ᓄᓇᕘᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦᑎᒍᑦ ᑐᒃᓯᖅᑑᑦ ᖅᑭᒥᕐᕈᔭᒃᓴᖅ #125765

Mueller's Ice Cap ice core

ᑐᒃᓯᖅᑑᑕᐅᔪᖅ ᖃᓄᐃᑦᑑᓂᖓ: New

ᐱᓕᕆᐊᕆᓴᐅᔪᒪᔫᑉ ᖃᓄᐃᑦᑑᓂᖓ: Scientific Research

ᐅᓪᓗᖓ ᑐᒃᓯᖅᑑᑎᓕᐊᖑᓂᐅᑉ: 1/13/2023 11:32:39 AM

Period of operation: from 0001-01-01 to 0001-01-01

ᑲᔪᓯᒃᑲᐃᔨᐅᓂᐊᕋᓱᒋᔭᐅᔪᑦ: from 0001-01-01 to 0001-01-01

ᐱᓕᕆᐊᖅᑲᕈᒪᔪᖅ:
Dorthe Dahl-Jensen
University of Manitoba
Center for Earth Observation Science, 535 Wallace Building, 125 Dysart Rd.
Winnipeg Manitoba R3T 2N2
Canada
ᐅᖄᓚᐅᑏᑦ: 204 298 4561, ᓱᑲᔪᒃᑯᑦ:

ᑐᓴᐅᒪᔾᔭᑦ

ᖃᓄᐃᑦᑑᑎᓂᒃ ᐱᓕᕆᐊᖅᑲᖅᓂᐊᕆᐊᖓᓐᓂᒃ

ᖃᓪᓗᓈᑎᑐᑦ: An ice core on Müller Ice CapDr. Dorthe Dahl-Jensen, University of ManitobaWe, a group of scientists from the University of Manitoba, plan to drill an ice core through Müller Ice Cap on Axel Heiberg Island. This core will be 10 cm in diameter and ~600 m long and will contain information about climate in Arctic Canada thousands of years ago. This core will help answer: • Did sea ice conditions respond to climate during the past 20,000 years? • What climatic conditions did arctic ice caps experience during the past and how did they respond? • How old is Müller Ice Cap? • How fast is Müller Ice Cap shrinking, and how much is climate warming there? We can use new measurement techniques to address these questions before warming melts the records in the ice cap.The project involves going to Axel Heiberg Island twice, once to pick the exact site of the core and once to drill. In 2023, we plan to have a team of five survey the ice cap with an ice-penetrating radar and collect some small snow samples. The radar does not affect people or animals but will identify the drill site that contains the most information about past climate. We also plan to fly 6 hours of surveys from Resolute Bay, with one aircraft more than 1200 ft above the ice. This will use human- and animal-safe radar and lasers to determine the ice thickness at inaccessible parts of Müller Ice Cap. In 2024, about 12 people will spend 2-3 months camping on the glacier, drilling the core, and making measurements on the surrounding snow. The core will be sent back to laboratories to determine past temperature, snowfall and sea-ice conditions in the area. The measurements will inform models of the past, present, and future evolution of Müller Ice Cap.The ice and snow we collect will have minimal environmental impact; in total, we plan to collect less than 10 m3, and additional snow melted for camp use will be less than 1 m3 per day. The primary environmental impact will be that we must put a non-freezing fluid in the hole so that it does not close around the drill. We plan to leave the fluid in the hole afterwards to allow future measurements of the ice flow and temperature (and since it is difficult to remove), as is done in Greenland and Antarctica. The fluid will be safely contained in the ice cap and is non-hazardous. In addition, the location of the work is over 400 km from Grise Fiord or Resolute, and will be in the centre of the glacier, far from wildlife.Data will be made available through the Canadian Watershed Information Network (CanWIN), a permanent online archive. An archive of the ice itself will be kept at the Canadian Ice Core Laboratory for future use. The results will be shared through consultations in Grise Fiord and Resolute, where data from the deep past can be integrated with knowledge from the communities. We hope these results can guide future community-led research on glaciers closer to the communities, and we have applied for funding from CFI to help make that possible (evaluation in June 2023). During 2024 we hope to employ 1-2 residents of Resolute or Grise Fiord for work on the ice cap—this could involve logistics, camp management, or cooking.

ᐅᐃᕖᑎᑐᑦ: n/a (Project is solely in North Baffin, closest communities are Resolute Bay and Grise Fiord)

ᐃᓄᒃᑎᑐᑦ: ᓂᓚᒃ ᐲᖅᑕᐅᓂᒃ ᒥᓪᓗᖅ ᐊᐅᔪᐃᑦᑐᖓᓂᑦᑑᒃᑕᖅ. ᑐᐊᑎ ᑕᕼᓪ-ᔦᓐᓯᓐ, ᓯᓚᑦᑐᖅᓴᖅᐱᒡᔪᐊᖓ ᒫᓂᑐᕋᐸᖅᓇᒃᑲᑦᑕ ᓂᐅᖅᑐᕈᒪᓪᓗᑎᒍ ᓂᓚᒃ ᐲᖅᓯᕕᒥᓂᐋᖅᓗᒍ ᒥᓪᓗᖅ ᐊᐅᔪᐃᑦᑐᖓ ᐅᒥᖓᒪᐃᑦ ᓄᓇᖓᓐᓂ. ᑖᓐᓇ ᐲᖅᓯᒪᔪᖅ ᐃᒪᓐᓇᑎᒋᐅᓂᐊᒻᒪᑦ 10 ᓰᓐᑐᒥᑦᑦ ᐅᓚᒥᖅᓂᖅᑲᖅᓗᓂ ᐊᒻᒪᓗ ~600 ᒥᑕᓂᒃ ᑕᑭᓂᖅᑲᖅᓗᓂ ᐊᒻᒪᓗ ᐱᖅᑲᓯᐅᔾᔨᓯᒪᓂᐋᖅᓗᓂ ᑐᓴᐅᒪᔾᔪᑎᒃᓴᓂᑦ ᓯᓚᖓᓂᑦ ᐅᑭᐅᖅᑕᖅᑐᖓᑕ ᑲᓇᑕᐅᑉ ᑕᐃᓴᖕᒥᓐᓂᐋᓗᐊᖅᑐᖅ ᐊᖅᖑᒍᓂ ᐅᐋᑦᑎᐊᕈᖅᓇᓴᓂ. ᑖᓐᓇ ᐲᖅᓯᒪᔪᖅ ᐃᑲᔪᖅᓂᐋᖅᒪᑦ ᑮᐅᔭᐅᑎᑦᑎᓗᓂ: • ᑕᐃᒪᓕ ᐃᒪᕕᐅᑉ ᓯᑯᖓᑕ ᖃᓄᐃᓕᖓᓂᖔᑦ ᒪᓕᖅᑲᑦᑕᓚᐅᖅᐹᑦ ᓯᓚᖕᒋᓃᑦ ᐊᑐᖅᑎᓪᓗᒥᑦ ᐊᓂᒍᓚᐅᖅᑐᑦ 20,000 ᐊᕐᕌᒍᐃᑦ? • ᖃᓄᐃᑦᑐᓂᒃ ᓯᓚᐅᑉ ᖃᓄᐃᓕᖓᓕᖅᓂᖓ ᐅᑭᐅᖅᑕᖅᑐᒥ ᐊᐅᔪᐃᑦᑐᖅ ᐊᑐᖅᑲᑦᑕᓚᐅᖅᐹᑦ ᐊᑐᖅᑎᓪᓗᒥᑦ ᐊᓂᒍᓚᐅᖅᑐᑦ ᐊᒻᒪᓗ ᖃᓄᐃᓕᖅᑲᑦᑕᓚᐅᖅᐹᑦ ᖃᓄᐃᓕᑎᑕᐅᓂᖔᑦ? • ᖃᓄᑎᒥ ᐱᑐᖅᑲᐅᑎᒋᓕᖅᒫᑦ ᒧᓪᓗᖅ ᐊᐅᔪᐃᑦᑐᖔ? • ᖃᓄᑎᒥ ᓱᒃᑲᓕᑎᒋᔪᒥᒃ ᒥᓪᓗᖅ ᐊᐅᔪᐃᑦᑐᖅ ᒥᑭᓪᓕᕚᓪᓕᐋᓂᖅᑲᐹ, ᐊᒻᒪᓗ ᖃᓄᑎᒦᖅᑐᒥᒃ ᓯᓚ ᐅᖅᑰᓯᕚᓪᓕᐊᑎᒋᕚ ᑕᐅᕙᓃ? ᐊᑐᕈᓐᓇᖁᑎᒍ ᓄᑖᑦ ᐆᒃᑐᖁᐃᔾᔪᑏᑦ ᐱᓕᕆᑎᐊᕈᑎᖏᑦ ᐱᓕᕆᐊᕆᓇᓯᐋᖅᓗᒥᑦ ᑕᒪᒃᑯᐊ ᐊᐱᖅᑯᑏᑦ ᐅᖅᑰᓯᕚᓪᓕᐋᓂᖅᓗᓐ ᐊᐅᒃᑎᑕᐅᓚᐅᖏᓐᓂᖏᓐᓂ ᐅᓂᒃᑳᖅᓯᒪᓂᖏᑦ ᐊᐅᔪᐃᑦᑑᑉ.ᐱᓕᕆᐊᒃᓴᖅ ᐱᓕᕋᖅᑲᒪᑦ ᑕᐅᕗᖓᕐᕆᔭᖅᑐᓂ ᐅᒥᖓᒪᐃᑦ ᓄᓇᖓᓐᓄᑦ ᒪᕐᕿᐃᖅᓱᖅᑐᓂ, ᐊᑕᐅᓯᐋᖅᑐᓂ ᐱᔭᖅᑐᕐᓱᐋᖅᑐᓂ ᑕᐃᑦᓱᒥᖓᓪᓗᐋᖅ ᐃᓂᒥᓂᐋᖅᑕᑎᓐᓂᑦ ᐲᖅᓯᕕᒥᓂᐋᖅᓗᒍ ᐊᒻᒪᓗ ᐊᑕᐅᓯᐊᖅᓗᓂ ᓂᐅᖅᑐᕕᒥᓗᒍ. 2023-ᒥ, ᐸᕐᓇᒃᑲᑦᑕ ᐱᓕᕆᖃᑎᒌᒃᑐᓂᒃ ᑕᓪᓕᒪᓂᑦ ᖃᐅᔨᓴᖅᓯᔭᖅᑐᕐᖁᔨᓪᓗᑕ ᐊᐅᔪᐃᑦᑐᒥᑦ ᐱᖅᑲᓗᑎᒃ ᓂᓚᖕᒥᑦ ᑕᐃᒧᓖᓇᔪᓐᓇᖅᑐᒥᑦ ᐃᑎᓂᖅᓯᐅᓇᔾᔪᑎᖅᑲᓗᑎᒃ ᐊᒻᒪᓗ ᓄᐊᑦᑎᓗᑕ ᒥᑭᔪᕈᓗᕐᒥᑦ ᐊᐳᑎᒥᒃ ᖃᐅᔨᓴᒐᒃᓴᕐᒥᑦ. ᐃᑎᓂᖅᓯᐅᓇᔾᔪᑎ ᐊᒃᑐᐃᓂᖅᑲᕐᒥᒻᒪᑦ ᐃᓅᖅᑎᒥᓂᒃ ᐅᕝᕙᓘᓐᓃᑦ ᐆᒪᔪᓂᒃ ᑭᓯᐊᓂ ᓇᓗᓇᐃᖅᓯᓂᐋᕐᒪᑦ ᓂᐅᖅᑐᕐᕕᐅᓂᐋᖅᑐᒥᒃ ᐃᓗᓕᖅᑲᓐᓇᓇᐋᕐᓗᒍ ᑐᓴᐅᒪᔾᔪᑎᐅᑲᓐᓂᕈᓐᓇᖅᑐᓂᒃ ᐸᕐᓇᒃᓯᒪᓕᕐᒥᔪᑦ ᖃᖓᑕᒃᑰᒃᑯᑦ ᖃᐅᔨᓴᕈᒪᓂᖅ ᖃᐅᓯᐃᑦᑐᕐᒥᕚᕐᓗᑕ, ᐊᑕᐅᓯᕐᒥᒃ ᖃᖓᑕᒃᑰᒃᑯᑦ ᖃᖓᑕᓂᐊᖅᑐᒥᒃ 1200 ᕖᑦ (Ft) ᐅᖓᑕᓂᒃ ᖁᓚᐅᑎᓗᑕ ᓯᑰᒥᒃ. ᑕᐃᑦᓱᒪᓂᐅᓚᐅᖅᑐᖅ ᓯᓚᒥᕆᓚᐅᖅᑕᖓᓂᒃ. 2024-ᒥ, ᐃᒪᓐᓇᑎᒋᐸᓘᕿᔭᕐᒪᑕ 12 ᐃᓅᖅᑎᒥᑦ ᑕᑉᐹᓂᒃᑲᔭᕐᓗᑎᒃ 2-3 ᑕᖅᑭᓂᒃ ᓯᓂᒃᑕᕝᕕᖅᒦᓪᓗᑎᒃ ᐊᐅᔪᐃᑦᑐᒥ, ᓂᐅᖅᑐᕐᓗᑎᒃ ᐱᖅᓯᕕᐅᓗᓂ, ᐊᒻᒪᓗ ᐆᒃᑐᖁᐃᓗᑎᒃ ᐊᕙᑎᒦᑦᑐᓂᒃ ᐊᐳᑎᓂᒃ. ᐲᖅᑕᐅᓯᒪᔪᖅ ᑐᔫᑎᒥᔭᐅᓂᐊᖅᑐᖅ ᖃᐅᔨᓴᖅᓯᕕᖕᒨᖅᑎᑕᐅᓗᓂ ᐃᓯᒪᓕᐅᕈᑕᐅᖁᓪᓗᒥᑦ ᑕᐃᑦᓯᒪᓂᐅᓚᐅᖅᑐᖅ ᐅᖅᑰᓂᖅᑕᓚᐅᖅᑕᖅᒥᑦ, ᖃᓐᓂᖅᑲᑦᑕᕐᓂᒥᓂᖅᒪᒃ ᐊᒻᒪᓗ ᐃᒪᕕᐅᑉ-ᓯᑯᖓᑕ ᖃᓄᐃᑦᑐᖅᑲᑦᑕᓂᒥᓂᖅᒪᒃ ᑕᒫᓂ ᖃᓂᒋᔭᖓᓂ.

ᐆᒃᑐᕋᐃᔪᑎᒥᔭᐅᔪᒥᓃᑦ ᑐᑭᓯᓇᖅᓯᑎᑦᑎᒐᔭᕐᒪᑕ ᖃᓄᐃᓕᖓᖃᑦᑕᓚᐅᓂᖏᓐᓂᒃ ᑕᐃᑦᓯᒪᓂᐅᓚᐅᖅᑐᖅ, ᒫᓐᓇᐅᔪᕐᓗ, ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᒥ ᐊᓯᑭᒃᐸᓪᓕᐊᓂᖓᓂᒃ ᒥᓪᓗᕐ ᐊᐅᔪᐃᑦᑐᖓᑕ.ᓂᓚᐃᑦ ᐊᒻᒪᓗ ᐊᐳᑏᑦ ᓄᐊᑕᕗᑦ ᒥᑭᓚᒥᒃ ᐊᕙᑎᑦᑎᓐᓂᒃ ᐊᒃᑐᐃᓂᖃᓂᐋᒪᑕ; ᑲᑎᓗᒥᑦ, ᐸᕐᓇᒃᑲᑦᑕ ᓄᐊᑦᑎᔪᒪᓪᓗᑕ ᒥᑭᓂᖅᓴᓂᒃ 10 m3 ᑕᕝᕙᓪᓚᓇᐅᔨᓗᓂ, ᐊᒻᒪᓗ ᐃᓚᖃᒃᑲᓐᓂᕐᓗᓂ ᐊᐳᑎ ᐊᐅᒃᓯᒪᔪᒥᒃ ᓯᓂᒃᑕᕐᕕᒥᔭᑦᑎᓐᓂᑦ ᐊᑐᖅᑕᑦᑎᓐᓂᒃ ᒥᑭᓂᖅᓴᐅᓚᔭᕐᓗᓂ 1 m3 ᑕᕝᕙᓪᓚᓇᐅᔨᓗᓂ ᐊᑐᓂ ᐅᓪᓗᕐᒥ. ᐱᒻᒪᕆᐅᓖᖅ ᐊᕿᑎᑦᑎᓐᓂᑦ ᐊᒃᑐᐃᓂᖅ ᐃᒪᓐᓇᐅᓂᐋᕐᒪᑦ ᐃᓕᓯᔭᕆᐋᖃᕐᓂᐋᕐᓗᑕ ᖁᐋᕈᓐᓇᖏᑦᑐᒥᒃ ᑯᕕᓰᒥᒃ ᓂᐅᖅᑐᖅᓯᒪᔪᒧᑦ ᒪᒥᖁᓇᒍ ᐊᖕᒪᔫᔪᓐᓃᕐᓗᓂ ᓂᐅᖅᑐᖅᑕᐅᓯᒪᓂᖓ. ᐸᕐᓇᒃᑲᑦᑕ ᐊᑕᐃᓐᓇᖅᑎᑦᑎᔪᒪᓪᓗᑕ ᑯᕕᓯᖅ ᓂᐅᖅᑐᖅᓯᒪᔪᒦᖏᓐᓇᕐᓗᓂ ᑭᖑᓂᖓᒍᑦ ᓯᕗᓂᒃᓴᒥ ᐆᒃᑐᕋᑕᐅᒃᑲᓐᓂᖃᑦᑕᖁᓪᓗᒍ ᓂᓚᐅᑉ ᐃᖏᕐᕋᕙᓪᓕᐋᓂᖓ ᐊᒻᒪᓗ ᓂᒡᓕᓇᓂᖅᓯᐅᕈᑎᖓ (ᐱᔭᕐᓂᒥᑦᑐᐋᓗᖕᒪᑦ ᐲᕋᓯᒥᐋᖓ), ᑕᐃᒪᓐᓇᐃᓘᖅᑕᐅᓚᐅᓂᖏᓐᓄᑦ ᐊᑯᑭᑦᑐᓂ ᐊᒻᒪᓗ ᐊᑖᓂᖓᖅᑐᖅ ᐅᑭᐅᖅᑕᖅᑐᕐᒥ. ᑯᕕᓰᕋᔭ ᐊᑦᑕᕐᓇᖅᑎᑦᑎᔫᖏᑦᑐᖅ ᐃᓗᐋᓂᑦᑐᖅ ᐊᐅᔪᐃᑦᑑᑉ ᐊᒻᒪᓗ ᐅᓗᓇᐊᓇᖅᑑᓇᓂ. ᐃᓚᒥᔭᐅᒃᑲᓂᕐᓗᓂ, ᐃᓂᒥᓂᐋᖅᑕᖓ ᐃᖃᓇᐃᔭᕐᕕᐅᔪᑉ ᐅᖓᑖᓂᒻᒪᑦ 400 ᑭᓛᒥᑐᑦ ᐊᐅᓯᐃᑦᑐᕐᒥᑦ ᐅᕝᕙᓘᓐᓃᑦ ᖃᐅᓯᐃᑦᑐᕐᒥᑦ, ᐊᒻᒪᓗ ᕿᑎᖓᓃᓐᓂᐊᕐᒪᑦ ᐊᐅᔪᐃᑦᑑᑉ, ᐅᖓᓯᒡᓗᓂ ᓂᕐᔪᑎᓂᑦ.ᖃᐅᔨᒪᔾᔪᑎᒃᓴᐃᑦ ᐱᔭᒃᓴᐅᓕᖅᑎᑕᐅᓂᐊᖅᑐᑦ ᑲᓇᑕᒥ ᐃᒪᖃᕐᕕᐅᔭᓂᑦ ᑐᓴᐅᒪᔾᔪᑎᒃᓴᓕᕆᓂᕐᒧᑦ ᐱᓕᕆᖃᑎᒥᒡᕕᖓᓂᑦ (CanWIN), ᐋᖅᑭᒃᓯᒪᐃᓇᖅᑐᖅ ᖃᕋᑕᐅᔭᒃᑰᕈᑎ ᑎᑎᕋᒃᓯᒪᔪᓕᐊᖑᓯᒪᔪᖅ. ᑎᑎᕋᒃᓯᒪᔪᓕᐊᖑᓯᒪᔪᑦ ᓂᓚᒃ ᑖᓐᓇ ᐱᓯᒪᔭᐅᓂᐋᕐᒪᑦ ᑲᓇᑕᒥ ᓂᓚᖏᑦ ᐂᖅᑕᐅᓯᒪᔭᓂᒃ ᖃᐅᔨᓴᖅᓯᕕᖕᒦᑎᑕᐅᓗᓂ ᓯᕗᓂᒃᓴᒥ ᐊᑐᖅᑕᐅᔪᓐᓇᓛᖁᓪᓗᒍ. ᐱᔭᓈᒃᑕᐅᔾᔪᑎᖏᑦ ᐱᖃᖃᑎᖃᕈᑕᐅᓂᐊᖅᑐᑦ ᐊᐱᖅᓯᖃᑦᑕᕐᓂᒃᑯᑦ ᐊᐅᓯᐃᑦᑐᕐᒥᒃ ᐊᒻᒪᓗ ᖃᐅᓯᐃᑦᑐᕐᒥᒃ, ᑕᕝᕙᓂ ᖃᐅᔨᒪᔾᔪᑎᒃᓴᑦ ᑕᐅᕙᖕᓖᖅᓯᒪᔪᑦ ᐃᑎᔪᑦ ᐊᓂᒍᖅᓯᒪᔪᑐᖃᕐᓂᑦ ᐃᓚᓕᐅᑎᔭᐅᔪᓐᓇᕐᓂᐊᕐᒪᑕ ᖃᐅᔨᒪᓂᕆᔭᐅᔪᓄᑦ ᓄᓇᓕᓃᖓᖅᓯᒪᔪᓂᑦ. ᓂᕆᐅᒃᑐᒍᑦ ᑕᒪᒃᑯᐊ ᐱᔭᓈᒃᑕᐅᔾᔪᑦ ᒪᓕᒃᑕᐅᑎᑦᑎᔪᓐᓇᖁᓪᓗᒥᑦ ᓯᕗᓂᒃᓴᕆᓂᐊᖅᑕᑦᑎᓐᓂ ᓄᓇᓕᖑ -ᓯᕗᓕᖅᑕᐅᓗᓂ ᖃᐅᔨᓇᓯᐋᕐᓂᐅᔪᓂᑦ ᐊᐅᔪᐃᑦᑐᓂᒃ ᖃᓂᒃᓴᓂᖅᓴᐅᔪᓂᑦ ᓄᓇᓕᖕᓂᑦ, ᐊᒻᒪᓗ ᑐᒃᓯᕋᐅᑎᓕᐅᖅᓯᒪᓕᖅᓗᑕ ᑮᓇᐅᔭᖃᒃᑎᑕᐅᔾᔪᑎᒃᓴᓂᒃ ᐅᑯᓇᖕᒫᖅᑐᓂᑦ ᑲᓇᑕᐅᑉ ᑐᙵᕕᖓ ᐱᓕᕆᔾᔪᓯᐅᓕᖅᑐᒧᑦ (CFI) ᐃᑲᔪᕈᑕᐅᖁᓪᓗᒍ ᑕᒪᓐᓇ ᐊᔪᕐᓇᕈᓐᓃᖅᑎᑕᐅᖁᓪᓗᒍ (ᖃᐅᔨᓴᖅᓯᓂᖅ ᔫᓂ 2023-ᒥ). ᐊᑐᖅᑎᓪᓗᒍ 2024 ᓂᕆᐅᒃᑐᒍᑦ ᐃᖃᓇᐃᔭᖅᑎᑦᑎᒐᔭᕈᒪᓪᓗᑕ 1-2 ᓄᓇᓕᖕᒥᐅᑖᖕᓂᒃ ᖃᐅᓯᐃᑦᑐᕐᒥᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐊᐅᓯᐃᑦᑐᕐᒥᑦ ᐃᖃᓇᐃᔭᕋᔭᕐᓗᑎᒃ ᐊᐅᔪᐃᑦᑐᒥ-ᑕᒪᓐᓇ ᐱᓕᕆᐊᖑᑎᑦᑎᑐᐃᓐᓇᕆᐊᖃᕐᒪᑦ ᐱᖁᑎᓕᕆᓂᕐᒥᑦ, ᓯᓂᒃᑕᕆᐊᕐᕕᐅᓯᒪᔪᒥᒃ ᐊᐅᓚᑦᑎᓂᕐᒥᒃ, ᐅᕝᕙᓘᓐᓃᑦ ᓂᕿᓕᐅᕐᓂᕐᒥᑦ.

Inuinnaqtun: n/a (Project is solely in North Baffin, closest communities are Resolute Bay and Grise Fiord)

Personnel

Personnel on site: 12

Days on site: 100

Total Person days: 1200

Operations Phase: from 2023-04-13 to 2024-08-18

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ᓇᒥ	ᖃᓄᐃᑦᑐᒥᑦ ᐱᓕᕆᐊᖅᓂᐊᕐᐸ	ᑭᒃᑯᑦ ᓄᓇᖁᑖᓂ	ᑐᓴᐅᒪᔭᒃᓴᑦ ᓄᓇᐅᑉ ᖃᓄᖅ ᐊᑐᒐᐅᓚᐅᕐᓯᒪᔭᕆᐊᖕᒐᓐᓂᒃ	ᐃᑦᓴᕐᓂᑕᖃᕐᐱᐅᕙᓚᐅᕐᐸ ᐃᓄᖕᓄᑦ ᓇᔪᕐᑕᐅᖃᑦᑕᕐᓂᑯᕙᓗ ᑕᐃᑦᓯᒪᓂᑐᖃᐅᓕᕐᑐᖅ	ᖃᓂᓐᓂᕐᐹᖅ ᓄᓇᓕᔭᐅᔪᕐ ᐊᒻᒪᓗ ᓴᐳᒥᒃᓯᐱᐅᕙᓗ ᓯᓇᓄᑦ
Area of Muller ice cap which we will survey--we plan to camp and drill an ice core at one point in this area.	Scientific/International Polar Year Research	Crown	The centre of Muller Ice Cap has, to our knowledge, been visited only by scientists. There were scientific surveys performed from 1959-1962 by McGill University. The site has a weather station installed by Queen's University in 2021.	Although Inuit have inhabited Axel Heiberg Island in the past, the available evidence suggests that was far from our proposed site, near the east coast of the island and not on the ice cap. Our proposed site has no known archaeological value, and is more than 50 km from the closest archaeological sites near Buchanan Lake.	Axel Heiberg Island is currently uninhabited. The proposed site is about 50 km from the Napaqtulik/Napurtulik Proposed Territorial Park. It is about 440 km from Grise Fiord and 580 km from Resolute Bay, the two nearest communities.
Camp location, 2023	Camp	Crown	To our knowledge, this camp location has never been visited.	Although Inuit have inhabited Axel Heiberg Island in the past, the available evidence suggests that was far from our proposed site, near the east coast of the island and not on the ice cap. Our proposed site has no known archaeological value, and is more than 50 km from the closest archaeological sites near Buchanan Lake.	Axel Heiberg Island is currently uninhabited. The proposed site is about 50 km from the Napaqtulik/Napurtulik Proposed Territorial Park. It is about 440 km from Grise Fiord and 580 km from Resolute Bay, the two nearest communities.
Planned aerial survey (only operating above ice, always >1200 ft above ground)	Researching	Crown	These areas have also been surveyed from the air by the British Antarctic Survey and NASA--there is some overlap between our planned survey and theirs.	The flight path does not cross the known archaeological sites on the island near Buchanan Lake.	Axel Heiberg Island is currently uninhabited. The flight plan does not reach nearer than 25 km from the Napaqtulik/Napurtulik Proposed Territorial Park. It is about 440 km from Grise Fiord and 580 km from Resolute Bay, the two nearest communities.

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			ᑐᓴᖅᑎᑕᐅᓪᓗᐊᖏᓐᓂᖅ
ᐊᐅᓚᐱᑐᖅ	Marty Kuluguqtup, Senior Administrative Officer	Hamlet of Grise Fiord	2022-07-06

ᓚᐃᓴᓐᓯᑦ ᐱᒨᓇᐅᑏ ᐊᖏᖅᑕᐅᓯᒪᔪᑦ

ᓇᒌᒋᐊᖏᓐᓂᒃ ᐱᓕᕆᐊᕆᕝᕕᐅᓂᐊᖅᑐᑦ ᑎᑎᕋᕐᓗᒋᑦ:

North Baffin

ᓚᐃᓴᓐᓯᑦ ᐱᒨᓇᐅᑏ ᐊᖏᖅᑕᐅᓯᒪᔪᑦ

ᒐᕙᒪᒋᔭᐅᔫᑉ ᐊᕕᒃᑐᖅᓯᒪᐅᕐᓂᖔᓐᓂ ᒪᓕᒐᕐᓅᖓᔪᓂᒃ ᐱᖁᔭᕐᓅᖓᔪᓂᒡᓗ ᑲᒪᔩᑦ ᐱᔪᓇᐅᑎᑖᕈᑎᓂᒃ ᓚᐃᓴᓐᓯᓄᓪᓗ ᑲᔪᓯᒃᑲᐃᔩᑦ	ᖃᓄᐃᑦᑐᓪᓚᓇᐅᕙ ᓚᐃᓴᓐᓯᑖᕈᑕᐅᔪᖅ ᐱᔪᓇᐅᑎᑖᕈᑕᐅᔪᖅ ᐊᖏᖅᑕᐅᔪᕐᓘᓐᓃᑦ	ᒫᓐᓇ ᖃᓄᐃᓕᖓᕙ	ᐅᓪᓗᒥ ᑐᓂᔭᖅ/ ᑐᒃᓯᖅᑑᑕᐅᓚᐅᖅᓯᒪᔪᖅ	ᑭᒡᓕᖅᑲᕐᕕᖓ
ᓄᓇᕗᒥ ᐃᒪᓕᕆᔨᑦ ᑲᑎᒪᔨᖏᑦ	We have forwarded the NPC conformity description to NWB and are in the process of applying for a Type B license.	Not Yet Applied		
ᓄᓇᕗᒥ ᖃᐅᔨᓴᖅᑐᓕᕆᔨᒃᑯᑦ	Scientific Research License	Applied, Decision Pending		

Project transportation types

Transportation Type	ᓱᓇᒧᑦ ᐊᑐᕐᐅᓂᐊᖅᐸ	Length of Use
Air	We will reach the site by Twin Otter from Resolute and Eureka. Surveying will be conducted with Basler (DC3) from Resolute or Eureka.	
Land	On site, we will use snowmobiles for surveying. We will use two snowmobiles pulling sleds to do this work.	

Project accomodation types

Temporary Camp

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ᐊᖏᔪᖅ ᐱᖁᑦ ᐊᑐᒐᐅᓂᐊᖅᑐᖅ ᖃᓄᐃᑦᑑᓂᖓ	ᖃᑦᓯᐅᕙᑦ	ᐊᖏᓂᖏᑦ - ᐳᖅᑐᓂᖏᑦ	ᓱᓇᒧᑦ ᐊᑐᒐᐅᓂᐊᖅᐸ
Drill	1	1x2x6 m	Needed to drill an ice core through Mueller Ice Cap. Drill designed to recover a 4 inch diameter core in 1-2 meter sections. Will also be used to recover a small sample of rock beneath the ice.
Ice-penetrating radar	1	2x2x2 m	Needed to determine optimal site to drill. Will be driven across the surface of the ice behind a snowmobile in order to measure ice thickness and layering in the ice.
Snowmobile	2	1x1x2 m	Used for moving around the ice cap and towing radar.
Basler or Twin Otter	1	21x29x5 m	Transportation from Eureka or Resolute to the ice cap.
Large tents	3	8x4x5 m	Shelter while drilling, eating, working, etc.
Personal tents	12	2x2x1 m	Sleeping during work.
Generator	3	1x1x2 m	2 gasoline and 1 diesel generator, used to power radar, drill, and camp.
Ice core analysis unit	1	0.5x0.5x0.5m	Used to measure some basic properties of the ice while we are on the ice cap (the majority of analyses will take place back in a laboratory). This analysis melts ice, with no waste other than the resulting water.

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ᓱᓇᒧᑦ ᐅᖅᓱᒃᓴᒡᒋᐊᖅ ᐊᑐᒐᐅᓂᐊᖅᐸ	ᖃᓄᐃᑦᑐᓪᓚᖓᐅᕙ ᐅᖅᓱᒃᓴᒡᒋᐊᖅ	ᖃᑦᓯᐅᕙᑦ ᐅᖅᓱᒃᓴᖃᐅᑏᑦ	ᑑᒃᓴᐅᐸ ᐃᒪᖃᖅᑎᒋᔪᓐᓇᕐᓂᖓ	ᑲᑎᓪᓗᒍ	ᑑᒃᓴᐃᑦ ᐊᒥᓲᓂᖏᑦ	ᓱᓇᒧᑦ ᐊᑐᒐᐅᓂᐊᖅᐸ
Propane	fuel	5	100	500	Lbs	Cooking, heating tents.
Gasoline	fuel	3	205	615	Liters	Power snowmobiles and small generators.

Diesel	fuel	30	205	6150	Liters	Power 12 kW generator for ice-core drilling. Approximately 2000 hours at 3 L/hr.
Estisol 140	hazardous	48	205	9840	Liters	This is a chemical, but is generally considered non-hazardous. It will be used as fluid to fill the drill hole.

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0	Drinking water will be obtained by melting hand-shoveled snow. We plan to collect ice-core samples and snow samples using ice-core drills (0.15 m3/day drinking water, 0.1 m3/day science samples).	Drinking-water snow will come from the surface of Muller Ice Cap. Scientific samples will be collected from the surface of the ice cap and from the subsurface.

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ᐱᓕᓇᐊᓇᔨᐅᔪᒪᔪᒍᑦ ᐱᓕᓇᐊᓇᔨᐅᓂᐊᖅᑐᖅ	ᖃᐅᓂᐃᑦᑐᖅ ᐊᖏᑕᑯᖅ	ᖃᐅᓂᑎᒋ ᐊᖏᑕᑯᑦ ᓴᖅᑭᐊᓂᐊᖅᑐᓇᔨᐅᐳᑦ	ᖃᐅᓂᖅ ᐊᖏᑕᖅᑕᐅᓂᐊᖅᓯ	ᓴᓗᒪᖅᓴᐅᑎᖏᓴᖏᓐᓂᐅᓂᐊᖅᑐᑦ
Camp	ᐊᖏᑕᑯᑦ ᐃᑯᐊᓪᑕᑎᐅᔪᓐᓇᖅᑐᑦ	9800 L	We plan to leave the drill liquid, which is a generally safe chemical, in the borehole. This allows future scientists to access the hole if additional measurements are desired. Leaving the fluid like this is standard practice in ice-core drilling, including in sensitive areas. Since the fluid is contained in the hole, and only rises to a level where the ice is impermeable, it does not leak out. At this remote site, there is no risk of it affecting drinking water or impacting wildlife.	The hole will have a cap/casing on top, which prevents anything from getting in and liquid from leaking away.
Camp	ᐃᒪᐃᑦ ᐊᑐᖅᑕᕐᔪᐊᓇᖅᓯᒪᔪᑦ	15 cubic meters	Sump in glacier, buried after use.	n/a
Camp	ᐊᖏᑕᑯᑦ ᐃᑯᐊᓪᑕᑎᐅᔪᓐᓇᖅᑭᑦᑐᑦ	3 cubic meters	All non-human camp waste will be flown out.	n/a
Camp	ᖃᐅᖅᑕᓪᓗᓂᖅ	2 cubic meters	We plan to leave only urine in a sump in the glacier.	Feces will be flown out in buckets.

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Potential water quality impacts stem from the drill fluid and from fuel use. Drill fluid is needed to keep the hole open during drilling. Leaving this fluid in the hole is standard practice including in sensitive areas (e.g., it is allowed under our permit in the Northeast Greenland National Park). The fluid will be contained in the hole, is not hazardous, and allows for future scientists to make additional measurements if desired. The impact will be mitigated by ensuring that fluid remains within the hole; while safely encased in the hole, the fluid will not harm water quality. Given the distance from the nearest communities, there is no risk of the drill fluid affecting people. The choice of a non-hazardous fluid is a backup in case the fluid escapes, for example due to climate change destabilizing the ice cap. Risk of fuel spills will be mitigated through the use of berms for all drums, and sufficient spill kits for cleanup; we will fly out any contaminated cleanup materials. There will be some noise from aircraft, generators, and snowmobiles; we will mitigate these effects by eliminating extra

flights, using small generators only when needed, and driving at low speeds. Negative impacts on polar bears will be mitigated by minimizing scents in camp and bring non-lethal deterrents in addition to firearms; we expect no other biological impacts. We hope for a positive economic impact by employing a community member for work in our camp during 2024.

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

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The proposed site is near the highest point of Muller Ice Cap. This portion of the ice cap is relatively flat with a surface elevation of 1600-1800 m. To the east, the ice cap slopes away gently to land-terminating glaciers. The site is bordered on the west by mountains, with some of the icecap draining through large outlet glaciers that transect the mountain range. Satellite radar data indicate that the ice in the area is moving less than 3 m/yr, with low enough strain rates that crevasses are not expected (and no crevasses are visible in satellite images of the study area). Airborne radar data indicate that the ice is 500-800 m thick in the area, and is underlain by relatively steep topography underneath. The geology directly beneath the site is unknown, but the exposed rock to the west suggests that it is underlain by folded and faulted Triassic and Tertiary rocks of the Sverdrup Basin. The site is far enough from the mountains to the west and flat enough that neither rockfall nor avalanches are possible. The site is near the hydrological divide between eastern and western Axel Heiberg Island, and directly on the ice divide between the east and west.Satellite data (from laser altimeters and photogrammetry) indicate that higher areas of the site (<1800 m) have a nearly stable surface elevation at present, with changes in glacier thickness that are indistinguishable from zero. Areas between 1600 and 1800 m are thinning at up to 10 cm/yr. There is substantial thinning of the glaciers that drain the ice cap in all directions, suggesting that the proposed site will experience large changes over the coming decades, as its outlets retreat and thin. The site is entirely in the dry-snow portion of the accumulation area of the ice cap (i.e. the annual snowfall has sufficient capacity to accommodate the annual melt in its pores. Ground-based observations from around 1960 and satellite radar data indicate that there are very few days with substantial snowmelt each year at this site, though this is also likely to change due to a warming climate. The elevation is such that no melt ponds form, although some are seen much lower down on the icecap.This site is well removed from sensitive areas. Because it is on top of the ice cap, we expect no interaction with flora or fauna. The site is 50 km from the site of the Napaqtulik/Napurtulik Proposed Territorial Park, which has a unique fossil forest. It is over 50 km from the archaeological sites near Buchanan Lake on the eastern part of Axel Heiberg Island.Our planned aerial survey will come slightly closer (~30 km) the proposed park, but will also only operate above Muller Ice Cap and the glaciers that flow from it.

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The proposed site is all on top of the ice cap and largely devoid of life. There is no vegetation on the ice cap. While some mammals and birds are seen regularly on glaciers, the location of our site away from the ice edge means that there are no food sources for animals near where we plan to work, and thus animal encounters are unlikely.There are four species under the Species at Risk Act whose nominal range includes Axel Heiberg Island: polar bears, Peary caribou, ivory gulls, and the islandica subspecies of Red Knot birds. Since the site is away from the ocean, at high elevation, and on ice, we expect that Polar bears do not regularly occupy the study site, though it is possible that they occasionally visit. According to the species' recovery plan, community information and surveys agree that the primary Peary Caribou sites on Axel Heiberg Island are east and south of the ice cap, and the migrate from there to the southeast. Environment and Climate Change Canada indicates that they do not generally enter the interior of the ice cap. While the ivory gull range map includes Axel Heiberg Island, Environment and Climate Change Canada indicates no known nesting areas or critical habitat on the island. The gulls nest in a variety of locations, but have not been observed to nest on glaciers

or ice caps. According to Environment and Climate Change Canada, Red Knots generally nest in dry south facing areas near water, which are not found at our site. When not nesting, they favor coastal areas, which again do not overlap with our site. In short, while the large-scale maps indicate that four species at risk have ranges that include the area, more detailed information shows that only polar bears might ever go to the interior of the ice cap, and we expect such visits to be very infrequent.

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The site is far from the closest communities; 440 km from Grise Fiord and 580 km from Resolute Bay. From consultations between our collaborators and community members, the large distance means that this is not an important hunting/fishing area for residents of Grise Fiord and Resolute Bay given the large distance from the communities. The nearest other people are at the McGill Arctic Research Station and Eureka; the McGill station is closest at about 50 km away, and we do not expect our work to have any negative impact on those scientists. Some tourism has taken place in the sounds east of Axel Heiberg Island; this is 75 km from our proposed site. Some tourism reaches the fossil forests 50 km from our site. Besides being distant from other human uses, the site is entirely on the ice cap at high elevation so it is a second step away from areas of socioeconomic importance.The site contains no archaeologically significant areas, and is more than 50 km from the known sites on the eastern part of Axel Heiberg Island. There is no currently protected area in the region, and the proposed site is 50 km from the Napaqtulik/Napurtulik Proposed Territorial Park.

Miscellaneous Project Information

A safety data sheet for the drilling fluid, indicating low risk to human health, is attached.

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The measurements on the core in the field will not leave any chemicals, and the radar operates at frequencies not hazardous for human or animal life, so there should be no impact from making the measurements themselves.The impact of the airborne survey will be minimized by keeping the aircraft more than 1200 feet above ground level, only surveying over ice, and by using radar and laser instruments that do not negatively affect wildlife.The primary impact will be the ice-core borehole itself, which will contain the drill fluid needed to keep the hole open during drilling. Leaving this fluid in the hole is standard practice including in sensitive areas, since it is difficult to remove and it allows future scientists to return and measure deformation and temperature (e.g., it is allowed under our permit in the Northeast Greenland National Park). The fluid will be contained in the hole, is not hazardous, and allows for future scientists to make additional measurements if desired. The impact will be mitigated by ensuring that fluid remains within the hole and that the hole is clearly marked; while safely encased in the hole, the fluid will not harm water quality. Given the distance from the nearest communities, there is no risk of the drill fluid affecting people. The choice of a non-hazardous fluid is a backup in case the fluid escapes, for example due to climate change destabilizing the ice cap.Risk to water quality from fuel spills will be minimized by keeping all drums within berms. We have already requested cleanup kits and berms from the Polar Continental Shelf Project. Any contaminated cleanup materials will be flown out.There will be some noise from aircraft, generators, and snowmobiles. This noise will have minimal impact because of the location of the work at the centre of the ice cap. We will further mitigate these effects by eliminating extra flights, using small generators and running them only when needed, and driving at low speeds.We think it most likely that we will have no impact on wildlife, since there is generally little life on the ice cap. However, interaction with a polar bear is possible but unlikely. The negative impacts of a possible polar bear encounter will be mitigated by minimizing scents in camp (storing food in sealed containers as much as possible, cooking away from sleeping tents) and bring non-lethal deterrents (bear bangers and spray) in addition to firearms.We hope for a positive economic impact by employing a community member for work in our camp during 2024.

Cumulative Effects

The ice cap has only seen sporadic scientific work over the last 65 years, and to our knowledge there have only been two visits to our study are during the last few decades. The last time people camped within the study area was in 1962. We thus expect no cumulative impacts on the ground.The project will add a small number of flights to the cumulative aircraft operations in the area, but since the total number of flights is still small we expect the cumulative effect to be low. To the extent possible, we will maximize space on flights,

minimize cargo, and efficiently link survey lines so that there are no more aircraft movements than strictly necessary to complete the work.

Impacts

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	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
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Camp		-	-	-	-	-	-	-	-	-	-	-	-		-	-	M	-	-		-	P	-	-	-
Researching		-	-	-	-	-	-	-	-	-	-	-	M		-	-	-	-	-		-	-	-	-	-
Scientific/International Polar Year Research		-	-	-	-	M	-	-	-	-	-	-	M		-	-	M	-	-		-	P	-	-	-
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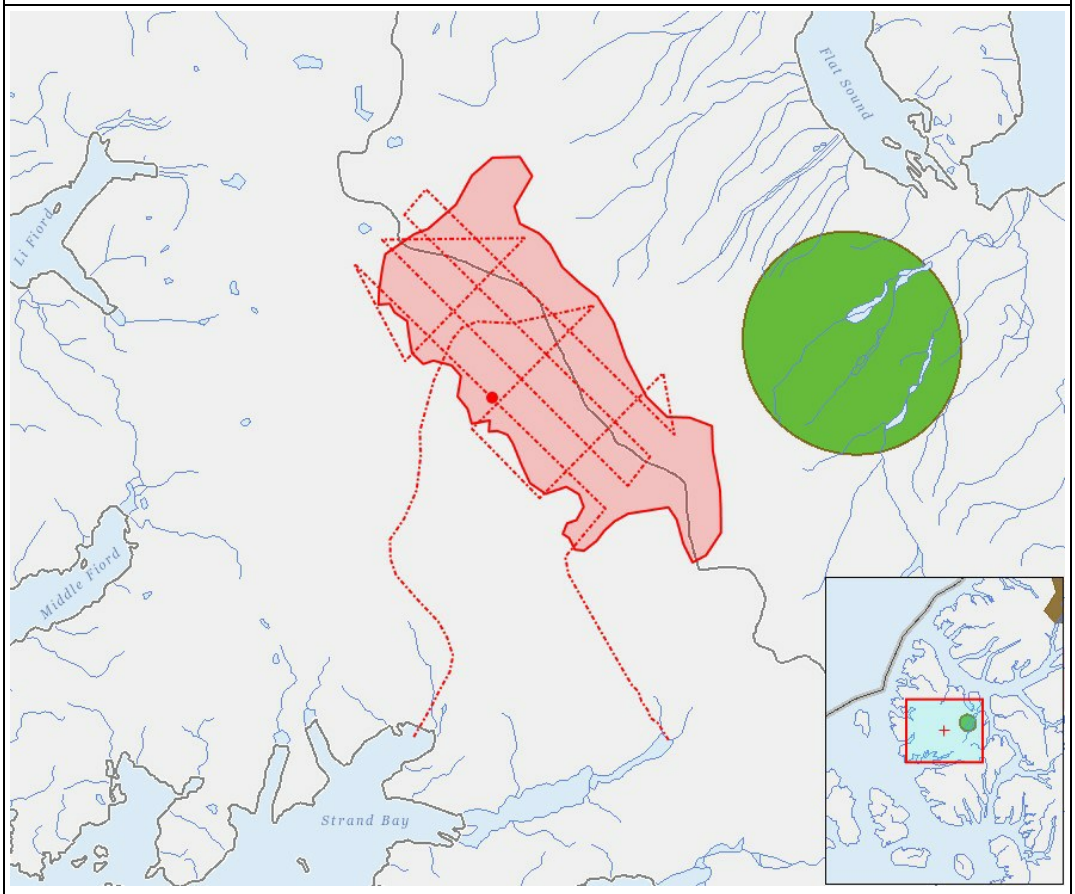
(P = ᐊᑲᐅᓈᕈᑎᔪᓐᓇᖅᑐᑦ, N = ᐊᑲᐅᙱᔾᔪᑕᐅᔪᓐᓇᖅᑐᑦ ᐸᓚᐅᒥᔾᔪᓯᖅᑐᖅᑕᐅᔪᓐᓇᙱᑦᑐᓪᓗ, M = ᐊᑲᐅᙱᔾᔪᑕᐅᔪᓐᓇᖅᑐᑦ ᐸᓚᐅᒥᔾᔪᓯᖅᑐᖅᑕᐅᔪᓐᓇᖅᑐᓪᓗ, U = ᖃᐅᔨᒪᓐᓇᙱᑦᑐᖅ)

ᓄᒋᒪᖃᓗᖅ ᐱᓕᓇᐊᓇᓴᐅᔪᖅ



List of Project Geometries

1 polygon	Area of Muller ice cap which we will survey--we plan to camp and drill an ice core at one point in this area.
2 polyline	Planned aerial survey (only operating above ice, always >1200 ft above ground)
3 point	Camp location, 2023