NIRB Application for Screening #125786

Arctic coastal and drifting ice processes and dynamics (project amendment)

Application Type:	New
Project Type:	Scientific Research
Application Date:	4/2/2023 11:51:25 AM
Period of operation:	from 0001-01-01 to 0001-01-01
Proposed Authorization:	from 0001-01-01 to 0001-01-01
Project Proponent:	Carleton University, Derek Mueller Carleton University Department of Geography, Carleton University, 1125 Colonel By Dr. Ottawa ON K1S 5B6 Canada Phone Number:: 613-520-2600x1984, Fax Number::

DETAILS

Non-technical project proposal description

English: At Milne Fiord on Ellesmere Island we wish to core sediments at the bottom of the fjord. These cores will be used to reconstruct past environments to help put recent changes in to a longer context. 2-5 cores will be taken annually over the next several years. We are also hoping to add sediment traps too our long-term mooring in the fiord. We will continue to use our newly purchased remotely operated vehicle (ROV) to explore under-ice environments. This ROV has a video camera, an imaging sonar and can take samples using a gripper arm. In 2017 we discovered a benthic ecosystem (scallops, corals, sea stars, worms) living inside the Milne Ice Shelf (https://wirl.carleton.ca/calving-2020/#life-inside-milne-ice-shelf). We had thought that this habitat was destroyed during the calving of the Milne Ice Shelf in 2020 but now we are not certain. We would like permission to sample some organisms IF we find this ecosystem in new locations in the fiord AND the organisms are abundant (we will sample only less than 5% of the population and take photos of the rest). In particular, we wish to take up to 40 scallops to analyze their shells to find their age and environmental history.

French: À Milne Fiord, sur l'île d'Ellesmere, nous souhaitons prélever des carottes de sédiments au fond du fjord. Ces carottes seront utilisées pour reconstituer les environnements passés afin de replacer les changements récents dans un contexte plus long. Deux à cinq carottes seront prélevées chaque année au cours des prochaines années. Nous espérons également ajouter des pièges à sédiments à notre ancrage à long terme dans le fjord. Nous continuerons à utiliser notre nouveau véhicule télécommandé (ROV) pour explorer les environnements sous la glace. Ce ROV est équipé d'une caméra vidéo, d'un sonar imageur et peut prélever des échantillons à l'aide d'un bras de préhension. En 2017, nous avons découvert un écosystème benthique (coquilles Saint-Jacques, coraux, étoiles de mer, vers) vivant à l'intérieur du plateau de glace de Milne (https://wirl.carleton.ca/calving-2020/#life-inside-milne-ice-shelf). Nous pensions que cet habitat avait été détruit lors du vêlage de la plateforme de glace de Milne en 2020, mais nous n'en sommes plus certains. Nous aimerions avoir la permission d'échantillonner certains organismes SI nous trouvons cet écosystème dans de nouveaux endroits du fjord ET si les organismes sont abondants (nous n'échantillonnerons que moins de 5 % de la population et prendrons des photos du reste). En particulier, nous souhaitons prélever jusqu'à 40 coquilles Saint-Jacques pour analyser leurs coquilles afin de déterminer leur âge et leur histoire environnementale.

Inuktitut: ᕿᙵᒍᐊᓂ ᖃᐅᓯᐃᑦᑖᑦ ᕿᑭᖅᑖᓗᐊᓂ ᓄᓇᐅᑉ ᐊᑖᓂᙵᓛᖅᑐᓂᒃ ᑐᐊᐸᖕᓂ ᑲᑎᖅᓯᐃᔪᒪᔪᒍᑦ ᐃᖅᑲᖕᒪᓂ ᕿᙵᒍᐊᑕ. ᑖᒃᑯᐊ ᑐᐊᐸᑦ ᐊᑐᖅᑕᐅᓇᔭᖅᑐᑦ ᑮᖕᒍᓂᑦᑎᓐᓂ ᐊᕙᑎᒃᑦ ᖃᓄᐃᑦᑑᓚᐅᕐᒪᖔᑦ ᖃᓄᕐᓗ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᑎᒥᖕᒪᖔᑦ ᖃᐅᔨᓭᔾᔪᔭᕐᓂᖅᓴᓇᔪᓐᓇᕐᒪᖔᑦ. ᒪᕿᒃᓂᒃ ᑕᓪᓕᒪᓄᑦ ᐊᒡᒐᖃᑦᑕᕋᔭᖅᐳᑦ ᐊᕐᕌᒍᑕᒫᑦ ᐊᕐᕌᒍᓗᓴᕐᔪᖕᓄᑦ. ᓂᓇᐅᒃᓗᑕᓗ ᐃᓚᔪᓐᓇᕈᒪᓪᓗᑎᒍᑦ ᐃᖅᑲᖕᒪᓂᙵᖕᒫᖅᑐᓂᒃ ᑐᐊᐸᒃᑕᕈᑎᓂᒃ ᐊᑯᓂᐅᓂᖅᓴᖅ ᑭᓴᖅᓯᒪᔪᓐᓇᖅᑐᓂᒃ ᕿᙵᒍᐊᓂ. ᓂᐅᕕᐊᓇᕌᓚᐅᖅᑕᕗᑦ ᐅᖕᒪᓯᒃᑲᓗᐊᕐᓗᓂ ᐊᐅᓚᑦᑎᔾᔪᑏᑦ ᐊᑐᐃᓐᓇᖁᔭᖅᑕᕗᑦ ᖃᐅᔨᓴᕐᓗᑎᒍᑦ ᓯᑰᑉ ᐊᑖᓃᑦᑐᑦ ᐃᑲᖅᖏᑦ. ᑖᓐᓇ ᖃᐅᔨᓴᕈᑎ ᐊᐅᔮᓕᐅᕈᑎᓕᒃ, ᖃᓄᐃᓕᖕᒪᓂᒡᓗ ᐃᖅᑲᖕᒪ ᑕᑯᒃᓴᐅᑎᑦᑎᔾᔪᖅᑰᓂ ᐊᒻᒪ ᐊᒡᒐᕈᑎᖃᖅᑰᓂ. 2017ᖑᑎᓪᓗᒍ ᐆᒪᔪᓂᒃ ᓇᓂᓯᓚᐅᖅᐳᑦ (ᐊᒻᒎᒪᔪᓂᒃ, ᕿᖅᑯᐊᓂᒃ, ᐅᓪᓗᓇᐊᙳᐊᓂᒃ ᑯᒪᖕᓂᓪᓗ) ᐆᒪᔪᓂᒃ ᕿᙵᒍᐊᑕ ᖁᑦᑎᒃᑐᒥ ᓯᑯᖕᒪᓂ (https://wirl.carleton.ca/calving-2020/#life-inside-milne-ice-shelf). ᑖᒃᑯᐊ ᐆᒪᔪᑦ ᓄᖑᑕᐅᓇᓯᒥᓯᒪᔭᕋᑦ ᓄᕐᖁᓕᐅᕐᓇᐅᑎᓪᓗᒍ ᕿᙵᒍᐊᑕ ᖁᑦᑎᒃᑐᒥ ᓯᑯᖕᒥᓐᓂ 2020ᐅᑎᓪᓗᒍ ᑭᓯᐊᓂ ᒫᓐᓇ ᓇᓗᓕᐅᖅᑲᕋᑦ. ᐱᔪᓐᓇᐅᑎᑖᕋᒪᕋᑦ ᐊᒡᒐᕈᓐᓇᕈᒪᓪᓗᑕ ᖃᐅᔨᓴᒪᒃᓴᓂᑦ ᐆᒪᔪᖅᑕᖃᕈᓂ ᐃᓂᒥᔭᐅᕙᙵᒥᑦᑐᓂ ᓄᑖᓂ ᐊᒻᒪ ᐆᒪᔪᑦ ᐊᒥᓲᒃᐸᑕ (ᖃᐅᔨᓴᖁᔭᖅᑕᕋᑦ 5% ᐅᓄᕐᓂᖏᑕ ᑐᖓᓂ ᐊᒻᒪ ᐊᓯᓗᒃᑖᖏᑦ ᐊᔾᔨᓕᐅᑲᑐᐃᓐᓇᕐᓗᒥᑦ). ᐱᓗᐊᖅᑐᒥᒃ 40ᓂᒃ ᐊᒻᒎᒪᔪᓂᒃ ᐱᔪᒪᓪᓗᑕ ᐅᕕᓗᖏᑦ ᖃᐅᔨᓴᕆᒪᓪᓗᑎᒍᑦ ᖃᓄᑎᒥ ᐆᒪᑎᒥᖕᒪᖔᑕ ᐊᒻᒪ ᐊᕙᑎᖏᑕ ᖃᓄᐃᑦᑑᓂᖏᓐᓂᒃ.

Personnel

Personnel on site: 8

Days on site: 10

Total Person days: 80

Operations Phase: from 2023-07-04 to 2027-12-31

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Ellesmere ice shelf, ice tongue, glacier, and fjord research area	Researching	Crown	Site of our ongoing research into fjord dynamics and ice shelf stability. We wish to amend our project to allow sediment coring/sampling in the fjord and sampling benthic organisms.	N/A	600 km to Grise Fiord, within the Tuvaijuittuq Marine Protected Area

Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Grise Fiord	Joseph Shoapik	(Team member July 2022 Ellesmere Island)	2022-07-01
Grise Fiord	Laisa Audlaluk-Watsko (met with team member Anna Crawford)	Nauttiqsuqtiit Guardians	2022-10-31
Grise Fiord	Susie Qaunaq	Iviq HTA	2023-04-21
Grise Fiord	Marty Kuluguqtuq	Hamlet	2023-04-21
Resolute Bay	Nancy Amaruilk	HTA	2023-04-21
Resolute Bay	SAO	Hamlet	2023-04-21
Grise Fiord	Community meeting (~25 people attended) where we mentioned our interest in sampling and found there was support to continue to study this environment	Hamlet	2019-06-26
Resolute Bay	Community meeting (~8 people attended) where we mentioned our interest in doing this sampling and found there was support to continue our work	At South Camp Inn	2019-06-30

Authorizations

Indicate the areas in which the project is located:

Transboundary
North Baffin
South Baffin

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Nunavut Water Board	I apply annually for a permit to use water without a licence for camping on Ellesmere Island	Applied, Decision Pending		
Nunavut Research Institute	I have a multiyear permit (renewed for this year for activities that are part of our original NIRB screenings)	Active	2023-04-11	2023-12-31

Project transportation types

Transportation Type	Proposed Use	Length of Use
Air	Some sites will be accessed by Twin Otter or by helicopter	
Water		
Land	Some sites can be accessed on foot, crossing land or glaciers	

Project accomodation types

Temporary Camp

Material Use

Equipment to be used (including drills, pumps, aircraft, vehicles, etc)

Equipment Type	Quantity	Size - Dimensions	Proposed Use
Ice auger	1-3	2 to 8 diameter	drilling holes in ice
Ice corer	1	5	taking short ice cores
ice-penetrating radar	3	50 cm x 50 cm	Measures ice thickness
Tracking beacons	2-5 per year	40 cm x 40 cm	Tracking the position of drifting ice
Ablation stakes	2-5 per year	3 m x 3 cm	Stakes positioned in the ice to measure melt
Uninhabited aerial vehicle (UAV)	1-2	50 cm diam	Mapping of ice features via stereo photography
Remotely operated vehicle (ROV)	1	60 cm x 80 cm	Mapping and measuring water properties under ice
Hole melter	1	1.5 x 1 x 1 m	Melting access holes through ice for instruments
Current meter/profiler	1-3	50 cm x 30 cm	Measure water currents
Temperature data loggers	10-20	1 x 10 cm	Measure temperature in water and ice
Conductivity-Temperature-Depth (CTD) datalogger/profiler	2-4	40 cm x 5 cm	Measure water properties
Helicopter	1	15 m x 5 m x 3 m	Transport
Twin Otter	1	20 x 20 x10 m	Transport
Snowmobile	0-2	1 x 2 m x 80 cm	Transport (at times)
Icebreaker/ship	1	100 m	Transport to field site
Generator	1-2	30 x 50 x 20 cm	Power generation
Kemmerer Bottle	1-2	50 cm x 10 cm	Water sampling
Small boats/launches	1	10 m	Accessing ice islands or icebergs and surveying
Seismometer	4-6	20 x 20 x 20 cm	Record ice movement
Sediment corer	1	2 m x 0.5 m x 0.5 m	To core sediment at the bottom of the fiord (ocean floor)
Sediment traps	5	40 x 10 cm	Collects falling sediment in the ocean (attached to a mooring line)
Automatic weather stations	6-8	2-3 m tall	Measure temperature, wind, solar radiation, ice melt/snow fall
SmartBUOY	2	3 m long	Measures sea ice temperature and thickness (installed by SmartICE)
SmartQamutik	1	2 m	Measures sea ice thickness (surveys by SmartICE) when towed behind a skidoo
Timelapse cameras	6-10	1 m x 2 m	Cameras on a tripod that take images on a regular interval in Milne Fiord and Admiralty Inlet. Some will

			be mounted on weather stations.
GNSS receivers	8-10	1 m x 50 cm x 50 cm	Global Navigational Satellite System receivers (base stations on land and rovers on ice). Accurate positioning and ice motion measurements (both Milne Fiord and Admiralty Inlet)
Tide gauges	4-6	3 x 3 cm	A small pressure recorder that lies in shallow water near the shore to monitor tides

Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Propane	fuel	3	20	60	Liters	Cooking/heating
Gasoline	fuel	3	25	75	Liters	Generator/snowmobiles
hazardous	hazardous	10	0.25	2.5	Liters	Powering UAVs, tracking beaons and some other instruments
Formalin (5%)	hazardous	1	1	1	Liters	Mixed with hypersaline water. 100 mL used as a preservative at the bottom of sediment traps to prevent organic matter from decaying. (5 sediment traps)
Aviation fuel	fuel	18	200	3600	Liters	Helicopter cache (Ellesmere Is)
Lithium batteries	hazardous	15	1	15	Kg	Powering equipment, tracking beacons and instruments
Diesel	fuel	1	200	200	Liters	Ice melting/power generation

Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
0	Scooping	Streams, ponds and lakes on land (Ellesmere Is), glaciers or floating ice

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Researching	Combustible wastes	1 kg per day	removal from site	incineration in nearest community
Camp	Greywater	up to 25 L per day	pour in sump away from lakes and streams; dispose of on ice so that it drains into the ocean	N/A
Researching	Non-Combustible wastes	1 kg per day	removal from site	disposal in nearest community
Camp	Sewage (human waste)	4 kg per day	removal from site	disposal or incineration in nearest community

Environmental Impacts:

See the text box on the previous page for details (I had more than 1500 characters of text)

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 of Existing Environment: Physical Environment

Milne Fiord is 35 km long, 5 to 10 km wide and has a maximum depth of just over 440 m. At the mouth of the fjord there is a large ice shelf. This very thick (up to 90 m, 50 m on average) landfast ice occupies much of the northern portion of the fjord and is about 120 km2 in area. It was nearly 200 km2 until a major break-up event in 2020. Within the fjord, behind the ice shelf, the ice is only 1-2 m thick and floats on a relatively fresh layer of water. This freshwater layer used to be considered an 'epishelf' lake but after 2020 it thinned considerably. A glacier flows into the fjord from the south and this ends in a floating ice tongue which is about 15 km long. The coastal area is within the Tuvaijuittuq Marine Protected Area (MPA). The fjords and the ice shelves of northern Ellesmere Island are considered to be ecologically significant components of the MPA.

Description of Existing Environment: Biological Environment

The northern coast of Ellesmere Island has very little wildlife. From time to time we see wolf, fox, hare, ptarmigan and ivory gull. We have only seen a seal once. The fjord waters provide habitats for plankton (both marine and freshwater). In 2017 we discovered an interesting habitat within the ice shelf under a thin section of the ice. A horizontal bench of ice with sediment on its surface was covered with scallops, worms, soft corals, brittle stars and sea anemones. We are not sure that this benthic (sea bottom) ecosystem exists anymore since our study site broke away in 2020.

Description of Existing Environment: Socio-economic Environment

Our study site is far from Grise Fiord and Resolute Bay and is seldom visited. Some adventure tourists do visit nearby Quttinirpaaq Park (only a few a year). We have brought people from Grise Fiord and Resolute to Milne Fiord in the past and plan on doing so in the future.

Miscellaneous Project Information

Identification of Impacts and Proposed Mitigation Measures

Our activities take place within the Tuvaijuittuq Marine Protected Area, but we will mitigate our impacts (NM). 1) Sediment coring. [See conformity in NPC 149813]. Sediment coring at the bottom of the fjord (NM) will remove a small quantity of sediment and disturb the sediment in where we are coring. We propose to take 2-5 cores of sediment per year from the bottom of Milne Fiord over the next few years. This involves lowering a tube through the water, into the mud at the bottom of the fjord and pulling it up. This will disturb the sediment and will temporarily cloud the water. It will affect an area of about 15 x 15 cm per core. Mitigation: We will be as careful as possible to recover good cores so we don't need to needlessly repeat the coring. We will also keep our coring activities to the minimum required to do our work. 2) Sediment traps. We seek permission to put a small amount of preservative at the bottom of sediment traps that we will keep on our oceanographic moorings to prevent organic matter from rotting. These collect sediment and algae that fall through the water column and the preservative will ensure that it remains until we can retrieve it in the

following summer. The preservative is toxic in high concentrations (NM). Mitigation: We will mix the small amount of preservative we need with very salty water and place this in the sediment trap before lowering it into the water. The dense salty water will keep it at the bottom of the trap so it does not go into the environment. 3) Sampling benthic organisms. I am requesting permission to sample benthic organisms with the gripper arm of our Remotely Operated Vehicle including a total of ≤40 adult scallops, ≤10 adult brittle stars, ≤10 adult anemones, ≤10 adult worms, ≤10 adult sponges, ≤10 adult sea cucumbers, ≤10 adult soft coral, ≤10 adult hydrozoa, ≤20 worms tubes over the next few years. To our knowledge none of these species are endangered although their habitat on ice is unusual. Mitigation: We will only sample organisms if they are abundant (we will sample only less than 5% of the population and take photos of the rest). We will be careful not to disturb other organisms when we are doing this sampling.4) Employment. We plan to hire field team members from Grise Fiord and this has a positive economic benefit, plus we get to work with great people!

Cumulative Effects

Given our small footprint at the site and the mitigation efforts detailed above, there should be no significant cumulative effects.

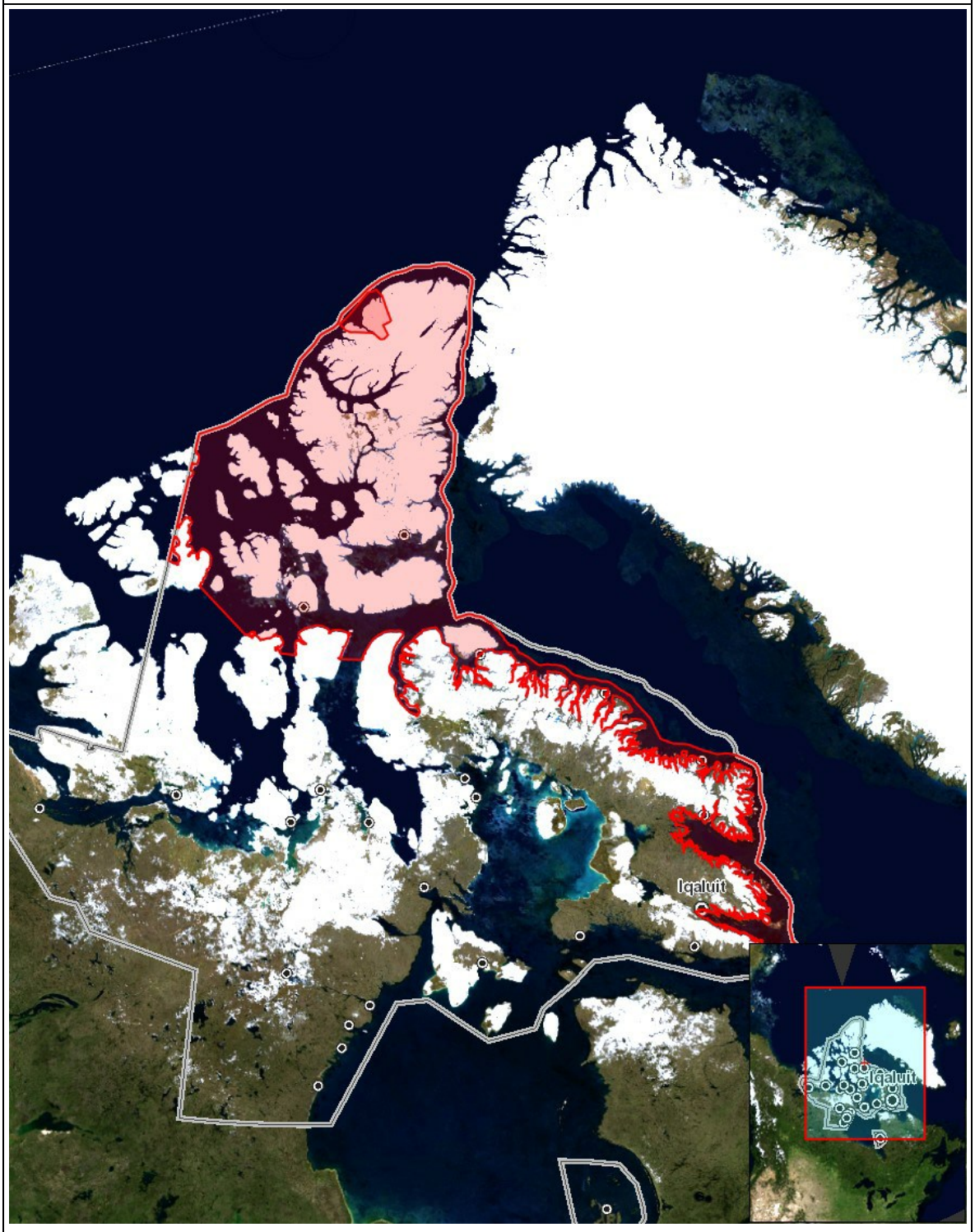
Impacts

Identification of Environmental Impacts

	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																									
-		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-
Operation																									
Researching		M	-	-	-	M	-	-	-	M	-	-	-		-	-	-	M	-		-	P	-	-	-
Decommissioning																									
-		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-

(P = Positive, N = Negative and non-mitigatable, M = Negative and mitigatable, U = Unknown)

Project Location



List of Project Geometries

1	polygon	Ice island, iceberg and landfast ice research area [offshore areas only]
2	polygon	Ellesmere ice shelf, ice tongue, glacier, and fjord research area