



NIRB Application for Screening #125966

Bursting the Banks: Dealing with Flooding due to Climate Change in the Arctic Hamlet of Pangnirtung

Application Type: New

Project Type: All-Weather Road / Access Trail

Application Date: 5/6/2024 12:49:56 PM

Period of operation: from 2024-10-01 to 2034-10-30

Project Proponent: Bhabesh Roy
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DETAILS

Non-technical project proposal description

English: Name of the Project: Bursting the banks: Dealing with flooding due to climate change in the Arctic Municipality of Pangnirtung, Nunavut. Introduction: The Municipality of Pangnirtung is located in the Canadian Territory of Nunavut and lies on the South-eastern shore of the Pangnirtung Fiord, which itself is located at latitude 69.1675° N and Longitude 65.6917° W on the eastern side of Baffin Island. In total, the community covers an area of 7.5 km² with a population of about 1850 in 2024. The Duval River is the only potable water source. A steel bridge over this river connects Eastern and Western parts of the town. In 2008, the old bridge was washed out and in 2023, a road containing a set of culverts failed due to flash flooding of Duval River. The fact that Pangnirtung is a remote area with underlying permafrost entails unique risks with respect to climate warming and altered hydrology. The Municipality of Pangnirtung has recently received funding from CIRNAC under the Climate Change preparedness in the North program to conduct Scientific Research. The proposed Research aims to better characterize the hydrology of Pangnirtung, especially the role of snow regime and its impact on flash flooding and drainage in the Duval River watershed and the community of Pangnirtung as climate changes. The project also seeks to learn more about the ground thermal/hydraulic regime at select points near the river and bridge. It builds on an existing NRC- funded project, which involves water flow and quality monitoring of the Duval River including assessing the resilience of the Hamlet's water supply. The proposed scientific Research involves mathematical modelling of the local hydrology in the Duval River watershed. This will be closely supported by field measurements, including snow depth at select locations, weather data, ground temperature at specific locations and possible aerial imageries of the watershed. Historical data collection The research team will collect available historical data, including temperature, precipitation, and snow from different sources and identify the data gaps. Field Monitoring A preliminary search of data sources reveals there is no sufficient information on snowfall. We are proposing to install a weather monitoring station including snowfall depths in the mid to upper reaches of the Duval River. In order to supplement this information, we are proposing to examine satellite data from sources, such as RADARSAT. In order to verify the RADARSAT data, we are proposing to measure the snow depths towards the end of winter season. Sensors will be deployed at select locations to record ground temperatures at different depths (permafrost conditions). The goal of this is to obtain a sense of how the active layer is changing, and, in turn, the potential for infiltration and groundwater contribution to surface flow. This entails consequences for both the amount of water available for flooding as well as drinking water supplies. Mathematical modelling The Duval watershed will be modelled via selection of an appropriate control volume and treating the problem as a hydrologic routing formulation, with particular emphasis on snowpack characterization and snowmelt contribution to flow. The control volume will focus on the Hamlet; however, it will likely encompass both the Duval watershed as well as some area outside of it. This requires establishing a snow monitoring station. As mentioned, the proposed research will make use of flow monitoring data currently being recorded by the Hamlet under the project funded by NRC. These datasets will enable development of a snowmelt-runoff model and improved understanding of the snowmelt physics. The models will be key in assessing the effects of climate change, particularly the shifts in the peak and/or flash flood occurrence, magnitude, and frequency in the drainage area and drainage problems in the inhabited areas of the Hamlet. This understanding will help Pangnirtung in designing various infrastructure facilities, such as a new bridge to connect two parts of town separated by the Duval River and other road arteries in the community in such a way that we can minimize drainage challenges and reduce maintenance costs. Expected deliverables and outcomes of your project: •Snow monitoring station and permafrost monitoring using thermistors which would be continued beyond the project period. •Mathematical model (calibrated and validated) to simulate the snowmelt runoff. •Relationship between temperature increases, precipitation events, and the phase shift and magnitude of flood events •Workshops to identify the Traditional Knowledge that could be embedded into the study •Training local college/school students on the use of and reading the data from the snow monitoring station. •Planning to collect Indigenous Knowledge/Inuit Qaujimajatuqangit during the project. The Municipality of Pangnirtung is seeking a Scientific Research Licence in order to conduct this Study from April 01, 2024 for three years.

French: Nom du projet : Faire éclater les berges : Faire face aux inondations dues au changement climatique dans la municipalité arctique de Pangnirtung, au Nunavut. Introduction : La municipalité de Pangnirtung est située sur le territoire canadien du Nunavut et s'étend sur la rive sud-est du fjord Pangnirtung, lui-même situé à 69,1675° de latitude nord et 65,6917° de

[illegible]

Days on site: 15

Total Person days: 75

Operations Phase: from 2024-09-01 to 2024-09-30

Operations Phase: from 2024-10-01 to 2034-10-30

Post-Closure Phase: from to

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Hamlet of Pangnirtung	Researching	Municipal	Hilly area	Bed rock	This site is about 2km away from the Hamlet office

Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Pangnirtung	Jamie Evic	Municipality of Pangnirtung	2024-05-14

Authorizations

Indicate the areas in which the project is located:

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Nunavut Water Board	Hamlet has an active water licence # 3AM-PAN1828,Type A	Active	2018-05-04	2028-05-03

Project transportation types

Transportation Type	Proposed Use	Length of Use
Land		

Project accomodation types

Community

Material Use

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

Equipment Type	Quantity	Size - Dimensions	Proposed Use
Excavator	1	medium size	Making trench for installing the stands of Solar panel
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Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Diesel	fuel	1	200	200	Liters	Digging trench for installing Solar panel stands
nil	hazardous	0	0	0	Lbs	nil

Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
147	Pumping	The Duval River to storage Reservoir. From there to Water treatment plant.

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Waste disposal	Combustible wastes	unknown	Trucking	N/A

Environmental Impacts:

No predicated Environmental impact is anticipated

Additional Information

SECTION A1: Project Info

Hamlet is building a new weather station in order to measure the snow thickness and rainfall intensity to know the flow in the Duval River per minute.

SECTION A2: Allweather Road

N/A

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

N/A

Description of Existing Environment: Biological Environment

N/A

Description of Existing Environment: Socio-economic Environment

N/A

Miscellaneous Project Information

N/A

Identification of Impacts and Proposed Mitigation Measures

N/A

Cumulative Effects

N/A

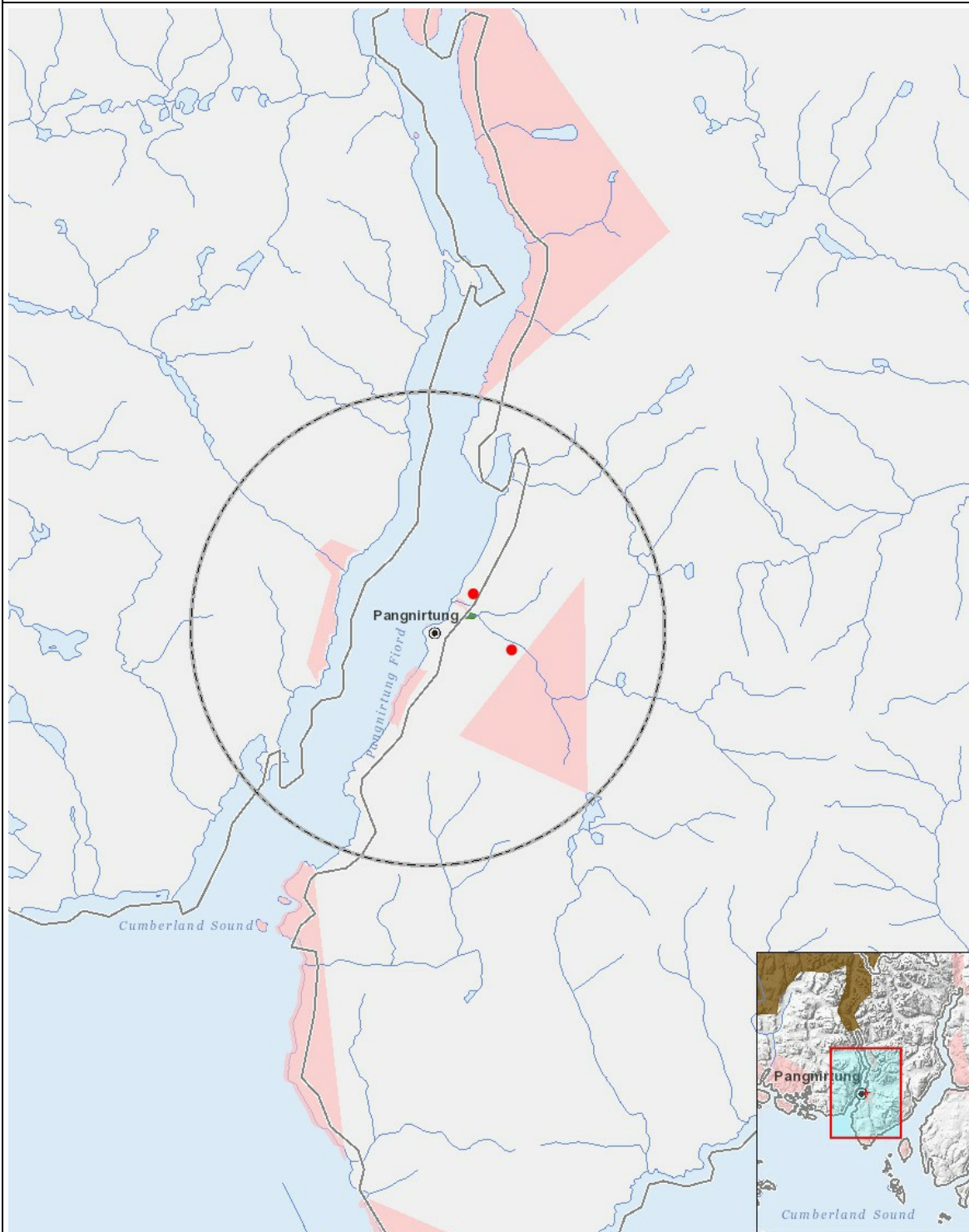
Impacts

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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Decommissioning	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Project Location



List of Project Geometries

- 1 point Hamlet of Pangnirtung
- 2 point Weather station is proposed to be installed at 2.4km away from the Town.