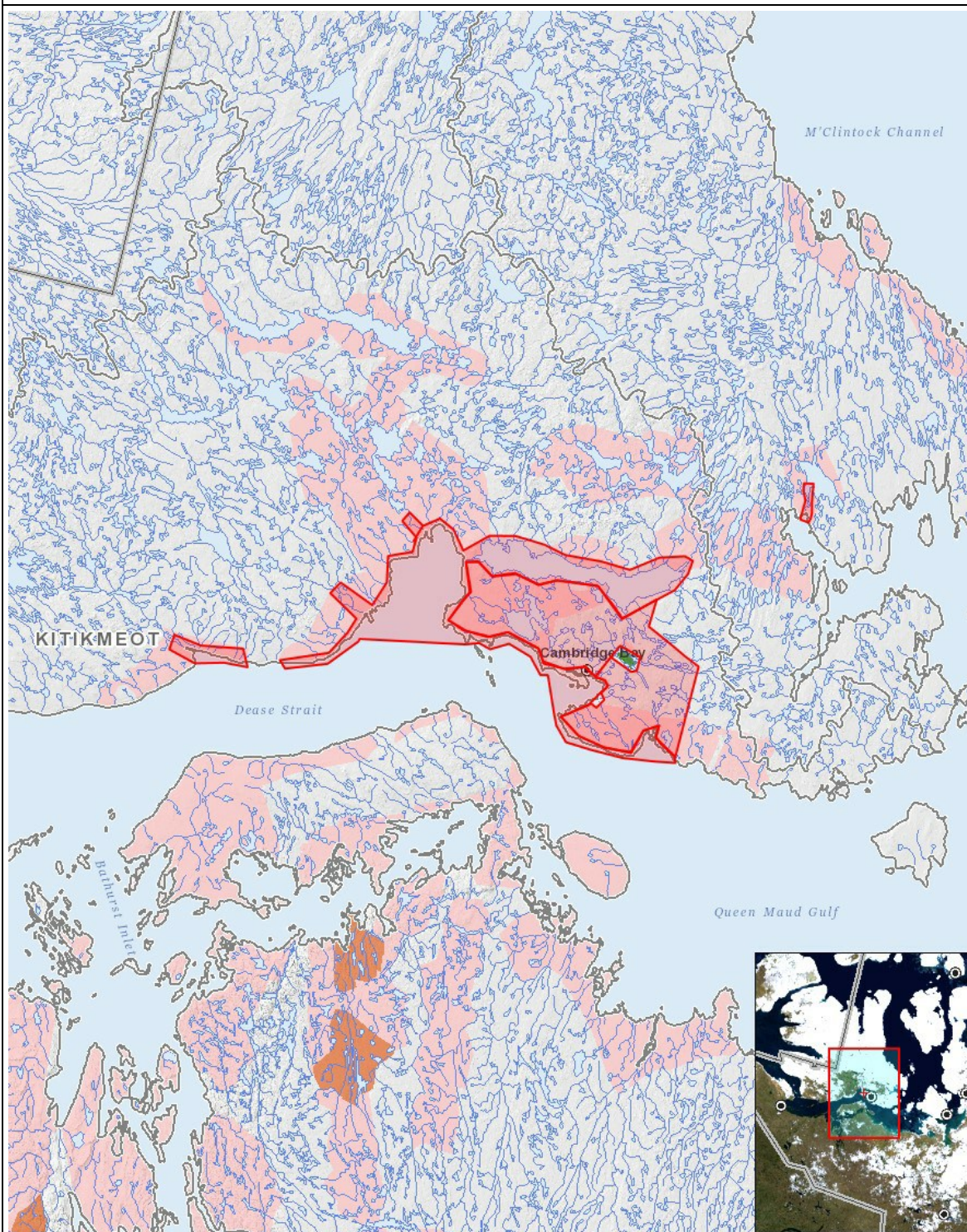
Identification des répercussions environnementales

		PHYSICAL	Designated environmental areas	Ground stability	Permafrost	Hydrology / Limnology	Water quality	Climate conditions	Eskers and other unique or fragile landscapes	Surface and bedrock geology	Sediment and soil quality	Tidal processes and bathymetry	Air quality	Noise levels	BIOLOGICAL	Vegetation	Wildlife, including habitat and migration patterns	Birds, including habitat and migration patterns	Aquatic species, incl. habitat and migration/spawning	Wildlife protected areas	SOCIO-ECONOMIC	Archaeological and cultural historic sites	Employment	Community wellness	Community infrastructure	Human health
Construction																										
-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exploitation																										
Sampling sites		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-		-	P	P	-	P
Désaffectation																										
-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(P = Positive, N = Négative et non gérable, M = Négative et gérable, U = Inconnue)



## Site du projet



## Liste des géométries de projet

- |   |         |   |
|---|---------|---|
| 1 | polygon | Jayko (Jayco) River commercial fishery study site |
| 2 | polygon | Subsistence waters near Cambridge Bay             |
| 3 | polygon | Subsistence waters near Cambridge Bay             |
| 4 | polygon | Greiner and Anderson Bay watersheds               |