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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYIT
OFFICE DES EAUX DU NUNAVUT

APPLICATION FOR APPROVAL FOR THE USE OF WATER OR DEPOSIT OF WASTE WITHOUT A LICENCE

Refer to the *Guide to the Approval for the Use of Water or Deposit of Waste Without a License* (Guide) in completing this Application.

APPLICATION NO:
(for NWB use only)

1. APPLICANT CONTACT INFORMATION (name, address)

Maya Bhatia
1-26 Earth Science Building
University of Alberta
Edmonton, AB, T6G 2E3

Phone: _(780) 492-3428_____
Fax: _____
e-mail: mbhatia@ualberta.ca

2. APPLICANT REPRESENTATIVE CONTACT INFORMATION if different from Block 1 (name, address)

Phone: _____
Fax: _____
e-mail: _____
(Attach authorization letter)

3. NAME OF THE OWNER OF THE LAND THAT WILL BE USED IN RELATION TO THE WATER TO BE USED OR THE WASTE TO BE DEPOSITED

Crown

4. NAME OF PROJECT (consistent with the name of the project issued by other regulatory agencies)

Impacts of Melting Tidewater Glaciers on Marine Biogeochemical Cycles
(2019 NPC File No: 149049; 2019 NIRB File No: 19YN020; 2019 NRI License No: 02 049 19N-M)

5. LOCATION OF UNDERTAKING

Project Extents (decimal degree format)

Location	Latitude	Longitude	Use
TrueLove Inlet	75.62343°N	84.43864°W	Temporary camp location and fuel cache location
Sverdrup Glacier	75.63761°N	83.13428°W	Temporary camp location; research site location
Belcher Glacier	75.52735°N	81.46723°W	Temporary camp location; research site location
Sydkap Glacier	76.68258°N	85.34045°W	Research site location
Jakeman Glacier	76.46906°N	80.81314°W	Research site location
Grise Fiord	76.41848°N	82.90328°W	Mobilization point

Camp Location(s) (decimal degree format)

TrueLove Inlet (Base Camp)	75.62343°N	84.43864°W
Sverdrup Glacier	75.63761°N	83.13428°W
Belcher Glacier	75.52735°N	81.46723°W

Name of the Water Management Area in which the Undertaking is located. (Please see Appendix D of the Guide):
57: Eastern Devon Island Watershed; 56: Western Devon Island Watershed

6. CLASSIFICATION OF UNDERTAKING - Indicate the classification of undertaking by checking one of the following boxes.

☐ Industrial
☐ Mining
☐ Conservation
☐ Municipal
☐ Agricultural
☐ Recreational
☐ Power
☒ Other: (describe)

Scientific Research project. Small field research camp (4 people) with domestic water use and disposal of domestic waste water.

See Appendix C of the Guide for descriptions of classifications of undertakings.

7. DESCRIPTION OF UNDERTAKING AND EQUIPMENT USED – Provide a brief description of the undertaking including a description of any equipment that will be used in using water or depositing waste.

The research program 'Impacts of Melting Tidewater Glaciers on Marine Biogeochemical Cycles' aims to understand how melting glaciers are exporting sediment and dissolved chemical species to the ocean and the impact of this material on downstream regional marine primary production and biogeochemistry.

Our research relies on measurements collected in the field in Jones Sound and on the Devon Ice Cap. Field work related to this project will be initiated in 2019. We anticipate work to continue until 2024. The project location is in the Qikiqtani Region, at Devon Ice Cap on Devon Island and in Jones Sound, Nunavut. The closest community to the proposed work is the Hamlet of Grise Fiord. The project will not encroach on any protected areas. The project is intended to be multi-year, conducted annually in the spring/summer, consisting of a small party (<6 people) of scientists spending approximately 1-2 months in the field. The project goal is to understand how melting glaciers are exporting nutrients and sediment to the ocean and the impact of this material on regional marine primary production and biogeochemistry. To achieve this goal, we will conduct ice-based activities on Devon Ice Cap and marine-based activities in Jones Sound. Our on-ice activities will be to install, download and retrieve time-lapse cameras and pressure transducers around Sverdrup and Belcher glaciers on Devon Island Ice Cap. Equipment will be deployed at the glacier terminus, and in/around ice-marginal ponds and streams, recording (i) changes in glacier hydrology as the melt season progresses and (ii) changes in plume development at the glacier terminus. We expect seasonal changes in the glacier hydrology to correspond to the timing, magnitude, and nature of discharge events at the glacier terminus. Finally, we will also collect glacier ice and meltwater samples and process them for chemical and microbial analyses and experiments. Our marine-based activities will involve oceanic surveys from the termini of glaciers on Devon and Ellesmere Islands, measuring changes in seawater conductivity, temperature, and pressure. This work will be conducted from small boats, consisting of a private sailboat and/or boats provided by the Grise Fiord Ranger Patrol group. Seawater samples in Jones Sound will also be collected to measure marine chemical and microbial properties. These samples will be processed on board the small boat or in

Grise Fiord. Collectively, the new knowledge generated by this project has valuable long-term implications by providing understanding of the drivers of marine production at the base of the food web in this region, as well as broader scale marine carbon cycling, and the susceptibility of these drivers to climate change. Field access will be provided by twin otter from the Polar Continental Shelf Project (PCSP), Resolute Bay to Grise Fiord. From Grise, we will board a private sailboat and/or Grise Fiord Ranger Patrol Group boats. To conduct our on-ice work we will travel to Truelove Inlet on Devon Island by boat. Travel on the ice cap will be achieved by helicopter/on foot. In some years, a temporary camp (party of 2-3 and the helicopter pilot) may be established at TrueLove Inlet for a few days, where we will meet the helicopter (provided by PCSP) in preparation for our airborne and on-ice sampling work. In other years, a temporary camp (<10 tents) may be established on the ice cap for a few weeks. All temporary camps will be dismantled seasonally at the conclusion of our annual field season. There should be no need for restoration as camp sites on land will be minimally used, avoid any plant development by being situated on bedrock, and all equipment on the ice/bedrock can be easily removed. The Hamlet of Grise Fiord is surrounded by melting tidewater glaciers. Local indigenous knowledge indicates that waters near the termini of these glaciers are biologically productive. The community has expressed interest in understanding the impacts that climate change and enhanced glacial melting in particular are having on the regional marine ecosystem. This project is being undertaken in collaboration with the Hamlet and the Geological Survey of Canada, who have been long-term partners to monitor the acceleration of glacier melt in this region. Data generated by this study will be used in student theses, research publications, public talks, and climate change assessment reports. Data will also be made available of the Hamlet of Grise Fiord. Ultimately, data will be deposited in a public data repository. Results will be communicated through annual reports to the Nunavut Research Institute and Nunavut Climate Change Center, and summaries of research results to Grise Fiord and Resolute Bay communities in Inuktitut and English. NWB and NRI will receive copies of published articles.

While working in Jones Sound and on the Devon Ice Cap every effort is made to minimize our impacts on the ocean, ice and watershed. Annual reporting of activities including water usage is provided to the NRI and NWB. For camp sites on land/ice: Our camps are minimal with no permanent buildings or structures (temporary tents only) and every effort is made to keep the camp clean. Greywater is disposed of in glacier crevasses where possible. If this is not possible, a single greywater disposal site is identified (as well as a separate area for toilet waste). Aside from greywater and human excrement all waste will be backhauled to Resolute Bay. PCSP stores fuel drums at TrueLove Inlet to support twin plane and helicopter work during the summer. All fuel drums will be handled/managed by twin plane/helicopter pilots and PCSP staff only and removed by PCSP at the conclusion of the project. Additional details regarding wastes and contingency plans are provided in our 2019 application to NIRB.

Fuel
For the 2019 field season most of our work will be marine-based conducted from boats, thus all fuel will be on the boats as described in our 2019 NIRB application. For the temporary camp at TrueLove in 2019 our fuel needs will consist of cooking fuel (propane) only, stored in 25 lb tanks of which we will have 1 on site. This will be removed at the end of the field season this year.

Other fuel that may be required to operate on the Devon Ice Cap in future years includes:
Gasoline: used for generators and ice coring drills. Stored in 45-gallon drums or 5-gallon portable containers. (1.5 drums on site); All removed at the end of the season.
Propane: cooking fuel. Stored and transported in 25lb tanks (10 tanks on site). All removed at the end of the season.

Empty steel fuel drums remain at the base camp and are removed whenever space in aircraft allows.
Bottles are stored in rubber bins at main camp until used and removed when empty.

Equipment
Transportation:
DHC-6 Twin Otter on wheels for transport to and from base camp (from Resolute Bay).
Helicopter [Bell 206L or Astar 212 with skid gear] used for transport to work sites on the ice cap at Sverdrup and Belcher Glaciers and to conduct airborne surveys of Sverdrup and Belcher Glaciers (Ellesmere Island) and Sydkap and Jakeman Glaciers (Ellesmere Island).

Other equipment:
Portable generator (Honda 1000W) and solar panels are used as an auxiliary power source. Temporary installations (science equipment): temperature and precipitation sensors (combination of solar and battery power). For equipment requiring batteries for power, any batteries that are no longer functioning are removed and backhauled separately from the regular solid waste to PCSP in Resolute Bay for disposal.

Current field research in Jones Sound and on the Devon Ice Cap:
2019 represents Year 1 of this project.

8. **SCHEDULE** – Applicants are advised that approvals without a license are issued for a one year term.

Proposed Start Date: __07/2019____ (Month/Year) Proposed Completion Date: _____08/2019_____ (Month/Year)

9. **TYPE OF USE OF WATER WITHOUT A LICENCE PROPOSED -** Check the box that applies to the type of water use proposed. If none of the water uses listed below applies to the proposed water use, an application for a water licence will be required. See the NWB's *Guide 4 – Completing and Submitting a Water Licence Application for a New Licence*.

☐ For an undertaking other than a Power undertaking and for a use of water related to the construction of a structure across a watercourse that is less than 5 metres wide at the ordinary high water mark at the point of construction.

☐ For an undertaking other than a Power undertaking and for a use of water related to the training of an intermittent watercourse.

☐ For an undertaking other than a Power undertaking and for a use of water related to the training of a watercourse that involves the infilling of the watercourse, if the watercourse has no inflow or outflow and a surface area of less than 0.5 hectares.

☐ For an undertaking other than a Power undertaking and for a use of water related to the training of a watercourse that involves removal or placement of less than 100 m^3 of material.

☐ For an undertaking other than a Power undertaking and for a use of water related to the construction of a temporary structure in a watercourse for the purpose of flood control.

☐ For an undertaking other than a Power undertaking and for any use of water related to the storage of 2,500 m3 or less.

☒ For an undertaking other than a Power undertaking and for any use of water less than 50 m^3 per day.

10. **QUANTITY AND QUALITY OF WATER INVOLVED -** For each type of water use indicated in Block 9, provide the source of water, the estimated quantity to be used in cubic metres per day, and the periods during which water will be extracted.

Type of Water Use indicated in Block 9	Name of water source	Estimated quantity of water to be used in cubic metres per day	Periods during which water will be extracted
Water for domestic use (drinking, cooking, personal hygiene)	Melted snow from Devon Ice Cap	0.05 cu. m/day	Spring (April-May)

11. TYPE OF DEPOSIT OF WASTE PROPOSED - Check the box that applies to the type of deposit of waste proposed. If none of the deposits of waste listed below apply to the proposed deposit of waste, an application for a water licence will be required. See the NWB's *Guide 4 – Completing and Submitting a Water Licence Application for a New Licence*.

☐ For an Industrial undertaking, for an activity related to hydrostatic testing or cleaning of storage tanks and pipelines, and for any deposit of waste resulting from hydrostatic testing or cleaning of unused storage tanks or pipelines.

☐ For an Industrial undertaking, for an activity related to quarrying and gravel washing, and for any deposit of waste that is not deposited to surface water and that results from quarrying or gravel washing above the ordinary high water mark.

☐ For a Mining undertaking, for an activity related to exploratory work, any deposit of sewage to a sump.

☐ For a Power undertaking, any deposit of sewage to a sump.

☐ For an Agricultural undertaking, any deposit of sewage to a sump.

☐ For a Recreation undertaking, any deposit of sewage to a sump.

☒ For any Other type of undertaking not listed above, other than Municipal, any deposit of sewage to a sump.

12. QUANTITY AND QUALITY OF WASTE INVOLVED – For each type of waste indicated in Block 11, describe the quantity in cubic metres/day, measures to avoid or mitigate adverse impacts, and periods of deposition.

Type of Waste indicated in Block 11	Quantity to be deposited in cubic metres per day	Measures to avoid or mitigate any adverse impacts	Periods during which waste will be deposited
Sewage	0.006m^3/day	Disposed of in glacier crevasse or backhauled to PCSP Resolute Bay	Spring (April-May)

Greywater	0.00175m^3/day	Camp dishes and domestic tasks are performed using minimal water. Greywater disposed of in glacier crevasse.	Spring (April-May)
Solid waste (non-combustible wastes)	0.004m^3/day	Backhaul to PCSP Resolute Bay.	Spring (April-May)

13. SIGNATURE

I, _____Maya Bhatia _____ (print name), certify that the information given on this form is, to the best of my knowledge, correct and complete.

X Yes ☐ No

OR

I, _____ (print name), as an authorized representative of the Applicant, _____, certify that the information given on this form is, to the best of my knowledge, correct and complete.

☐ Yes ☐ No

I certify that the Nunavut Planning Commission's land use planning requirements under Article 11 of the Nunavut Land Claims Agreement have been met.

X Yes ☐ No

I certify that the Nunavut Impact Review Board's development impact review requirements under Article 12 of the NLCA have been met.

X Yes ☐ No

I certify that the proposed water use is of a type set out in column 2 of Schedule 2 of the Regulations that is further specified by column 3, in respect of an undertaking set out in column 1. See list in Block 9.

X Yes ☐ NA ☐ No

I certify that the proposed deposit of waste is an activity that is set out and then further specified in columns 2 and 3 of Schedule 3 of the Regulations, in respect of an undertaking that is set out in column 1 of Schedule 3. See list in Block 11.

X Yes ☐ NA ☐ No

I certify that the proposed water use or deposit of waste will not substantially affect the quality, quantity or flow of the watercourse whose waters are used.

X Yes ☐ No

I certify that the proposed water use or deposit of waste will not substantially affect the quality, quantity or flow of waters flowing through Inuit Owned Lands.

X Yes ☐ No

I certify that the proposed water use or deposit of waste will not affect the use of waters by a person who would be entitled to compensation under sections 58 or 60 of the *Nunavut Waters Nunavut Surface Rights Tribunal Act* (Act) if their use of these waters were to be adversely affected by an applicant for a licence.

X Yes ☐ No

I certify that a licence is not required for another use of water, or deposit of waste in respect of the proposed undertaking.

X Yes ☐ No

I have read and agree to comply with the following conditions outlined in sections 4(3), 5(4), 5(5) and 6 of the *Nunavut Waters Regulations*:

1. In the case of an applicant who has a mineral right and who intends to use waters or deposit waste in relation to that right, the applicant shall respect the priority conferred on Inuit by section 62 of the *Act* as if that applicant had a licence for the use or deposit.

2. Measures must be taken prior to using water to minimize any alteration to the bed or banks of a watercourse whose waters are to be used, and the measures shall be maintained during the operation of the undertaking.

3. No waste is to be deposited to surface water or within 31 metres of the ordinary high water mark of any body of water.

4. The waste shall not contain more than 15 milligrams per litre of petroleum or petroleum product and must not have a visible hydrocarbon sheen.

5. Prior to the closure or abandonment of the undertaking or end of the period authorized for the use of water or deposit of waste without a licence, whichever occurs first, the site shall be restored — to the extent practicable — to the state in which it was before the water was used or the waste was deposited.[a]

6. An applicant who is authorized under the Regulations to use waters or deposit waste without a licence shall:
    a. maintain accurate and detailed books and records of:
        i. the quantity of water, in cubic metres, used each day,
        ii. the quantity, in cubic metres, of waste deposited each day,
        iii. the type of waste deposited each day,
        iv. where the waste is deposited,
        v. the concentration of the substance, or substances, in the deposited solid or liquid that has the effect of making the deposit waste,
        vi. the methodology used to calculate or determine the information referred to in items (i) to (iv), and
        vii. the measures that were taken to avoid or mitigate any adverse impacts of the deposit of waste.
    b. keep the books and records on the site of the undertaking during the period of its operation and make them available during that period to an inspector on request;
    c. submit to the Board a report containing a summary description and supporting photographs of the restoration of the site of the undertaking within 30 days after the earliest of (i) the day on which the undertaking is closed or abandoned, and (ii) the last day of the period authorized for the use or deposit without a licence;[b] and
    d. keep the books and records for two years after submitting the report describing the restoration of the site of the undertaking.

    Notes:

    a) A site need not be restored prior to the end of the period authorized for the water use or deposit of waste without a licence, as required by Item 5, if the Board issues a licence for the use of water or deposit of waste on that site prior to the end of that period.

b) An applicant need not submit the report referred to in Item 6 (c), to the Board if the applicant obtains the Board's approval for a use of water or deposit of waste without a licence, or a licence for a use of water or deposit of waste, on the same site within thirty (30) days after the last day of the period authorized for the use or deposit.

X Yes ☐ No

I understand that any approval granted by the Board for the use of water or deposit of waste without a licence will be authorized for a period of one year after the day on which the Board approves the Application. The use or deposit is not authorized until the Board approves the Application and it is only valid as long as the applicant is in compliance with the conditions set out in the declaration above.

X Yes ☐ No

I understand that if I have answered "No" to any of the above statements a water license is required from the Nunavut Water Board prior to the use of water or deposit of waste.

X Yes ☐ No

Maya Bhatia	Assistant Professor		June 14,2019
Name (Print)	**Title (Print)**	**Signature**	**Date**