NIRB Application for Screening #125711

Developing new technologies to investigate the Devon Island subglacial lake system

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DETAILS

Non-technical project proposal description

English: Recent evidence obtained through orbital radar sounding indicates the presence of subglacial lakes ~800 meters below Mars' southern ice cap. Such subsurface saline water bodies may support active microbial ecosystems. Considerable evidence has also been found in the last decade to support the existence of large cold, salty oceans under the ice covers of the icy moons, Europa and Enceladus. The main goal of this project is to characterize a unique terrestrial analogue environment of these icy worlds: the recently discovered hypersaline lake complex under the Devon Ice Cap of Nunavut, Canada. The Devon Island subglacial lakes consist of 3 lakes lying beneath 560-740m of ice; modelling indicates temperatures of -12ºC and high salinities of ~ 15% salt. Due to their hypersaline nature, the Devon subglacial lake complex is a particularly tantalizing analogue for brine bodies inferred to exist on Europa, Enceladus, and Mars, and make it a compelling site to address fundamental questions about how life persists at terrestrial extremes of darkness, temperature, salinity, and pressure. Our 3-year CSA FAST application is the first step to access the Devon Island lakes directly by testing and optimizing an ice drilling system, collecting ice samples overlying the lakes for microbiological analyses and optimizing 2 biosignature detection prototypes, and to further constrain geomorphological parameters of the system.We are requesting 1 trip (1 - 7 days) per summer from 2022 to 2024 between the months of May and July for Brady O'Connor (PhD Student), Dr. Lyle Whyte (Professor), Dr. Kris Zacny (Honeybee Robotics) and Leo Stolov (Honeybee Robotics) to the Devon Island ice cap. The field site for all 3 years will be directly above the subglacial lakes, northwest of the centre of the ice cap and approximately 120 km from the nearest community (Grise Fjord). During the field trips in 2023/24, 1 or 2 additional team members from the University of Alberta may also accompany us. For July 2022, we will be staying at the PCSP Resolute Bay facility and will take 1 or 2 half-day trips by helicopter to the top of the Devon Ice Cap above the subglacial lakes. There will be no field camp on top of the ice cap, and we will be on the surface for ~ 4-5 hours. The 2022 trip is primarily for local reconnaissance of the Devon Island surface on top of the subglacial lakes to determine optimal sites for future drilling and sample collection for field seasons in 2023 and 2024. In addition to site reconnaissance, using a Kovacs manual ice corer, we will collect near surface ice samples (1 – 2 m) for analyses of the microbial communities inhabiting the ice back at my lab at McGill University in Montreal. This will include culturing of microbes inhabiting the surface ice and genomics analyses to better understand the diversity and metabolic potential of the microbial communities. We will test whether the ice-inhabiting microbes are active or in a dormant state. The samples will also be tested using the prototype MICRO Life Detection Platform, which can characterize microbial communities and will demonstrate the platforms usefulness as a biosignature detection platform for future planetary missions.The 2023 and 2024 field seasons will include longer stays atop the ice cap. In 2023/24 we will camp at the site for 4 to 5 days to a maximum of 7 days during the month of May. To accommodate the supplies required for these longer trips, a twin otter aircraft will be used to transport our team to and from the site. The need for a longer stay and camp at the site is to operate the SLUSH melt probe. In 2023/24 we will attempt to melt down between 50 and 100 meters which will require a few days to achieve given the slow speed of the melt probe and the challenging conditions atop the ice cap. In parallel, we will also collect deeper ice cores using the Kovacs corer, this time to a maximum depth of 20 meters and will be transported back to McGill University for microbiological analyses the same as described above. During the 2023/24 field seasons, team members from the U. of Alberta will perform non-invasive remote sensing work to further constrain the geomorphology of the subglacial lakes and the surrounding environment.The camp in 2023/24 will require 4-6 people for ~5-7 days. The camp will include up to 5 tents (2 - 3 for sleeping, 1 for technical work and cooking, and 1 for a bathroom and storing materials), 3 power generators and 3 propane tanks. All grey water and human waste will be sealed in containers and disposed of back at PCSP Resolute Bay. Food and all other waste material will be contained in sealed bags and disposed of at PCSP Resolute Bay. The field site will be left as it was found with minimal lasting impact to the ice cap surface.

French: N/A

Inuktitut: ᒫᓐᓇᐅᔪᖅ ᑕᑯᑦᑎᑎᓯᒪᔪᑦ ᐱᔭᐅᔪᑦ ᓅᓇᕐᔪᐊᑉ ᓯᓚᑖᓂ ᓯᓚᑦᑎᓐᓂᑦ ᖃᖕᒪᑦᑕᖅᑎᑕᐅᓯᒪᔪᒥᑦ ᓇᓗᓇᐃᖅᓯᓯᒪᕗᖅ ᐱᑕᖃᓂᖏᓐᓂ ᓯᕐᒥᓂᖕᖕᒪᖅᑐᑦ ᑕᓲᑦ ~800 ᒦᑕ ᐊᑖᓂ ᒥᒥᐅ ᖃᐅᔨᓴᕈᑎᖏᑦ ᓂᒥᐊᓂ ᕿᕿᔪᖅ ᐊᐅᓗᓐᓇᓐᖏᑦᑐᖅ ᖄᖕᒪ. ᑕᒪᒃᑯᐊ ᖄᖕᒥᑦ ᑕᓇᐅᖃᖅᑐᑦ ᐃᒪᐃᑦ ᐃᑲᔫᑎᒐᔭᖅᑐᖅ ᒫᓐᓇᐅᔪᖅ ᖁᐱᕐᕆᖏᓐᓂᒃ ᐆᒪᔪᕋᓚᓚᒫᑦ ᐊᕙᑎᖏᓪᓗ. ᐃᓱᒪᒋᑦᑎᐊᖅᑲᕐᒥᑦ ᑕᑯᔭᐅᓯᒪᔪᑦ ᓇᓂᔭᐅᔪᓂᑦ ᑭᖑᓪᓕᖅᐹᖏᓐᓂᑦ ᖁᓕᑦ ᐊᖅᕿᒍᓂ ᐃᑲᑲᔫᑎᔪᒃᓴᓂᒃ ᐱᑕᖃᓂᖏᓐᓂᒃ ᓂᓪᓕᓱᒃᑐᒥ, ᑕᓇᐅᖅ ᐃᒪᕕᖕᒥ ᐊᑖᒍ ᓯᑯᓯᒪᔪᑦ ᑕᕿᑦ, ᐅᕈᐸ ᐊᒻᒪᓗ ᐃᓐᓯᓚᑕᔅ. ᐅᑯᐊ ᑐᕌᓂᔭᖕᒥᑦ ᑕᒪᑐᒨᖓ ᐱᓕᕆᐊᖑᔪᒧᒃ ᖃᐅᔨᓗᑕ ᑭᓯᖅᑲᖅᒪᖕᒫᑕ ᐊᔾᔨᐅᒥᔭᐅᓂᖕᒥᓐᓂᒃ ᓄᓇᒥᐅᑕᕐᓂᒃ ᖃᓅᑎᒥᖕᒪᖕᒫᑕ ᐊᕙᑎᖕᒥᓐᓂ ᑖᒃᑯᐊ ᓯᑯᖃᖅᑐᓂ ᓯᓚᖅᔪᐊᒥᑦ: ᒫᓐᓇᐅᔪᖅ ᓇᓂᓯᕖᖅᑐᑦ ᑕᓇᐅᖑᓂᖅᓴᒥᒃ ᐃᒪᕕᖕᒥᑦ ᑕᓯᖅᒥᒃ ᐊᑖᓂ ᑕᓪᓗᕈᑦ ᕿᕿᔪᖅ ᖄᖏᓂᑦ ᓅᓇᕗᒻᒥ, ᑲᓇᑕ. ᐅᓇ ᑕᓪᓗᕈᑦ ᕿᑭᖅᑕᖕᒐᓂ ᓯᕐᒥᓂᖕᒫᖅᑐᑦ ᑕᓲᑦ ᐱᖕᒐᓱᖕᒍᖅᓯᒪᔪᑦ (3) ᑕᓯᑦ ᐊᑖᓂ 560-740ᒦᑕ ᓯᑯ; ᖃᓄᐃᓕᖕᒪᓇᔭᕐᓂᖓ ᖃᐅᔨᓴᕈᑎᑦᑎᒍᑦ ᓇᓗᓇᐃᖅᓯᒪᔪᖅ ᓂᓪᓕᓱᖕᓂᖓ -12 °ᓯᐅᑎᐊᔅ ᐊᒻᒪᓗ ᐊᕐᕆᔪᒥᒃ ᑕᓇᐅᖃᖅᑐᖅ ~15 ᑕᓇᐅᖅ. ᐱᔾᔪᑎᒋᓪᓗᒍ ᑕᓇᐅᖑᓗᐊᕐᓂᖏᓄᑦ, ᑕᓪᓗᕈᑦ ᓯᕐᒥ ᑕᓯᕈᖅᓯᒪᔪᑦ

ᐊᔾᔨᒌᖕᖏᑦᑑᔪᑦ ᐱᓗᐊᖅᑐᒥᒃ ᖃᐅᔨᓇᖅᓯᕙᓪᓕᐊᑎᐊᕐᑰᔨᕗᖅ ᑕᕆᐅᖅᒍᕐᑎᑦᑎᕙᓪᓕᐊᓂᖓ ᑕᐃᒪᓐᓇᐅᕐᑰᔨᖅᒪᑦᑕᑕᐅᖅ ᑖᒃᑯᓇᓂ ᔪᓗᐸ, ᐃᓐᓯᓚᑕᔅ, ᐊᒻᒪᓗ ᒦᔅ, ᐊᒻᒪᓗ ᐃᓂᑦᑎᐊᕙᐅᔪᓐᓇᕐᒪᑦ ᑐᑭᓯᓂᐊᖅᓱᒍ ᐊᐱᕐᑯᑎᑐᖅᑲᑦ ᐱᔾᔪᑎᒥᓪᓗᒍ ᐆᒻᒪᖅᑐᖅᑲᑭᓐᓇᕐᒪᖔᑦ ᓄᓇᒥᐅᑕᓂᒃ ᑖᖅᑐᒻᒪᕆᐋᓗᑲᓗᐊᖅᐸᑦ, ᓂᒡᓚᓱᒃᑐᒻᒪᕆᐋᓘᑲᓗᐊᖅᐸᑦ, ᑕᕆᐅᕐᒥᓐᓇᐅᓚᓗᐊᖅᐸᑦ, ᐊᒻᒪᓗ ᐳᓪᓚᕐᑲᕋᒥᒃ. ᐅᓇ 3-ᐅᑭᐅᓄᑦ ᑲᓇᑕᒥ ᐊᓂᕐᓂᖅᑲᕐᓇᖕᖏᑦᑐᒧᑦ ᓄᓇᕐᔪᐊᖅ ᓯᓚᑖᓄᑦ ᑎᒥᕐᑯᑖ ᖃᖓᑕᓲᑦ ᐊᒻᒪᓗ ᓄᓇᒥ ᓴᓇᔪᑦ ᐃᓕᑦᑎᕖᓪᓕᕐᓗᑎᒃ ᖃᐅᔨᓴᐃᓂᒻᒪᕆᒃᑯᑦ ᐊᒻᒪᓗ ᖃᕆᓴᐅᔭᓕᕆᓂᒃᑯᑦ ᐊᑐᖅᑕᐅᔪᖅ ᓯᕗᓪᓕᖅᐹᒥᒃ ᐊᑐᖅᓯᕙᒥᓂᐊᕐᓗᒍ ᑕᓪᓗᑭᑦ ᑕᓯᕐᓂᑦ ᐃᓂᖃᕐᓗᑎᑦ ᖃᐅᔨᓴᕐᕕᒥᓗᒥᑦ ᐊᒻᒪᓗ ᐊᑐᖅᓯᑦᑎᐊᕈᑎᒥᓗᒥᑦ ᓯᑯᒥ ᓂᐅᖅᑐᐃᓂᖅ, ᓄᐃᑦᑎᓂᖅ ᓯᑯᓂᒃ ᖃᐅᔨᓴᕈᑎᑖᕐᓗᑎᒃ ᖄᖏᓐᓂᑦ ᑕᓲᑦ ᐆᒻᒪᔭᑦᑐᓂᒃ ᖃᐅᔨᓴᕐᓗᑎᒃ ᐊᒻᒪᓗ ᐊᑐᖅᓯᑦᑎᐊᕈᑎᒥᓗᒥᑦ 2 ᐆᒪᔪᑦ ᐊᔾᔨᒌᖕᖏᑦᑐᑦ ᓇᓂᔭᐅᔪᑦ, ᐊᒻᒪᓗ ᑐᑭᓯᓇᓱᒥᐊᑲᓂᕐᓗᑎᒃ ᓄᓇᒥᒃ ᖃᐅᔨᓴᕐᓗᑎᒃ ᐊᐸᓗᓕᒫᖓᓂ ᑕᐃᒪᐃᑦᑐᖅᑲᖅᑐᑦ. ᑐᒃᓯᕋᖅᑐᒍᑦ 1 ᑕᐅᕗᖓᖅᓯᒪᓗᑕ (1-7 ᐅᓪᓗᐃᑦ) ᐊᑕᐅᓯᐊᕐᑲᑦᑕᕐᓗᑕ ᐊᕐᕌᒍᒥ 2022 ᑎᑭᓪᓗᒍ 2024 ᐊᕙᑖᓂᑦ ᑕᕐᑮᑦ ᒪᐃ ᐊᒻᒪᓗ ᔪᓚᐃ ᑖᒃᑯᓄᖓ ᐳᓚᐃᑎ ᐅ'ᑳᓄ (ᐃᓕᓐᓂᐊᕐᕕᒃᔪᐊᒥ ᐃᓕᓐᓂᐊᖅᑐᖅ), ᔫᒃᑖᖅ ᒪᐃᔪ ᒍᐃᑦ (ᐃᓕᓴᐃᔨ), ᔫᒃᑖᖅ ᑯᓕᔅ ᔭᑦᓂ (Hᐊᓂᐲ ᖃᕆᓴᐅᔭᓕᕆᔨᑦ) ᐊᒻᒪᓗ ᓕᐅ ᓯᑐᕗ (Hᐊᓂᐲ ᖃᕆᓴᐅᔭᓕᕆᔨᑦ) ᑕᐃᑯᖓ ᑕᓪᓗᑭᑦ ᓯᑯ ᕿᕿᔪᖅ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᒍᑦ. ᓄᓇᒥ ᐃᓂᒥᔭᕗᑦ ᑕᒪᐃᓐᓄᖅ 3 ᐊᕐᕌᒍᓂ ᖁᓛᓂᑦᑎᐊᖅ ᓯᕐᒥᖕᓂᑦ ᑕᓯᕈᖅᓯᒪᔪᑦ, ᐅᐊᖕᓇᖕᓕᓂ ᐱᓇᖕᓇᖓ ᕿᑎᖓᓂᖔᕐᓗᒍ ᓯᑯ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐊᒻᒪᓗ 120 ᑭᓚᒦᑕᔅ ᖃᓂᓖᖅ ᓄᓇᓃᑦ (ᐊᐅᔭᐃᑦᑐᖅ).ᑕᐃᑲᓂ ᓄᓇᒦᓪᓗᑕ 2023/24, 1 ᐅᒡᐸᔫᓐᓃᑦ 2 ᐱᓇᓱᐊᖃᑕᐅᔪᑦ ᐃᓚᒥᔭᐅᑲᓐᓂᕐᓂᐊᖅᑐᑦ ᐃᓕᓐᓂᐊᕐᕕᒃᔪᐊᖓᓂᑦ ᐊᐃᐳᑕ ᐅᕙᑦᑎᓐᓂ ᐃᓚᐅᓂᐊᖅᑐᑦ. ᑕᐃᔅᓱᒪᖓ ᔪᓚᐃ 2022, ᑕᐃᑲᓂ ᑐᔪᕐᒥᓂᐊᖅᑐᒍᑦ ᕿᕿᔪᕐᒥᒃ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᒥᒃ ᐱᓕᕆᑦᑎᔾᔪᑕᐅᔪᖅ ᐃᓪᓗᖁᑎᖓ ᖃᐅᓯᐃᑦᑐᕐᒥ ᐊᒻᒪᓗ 1 ᐅᒡᐸᔫᓐᓃᑦ 2 ᐅᓪᓗᖅ ᐃᓚᖏᓐᓇᖓᓂ ᐊᐅᓪᓚᖅᓯᒪᓗᑕ ᖁᓕᒥᒎᓕᒃᑯᑦ ᖁᓛᒎᕐᓗᑕ ᑕᓪᓗᑭᑦ ᓯᕐᑯ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᖁᓛᒍᑦ ᓯᕐᒥᕕᓃᑦ ᑕᓯᕈᖅᓯᒪᔪᑦ. ᐋᕿᒃᓯᓂᐊᖕᖏᑦᑐᑦ ᑐᐱᕐᓂᒃ ᓯᓂᒃᑕᔫᖕᖏᑦᑐᑦ ᖃᖓᓂ ᕿᕿᔪᖅ ᓯᑯ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ, ᐊᒻᒪᓗ ᖃᖓᓃᓪᓗᑕ ~4-5 ᐃᑲᕐᕋᓄᑦ. ᑕᐃᑲᓂ 2022 ᐊᐅᓪᓚᖅᓯᒪᓂᕆᔭᕗᑦ ᑕᐅᕗᖓ ᓄᓇᓕᖕᓂ ᖃᐅᔨᓴᖅᑎᖃᕐᓗᑕ ᑕᓪᓗᑭᑎ ᖄᖓᓂ ᓯᕐᒥᕕᓃᑦ ᑕᓲᑦ ᖃᐅᔨᓇᓯᓪᓗᑕ ᐃᓕᑦᑎᐊᕙᐅᖕᒪᖔᑦ ᓯᕗᓂᒃᓴᑦᑎᓐᓂ ᓂᐅᖅᑐᕐᕕᒥᓂᐊᕐᓗᒍ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕈᑎᒃᓴᓂᒃ ᓄᐊᑦᑎᕕᒥᓗᒍ ᓯᑯᓂᒃ ᐊᐅᔭᖏᓐᓂ 2023 ᐊᒻᒪᓗ 2024. ᐊᒻᒪᓗ ᐃᓂᖓᓂ ᖃᐅᔨᓴᕐᓗᑕ, ᐊᑐᖅᓯᓗᑕ ᑰᐸᒃᔅ ᓯᑯᒥᑦ ᓂᐅᖅᑑᑎᒥᒃ, ᓄᐊᑦᑎᓂᐊᖅᑐᒍᑦ ᖄᖓᓂᑦ ᓯᑯᓂᒃ ᖃᐅᔨᓴᕈᑎᒃᑕᖅᔫᕐᓗᑕ (1-2 ᒦᑕ) ᖃᐅᔨᓇᓯᑦᑎᐊᕐᓂᐊᕐᕋᑦᑕ ᐆᒪᔪᖏᓐᓂᒃ ᓯᑯᓃᓯᓂᒃ ᑐᓄᐊᓂ ᐊᖏᓐᓇᖅᑐᓄᑦ ᖃᐅᔨᓴᕈᑎᑦ ᒥᒥᐅ ᐃᓕᓐᓂᐊᕐᕕᒃᔪᐊᖓᓂ ᒪᓐᑐᕆᐊᒥ. ᐅᓇ ᐃᓚᖃᖅᑐᖅ ᓄᑕᐅᔭᓐᓃᖅᑎᓪᓗᒥᑦ ᖃᐅᔨᓴᕐᓗᒥᑦ ᖁᐱᕐᕈᖏᑦ ᐆᒪᔪᑦ ᖃᖓᓂ ᓯᑯ ᐊᒻᒪᓗ ᖃᓄᖅ ᐆᒪᑎᒥᖕᒪᖔᑕ ᑐᑭᓯᑦᑎᐊᕐᓂᐊᕐᕋᑦᑕ ᐊᔾᔨᒌᖕᖏᑦᑐᓂᒃ ᐊᒻᒪᓗ ᐆᒪᔪᖁᑦᓴᓐᓗ. ᖃᐅᔨᓴᕐᓂᐊᖅᑐᒍᑦ ᖃᓄᖅ ᓯᑯ-ᐆᒪᕕᐅᖕᒪᖔᑦ ᐅᒡᐸᔫᓐᓃᑦ ᓱᓕ ᐆᒻᒪᖅᓯᒪᖕᖏᑦᑐᓂᒃ. ᐅᑯᐊ ᖃᐅᔨᓴᕈᑎᑖᕗᑦ ᖃᐅᔨᓇᓯᖕᓂᐊᕐᒥᔪᑦ ᓯᕿᓂᕐᒍᑦ ᒥᑭᔪᓂᒃ ᐆᒪᔪᓕᐅᖅᐸᖕᒪᖔᑦ ᖁᐱᕐᕈᓂᒃ, ᐅᑯᐊᓗ ᑭᓯᓂᖏᓐᓂᒃ ᓇᓗᓇᐃᕐᓗᑎᒃ ᖁᐱᕐᕈᑦ ᑲᑎᖕᒪᔪᑦ ᐊᒻᒪᓗ ᑕᑯᑎᑦᑎᓗᑕ ᐊᑐᖅᑕᑦᑎᓐᓂᒃ ᐊᑑᑎᖃᕐᒪᖔᑦ ᐆᒪᔪᓄᑦ ᑭᓯᓂᖏᓐᓂᒃ ᖃᐅᔨᑎᑦᑎᕙᒃᑐᑦ ᐊᑐᖅᑕᕗᑦ ᑖᒃᑯᐊ ᓯᕗᓂᒃᓴᑦᑎᓐᓂ ᓄᓇᕐᔪᐊᑦᑎᓐᓄᑦ ᖃᓄᐃᓕᐅᕈᑕᐅᔪᓐᓇᕐᒪᖔᑕ. ᑕᐃᑲᓂ 2023 ᐊᒻᒪᓗ 2024 ᐊᐅᔭᖓᓂ ᓄᓇᒦᑎᓪᓗᑕ ᐃᓚᖃᕐᓕᐊᖅᑐᖅ ᐊᑯᓂᐅᓂᖅᓴᒥᒃ ᑕᐅᕙᓃᓪᓗᑕ ᖃᖓᓂ ᓯᑯ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ. ᑕᐃᑲᓂ 2023/24 ᑕᖕᒫᖅᓯᒪᓂᐊᖅᑐᒍᑦ 4 ᑎᑭᓪᓗᒍ 5 ᐅᓪᓗᓄᑦ ᐊᑯᓂᐅᓂᖅᓴᐅᓂᐊᕈᑦᑕ 7 ᐅᓪᓗᓄᑦ ᑕᑭᖓᓂ ᒪᐃ. ᐱᓯᒪᓂᐊᖅᑐᒍᑦ ᐱᖁᑎᑦᑎᓐᓂᒃ ᐊᑐᓇᖅᑲᖅᑐᓂᒃ ᐊᑯᓂᐅᓂᖅᓴᐅᓂᐊᕈᑦᑕ ᐊᐅᓪᓚᖅᓯᒪᓗᑕ, ᖃᖓᑕᓲᖅ ᒥᑭᔪᖅ ᐊᑐᕐᓂᐊᖅᑕᕗᑦ ᓇᒧᖓᐅᔾᔪᑕᐅᖃᑦᑕᕐᓗᓂ ᐱᓇᓱᐊᖃᑎᒥᔭᑦᑎᓐᓂᑦ ᑕᐃᒍᖓᐅᑎᔭᐅᕙᓪᓗᑎᒃ ᐊᒻᒪᓗ ᐊᖏᕐᕋᐅᑎᔭᐅᕙᓪᓗᑎᒃ. ᐊᑯᓂᐅᓂᖅᓴᒥᒃ ᑕᐅᕙᓃᑦᑕᕆᐊᖃᕐᓂᐊᕈᑦᑕ ᐊᒻᒪᓗ ᑕᖕᒫᖅᓯᒪᔭᕆᐊᖃᕐᓂᐊᕈᑦᑕ ᐃᓂᖓᓂ ᐊᑐᕐᓂᐊᖅᑐᒍᑦ ᓯᑯᐊ ᐊᐅᓪᓚᕐᓗᑕ ᐃᒥᖅᑲᑕ. ᑕᐃᑲᓂ 2023/24 ᐊᐅᓪᓚᕐᓂᖅᓂᐊᖅᑐᒍᑦ ᐊᕙᑖᓂ 50 ᑎᑭᓪᓗᒍ 100 ᒦᑕᔅ ᐊᑐᓂᐊᖅᑕᕗᑦ ᐊᒥᓲᖕᒋᖅᑐᓄᑦ ᐅᓪᓗᓄᑦ ᖃᓄᖅ ᐊᐅᓯᔪᓐᓇᖅᑎᒋᖕᒪᖔᑦ ᓯᑲᓂᖕᒐ ᐊᒻᒪᓗ ᐱᔭᕐᓂᖕᖏᑦᑑᖕᒪᑕ ᖃᓄᓗᐃᓂᖕᒐ ᖄᖕᒪᓂ ᓯᑯ ᕿᕿᔪᖅ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ. ᒪᓕᑦᑎᐊᕐᓗᒍᑦᑕᐅᖅ, ᓄᐊᑦᑎᓂᐊᖅᑐᒍᑦ ᐃᓗᐊᓃᓐᓂᖅᓴᓂᒃ ᓯᑯᓂᒃ ᐊᑐᖅᓯᓗᑕ ᑯᐹᒃᔅ ᓄᐅᖅᑑᑎᒥᒃ, ᒫᓐᓇᐅᔪᖅ ᐊᖏᓛᖅ ᐃᑎᓂᖓ 20 ᒦᑕᔅ ᐊᒻᒪᓗ ᐊᓪᓚᖅᑕᐅᓗᑎᒃ ᒥᒥᐅ ᐃᓕᓐᓂᐊᕐᕕᒃᔪᐊᖕᒪᓄᑦ ᐊᖏᓐᓇᖅᑐᑎᒍᑦ ᖃᐅᔨᓴᕐᓗᒥᑦ ᑕᐃᒫᒃ ᓇᓗᓇᐃᖅᑕᐅᔭᓐᓂ ᖁᓖᓂ. ᑕᐃᑲᓂ 2023/24 ᓄᓇᒦᑎᓪᓗᑕ ᐊᐅᔭᒃᑯᑦ, ᐱᓇᓱᐊᖅᑎᒦᑦ ᑕᐃᑲᖕᒪᑦ ᐃᓕᓐᓂᐊᕐᕕᒃᔪᐊᖕᒪᓂᑦ ᐊᐃᐳᑕ ᐸᓪᕕᖕᒥᓪᓗᑎᒃ ᖃᐅᔨᓴᓕᐊᖅᑐᑦ ᐅᖕᒪᓯᒃᑐᒥ ᖃᓄᖅ ᐊᒃᓯᑭᕐᓇᖅᑑᒥᓪᓕᖅᑎᒋᖕᒪᖔᑦ ᓄᓇᖕᒪ ᐊᒻᒪᓗ ᒪᓂᕋᖕᒪ ᓯᕐᒥᕖᓂᑦ ᑕᓯᕐᖁᑎᓐᓗ ᐊᒻᒪᓗ ᐊᕙᑎᓕᒻᒥᑦ. ᐅᓇ ᑕᖕᒫᖅᓯᒪᕕᒥᔭᕗᑦ 2023/24 ᑖᒃᑯᐊᖕᒍᓂᐊᖅᑐᑦ 4-6 ᐃᓄᐃᑦ ~5-7 ᐅᓪᓗᓄᑦ. ᑕᖕᒫᖅᓯᒪᕕᒥᔭᕗᑦ ᐃᓚᖃᕐᓂᐊᖅᑐᖅ 5 ᑐᐱᕐᓂᒃ (2-3 ᓯᓂᒃᕕᑦ, 1 ᖃᓄᐃᓕᐅᕆᐊᖃᕐᕕᖅᑐᓄᑦ ᓴᓇᕕᒃ ᐊᒻᒪᓗ ᐃᒐᕕᒃ, ᐊᒻᒪᓗ 1 ᐊᓇᕐᕕᒃ ᐊᒻᒪᓗ ᓯᕐᓗᐊᕆᓗᒍ), 3 ᓵᓄᓚᐃᑕᔅ ᐊᒻᒪᓗ 3 ᐳᓪᓚᓃᑦ. ᑕᒪᕐᒥᒃ ᐊᑐᖅᑕᐅᔭᕆᖅᑐᑦ ᐃᒪᐃᑦ ᐊᒻᒪᓗ ᐊᓇᖅᑕᐅᑎᑦ ᐆᖅᑕᐅᑦᑎᐊᕐᓂᐊᖅᑐᑦ ᐊᒻᒪᓗ ᐃᒥᑕᐅᓗᑎᒃ ᕿᕿᔪᓂ ᖃᐅᔨᓴᕐᕕᒃ ᖃᐅᓯᐃᑦᑐᕐᒥ. ᓂᕿᑦ ᐊᒻᒪᓗ ᑕᒪᕐᒥᒃ ᐊᓯᖕᒥᑦ ᐊᒃᑕᑯᑦ ᐆᖅᑕᐅᑦᑎᐊᕐᓂᐊᖅᑐᑦ ᐊᒻᒪᓗ ᐃᒥᑕᐅᓗᑎᒃ ᕿᕿᔪᓂ ᖃᐅᔨᓴᕐᕕᒃ ᖃᐅᓯᐃᑦᑐᕐᒥ. ᓄᓇᒥ ᓇᔪᖅᑕᕗᑦ ᕿᒪᖕᓂᐊᖅᑕᕗᑦ ᑕᐃᒫᒃ ᐅᐸᓗᖅᑕᑦᑎᑐᑦ ᐋᕿᒃᓯᒪᑦᑎᐊᕐᓗᓂ ᒥᑭᔪᒥᒃ ᓯᑯᒥᒃ ᖃᖕᒪᓂ ᐊᒃᑐᐃᓂᐊᖅᑐᑦ.

Inuinnaqtun: N/A

Personnel

Personnel on site: 4

Days on site: 2
Total Person days: 8
Operations Phase: from 2022-06-15 to 2024-07-31

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Devon Island Subglacial Lakes Region	Sampling sites	Crown	N/A	None. Not aware of any archeological/paleontological value of the ice cap.	Approximately 120 km to Grise Fiord which is the nearest community we're aware of. Approximately 120 km to Nirjutiqavvik National Wildlife Area (Coburg Island National Wildlife Area) which is the nearest protected area we're aware of.

Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Resolute Bay	N/A	Hunter and Trappers Association of Resolute Bay	2022-11-01

Authorizations

Indicate the areas in which the project is located:

North Baffin

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Government of Nunavut, Nunavut Research Institute	We have completed the NPC application and once this NIRB application is submitted we will be waiting on confirmation of the NRI license.	Active		

Project transportation types

Transportation Type	Proposed Use	Length of Use
Air	Helicopter or twin otter transportation from Resolute Bay (PCSP) to the top of the Devon Island ice cap	

Project accomodation types

Temporary Camp

Material Use

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

Equipment Type	Quantity	Size - Dimensions	Proposed Use
Kovacs corer	1	0.2m x 0.2m x 1m	A corer which will be used to collect ice core samples 1 -2 meters into the subsurface of the ice cap.
SLUSH Drill system	1	0.57m x 0.57m x 5m	A drill developed by Honeybee Robotics used to drill into ice using a melt probe. In year one, the drill will be used to drill up to 2 meters into the subsurface of the ice cap and up to 100 meters by year 3 of the project.

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	5	15	Gallons	Propane will be used in years 2 and 3 of the project (2023 & 2024) for heating and cooking while camping at the field site.
Other	fuel	1	2	2	Gallons	Gasoline/oil mix to be used to power a Honda 2 kw generator which will in turn be used to power the SLUSH drill.

Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
0	Snow melt/bring from PCSP Resolute	PCSP Resolute

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Camp	Greywater	50 liters	Transport back to and disposal at PCSP Resolute.	N/A
Camp	Sewage (human waste)	50 liters	Transport in sealed containers back to PCSP Resolute for proper disposal.	N/A

Environmental Impacts:

We predict minimal environmental impact to the field site. In 2022 we only plan to spend up to 10 hours on the ice cap over the course of two days. No equipment and/or waste will be left in the field. All waste will be collected in waste containers and transported back to PCSP at Resolute Bay for disposal in the proper manner. For 2023 and 2024, we plan to camp at the field site for 4 - 5 days. During this time, human waste will be collected in sealed buckets and transported back to PCSP Resolute for proper disposal. All other waste material will be stored in trash bags and brought back to PCSP Resolute for proper disposal. We foresee causing very little impact on the field site. We perceive NO impact to Eskers and other unique or fragile landscapes, unlike what is stated in the form below, which will not save as such.

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

The Devon Island ice cap is a large ice cap situated on the eastern side of the island. The ice cap has a maximum depth of ~900 meters. The top layer of the ice cap where the study will take place is mainly composed of firn and snow. Crevasses in the ice cap are also known.

Description of Existing Environment: Biological Environment

There is no vegetation on the ice cap and to the best of our knowledge, there are no animal populations which reside on the ice cap.

Description of Existing Environment: Socio-economic Environment

The site is far from any community. Devon Island is uninhabited. We perceive it highly unlikely to encounter archaeological or culturally significant sites on the ice cap. There is no land or resource use on the ice cap.

Miscellaneous Project Information

Please see attached PCSP application form for details on training and measures used to mitigate emergencies while in the field. Please see attached document for our comprehensive spill prevention/plan. Our confirmation of application to the NPC is also attached.

Identification of Impacts and Proposed Mitigation Measures

We perceive very little impact to the site. The only lasting impact to the site will be shallow bore holes in the top of the ice cap and one up to 100 meters deep by year 3 of the project. These boreholes are small in diameter (approximately 15 cm wide) and we expect them to fill in naturally after one Arctic winter/spring thaw. These boreholes will also be localized to an area of only 20 to 30 meters, minimizing their impact on the surrounding environment. All impacts on the site from human activity will be minimized by containing all waste materials and fluids in sealed containers which will be transport back to and disposed of properly at PCSP Resolute. No materials will be left at the site once work is completed.

Cumulative Effects

Aside from seasonal melt on top of the ice cap, the Devon Island ice cap is relatively unchanging year over year. We plan not to leave any evidence of our presence or work beyond a few localized shallow boreholes. These boreholes are predicted to fill naturally within one year, therefore we do not foresee any cumulative effects from our work on the environment.

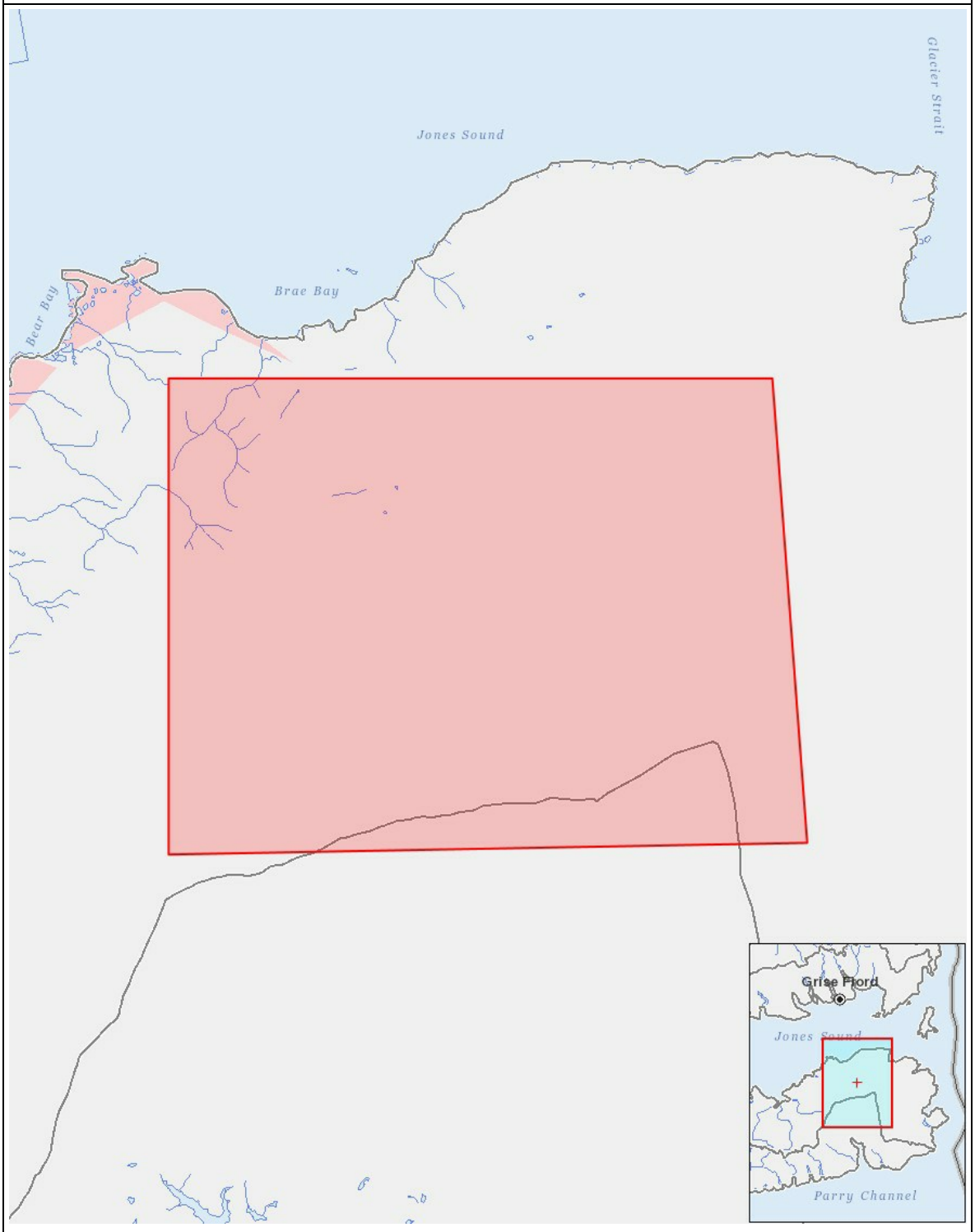
Impacts

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																									
Sampling sites		-	-	-	-	-	-	-	-	-	-	-	-		-	U	U	-	-		-	P	-	-	-
Decommissioning																									
-		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-	-

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

Project Location



List of Project Geometries

1	polygon	Devon Island Subglacial Lakes Region