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X-ray computed tomography (CT) provides non-destructive 3D imaging and analysis of internal structure for any porous media. Our team utilizes CT imaging to probe permafrost and sea ice for microbes in samples collected from Alaska, Canada, and Greenland. Recent advances in this technology now allow for imaging at the nanoscale, where we ultimately seek to visualize microorganisms inhabiting the pore spaces. By characterizing this structure, we will further our understanding of how microbial communities relate to their environment, and how changes such as increased freeze/thaw cycles in a changing climate may impact their health and microbial function. In addition to imaging the permafrost and sea ice, we extract DNA from samples to examine microbe diversity to connect the physical and biological characteristics of cores from different sites and by depth. This work will provide the first images of permafrost and sea ice at the nanoscale. The entire scope of this project involves fieldwork across the Arctic, covering Alaska, Canada, and Greenland. For the fieldwork in Cambridge Bay May 11-25 2025, we will select 5-6 permafrost locations outside of town and accessible by truck. As much as possible, we will seek to co-locate field sites with previous permafrost studies for comparison with the literature and traditional ecological existing knowledge. Similarly, we will select 5-6 sea ice coring locations in the Cambridge Bayharbour to be accessed via snow machines. Both sea ice and permafrost cores will be approximately 1 m in length and 7.5 cm in diameter. All cores will be shipped back to Vermont at sub-eutectic temperatures until imaging as described above.

Sharing Results: While in Nunavut, we plan to share our work with the local community via public presentations and outreach events in the local school if welcomed. For any community where we complete fieldwork, we prioritize sharing our research with the local community and thoroughly enjoy the exchange of ideas at such gatherings. For example, while in Utqiagvik, Alaska in February 2025, we presented at a community dinner gathering as well as with the local high school. We try to get students using our drills to core their own samples of either permafrost and sea ice, and let the students get hands on experience looking at the ground beneath them. Additionally, we plan to publish the scientific findings of this work in peer-reviewed academic journals and present at both scientific conferences and with the general public. Already we have presented at the American Geophysics Union annual meeting (December 2024), as well as local presentations at Vermont State University. We plan to continue reaching out to schools in our area upon returning to Vermont.

▷ ΔΑΝΩΣ: N/A

Δ_ḡΠ_ḡ: N/A

Inuinnaqtun: X-raymut kitaytuni iksuluritinut (CT) piqaqtitni hurulaittut 3D piksait qauihiaqnilu iluanut hunat kitutliqak anigulalgit piyauni. Havaqatigivut atuqtai CT piksait naunaiqtuqni qiqumainnaqni tariuplu hikua mikkataqnut naunaiyagat katitauni talvanga Alaska, Kanata, tamnalu Akukittuq. Qangahaq hivunmuktitni uuma pitquhiliqutit pipkalaliqtai kangiqhimanivut qanuq mikatannuit, tapkunani qiniqvigivaktaptingni takuyangi mikkatannuit uumayut nayuqtai angmavinnuit. Ihuaqhautiplugu una hanahimania, kangiqhivalliqniaqtavut qanuq mikkataat uumayuvallit turangani avataini, qanuqlu ahianguqni tapkuatut ilagiaqni qiqumani/auktuqni pitquhi allanguqninut ahilap aktualaqni aaniaqtailini, mikkataatlu uumayuvallit pitquhi. Ilagiplugit piksaliuqni qiqumainnaqnit tariuplu hikua, amuyavut DNA naunaipkutarnit anunaiyagat mikkatat allatqikni attatariangi timait uumayuvallitlu pityquhit angmanivaluinit allatqini inait itinilu. Una havaq piqaqtitniagai hivullit piksat qiqumainarniqnut tariuplu hikua talvani mikkataat uukturautit. Tamna tamaat havakhait uuma havanguyuuq ilalgit maniqami havat humiliqak Ukiurtaqtumi, tamnaluttauq Alaska, Kanata, tamnalu Akukittuq. Tapkununga maniqami havat Ikaluktutiakmi Mai 11-25, 2025, tikkuaqniaqtavut 5-6 qiqumainnaqtuq inait hilataani nunaliiyuuq tikitaulaqlu akhaluutikkut. Ayuqnaittarangat, qiniqniaqtugut iniqanikhanik maniqami inait hivuani qiqumainnaqnit naunaiyaqni hutqigiakhait tapkununga pitquhit uumayuliquitit atuqtut ilihimanit. Taimattauq, tikkuaqniaqtavut 5-6 tariuqni hikut amuhiviuni inait tahamani Ikaluktutiak tulaktaqviani naunaiyariangi atuqhugit sikiitut. Tamaknik tariuq hikua qiqumainnarniqlu amuhiviuni mikhaanitniat 1 miitat takini tamnalu 7.5 cm akimut. Tamaita amuhiviuni aulaqtitauniat utimut talvunga Vermont qiqittaqniani auktuqtaqniani uunaqnit utaqilugu piksaliuqnit unniqtuqnigut qulaani. Atuatigikni Qanuritnit: Tahamanitluta Nunavutmi, parnakhimayugut atuqatigikni havavut nunalikni nunaliiyunut atuqlugit inungnik hatqititaivit pipkarahuaqnilu huliniit nunalikni ilihagvikni qaitquyauqupta. Kitunutliqak nunalikni iniqhiqupta maniqami havat,

hivulliutyaqtavut atuqatigikni naunaiyagavut nunaliknut nunaliuyut aliagiqpiaqhugitlu uqaqatigiknit ihumaliurutit taimaittuni katitviuni. Naunaipkutariplugu, talvanillakhuta Utqiagvik, Alaska talvani Fibruari 2025, hatqigtavut nunalikni unnugumitarniq katitviuni nunaliknilu puqtunighani ilihaqvik. Pipkarahuaqtavut ilihaqtut atuqni ikuutavut amuhiyangi inmingnik naunaiyagat naliaknik qiqumainnaqni tariuplu hikua, pipkaqnilu ilihaqtut tiguttaqni atuqhimaninut qiniqni maniqami ataani tapkuat. Ilagiahugit, paraktugut makpiraliuqni naunaiyainiq nalvagai uumatut havaq havaqatimingni naunaiyaqni ilihaqpiqhimagunit tuhagakhaliuqvut hatqigtitnilu tamatkikni naunaiyaqni katimaqyuarnit tamaitnutlu inungnut. Hatqigtittariqtavut talvani American Geophysics Unionnga ukiumut katimaniq (Tisaipa 2024), talvaniluttauq nunalikni hatqigtitaunit talvani Vermont State Universitynga. Parnaktavut atuinaqni pipkarahuaqni ilihaqvut nunagiyaptingni utirangat talvunga Vermont.

Personnel

Personnel on site: 6

Days on site: 8

Total Person days: 48

Operations Phase: from 2025-05-11 to 2025-05-25

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ᐃᖅᑲᕈᓄᓚᐊᖅ	Gabriel Ferland	Vivitem	2024-12-15
ᐃᖅᑲᕈᓄᓚᐊᖅ	David Hik	POLAR - Canadian High Arctic Research Station	2024-11-12

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Project transportation types

Project accomodation types

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◀▷σ◀^{εb}▷^{εb}

$\Lambda^{\epsilon_d C} \triangleleft^{a_r r^{\epsilon_b}} \triangleleft D^{\epsilon_b} C \triangleright \sigma \triangleright h^{\epsilon_b}$ $\Delta_C^{\epsilon_b} p \triangleright n \triangleright r^C$ $\Delta j C \Delta^C$, $r^C \triangleright q \dot{r}^C$, $\epsilon^b L C j^{\epsilon_b}$, $m e r \triangleright^C \triangleleft r^a r^C \triangleright$

$\Delta^{\circ}\Gamma^{\circ}\Lambda^{\circ}\Delta^{\circ}$ $\Delta\Delta\Delta\sigma\Delta\Delta$ $\Delta\Delta\Delta\Delta\sigma\Delta$	$\Delta^{\circ}\Gamma^{\circ}\Delta^{\circ}$	$\Delta^{\circ}\Gamma^{\circ}\Delta^{\circ} - \Delta^{\circ}\Delta\sigma\Delta^{\circ}$	$\Delta\Delta\Delta\Delta\Delta\sigma\Delta\Delta$
Drill	2	7 cm	permafrost and sea ice coring drills
Snowmobile	5	2 m x 1 m	Access to coring site
Truck	1	2 m x 1 m	Access to permafrost sites along road

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$\triangle^b C d^c$
$$\Delta^b C d r n \sigma \Delta^c \sigma^c$$

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᠕ᠴᠢᠨᠳᠡᠯᠤᠰᠣᠳᠦᠵᠥ	ᠳᠦᠴᠳᠦ	ᠶᠦᠫᠦᠭᠦᠳᠦᠵᠥᠨᠲᠦᠭᠦ	ᠳᠦᠴᠦᠴᠦᠳᠦᠵᠥ	
Information is not available				

$\triangleleft \nabla \cap \Gamma \triangleright C \dot{\sigma}^C \supset^C \triangleleft^b \supset^{qb} C \triangleright \gamma L \gamma^C$

We will be using snowmobiles and pickup trucks but will have no waste. Anything taken into the field will leave with us. We will fill any coring holes in the ice and ground.

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

[illegible]

Permafrost will be sampled on the tundra away from Cambridge Bay. Sea ice will be sampled off the coast of Cambridge Bay.

[illegible]

Existing permafrost environment will be open tundra. There will be minimal disruption of grass, lichen, and soil to sample permafrost. Wildlife (caribou, birds, foxes, bears) will be avoided.

[illegible]

Both permafrost and sea ice will be sampled away from the town of Cambridge Bay.

Miscellaneous Project Information

[illegible]

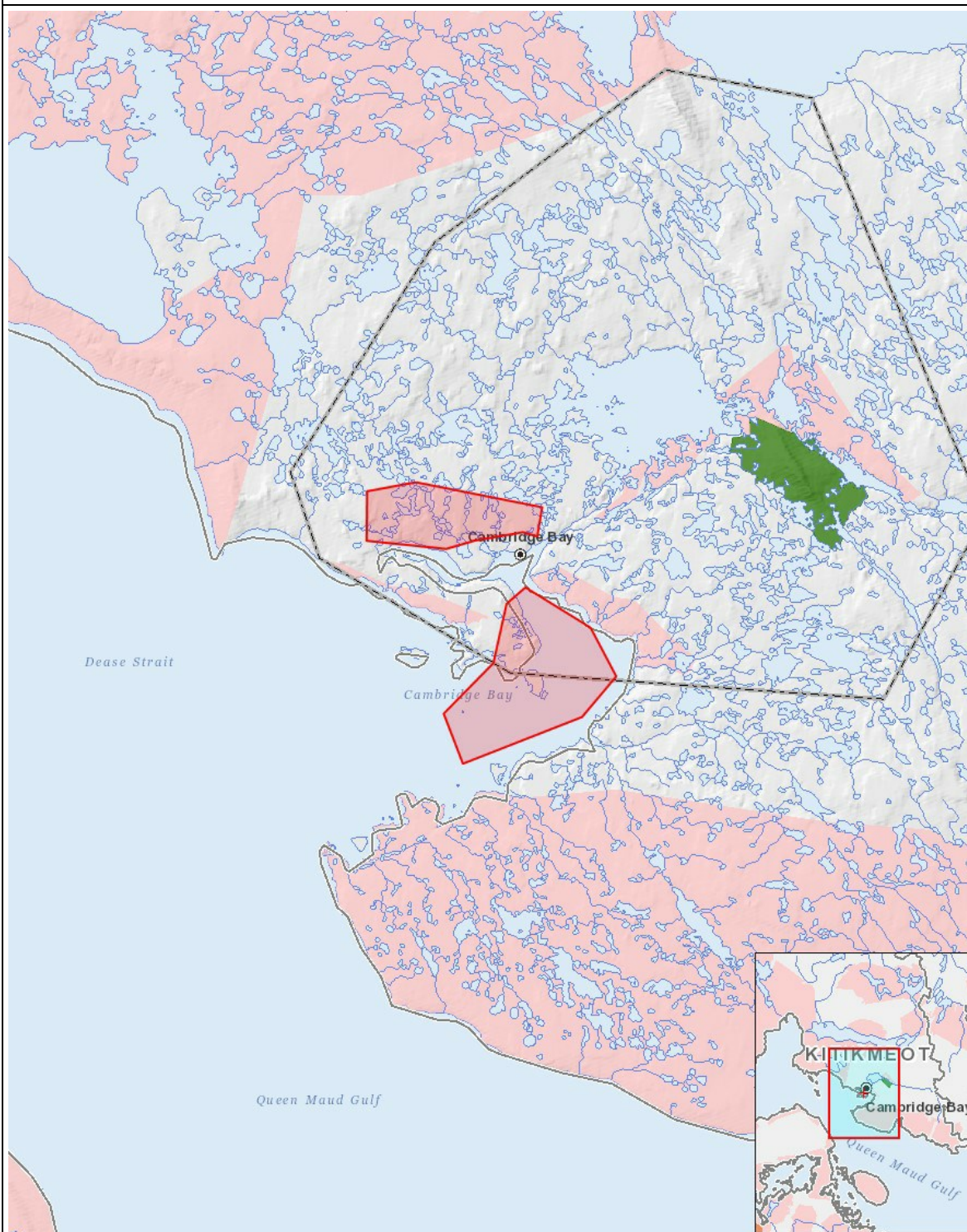
There are no significant impacts identified for either permafrost or sea ice sampling.

Cumulative Effects

Impacts

$\mathbf{e} \rightarrow \mathbf{e} \Delta^{\mathbf{q}_b} \mathbf{C} \triangleright \sigma^{\mathbf{q}_c} \mathbf{r}^{\mathbf{c}} \leftarrow \mathbf{e} \mathbf{n} \Gamma \triangleright \mathbf{C} \dot{\sigma}^{\mathbf{c}} \mathbf{C} \leftarrow \mathbf{e} \mathbf{C}^{\mathbf{q}_b} \mathbf{C} \triangleright \mathbf{r}^{\mathbf{L}} \mathbf{r}^{\mathbf{c}}$

[illegible]
$$(P = \langle b \rangle_{\dot{a} p n^a q^c}, N = \langle b \rangle_{\dot{a} n^a r^c} \langle \dot{c} \rangle_{\dot{d} p^a q^c} \langle \dot{c} \rangle_{\dot{d} n^a q^c}, M = \langle b \rangle_{\dot{a} n^a r^c} \langle \dot{c} \rangle_{\dot{d} p^a q^c} \langle \dot{c} \rangle_{\dot{d} n^a q^c}, U = \langle b \rangle_{\dot{a} l^a q^c})$$



List of Project Geometries

- | | | |
|---|---------|---|
| 1 | polygon | Sea ice in Cambridge Bay |
| 2 | polygon | Permafrost accessible by road outside of town |