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# MAPPING OF EXISTING GROUND CONDITIONS

NOVEMBER 14, 2025  
PROJECT 33912401



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# INTRODUCTION

This report presents the results of the mandate for mapping existing ground conditions within the City of Iqaluit. The work was carried out by BC2 in collaboration with CIMA+. The mandate represents the first step in the City's broader hazard mapping initiative, which will be developed over multiple phases, and aims to better understand geotechnical conditions and natural hazard risks across the municipal territory. The hazard mapping project will be completed over the following three phases:

## **Phase 1: Mapping of Available Data**

- The purpose of phase 1 is to compile, analyze, and spatially represent all available geotechnical data to establish a comprehensive overview of the city's subsurface conditions. This mapping exercise serves as a decision-making tool by identifying data gaps and providing recommendations for future geotechnical surveys. The findings and recommendations presented in this report are intended to guide the next phases of the hazard mapping effort.

## **Phase 2: Field Investigations**

- This phase will focus on conducting additional geotechnical surveys and site investigations to address the information gaps identified in phase 1.

## **Phase 3: Final Hazard Mapping**

- The final phase will involve the development of a comprehensive hazard map that provides details of existing ground conditions, identifies areas of development risk, and provides tangible recommendations for integrating the hazard information into municipal planning tools and infrastructure development.

The findings of phase 1 are preliminary. They are based exclusively on existing data and do not constitute a full geotechnical characterisation of all areas within the City of Iqaluit. The purpose of this report is to identify what is known and what additional investigations are required before a full hazard assessment can be made.

## **Report Structure**

The report is structured into the following sections:

### **1. Background and Context**

Provides an overview of the phase 1 mandate and methodology used to complete the work.

### **2. Site Description**

Summarizes the environmental characteristics of the City of Iqaluit, including geology, permafrost, and other climate considerations. Descriptions are based on existing documentation.

### **3. Inventory of Existing Geotechnical Data**

Compiles all available geotechnical data for the City of Iqaluit and presents preliminary maps to illustrate borehole locations, depth to bedrock, frozen ground depth, slope gradients, and construction constraints.

#### **4. Geotechnical Recommendations**

Identifies data gaps and proposes a methodology to guide phase 2 geotechnical investigations, including the approach to area prioritization and data collection.

#### **5. Planning and Development Considerations**

Summarises the existing planning framework in Iqaluit, outlines tools currently available to support hazard mapping, and provides preliminary suggestions for integrating hazard assessments into land use planning and development process. The recommendations will be refined once phase 2 investigations are complete.

# 1 BACKGROUND AND CONTEXT

## 1.1 OBJECTIVES OF THE MANDATE

The City of Iqaluit is undertaking a multi-phased hazard mapping project to improve its understanding of local ground conditions and support the management of geotechnical and environmental risks associated with land development.

Obtaining data on ground conditions is essential to understand the geophysical dynamics and geotechnical aspects of the municipal territory, to assess the risks associated with permafrost, and to evaluate the influence of bedrock depth on existing buildings and potential future developments

This first phase of the project focuses on consolidating existing geotechnical information to establish a clear picture of existing ground conditions. Over the years, various investigations and borehole studies have been carried out across the city to support infrastructure projects. However, these datasets have remained dispersed across multiple reports and formats, limiting their utility for citywide planning and risk assessment.

Compiling and mapping these datasets will provide a geospatial baseline and support the City of Iqaluit to:

- Assess the spatial distribution and quality of existing geotechnical data;
- Identify areas where data is missing or insufficient; and
- Build a consistent foundation for the next phases of hazard mapping.

## 1.2 METHODOLOGY AND APPROACH

This section provides an overview of the methodology and approach used to carry-out phase 1 of the hazard mapping initiative.

### 1.2.1 Mapping of Available Data

The City of Iqaluit provided 30 documents for review, consisting mainly of geotechnical investigation reports. A QGIS project and associated GIS data were also provided to serve as a base map for the city. The QGIS project is a digital mapping file that organizes and displays different spatial datasets, such as buildings, roads, infrastructure, and land uses from the current City of Iqaluit General Plan (by-law No.898), in a single geographic platform.

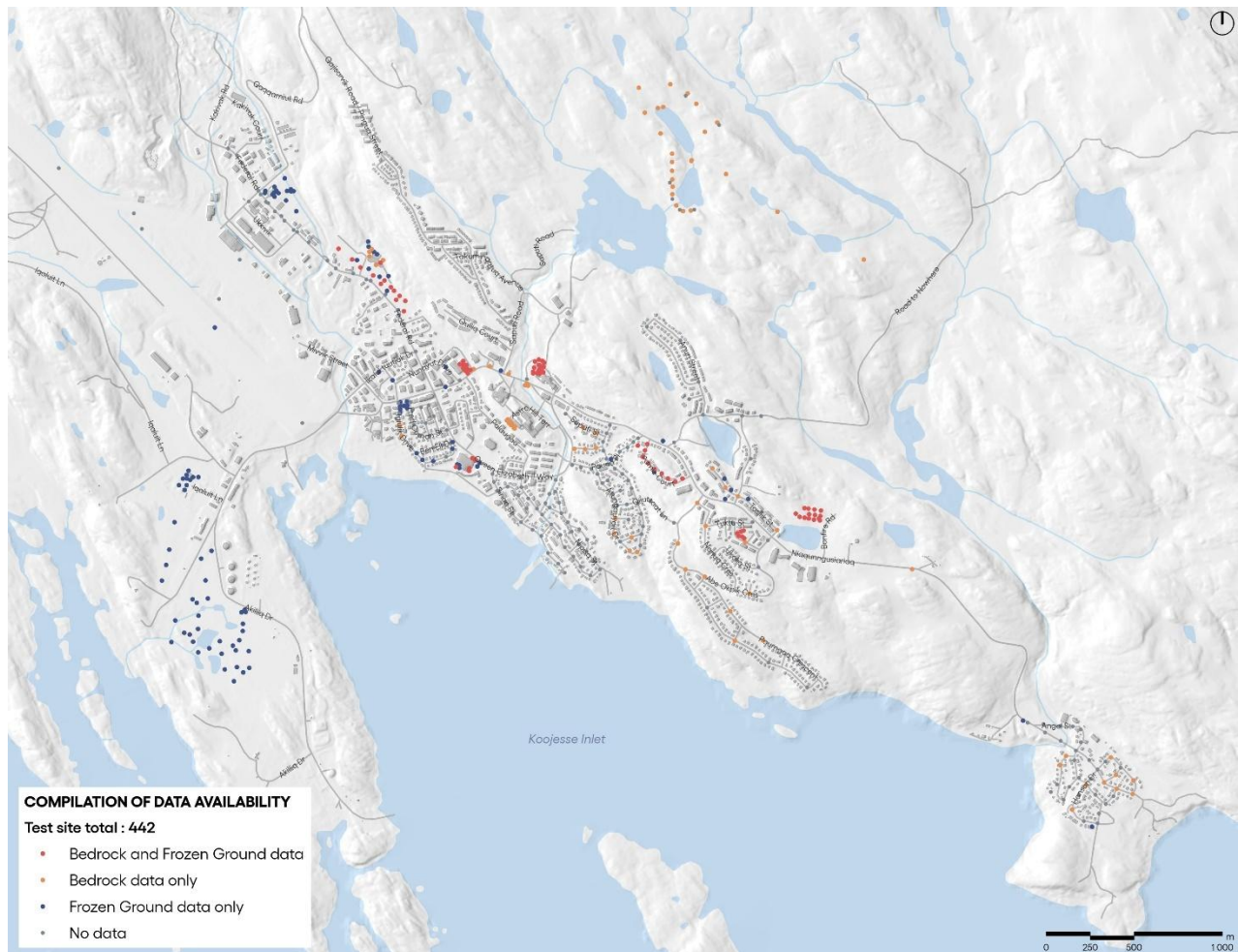
To compile the data, the maps and coordinates contained in the geotechnical investigation reports were used by BC2 to manually georeference each borehole and test pit. Information extracted from the reports was added as attribute data, including:

- Borehole depth;
- Test pit depth;
- Bedrock depth;
- Presence of frozen ground;
- Depth of frozen ground;
- Presence of water; and
- Type of instrument installed.

Following data compilation, 442 points were entered into the database. Of these, 222 contained relevant information. These points are unevenly distributed across the city and often occur in clusters, which limits the dataset's overall coverage of Iqaluit.

Based on the available data on bedrock depth and frozen ground conditions, an interpolation analysis was completed using the Natural Neighbor Method to estimate values in areas where no data was available. A total of 157 points were used for the bedrock depth interpolation analysis (Appendix 2) and 86 points for frozen ground conditions interpolation analysis (Appendix 3), as the points excluded from the analysis did not contain the information. Of all the available points, only 21 points contained data on both bedrock depth and frozen ground conditions.

**FIGURE 1 - Data Availability**



Given the spatial distribution of the available data points, these interpolations do not represent an actual depiction of bedrock depth or frozen ground depth, but rather an estimate that helps visualize general trends. As new data become available, the maps should be updated to provide a more accurate overview of actual bedrock and frozen ground depths.

Additional information was also compiled, including the surficial geology mapping by Allard et al. (2012) and 2 m resolution tiles from the ArcticNet digital elevation model (DEM) (Porter et al., 2023). The surficial geology layer was used as a comparative reference to verify whether the recorded bedrock depths were consistent with the location of rock outcrops identified in the geological map. The DEM was used as the basis for

geospatial analyses, including a slope analysis, which produced a model showing the percent rise within each 2 m x 2 m pixel. This made it possible to identify areas with a slope of 25% or greater, where development can be more challenging.

### **1.2.2 Proposed Investigation Methodology**

CIMA+ reviewed the content of the geotechnical investigation reports and validated the database accordingly. Based on the compiled data, geospatial analyses, and external research, the CIMA+ proposed a recommended methodology designed to effectively cover large areas where data are missing to improve understanding of Iqaluit's subsurface conditions (overburden type and thickness, permafrost state and characteristics). This methodology encourages large-scale data collection, cost efficiency, and considers resource availability. The findings from the proposed investigation program, which details the field investigations needed to collect the missing geotechnical and permafrost data, would be used to support land use planning.

### **1.2.3 Planning Context Review**

BC2 conducted a preliminary review of the existing territorial and municipal planning framework to assess how hazard-related information is currently integrated into the land use planning and development process. This included a review of key territorial legislation as well as several existing plans which were provided by the City of Iqaluit, including the *City of Iqaluit General Plan*, *City of Iqaluit Zoning-By-law* and other relevant plans related to climate change adaptation. Following the review, several preliminary recommendations were formed to support the existing planning tools. The recommendations are general and will be refined once phase 2 investigations are complete.

## 2 SITE DESCRIPTION

Iqaluit is the capital of Nunavut. It is located on the southeast part of Baffin Island, at the head of Frobisher Bay. Iqaluit is located within the continuous permafrost zone (Zhang et al, 2008), which underlies approximately 90% to 100% of the ground surface.

The topography of Iqaluit is characterized by flat terrain surrounded by gently rolling hills and rock outcroppings. The average elevation is approximately 50 m, with local elevation varying between 15 m and 125 m (LeBlanc et al, 2015).

### 2.1 SURFICIAL GEOLOGY

Surficial geology mapping of the area was completed by Allard et al. (2012). The surficial geology is separated into six stratigraphic units, listed from oldest to youngest, as follows:

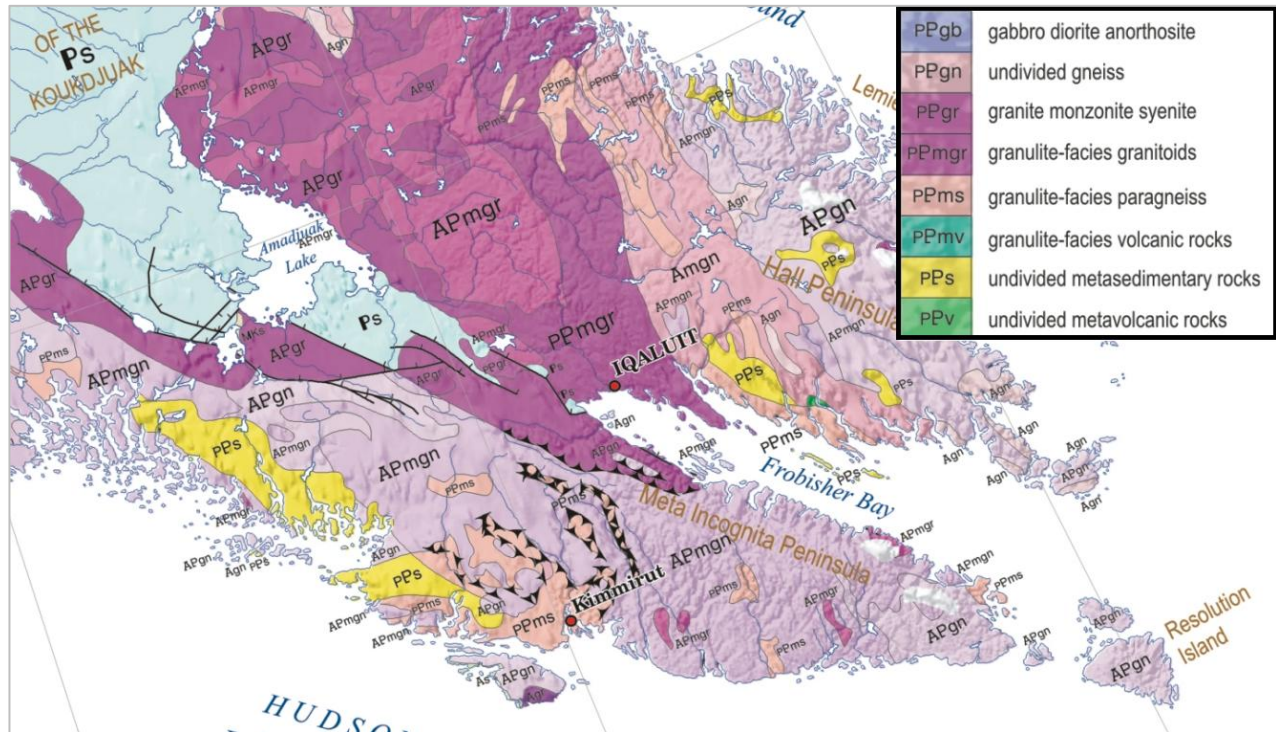
- Till, subdivided into till veneer (Tv) or till blanket (Tb);
- Glaciofluvial deposits, including subaerial outwash plain (GFp) and esker deposits (GFr);
- Glaciomarine deposits composed of glaciomarine delta (GMd);
- Postglacial marine deposits, comprising marine veneer (Mv) and littoral and nearshore sediments (Mn);
- Actual marine deposits, consisting of littoral and nearshore sediments (Mr) or intertidal sediments (Mi);
- Holocene sediments, including organic deposits (O), alluvial floodplain (Ap), alluvial terraced sediments (At) or lacustrine veneer (Lv).

The surficial materials of Iqaluit's core and heavy industrial areas consist primarily of marine deposits (Mn) composed of sand, silt, and gravel in varying proportions. The residential community mainly sits on soils consisting of till (Tb and Tv), described as sand, silt, and gravel with variable proportions and thickness ranging from 1 to 10 m thick and 0.5 to 2 m, respectively. It also includes glaciofluvial deposits (GFp), consisting of stratified gravel and sand up to 30 m thick, as well as exposed bedrock. The airport and Apex sectors are underlain by glaciomarine deposits (GMd) composed of sand, silt, gravel and boulders, with thicknesses ranging from 2 to 20 m. The road connecting Iqaluit to Apex crosses areas characterized by glaciofluvial deposits (GFp), till (Tb and Tv), and marine deposits (Mv) composed of sand, silt and gravel in varying proportion, generally 0.5 to 2 m thick.

## 2.2 BEDROCK GEOLOGY

Iqaluit is underlain by Paleoproterozoic rocks of the Churchill Platform in the Canadian Shield (De Kemp et al, 1997). Bedrock comprises predominately igneous rocks such as granitoids. Surficial bedrock is highly weathered and frost fractured. Figure 2 shows the geological map of south Baffin-Island:

**FIGURE 2 - Geological map of South Baffin Island**



(Canada-Nunavut Geoscience Office (CNGO), n.d.)

## 2.3 CLIMATE

Iqaluit has a tundra climate according to the Köppen-Geiger climate classification system, with long and cold winters and short, cool summers. It has a mean annual air temperature of -8.6°C based on the 1991–2020 normal period) and receives approximately 360 mm of precipitation annually.

## 2.4 PERMAFROST

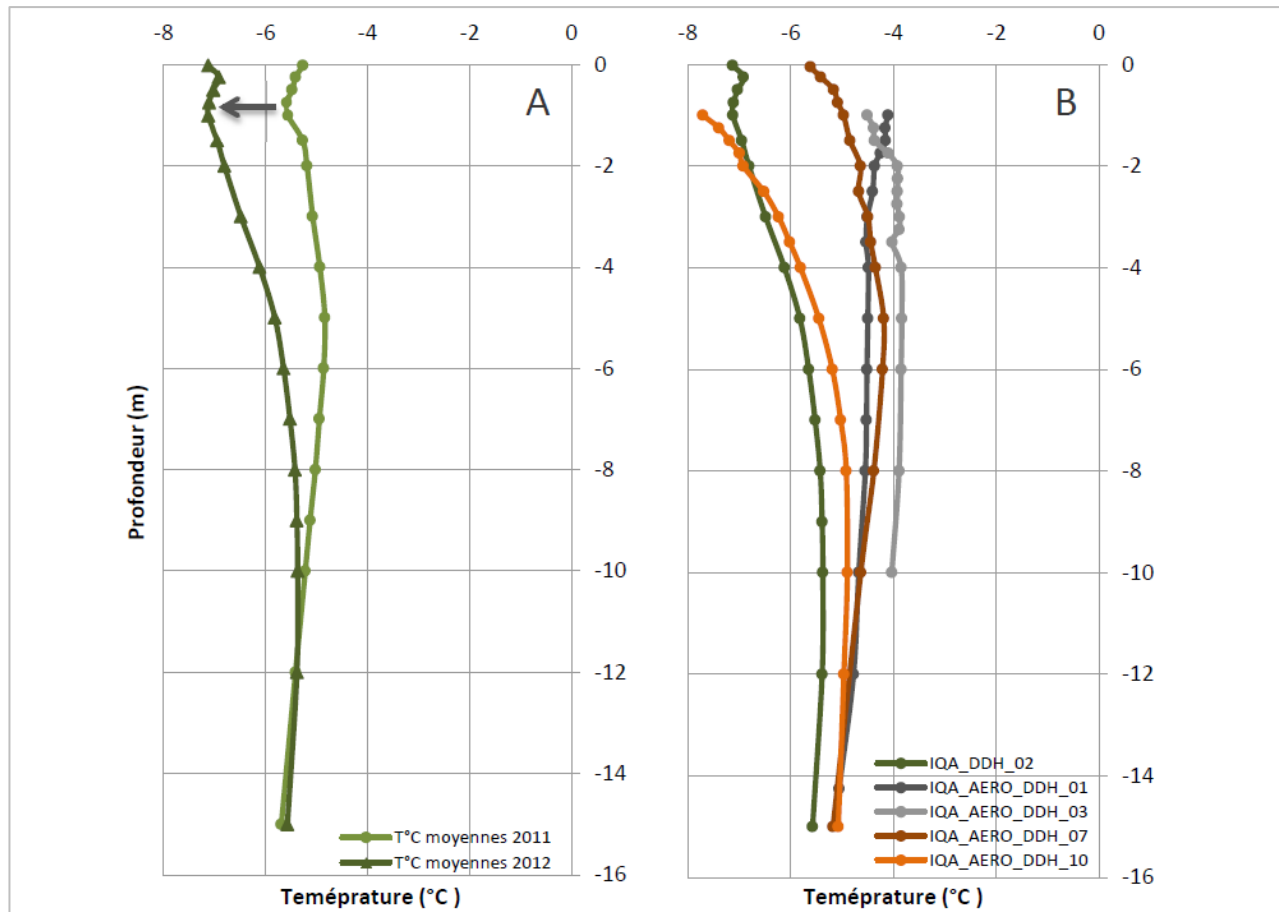
Permafrost refers to earth materials (soil or rock, gases, and organic material) that remain at or below 0°C for at least two consecutive years (2025, Lewkowicz and al.). When ground temperatures drop below 0°C, almost all the moisture present within the soil or rock is in the form of ground ice. Ground ice can exist in three main forms: pore ice, lenses or veins usually referred as segregated ice, and as larger bodies of relatively pure ice in the form of wedges. Ground ice distribution is influenced by soil texture, with fine-grained soils typically tending to be rich in segregated ground ice (TAC, 2010).

The layer of ground that freeze and thaws yearly above permafrost is referred to the active layer. The thickness of the active layer varies from one site to another depending on several factors such as the soil texture of surficial deposits, the thickness of organic materials, the vegetation, and snow cover. The thermal regime of the permafrost in Iqaluit remains poorly documented; however, the Iqaluit International Airport area has been

the focus of a research program. As part of this program, six thermistor cables were installed at various locations to monitor ground temperature (Mathon-Dufour, 2014)

Ground temperature measurements indicate a permafrost temperature of approximately  $-5.4^{\circ}\text{C}$  at a depth of 10 m, with an active layer thickness ranging between 1.4 and 2.5 m near the Iqaluit International Airport (Mathon-Dufour et al, 2015), as shown in Figure 3.

**FIGURE 3 - Mean annual temperature profiles**



A) Mean annual temperature profiles at site IQA\_DD\_H\_02 for the 2011 and 2012 climatic years; and B) Mean annual temperature profiles at sites IQA\_AERO\_DD\_H\_01, 03, 07, and 10 for the 2012 climatic year (Mathon-Dufour et al, 2015).

### 2.4.1 Permafrost Degradation

Permafrost degradation refers to a decrease in the thickness and/or area underlain by permafrost, or a decrease in ice bonding caused by an increase in unfrozen water content (2025, Lewkowicz and al).

In Iqaluit, permafrost degradation can occur due to natural climate changes and anthropogenic disturbances, which is projected to be accompanied with an increase in active layer thickness and changes in precipitation patterns. These processes can lead to thaw subsidence, changes in drainage, and decreased in bearing capacity.

## **2.4.2 Ice Wedges**

Ice wedges are widespread in continuous permafrost areas. They typically form within a few meters of the ground surface where winter cooling is most pronounced. Intense cold causes the ground to shrink in mid to late winter, which leads to pervasive subvertical cracks that typically extend to depths of 3 to 5 m and form a polygonal pattern at the ground surface.

The Iqaluit airport infrastructure was built on a network of dense ice-wedges polygons. Forst cracks and ice wedges furrows were documented by Allard et al. (2012).

# 3 INVENTORY MAPPING OF EXISTING GEOTECHNICAL DATA

The objective of the assessment was to compile an inventory of geotechnical data for the City of Iqaluit and to produce a series of preliminary maps to inform recommendations for future work. This initiative represents an initial step toward hazard mapping, involving the creation of an office-based database to assess the spatial distribution of geotechnical data in Iqaluit. The scope and level of detail of this work are limited by the quality, quantity and resolution of existing data.

To support land use planning, all available geotechnical information was compiled and organized into an Excel database. From this inventory, several map sets were generated to illustrate the location of available data, depth to bedrock, frozen ground depth, slope gradients, and construction potential.

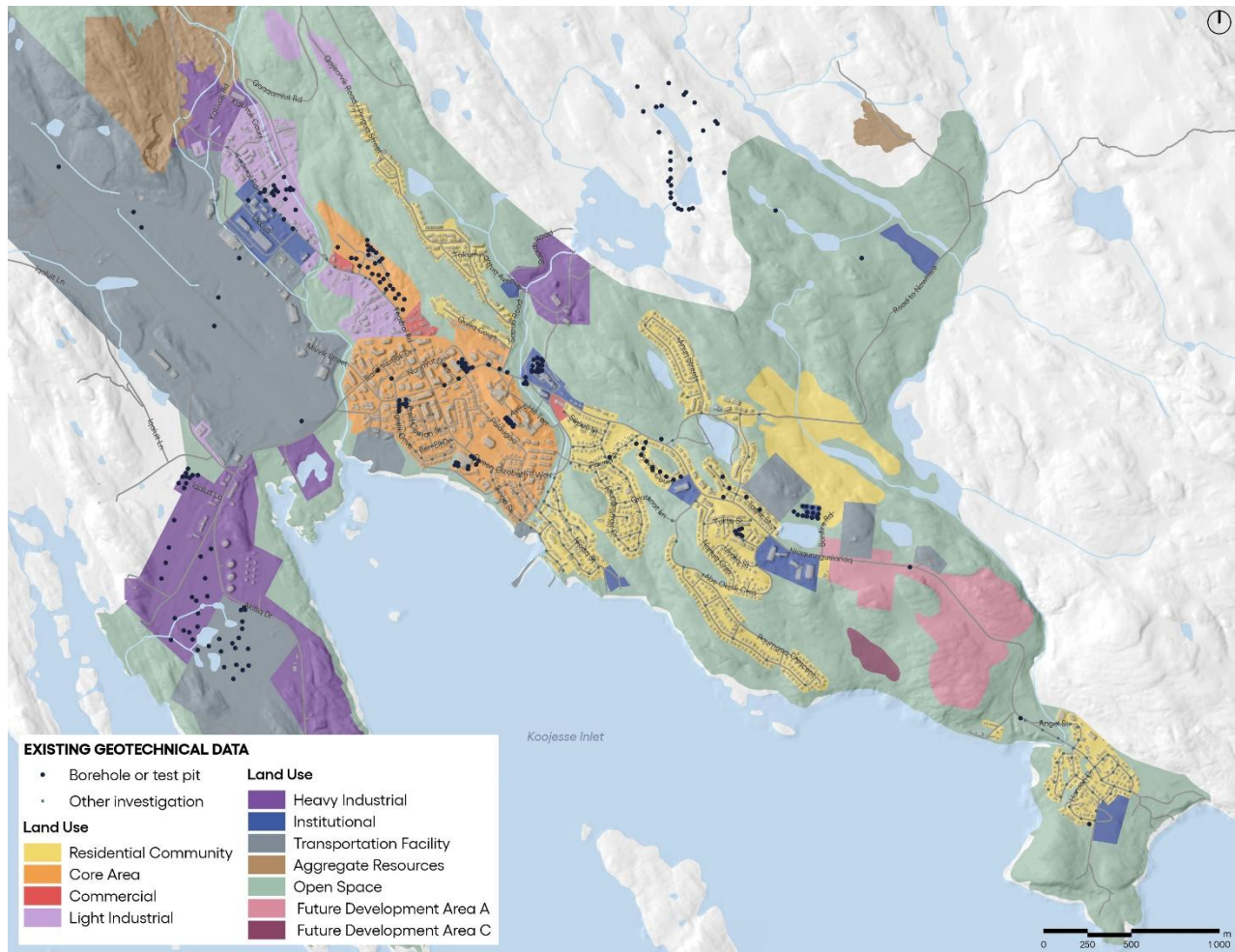
Section 3.1 describes the content of the geotechnical database, while section 3.2 presents the map derived from this dataset.

## 3.1 SUMMARY OF GEOTECHNICAL INFORMATION PROVIDED

Geotechnical investigation reports were provided to BC2 and CIMA+ by the City of Iqaluit. Site characterization data was collected throughout the city, including the community of Apex and the parcel of untitled City land located northeast of the community, as presented in Figure 4. It should be noted that data from Trow Associates Inc. (2009, February 25) are not presented in this section, as the dataset is sparse and limited to depths of less than 1 m. However, since 20% of their boreholes reached bedrock, these data were considered in the bedrock mapping and are represented by light grey dots in Figure 4.

Most of the investigations were conducted during the winter; therefore, the overburden was generally completely frozen. Consequently, the ground was described in this section as frozen ground, as the true depth of the permafrost table could not be identified. In addition, the majority of the drilling programs were completed using destructive drilling methods, in which soil samples are collected from drill cuttings. This method does not allow for in situ characterization of ice content and geotechnical parameters definition.

**FIGURE 4 - Overview of existing geotechnical data**



### 3.1.1 Subsurface Conditions

The following section presents a synthesis of the available data.

- The **heavy industrial area** located south of Iqaluit Airport is underlain by marine deposits (Mn) consisting of sand, silt and gravel in varying proportions (Allard et al., 2012). Geotechnical data collected by Concentric (2016) and ABG (2024) included 45 test pits excavated to depths ranging from 0.2 m to 1.4 m below ground surface, none of which encountered bedrock. Frozen ground was observed in all test pits at depths between approximately 1.2 m and 1.4 m. The overburden was described as ranging from sand with gravel, to sand, silty sand, and sand with silt.
- The **light industrial area** located northeast of the Iqaluit Airport is underlain by alluvial deposits (Ap) comprising of gravel and sand up to 10 m thick and glaciofluvial deposits (GFp) consisting of stratified gravel and sand ranging from 1 m to 30 m in thickness (Allard et al., 2012). Geotechnical data collected by EXP (2018, May 4) included eight boreholes drilled from 10 m to 15 m depth and six test pits excavated to depths ranging from 1 m to 2 m, none of which encountered bedrock. Thermistor data indicate a ground temperature ranging between -7°C to -10.1°C at a depth of 4.5 m. The overburden was described as ranging from sand with gravel and cobbles to silty sand.

- The **core area** is primarily underlain by marine deposits (Mn) composed of sand, silt and gravel in varying proportions and locally by bedrock (Allard et al., 2012). Geotechnical data collected by EXP (2013, August 14 and 2016, April 20), Canadrill (2021, December 2), ABG (2024, March 8), and Tetra Tech (2025, February 27) included 39 boreholes drilled to depths ranging from 9 m to 23 m, with bedrock encountered in 26 boreholes between 6.4 m and 20.7 m. Four test pits (TP04 to TP07) were also excavated to depths ranging from 1.8 m to 2.1 m and bedrock was not encountered. Frozen ground was observed in 19 boreholes and all test pits at depths ranging from 0 m to 2.7 m. Thermistor data indicate a ground temperature ranging between  $-3.0^{\circ}\text{C}$  and  $-4.3^{\circ}\text{C}$  at 10 m to 15 m depth. The overburden was described as sand and gravel, sand, sand with silt, and gravel to silty sand. A layer of silt transitioning to a thick low plastic clay at a depth of about 5 m below ground surface was encountered near Mivvik Street.
- The **core area** located north, and northeast side of Federal Road is primarily underlain by glaciofluvial deposits (GFp) consisting of stratified gravel and sand ranging from 1 m to 30 m in thickness (Allard et al., 2012). Geotechnical data collected by EXP (2016, July 8 and 2014) included 21 boreholes drilled to depths ranging from 4.3 m to 15.8 m, with bedrock encountered in 18 boreholes between 2.4 m to 13.7 m. Seven test pits were also excavated to depths ranging from 0.2 m to 2.0 m. Frozen ground was observed in all test pits at depths ranging from 0.3 m to 2.0 m, and in 16 boreholes at 0.3 m depth. Thermistor data indicate a ground temperature of  $-3.0^{\circ}\text{C}$  at 8 m depth. The overburden was described as gravelly sand, gravel with sand, to silty sand with gravel containing frequent cobbles and boulders. A massive boulder field was observed in the vicinity of the hotel construction area (exp., 2016, July 8).
- The **residential areas** are underlain by marine deposits (Mn), glaciomarine deposits (GMd), glaciofluvial deposits (GFp), till (Tb and Tv) and by bedrock (Allard et al., 2012).
  - > Joamie Subdivision: Geotechnical data collected by EXP (2016, November 24 and 2023, December 1<sup>st</sup>) and Canadrill (2021, December 2) included seven boreholes drilled to depths ranging from 1.5 m to 6.4 m (BH-1 to -4, BH-9 and BH-10 and BH7), with bedrock encountered at depths ranging from 1.2 m to 4.3 m and one test pit (TP04) excavated to 1.8 m, where refusal on frozen ground was encountered. Bedrock outcrops were identified at proposed location of BH-5 to -8. Ice lenses were reported in BH-2. The overburden was described as sandy gravel, sand and gravel to silty gravelly sand.
  - > Tasilik St: Geotechnical data collected by EXP (2023, December 1<sup>st</sup>) included five boreholes (BH2 to BH6) drilled to depths ranging from 4.6 m to 6.4 m. Bedrock was not inferred at any borehole locations. The active layer was encountered at BH2, BH3 and BH4 at depths of approximately 1.8 m. The overburden was described as sand and gravel, sandy gravel to silty sand.
  - > Tulugaq St: Geotechnical data collected by Tetra Tech (2018, January 4) included six boreholes drilled to depths ranging from 2.0 m to 5.0 m, with bedrock encountered at depths ranging from 0.25 m to 2.3 m. Bedrock outcrops were identified in the area. Thermistor data indicate a ground temperature ranging between  $-0.9^{\circ}\text{C}$  and  $-2.3^{\circ}\text{C}$  at 1.5 m to 5 m depth, with an average temperature of  $-1.3^{\circ}\text{C}$  at a depth of 3.0 m. The overburden was described as sand with varying amounts of gravel (gravelly to some) and varying amounts of silt (silty to trace).
  - > Road leading to Apex and Apex: Geotechnical data collected by Canadrill (2021, December 2) included two test pits located along the road leading to Apex (TP02 and TP03) and one in Apex (TP01). The test pits were excavated to depths ranging from 0.6 m to 2.4 m, where refusal on bedrock was encountered in TP03 at 0.6 m depth, and on frozen ground in TP01 and TP02 at 1.8 and 2.4 m depth, respectively. The overburden was described as sand with silt and gravel and sand to clayey sand (TP01).

- The **institutional area located east of Iqaluit’s airport** is underlain by glaciofluvial deposits (GFp) consisting of stratified gravel and sand ranging from 1 m to 30 m in thickness (Allard et al., 2012). Geotechnical data collected by EXP (2022, March 14) included six boreholes drilled to depths ranging from 3.5 m to 5 m located on the existing road. Bedrock was not encountered. The subsurface conditions consisted of surficial granular fill underlain by sand and gravel in variable proportions.
- The **institutional area located northeast of Iqaluit’s core** is underlain by glaciofluvial deposits (GFp) consisting of stratified gravel and sand ranging from 1 m to 30 m in thickness and exposed bedrock (Allard et al., 2012). Geotechnical data collected by EBA (1998, May) included 16 boreholes drilled to depths ranging from 0.6 m to 3.5 m, with bedrock encountered at depths ranging from 0 m to 2 m. Bedrock outcrops were identified in the area. The overburden was described as gravelly sand to sand, with an area of large cobbles in the vicinity of BH-1, -2 and -16.
- The **institutional area located north of Toonik Pond** is underlain by bedrock (Allard et al., 2012). Geotechnical data collected by Canadrill (2020, December 14) included 14 boreholes drilled to depths ranging from 0.9 m to 6.7 m, with bedrock encountered at depths ranging from 0 m to 5.5 m. Bedrock outcrops were identified in the area. Thermistor data indicate a ground temperature ranging between -0.7°C to -0.9°C at a depth of 4 m. The overburden was described as silty sand with gravel to gravel with sand.

### 3.1.2 Ground Temperatures Readings

As part of various geotechnical investigations, thermistor cables were installed in vertical boreholes drilled in Iqaluit, as presented in Figure 5. Based on the review of the information available at the time of this report, ground temperature measurements presented below are referenced in the following reports:

- *Geotechnical Investigation for the Proposed New Aquatic Centre, Iqaluit, Nunavut. Final Report.* (EXP., 2013).
- *Geotechnical Investigation Inuit Owned Land, Iqaluit, Nunavut. Final Report.* (EXP., 2014).
- *Geotechnical Investigation - Northmart site* (EXP., 2016).
- *Geotechnical Evaluation for Multiplex Units, Iqaluit, NU* (Tetra Tech, 2018).
- *Geotechnical Investigation – Proposed Expansion to City of Iqaluit Public Works Garage Facility* (EXP., 2018).
- *Geotechnical Investigation Recovery Centre Building, Toonik Pond Site, Iqaluit, NU* (Canadrill, 2020).
- *Geotechnical Site Evaluation for New Mixed-use Buildin, Iqaluit, NU* (Tetra Tech, 2025).
- *Preliminary Geotechnical Investigation Report – DRAFT* (Arcadis, 2025).

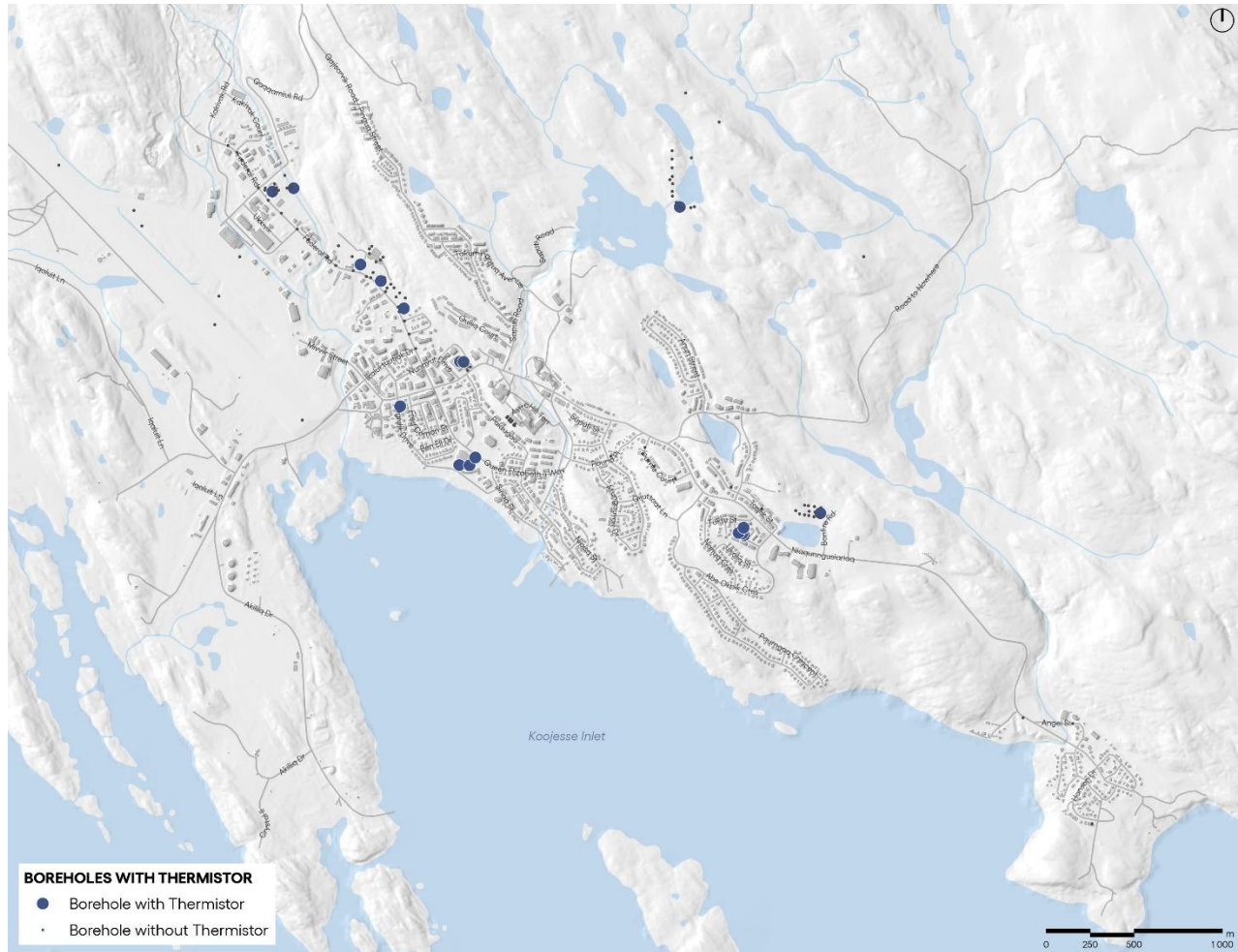
The findings from the ground temperature readings can be summarized as follows:

- Multi-bead thermistor cables were installed in boreholes PH1A and PH7A, located in the vicinity of the Aquatic Centre site, within an area where marine sediments (Mn) were mapped by Allard et al. (2012). The depth to bedrock ranges from approximately 9.5 m to 12.5 m. Ground temperatures recorded between June 8<sup>th</sup> and July 26, 2013, ranged from -1.1 to -2.0°C at a depth of 1 m, and from -3.5 to -4.0°C at a depth of 15 m.
- Multi-bead thermistor cables were installed in boreholes BH-5, BH-9 and BH-16, located on the northeast side of Federal Road, within an area where glaciofluvial deposits (GFp) was mapped by Allard et al. (2012). The depth to bedrock ranges from approximately 10.7 m to 13.7 m. Ground temperatures recorded on December 12, 2013, ranged from -0.1 to -0.5°C at depths of 2 m to 3 m, and from -2.3 to -3.0°C at a depth of 8 m.

- Multi-bead thermistor cables were installed in boreholes BH-3, BH-5 and BH-8, located on the North Mart premises near Queen Elizabeth II Way, within an area where marine sediments (Mn) was mapped by Allard et al. (2012). The depth to bedrock ranges from approximately 11.3 m to 20.7 m. Ground temperatures recorded between November 20 and 25, 2015, ranged from -0.1 to -0.5°C at depths of 1 m to 2.5 m, and from -2.7 to -3.5°C at depths of 8.5 to 10 m.
- Single-bead thermistor cables were installed in probeholes PH01, PH02, PH03 and PH06, located near Tulugaq Street, within an area where bedrock was mapped by Allard et al. (2012). The depth to bedrock ranges from approximately 0.25 m to 1.2 m. Bedrock temperatures recorded on November 17, 2017, at depths ranging between 1.5 m and 5 m, ranged from -0,9 and 2,3°C.
- Multi-bead thermistor cables were installed in boreholes BH3 and BH5, located near Federal Road for a proposed garage building, within an area where glaciofluvial deposits (GFp) was mapped by Allard et al. (2012). Bedrock was not encountered and the boreholes were drilled to 10 m and 15 m, respectively. Ground temperatures recorded between April 13 and 15, 2018, ranged from -7 to 10.1°C at a depth of 4.5 m.
- Multi-bead thermistor cables were installed in borehole BHT06, located near Toonik pond site, within an area where bedrock was mapped by Allard et al. (2012). Bedrock was encountered at 0.8 m depth and the borehole was drilled to 4.9 m. Ground temperatures recorded between November 8 and 22, 2020 ranged from -0.7 to 0.9°C at a depth of 4 m.
- Multi-bead thermistor cables were installed in probehole PH-01, located near Mivvik Street, within an area where littoral and nearshore sediments (Mn) was mapped by Allard et al. (2012). Bedrock was not encountered and the probehole was drilled to 18 m depth. Ground temperatures recorded between December 16, 2024 to February 26, 2025, ranged from -1.3 to -5.7°C at a depth of 2 m, and from 4.2 to -4.4°C at a depth of 17 m.
- A multi-bead thermistor cable was installed in borehole BH2023-4b, located under the footprint of the proposed main dam structure near Iqaluit's water storage, within an area where till veneer (Tv) was mapped by Allard et al. (2012). Ground temperatures recorded between December 2 and 14, 2024 ranged from 0 to -0.3°C at a depth of 3.5 m.

Based on the analyzed data, the overburden was generally completely frozen during the investigations, except for the data reported by EXP (2013), where the permafrost table was estimated at approximately 2 m. For most locations, the true depth of the permafrost table could not be identified. Permafrost temperatures within the overburden in the vicinity of the city of Iqaluit (excluding bedrock and the parcel of untitled city land located northeast of the community) range from -2.3°C to -10.1°C at depths between 8 m and 18 m.

**FIGURE 5 - Location of instrumented boreholes**



### 3.1.3 Interpretation and Discussion

Generally, the subsurface conditions identified from the geotechnical investigations are consistent with the surficial geology mapping by Allard and al. (2012). However, discrepancies were observed in localized areas where bedrock was mapped but not encountered at shallow depths. For example, in the core area near Mivvik Street, exposed bedrock was mapped, yet up to 3.5 m of surficial deposits were encountered. Near the Astro Hill lookout development, exposed bedrock was also mapped, but drilling results indicated that bedrock was inferred to range from 6.4 m to 12.2 m in depth. Near Joamie Court, surficial deposits up to 4.2 m thick were observed above bedrock, despite mapping indicating exposed bedrock. Similarly, near Tasilik Street, a borehole located within the mapped Till veneer (Tv) was drilled to 6.4 m and did not encounter bedrock, even though the Tv unit is described as 0.5 m to 2 m thick. Near Tulugaq Street, exposed bedrock was mapped where geotechnical data identified up to 2.3 m of surficial deposits. North of Toonik Pound, five boreholes encountered surficial deposits thicker than 1 m and up to 5.5 m where the mapping indicated exposed bedrock.

These variations reflect the scale limitations of regional mapping. The bedrock surface can be highly variable and can change by several meters over a short distance. Additionally, the available geotechnical data are insufficient to accurately define the depth of the permafrost table or to characterize the permafrost in terms of ice content.

## 3.2 GEOTECHNICAL DATA MAPS

Several maps were generated to visualize and interpret the available geotechnical data. These maps present the location of available data, providing an overview of spatial coverage and data density across the city. The depth to bedrock map (Appendix 2) highlights areas with shallow or deep bedrock conditions. The frozen ground depth map (Appendix 3) provides an overview of the depth to frozen ground based on available data. The slope gradient map (Appendix 4) was derived from topographic data to identify areas of steep terrain that may pose geotechnical constraints. Finally, the construction potential map (Appendix 5) present preliminary recommendations for new development areas location.

Construction potential was assessed for undeveloped areas based on slope gradients and the thickness of surficial deposits, as mapped by Allard et al. (2012) or derived from the database. Due to limited information on permafrost characterization, permafrost conditions were not integrated into the construction potential map (Appendix 5). Slopes were derived from a digital elevation model (DEM) created using 2 m resolution LiDAR (Light Detection and Ranging) data. The construction potential map identifies areas classified as favorable for construction or unknown construction potential, according to the following criteria:

### 1. Slope (%)

- a. Slopes between 0 and 25% were classified as favorable for construction.
- b. Slopes near or greater 25% were classified as not favorable.

### 2. Surficial deposit thickness

- a. Exposed bedrock was classified as favorable.
- b. Surficial deposits between 0.5 m and 2 m thick (Mv and Tv) were classified as favorable.
- c. Deposits of unknown thickness were classified as having unknown construction potential

## 4 GEOTECHNICAL RECOMMENDATIONS

This section provides geotechnical recommendations to support development of hazard mapping, based on the current understanding of subsurface and bedrock conditions. The proposed approach aims to refine hazard mapping and address existing data gaps. As additional information becomes available, the mapping will continue to evolve, ultimately resulting in a more accurate and useful planning tool.

To enhance the quality and reliability of the mapping work, several complementary actions are recommended, including LiDAR acquisition, a terrain field assessment, as well as subsequent preliminary and detailed site investigations, presented in the following sections.

The specific objectives of the preliminary and detailed site investigations are as follows:

1. Obtain sufficient data to improve the accuracy of soil and subsurface conditions.
2. Refine data collection at strategic locations, particularly in areas with significant projected development, deep bedrock, or suspected ice-rich permafrost.
3. Grab samples for index soil laboratory testing to estimate the soils geotechnical parameters and to characterize permafrost conditions.
4. Optimize the costs associated with geotechnical investigation campaigns.

To meet these objectives, a geotechnical investigation program incorporating various exploration techniques has been developed. It should be noted that this program must be carried out in several phases, and that a preliminary site visit, recommended as part of the terrain field assessment (section 4.2) is required to refine the details and determine the exact locations of the investigations. It is also recommended to update the geotechnical database throughout this process.

The proposed recommendations should be considered for discussion and planning purposes. The scope may be refined after consultation with the client.

### 4.1 LIDAR ACQUISITION

It is recommended that the City of Iqaluit acquire LiDAR data with a minimum density of 10 points per square metre to allow the generation of a DEM at a 1 m resolution or better. LiDAR is a remote sensing technique that uses laser pulses to collect information about the Earth's surface. The resulting data could be used to generate a high-resolution DEM that provides detailed topographic information. Such information is essential for identifying slope hazards, drainage patterns, and geomorphic features.

### 4.2 TERRAIN FIELD ASSESSMENT

It is recommended that the City of Iqaluit plan a field assessment to perform an inventory of sites to be visited. This field assessment would allow them to better understand the material composition and the geomorphic processes that shapes the landscape. This field assessment should include mapping of bedrock outcrops, a collection of data on bedrock characteristics, and validating surficial deposit mapping using a hand auger. The results of this assessment would help plan the subsequent geotechnical investigation program.

## 4.3 RECOMMENDED SITE INVESTIGATION METHODOLOGY

To accomplish the objectives of the site investigation, a three-step methodology is proposed and outlined below. The geotechnical program is not intended to replace a site-specific geotechnical study required for individual building design; rather, it is meant to support designers in the overall geotechnical risk assessment process.

Local surveyors are required to stake out survey lines, borehole locations, and test pit excavation sites. Underground infrastructure, such as buried cables and pipes, must be identified prior to the investigation. Site access should be coordinated and facilitated by the client, particularly in cases where permits or authorizations are required.

The timing of geotechnical investigations in northern environments must be carefully planned. Site access can be challenging in the spring due to thawing conditions and poor drainage, while winter is not optimal due to extreme cold temperatures, limited daylight, and frozen ground conditions that prevent permafrost characterization. It is recommended to conduct the entire program during the late summer period to ensure optimal data quality and to benefit from extended daylight hours. The locations of the preliminary site investigation are presented in Appendix 5.

### Step 1 – Preliminary site investigation

The first step consists of gathering a significant amount of geotechnical information across the city within a short timeframe. The objective of this step is to better define the bedrock surface and identify areas or sites that may present potential permafrost-related issues.

To achieve this, geophysical investigations must be conducted and complemented with destructive boreholes or test pit excavations to calibrate and validate the geophysical model. Geophysical surveys are cost-effective because they are non-invasive, allowing large areas to be assessed quickly. A detailed description of each investigation method, including their specific objectives and advantages, is presented below.

**TABLE 1 - Investigation Methods**

<b>GEOPHYSICAL INVESTIGATION</b>	
<b>Three non-destructive geophysical methods are proposed as part of the geotechnical investigation program and are described below.</b>	
Line streamer	<p>This investigation method consists of attaching a seismic source and a line of accelerometers to a vehicle. The vehicle travels at a speed of approximately 2 km/h, allowing for the rapid acquisition of data over large areas. Figure 6 illustrates the setup.</p> <p>The surveys can only be conducted along accessible roads. These surveys provide stratigraphic profiles as well as site classification categories for future building developments. While it is possible to delineate the bedrock profile using this technique, it does not effectively characterize permafrost conditions. The maps presented in Appendix 5 show the proposed survey routes, totaling approximately 25 km of lines within the city of Iqaluit.</p>
Ground-Penetrating Radar (GPR)	<p>GPR consists of scanning large open areas using a cart-mounted system to evaluate bedrock depth. This method is quick and most effective where the depth to bedrock ranges within 0 to 10 meters. GPR surveys are therefore proposed for mapping areas favorable for construction as well as zones with unknown development potential. Based on current assessments, these combined areas cover approximately 180 km<sup>2</sup>, of which an estimated 25% to 40% are soil-covered.</p>

Thermal resistivity

This method consists of a linear geophysical survey. It is a technology commonly used for permafrost characterization, due to the strong dielectric contrast between water and ice. Consequently, areas with a high ice content can be efficiently identified and mapped using this technique. These surveys should be conducted in areas where permafrost potential is high and where major structures or infrastructure are planned. At this stage, it is not possible to precisely locate the survey lines; however, a contingency of approximately 10 thermal resistivity lines is recommended to complete the geotechnical investigation program.

#### DESTRUCTIVE BOREHOLE DRILLING

Destructive drilling is the most common investigation method used in Iqaluit. These boreholes are quick to perform and essential for calibrating geophysical data by providing localized measurements of bedrock depth. Destructive drilling also minimizes disturbance to existing ground surfaces, which makes it particularly suitable for areas already developed with infrastructure. Based on the current evaluation, approximately 70 destructive boreholes extending to bedrock are required to calibrate geophysical surveys across developed areas of the city.

#### TEST PIT EXCAVATION AND SAMPLING

Test pit excavations are planned to be performed by a local excavator and used to further characterize surficial deposits. Test pitting can be completed quickly and allow for the collection of soil and permafrost samples, while also providing visual confirmation of shallow bedrock when possible. Based on the current evaluation, approximately 20 to 40 test pits are required to calibrate geophysical surveys and collect samples across areas considered favorable for construction as well as zones with unknown development potential.

#### LABORATORY TESTING PROGRAM

A laboratory program is proposed to perform geotechnical analyses on representative samples collected from test pits. The objective is to characterize the encountered materials and to confirm field descriptions. The soil laboratory testing program may include the following tests: natural water content, excess water content, grain-size distribution, Atterberg limits, and salinity.

**FIGURE 6 - Line streamer setup**



(Géostack, 2024)

## Step 2 – Data analysis

Prior to Step 3, all collected data must be analyzed and compiled into the database and presented in a map. With the newly available information, a reasonably accurate bedrock surface map can be generated; however, areas affected by permafrost continue to require further refinement. Consequently, this analysis phase enables the identification of proposed borehole locations, determination of the instruments to be installed, and definition of additional laboratory required.

## Step 3 – Detailed site investigation

The table below presents the methods recommended for conducting detailed site investigations.

**TABLE 2 - Detailed Site Investigation Methods**

<b>BOREHOLE WITH CORE RECOVERY</b>
Geotechnical boreholes, which involve sampling soil, rock, and permafrost are complex, time-consuming, and costly, as they require specialized equipment that must be mobilized to Iqaluit. These boreholes make it possible to obtain samples for visual inspection, laboratory testing, and the determination of geotechnical parameters and potential issues. Boreholes also allow for the installation of instruments such as thermistor strings and piezometers, used respectively to monitor ground temperature and groundwater levels. The borehole program is generally tailored to the type of project being undertaken. Consequently, Step 1 of the geotechnical investigation must be completed before determining the number and depth of boreholes to be performed.
<b>INSTRUMENTATION INSTALLATION</b>
Installation of thermistors in selected boreholes may be required to obtain ground temperature measurement and characterized permafrost conditions. Where applicable, piezometers may also be installed to monitor groundwater levels over time.
<b>LABORATORY TESTING PROGRAM</b>
A laboratory testing program should be conducted on representative unfrozen and frozen samples collected from boreholes

For future road embankments constructed on ice-rich permafrost conditions, it is recommended that detailed site investigations and ground temperature measurements be carried out to identify areas susceptible to permafrost degradation and differential settlement.

## 4.4 DATABASE UPDATE AND AREA PRIORITIZATION

The proposed investigation program presented in Section 4.3 is preliminary and might be adjusted based on sector prioritization, site visit observations, and comments provided by the client.

As new information becomes available, the geotechnical database should be updated on a regular basis. Up-to-date datasets improves the accuracy and usefulness of maps and reduces the cost of geotechnical investigation programs.

# 5 PLANNING AND DEVELOPMENT CONSIDERATIONS

This section highlights existing planning tools and development mechanisms related to the hazard mapping initiative. It provides an overview of the key actors and summarizes the territorial and municipal planning frameworks that guide land use and infrastructure development in the City of Iqaluit. The list of plans is not exhaustive; however, they provide helpful insight into some of the existing planning mechanisms and previous work related to hazard mapping. The section concludes with preliminary recommendations for integrating hazard mapping and geotechnical information into planning and development processes. Future phases of the project will include a best practice review and recommendations for additional planning tools and policies that can strengthen the integration of geotechnical and hazard information into land use decision-making.

## 5.1 SUMMARY OF CITY OF IQALUIT PLANNING FRAMEWORK

**TABLE 3 - Key actors and roles in regards to land use planning**

Key Actors	Role and Responsibilities
Nunavut Tunngavik Incorporated (NTI)	Legal representative of Inuit of Nunavut. Holds title to Inuit Owned Lands (356,000 km <sup>2</sup> ) with regional Inuit associations.
Qikiqtani Inuit Association (QIA)	Regional Inuit association representing Inuit of the Qikiqtani Region, which includes Iqaluit. Manages Inuit Owned Lands within the region.
Nunavut Planning Commission (NPC)	Co-management body established under the <i>Nunavut Agreement</i> . Responsible for preparing the Nunavut Land Use Plan (NLUP), screening projects, and forming recommendations for approval to Ministers.
Nunavut Impact Review Board (NIRB)	Co-management body established under the <i>Nunavut Agreement</i> . Responsible for screening proposed developments for socio-economic and ecosystemic impacts.
City of Iqaluit Planning & Development Department	Municipal authority that manages land use planning, including: General Plan, zoning, permitting, land leasing, subdivision approvals

**TABLE 4 - Key territorial planning-related legislation and plans**

Legislation or Plan	Key Points
<b>LEGISLATION</b>	
<i>Nunavut Agreement</i> (1993)	The land claim agreement establishing Nunavut and affirming Inuit rights. Articles 10-12 establish the NPC and NIRB. Article 14 grants municipalities land rights.
<i>Nunavut Planning and Project Assessment Act</i> (2010)	Federal Act that builds on the <i>Nunavut Agreement</i> and outlines the requirements for a Nunavut Land Use Plan, prepared by the NPC, the powers of the NPC, and a process for assessing development projects.
<i>Environmental Protection Act</i> (Current to July 2013)	Territorial legislation outlining environmental protection measures and responsibilities for managing waste, pollution, and environmental hazards.
<b>MAJOR PLANS</b>	
Nunavut Land Use Plan (Recommended, 2023)	The <i>Nunavut Agreement</i> and the <i>Nunavut Planning and Project Assessment Act</i> set out the purposes and required content of the Land Use Plan. In addition, in 2007, the Government of Canada, Nunavut, and NTI collectively established the Broad Land Use Planning, Policies, Objectives and Goals to provide further direction of the NLUP.

Legislation or Plan	Key Points
	<p>The NLUP, when approved, will apply to all projects within the Nunavut Settlement Area (with exceptions).</p> <p>Within municipal boundaries, the NLUP will apply to projects that have ecosystemic impacts outside the municipality, or involve the deposit of waste by a municipality, the bulk storage of fuel, the production of nuclear or hydro-electric power or any industrial activities.</p> <p>As 2023, the Commission submitted a recommended Plan to the Government of Canada, the Government of Nunavut, and Nunavut Tunngavik Inc. for consideration.</p>

**TABLE 5 - Key municipal planning legislation and plans**

Legislation or Plan	Key Points
<b>LEGISLATION</b>	
<i>Planning Act</i> (Consolidated 2024)	The <i>Planning Act</i> is a territorial law, passed by the Legislative Assembly of Nunavut and guides municipal planning within Nunavut's communities. It governs how municipalities prepare general plans as well as other local land use tools, including zoning by-laws, and permitting.
<i>Cities, Towns, And Villages Act</i> (Current to Sep. 2018)	A territorial law that applies to incorporated municipalities in Nunavut. The law establishes the framework for how municipalities are created, governed, and managed. It defines municipal power and responsibilities.
<b>PLANS and BY-LAWS</b>	
General Plan – By-law 898 (2021, Consolidated 2025)	The General Plan sets out goals for housing, infrastructure, environmental protection, and economic development over 20 years. It provides the basis for a more detailed City zoning by-law to guide land uses. General Plan should be reviewed at least every five years to ensure that it reflects current need.
Zoning By – Law 899 (2021, Consolidated 2025)	Implements General Plan; defines permitted/conditional uses, density, setbacks.
Land Administration By-Law 897 (2022, Consolidated 2025)	Governs leasing and transfer of municipal lands; prioritizes Inuit residents; sets lease terms and disposal processes.
Other plans	<p>The following are additional City of Iqaluit plans for consideration:</p> <ul style="list-style-type: none"> <li>— Iqaluit Sustainable Community Plan (2014)</li> <li>— Climate Change Adaptation Action Plan (2010)</li> <li>— Iqaluit Community Action Plan (2008)</li> <li>— Climate Change Impacts, Infrastructure Risks &amp; Adaptive Capacity Project (2007)</li> <li>— Core Area &amp; Capital District Redevelopment Plan (2004)</li> <li>— The Transportation Master Plan (2022)</li> <li>— The Recreation Master Plan (2020)</li> <li>— The Community Economic Development Plan (2015)</li> <li>— The Iqaluit Kuunga Territorial Park Reserve Master Plan</li> </ul>

## 5.2 CITY OF IQALUIT PLANS

The City of Iqaluit has adopted several policy documents that inform or complement the hazard mapping initiative. These planning frameworks collectively guide decisions related to growth, infrastructure, housing, and environmental protection. They acknowledge that in the coming years, it will be essential for the City to better understand potential environmental changes and to prepare to respond quickly and effectively. Information on the specific impacts of climate change on local ground conditions, permafrost, and infrastructure will be critical to informing decisions and building adaptive capacity.

### 5.2.1 Iqaluit General Plan

The *City of Iqaluit General Plan* (no.898) establishes the City of Iqaluit's overall development strategy and provides the main policy framework for future growth land uses. Several provisions of the General Plan are relevant to the hazard mapping initiative:

#### Vision & Actions

The following vision statements and objectives are most relevant to hazard mapping:

2.2 - A Livable City: *Iqalungmiut will live in a safe, caring, prosperous and attractive City that reflects an arctic lifestyle*

— Objectives

- > Recognizing and protecting the arctic way of life.
- > Providing a clear development strategy for housing choice.
- > Promoting attractive & well-designed developments.
- > Ensuring economic opportunities.
- > Ensuring security and safety through design.
- > Protecting access to the land & sea.

2.3 - An Environmentally Responsible and Sustainable City: *Iqalungmiut will live in a City that preserves, protects and enhances a clean and healthy natural environment.*

— Objectives

- > Ensuring that development respects the natural environment.
- > Ensuring clean air, water, & land.

2.5 - A Community That Adapts to Climate Change: *Iqalungmiut will partner with the City in studying and finding ways to adapt to climate change.*

— Objectives

- > Study the impact of climate change.
- > Adopt policies that recognize and respond to the long-term impacts of climate change.

These vision statements and objectives highlight City's commitment to climate-resilient development and the importance of understanding environmental change and using data-driven tools to guide future land use and infrastructure decisions.

## Land Use Policies

Several land use policies outlined in the *City of Iqaluit General Plan* support the objectives of the hazard mapping initiative, particularly where future development may be affected by environmental or geotechnical conditions and may require further studies.

### Residential development assessment on slopes exceeding 25%:

A professional architectural or geo-technical assessment may be required for construction on slopes exceeding 25% (policy 5, section 5.2.1).

### Pile depth study on pile foundations:

As a condition of Development Permit approval for any new construction on pile foundations, the City may require the applicant to submit a post-construction report indicating the depth of each pile on the site (policy 1, section 7.1).

### Environmental site assessment:

An application for development or redevelopment requiring a development permit, rezoning, consent, subdivision or amendment to the General Plan on lands known to be or suspected of being contaminated will require a Phase 1 Environmental Site Assessment (policy 5, section 7.2).

## Future Development Areas

The *City of Iqaluit General Plan* identifies several Future Development Areas dedicated for future housing, services and employments. As part of future phases of the hazard mapping initiative, it is recommended that additional or validating geotechnical studies be conducted within these planned development zones to guide infrastructure and planning decisions. The following areas have been identified as future development areas:

- Area A: Includes lands on both sides of Niaqunngusiaq Road, between the AWG Arena and the natural slope leading down toward Apex.
- Area B: Includes lands along the Road to Nowhere, between the Lake Subdivision and the Niaqunguk River.
- Area C: Includes lands located on a ridge east of Tundra Valley and below the AWG Arena.
- Sivumugiaq North Development Area: Includes land North of the Inuit Owned parcel near Sivumugiaq Street
- Infill / Core Area Redevelopment: Includes lots for which additional geotechnical studies are required to assess their development potential.

**TABLE 6 - Iqaluit Future Development Areas**

Development Area	Area (HA)	Commercial / Institutional (HA)	Residential (HA)	Potential Housing Units
Plateau Subdivision <sup>1</sup>				240 - 280
A	22.4	7.7	14.7	440 - 515
B	21.8	6.5	15.3	460 - 535
C	3.3	3.3	0	0
Sivumugiaq Street IOL	7.2	3.6	3.6	300 - 400
Infill / Core Area Redevelopment	7.1	2.9	4.2	250 - 300
<b>TOTAL</b>	61.8	24	37.8	1,690 – 2,030

Source: City of Iqaluit General Plan (2021) – Appendix A: Development Potential.

### 5.2.2 Zoning By-law

The *City of Iqaluit Zoning By-Law* (no. 898) is the principal means for implementing the *City of Iqaluit General Plan*. There are several provisions that are relevant to the hazard mapping initiative and provide mechanisms for integrating environmental data into the development review process.

#### Additional studies at request of Development Officer

As part of an application for a Development Permit, there are several studies that may be requested by the Development Officer that provide insight into existing site conditions. Among them include:

- Grading and Drainage Plan: typically required for developments greater than 1,000 m<sup>2</sup> or where there are significant slopes on the site.
- Servicing Study: typically required for developments on piped services that are greater than 1,000 m<sup>2</sup>.
- Snow and Wind Study: typically required for developments greater than 1,000 m<sup>2</sup>.
- Environmental Site Assessment: required where land is potentially contaminated.

#### Development protection from natural constraints

The zoning by-law establishes development restrictions near water bodies and lakes to reduce risk of flooding and erosion.

### 5.2.3 Additional City of Iqaluit Plans to Consider

The hazard mapping initiative interconnects and builds on several existing plans developed by the City of Iqaluit. These documents collectively help understand the growing impacts of climate change on infrastructure and land development.

#### Iqaluit Sustainable Community Plan (2014)

This plan describes a long-term vision, goals, strategies, and actions for the City of the next 50 years. This plan considers all aspects of community growth, including the impacts of climate change on infrastructure. It

<sup>1</sup> Note : The Plateau Subdivision was included as a Future Development Area in the General Plan. However, this area has since been developed and does not require further geotechnical studies.

acknowledges the importance of planning for environmental changes by taking proactive adaptation actions to prepare for expected changes in the climate.

### **Climate Change Adaptation Action Plan for Iqaluit (2010)**

The objective of this plan was to identify potential impacts of climate change on local infrastructure, such as buildings, roads, water supply, wastewater treatment and waste disposal, and to integrate these considerations into the *City of Iqaluit General Plan*. Many of the recommendations from this plan have been incorporated into the general plan; however, it recognises the need for additional information relative to:

- Permafrost conditions and potential thaw settlement.
- Sea-level rise and its impacts on coastal geomorphology.
- Projected changes to wind and snow drift patterns.

### **The City of Iqaluit's Climate Change Impacts, Infrastructure Risks & Adaptive Capacity Project (2007)**

This project aimed to identify risks to infrastructure and develop adaptation options for the City of Iqaluit. It found that a decrease in permafrost stability was the most significant climate-related concern for local infrastructure. According to the project, some of the most at-risk assets, include:

- Buildings with shallow foundations.
- Buildings, roads and buried piped along steep-south facing slopes and/or in areas of high snow accumulation.
- Buildings or roads in areas of poor drainage where water may pool.
- The landfill and former waste disposal sites.

The project identified several adaptation strategies, including educational programs, infrastructure retrofits, policy changes, and building standard amendments.

### **The Core Area & Capital District Redevelopment Plan (2004)**

This plan provides detailed design themes and strategies for the redevelopment of Iqaluit's central area. It supports the City's broader goal of sustainable development and supports the need for validating geotechnical studies in this area.

## 5.3 PRELIMINARY PLANNING RECOMMENDATIONS

The following recommendations provide initial considerations for improving the integration of hazard mapping and geotechnical information into the City of Iqaluit's planning and development processes. These recommendations are preliminary and will be refined in the next phase of this project, once borehole investigations and additional ground-studies are completed.

### 1. Leverage existing planning tools

- Continue to apply and strengthen the application of existing tools in the general plan, zoning by-law.
- Several existing mechanisms already allow the City to request additional studies (e.g., geotechnical reports, snow and wind studies, drainage plans) as part of development approvals. These may be used to obtain site-specific information at the expense of the proponent.

### 2. Expand the use of geo-technical assessment

- Currently, the general plan enables the request of geo-technical assessments primarily on sites for construction on slopes exceeding 25%. The criteria could be broadened to include lands with unknown ground conditions or known environmental hazards (e.g., thaw-sensitive permafrost, flood-prone areas).

### 3. Update existing City of Iqaluit plans and policies

- As the City of Iqaluit reviews its general plan and zoning by-Law, consider consolidating all hazard-mapping related tools into one section and clarify the conditions for when additional studies are required.
- Many of the City's guiding climate change documents are more than a decade old. Updating these plans could help ensure that climate change adaptation strategies are aligned with current development pressures, recent climate projections, and new technologies.

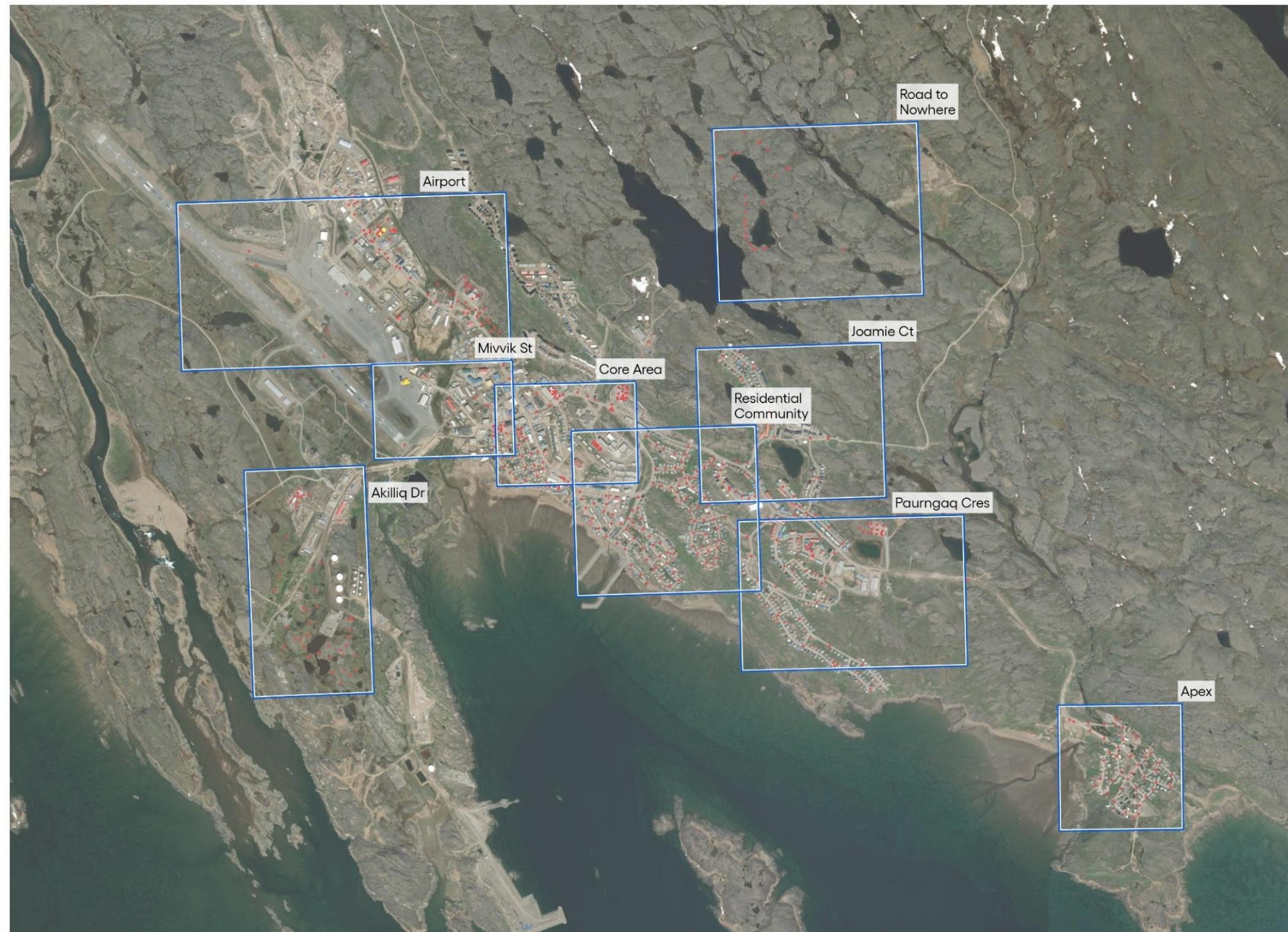
### 4. Strengthen interdepartmental collaboration

- Increase collaboration with relevant departments, such as Public Works, and Engineering to leverage technical skills and ensure and ground studies are consistently reviewed during development approval and permitting process.

### 5. Develop a hazard construction guide

- Prepare a practical construction guide outlining best practices for development in hazard-prone terrain, such as unstable permafrost, steep slopes, areas of poor drainage, and other sensitive conditions.

APPENDIX 1 - Maps - Location of Existing Boreholes and Geotechnical Information



**LEGEND**

- Extent
- Test Site (442)



**BC2**

Appendix 1 - Data Localisation  
City of Iqaluit - General

November 14, 2025



**LEGEND**

- Borehole with thermistor (5)
- Test pit (16)
- ◆ Borehole (61)

**BC2**

**Appendix 1 - Data Localisation**  
Airport

November 14, 2025



**LEGEND**

- ✚ Test pit (45)
- ⚡ Borehole (3)



**BC2**

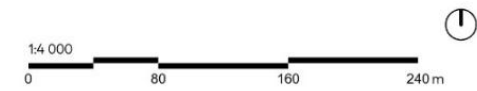
**Appendix 1 - Data Localisation**  
Akilliq Dr

November 14, 2025



**LEGEND**

- ⊠ Test pit (2)
- ◆ Borehole (37)



**BC2**

**Appendix 1 - Data Localisation**  
Apex

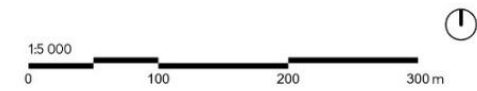
November 14, 2025





**LEGEND**

- ☒ Test pit (1)
- ◆ Borehole (62)



**BC2**

**Appendix 1 - Data Localisation**  
Joamie Ct

November 14, 2025






**BC2**

**Appendix 1 - Data Localisation**  
Mivvik St

November 14, 2025



**LEGEND**

-  Borehole with thermistor (5)
-  Test pit (1)
-  Borehole (57)



**BC2**

**Appendix 1 - Data Localisation**  
Paurngaq Cres

November 14, 2025



**LEGEND**

- Borehole with thermistor (3)
- Test pit (1)
- Borehole (141)



**BC2**

**Appendix 1 - Data Localisation**  
Residential Community

November 14, 2025



**LEGEND**

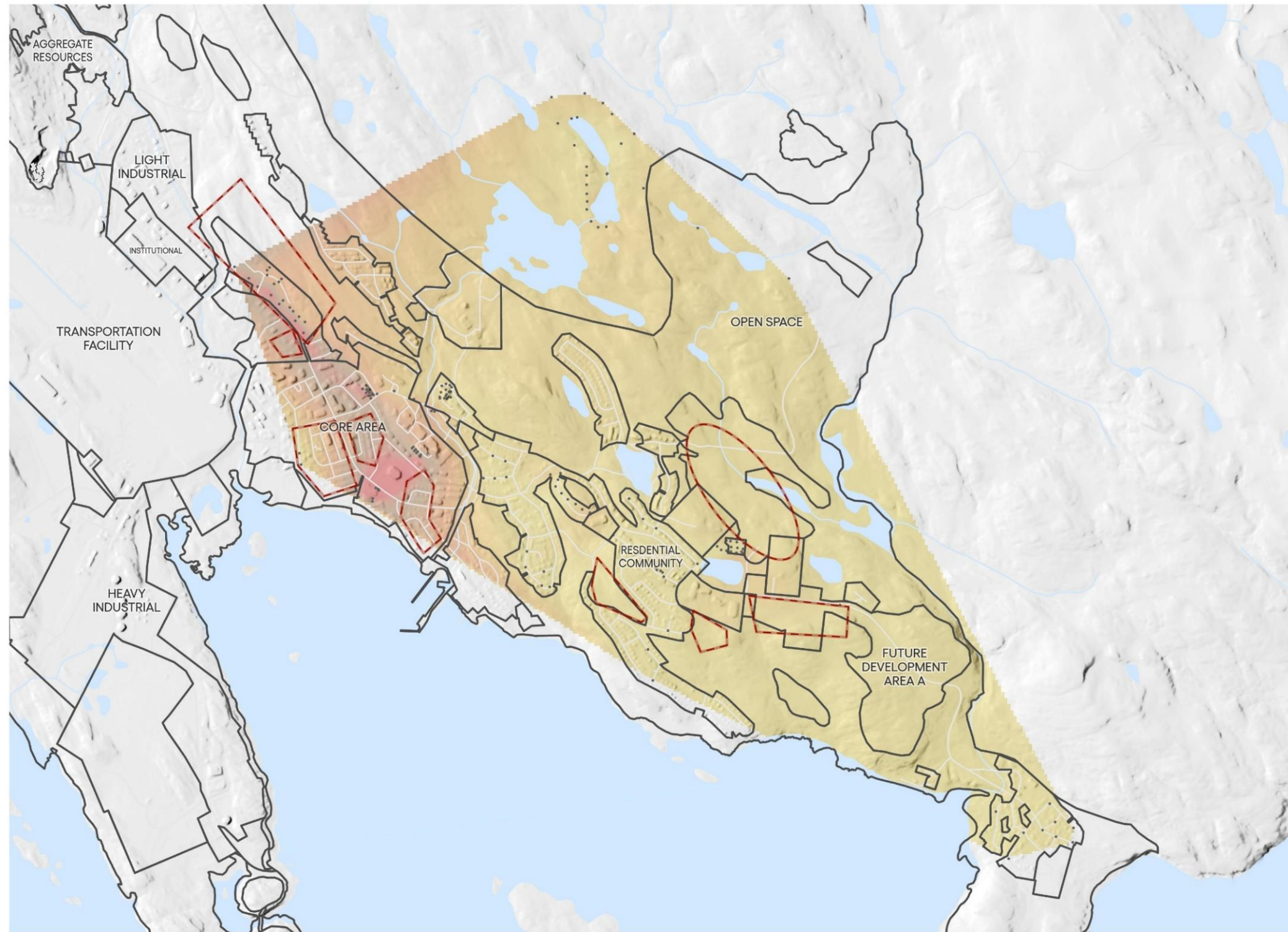
-  Borehole with thermistor (1)
-  Borehole (30)

**BC2**

**Appendix 1 - Data Localisation**  
Road to Nowhere

November 14, 2025

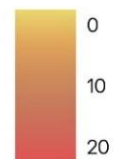
APPENDIX 2 - Maps - Depth to Bedrock



**LEGEND**

- Land Use
- Planned or Future Development Area
- Borehole and test pit with bedrock data (157)

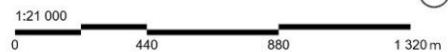
**Depth to bedrock (m)**



**NOTES**

Bedrock depth shown on this map is derived from an interpolation of available point data. The results are indicative only and do not represent actual measured depths. Additional site-specific investigations are required to obtain accurate information.

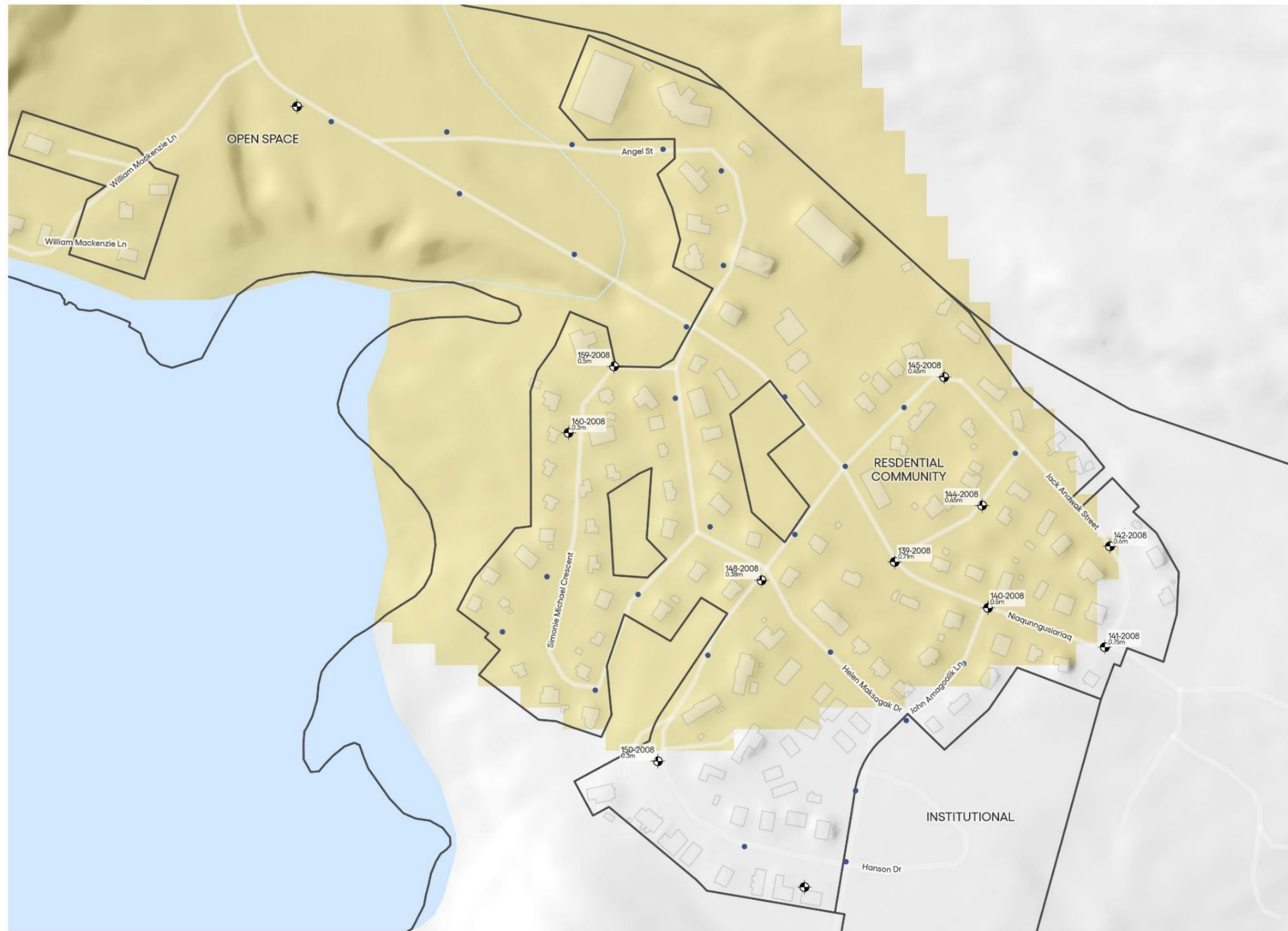
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvis, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Negrete, Adelaide; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

Appendix 2 - Depth to Bedrock  
City of Iqaluit - General

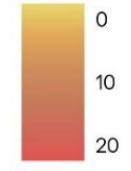
November 14, 2025



**LEGEND**

- Land Use
- Borehole or Test Pit
- Other investigations

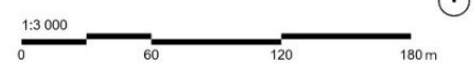
**Depth to bedrock (m)**



**NOTES**

Bedrock depth shown on this map is derived from an interpolation of available point data. The results are indicative only and do not represent actual measured depths. Additional site-specific investigations are required to obtain accurate information.

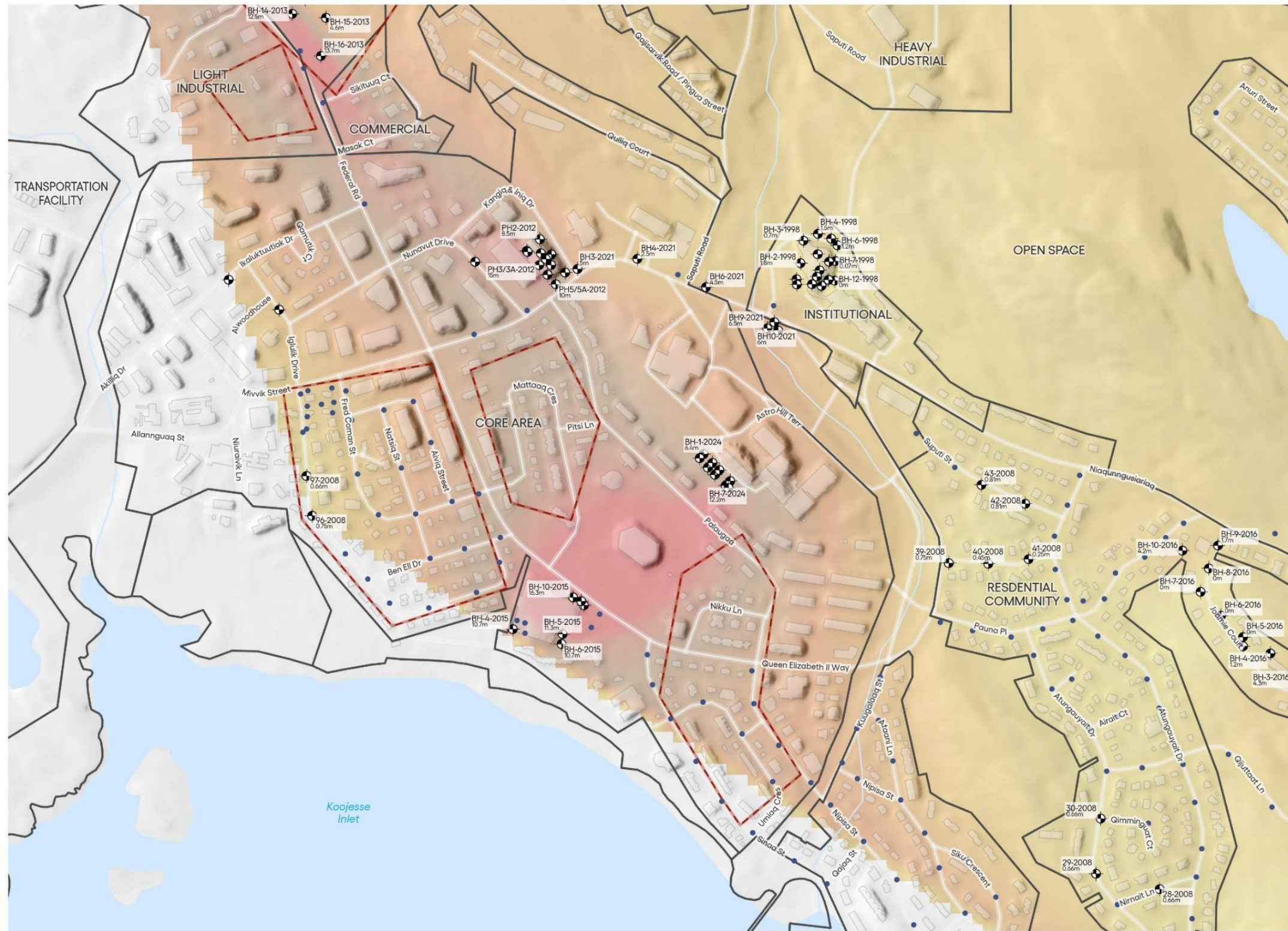
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvie, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Nørgrete, Adelaide; Vedav, Bishyananda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 2 - Depth to Bedrock**  
Apex

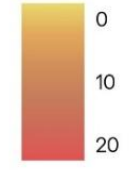
November 14, 2025



**LEGEND**

- Land Use
- Planned or Future Development Area
- Borehole or Test Pit
- Other investigations

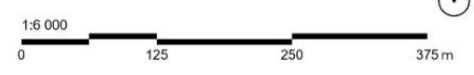
**Depth to bedrock (m)**



**NOTES**

Bedrock depth shown on this map is derived from an interpolation of available point data. The results are indicative only and do not represent actual measured depths. Additional site-specific investigations are required to obtain accurate information.

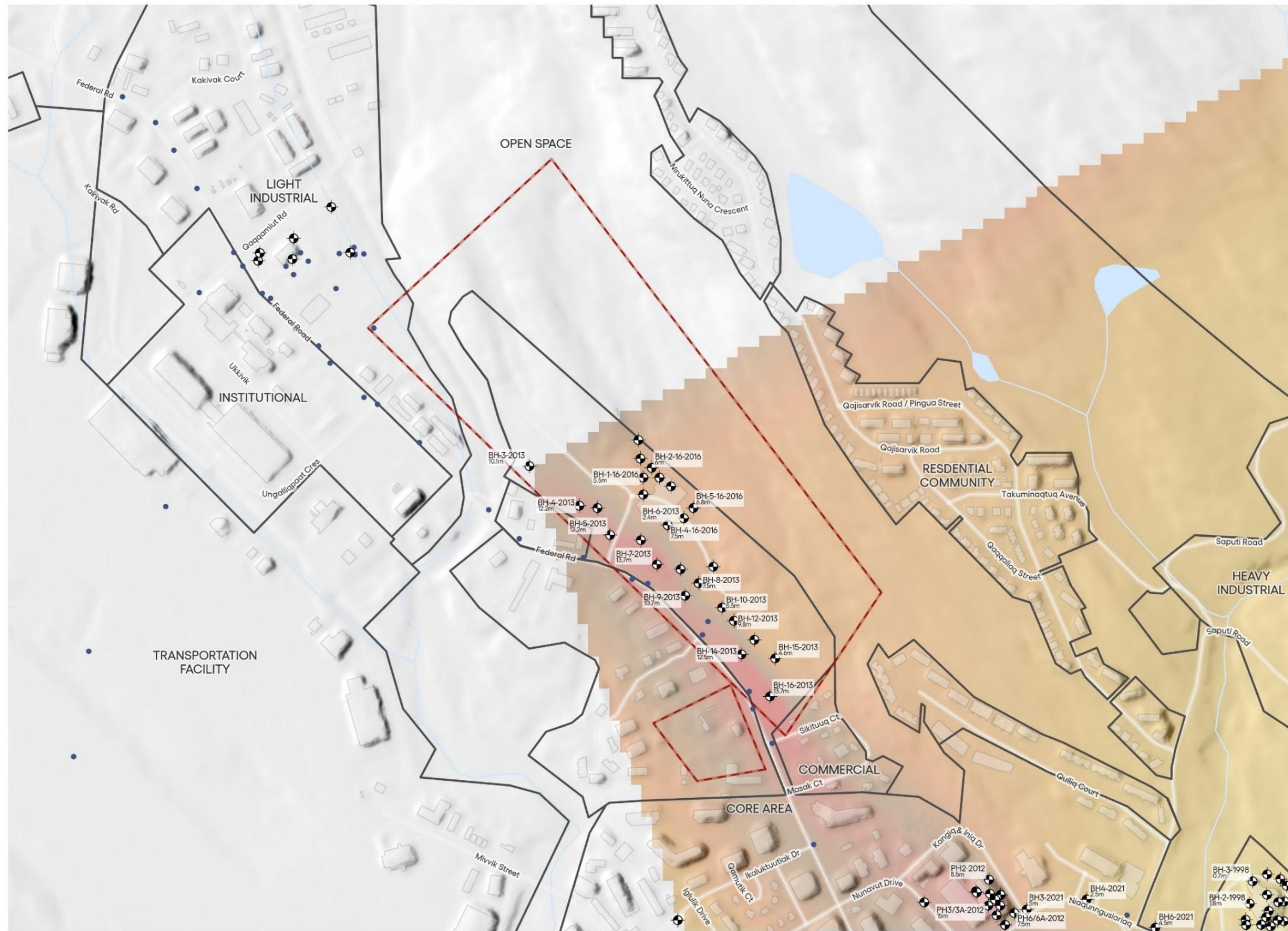
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuviv, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Nogrette, Adelaide; Vedav, Bishyananda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 2 - Depth to Bedrock Core Area**

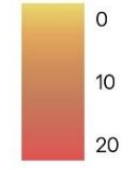
November 14, 2025



**LEGEND**

- Land Use
- Planned or Future Development Area
- Borehole or Test Pit
- Other investigations

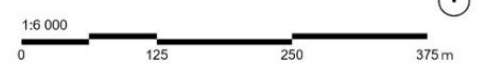
**Depth to bedrock (m)**



**NOTES**

Bedrock depth shown on this map is derived from an interpolation of available point data. The results are indicative only and do not represent actual measured depths. Additional site-specific investigations are required to obtain accurate information.

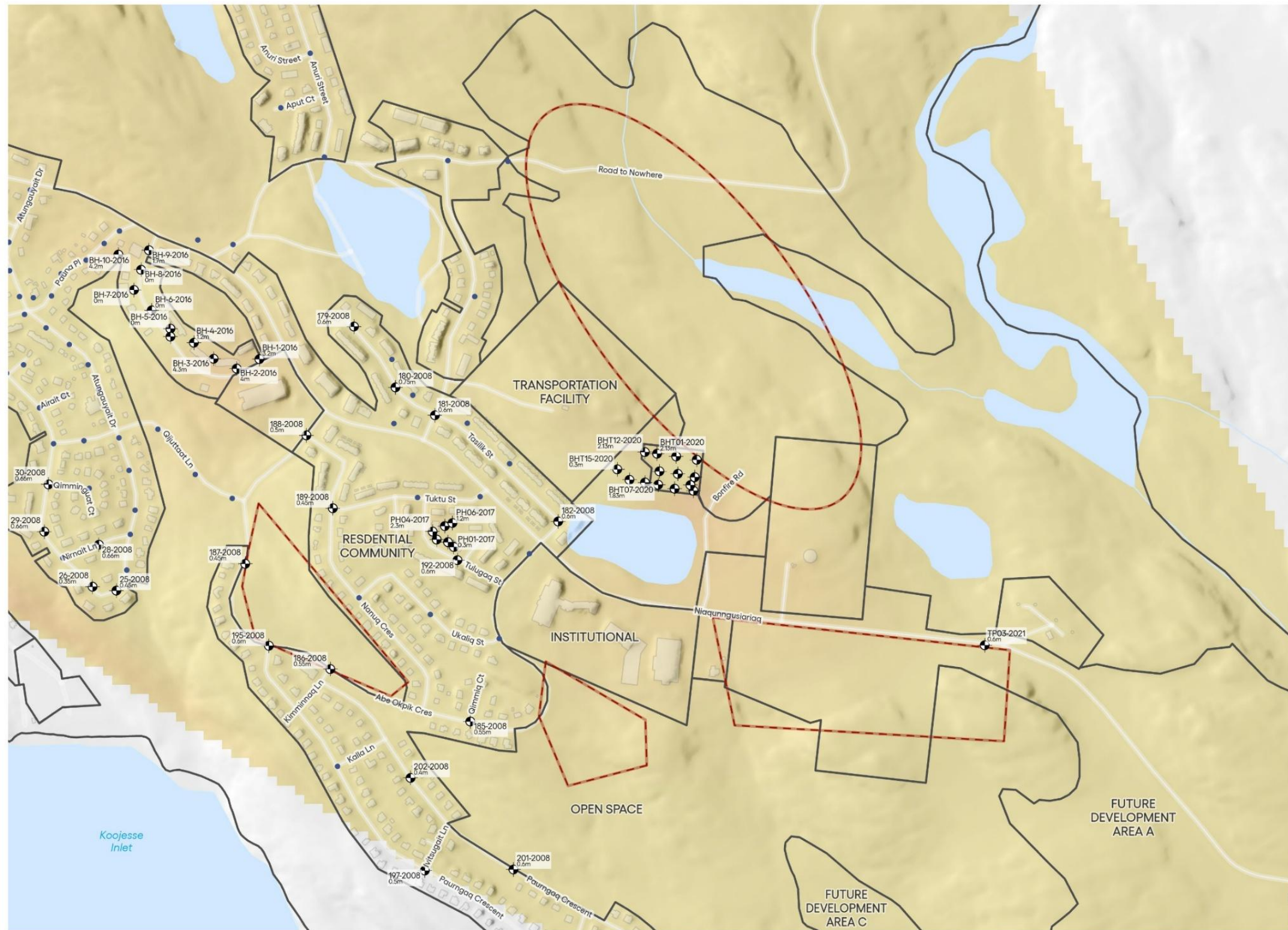
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuviv, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Nogrette, Adelaide; Vedav, Bishyananda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 2 - Depth to Bedrock**  
Federal Road

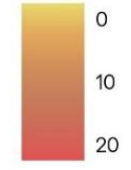
November 14, 2025



**LEGEND**

- Land Use
- Planned or Future Development Area
- Borehole or Test Pit
- Other investigations

**Depth to bedrock (m)**



**NOTES**

Bedrock depth shown on this map is derived from an interpolation of available point data. The results are indicative only and do not represent actual measured depths. Additional site-specific investigations are required to obtain accurate information.

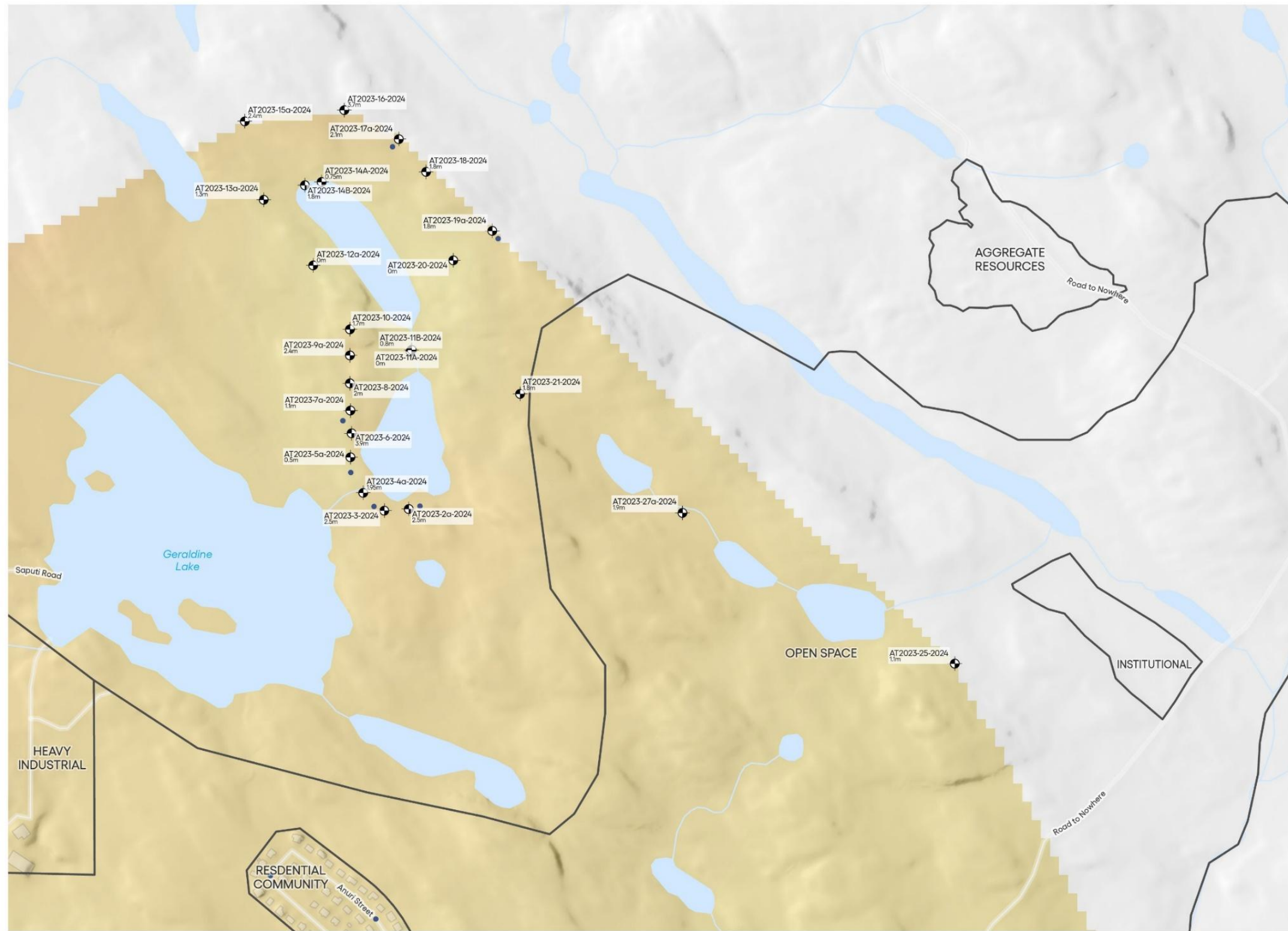
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvie, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Nogrette, Adelaide; Vedav, Bishyananda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

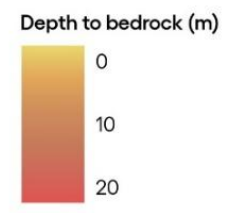
**Appendix 2 - Depth to Bedrock  
Residential Community**

November 14, 2025



**LEGEND**

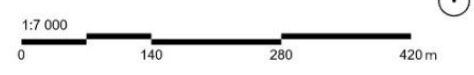
- Land Use
- Borehole or Test Pit
- Other investigations



**NOTES**

Bedrock depth shown on this map is derived from an interpolation of available point data. The results are indicative only and do not represent actual measured depths. Additional site-specific investigations are required to obtain accurate information.

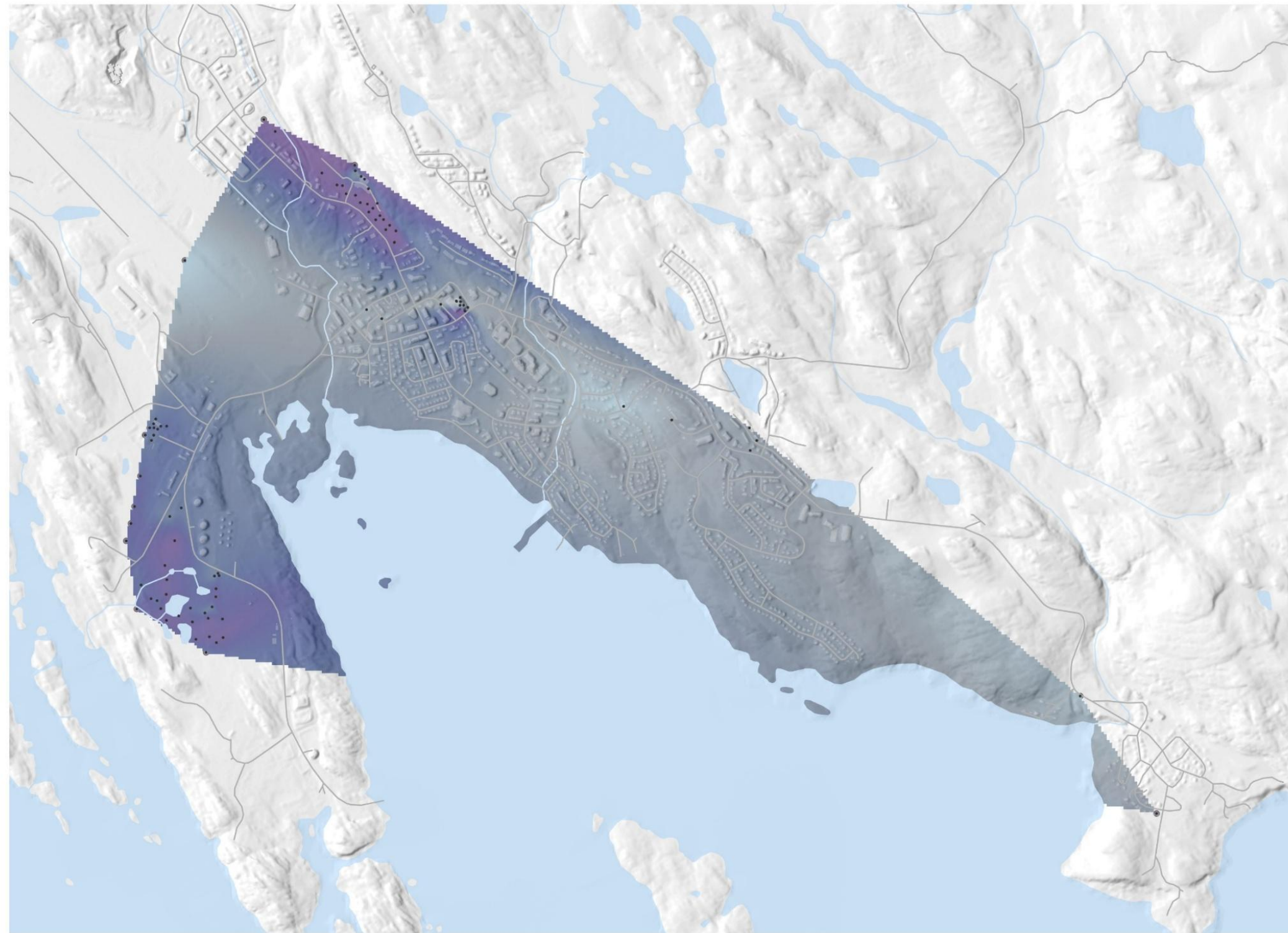
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvie, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Nogueira, Adelaide; Vedav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 2 - Depth to Bedrock**  
Road to Nowhere

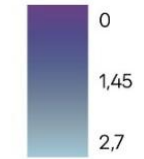
November 14, 2025



**LEGEND**

- Test site with permafrost data (86)

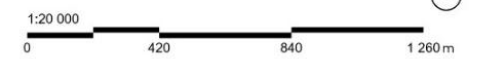
**Depth to frozen ground (m)**



**NOTES**

For most locations, the true depth of the permafrost table could not be identified since the overburden was generally completely frozen during the investigations.

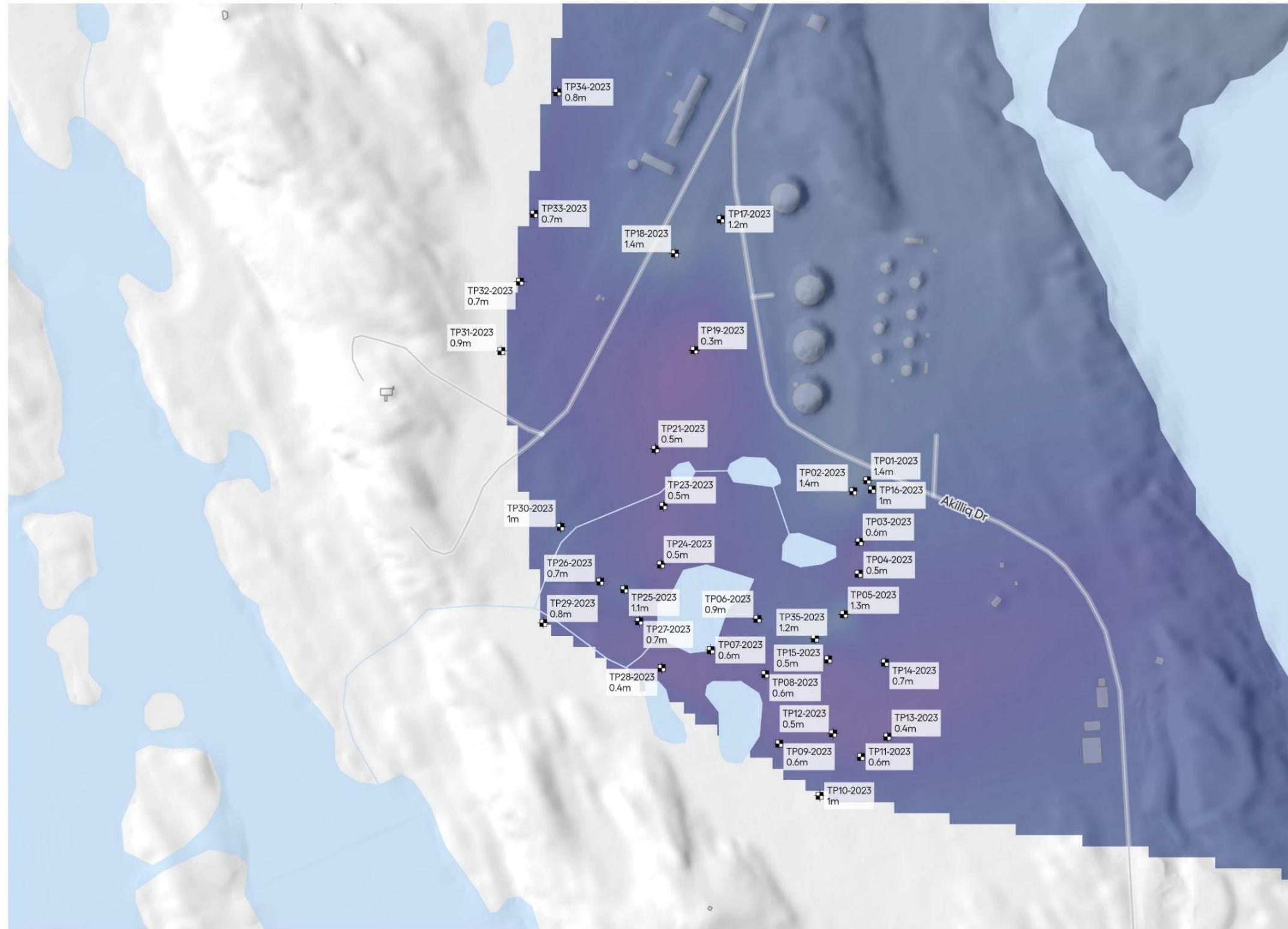
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvsi, Samuel; Danish, Ewan; Tomko, Karen; Gardner, Judith; Negrete, Adelaida; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

Appendix 3 - Frozen ground  
City of Iqaluit - General

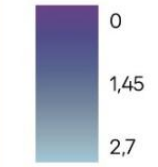
November 14, 2025



**LEGEND**

☒ Test pit

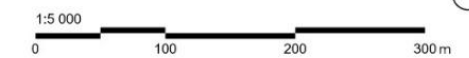
**Depth to frozen ground (m)**



**NOTES**

For most locations, the true depth of the permafrost table could not be identified since the overburden was generally completely frozen during the investigations.

Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvia, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Negrete, Adelaide; Yedav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloulier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 3 - Frozen ground**  
Akilliq Dr

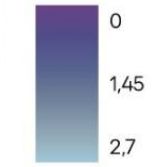
November 14, 2025



**LEGEND**

✚ Test pit

**Depth to frozen ground (m)**



**NOTES**

For most locations, the true depth of the permafrost table could not be identified since the overburden was generally completely frozen during the investigations.

Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvia, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Negrete, Adelaide; Yedav, Bidhyaranda; Klassen, James; Kelleher, Cole; Clouier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1

1:1 000

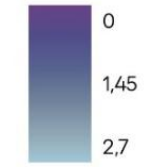




**LEGEND**

✚ Test pit

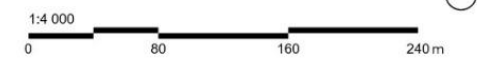
**Depth to frozen ground (m)**



**NOTES**

For most locations, the true depth of the permafrost table could not be identified since the overburden was generally completely frozen during the investigations.

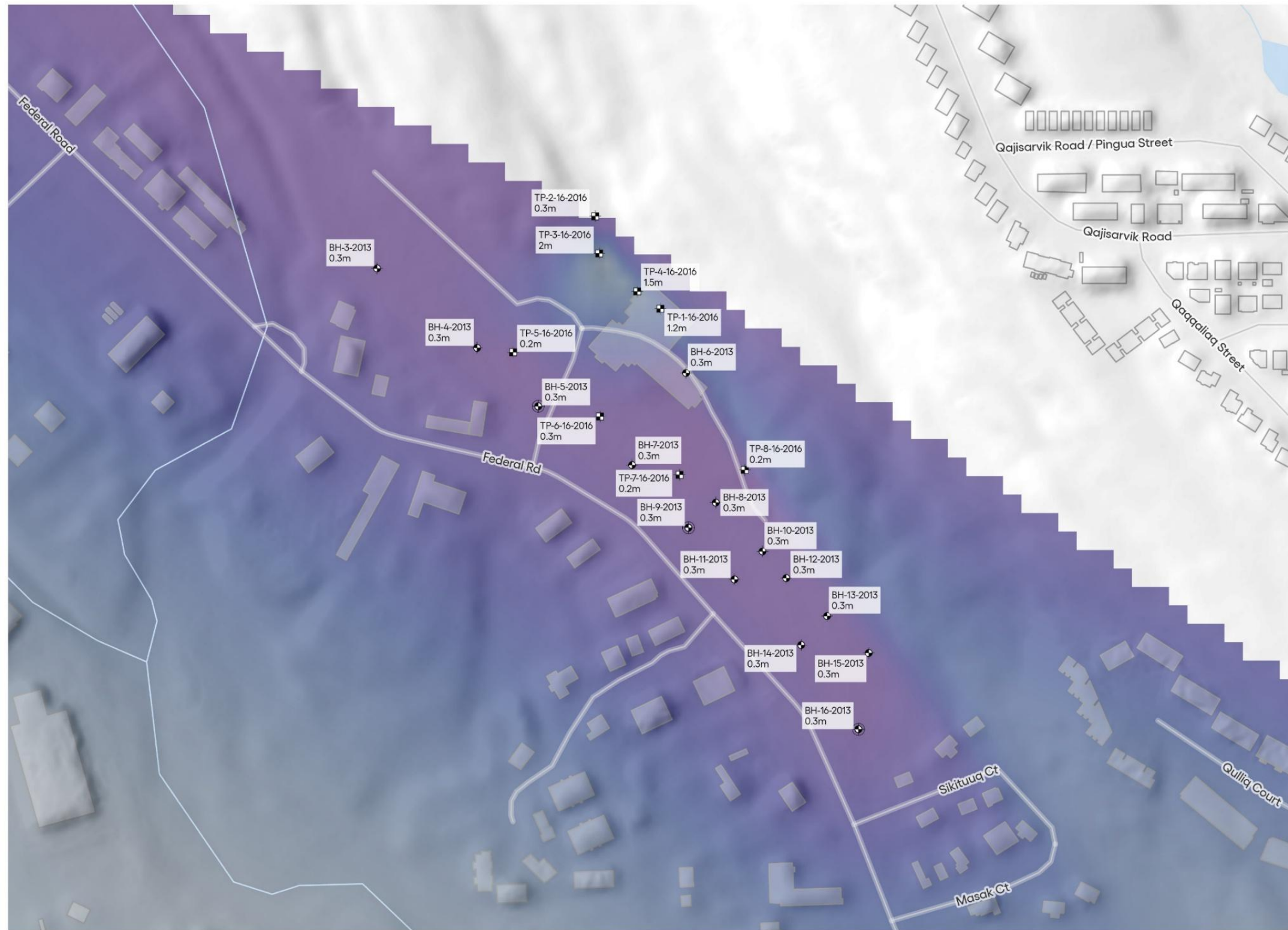
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvie, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Negrete, Adelaide; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloulier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 3 - Frozen ground**  
Apex

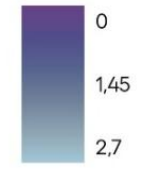
November 14, 2025



**LEGEND**

- ✚ Test pit
- ⬮ Borehole
- ⊙ Borehole with thermistor

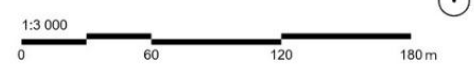
**Depth to frozen ground (m)**



**NOTES**

For most locations, the true depth of the permafrost table could not be identified since the overburden was generally completely frozen during the investigations.

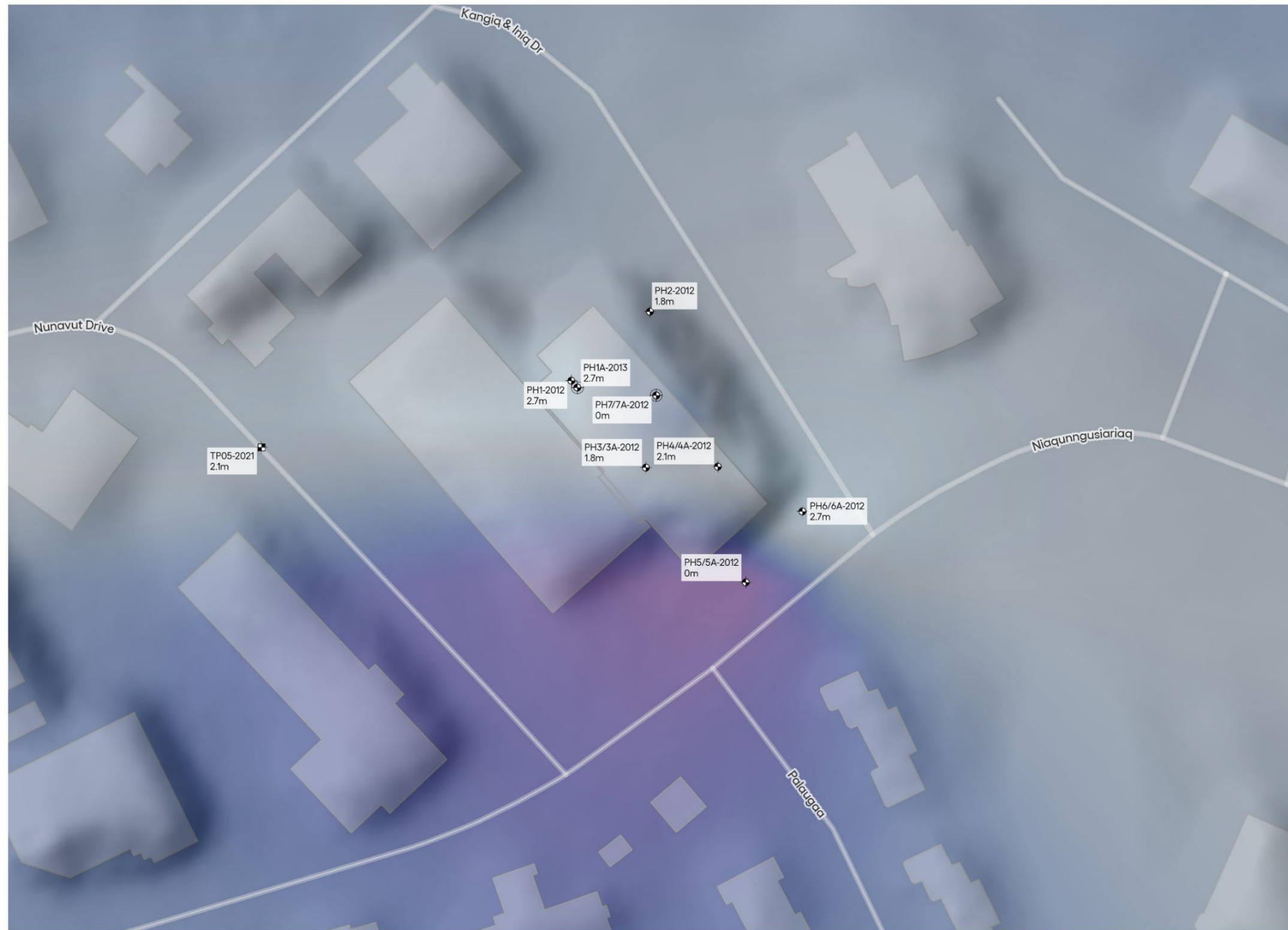
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvia, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Negrete, Adelaide; Yedav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloulier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 3 - Frozen ground**  
Aqsarniit Hotel

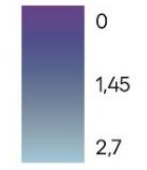
November 14, 2025



**LEGEND**

- ✚ Test pit
- ◆ Borehole
- ⊙ Borehole with thermistor

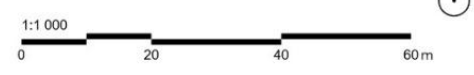
**Depth to frozen ground (m)**



**NOTES**

For most locations, the true depth of the permafrost table could not be identified since the overburden was generally completely frozen during the investigations.

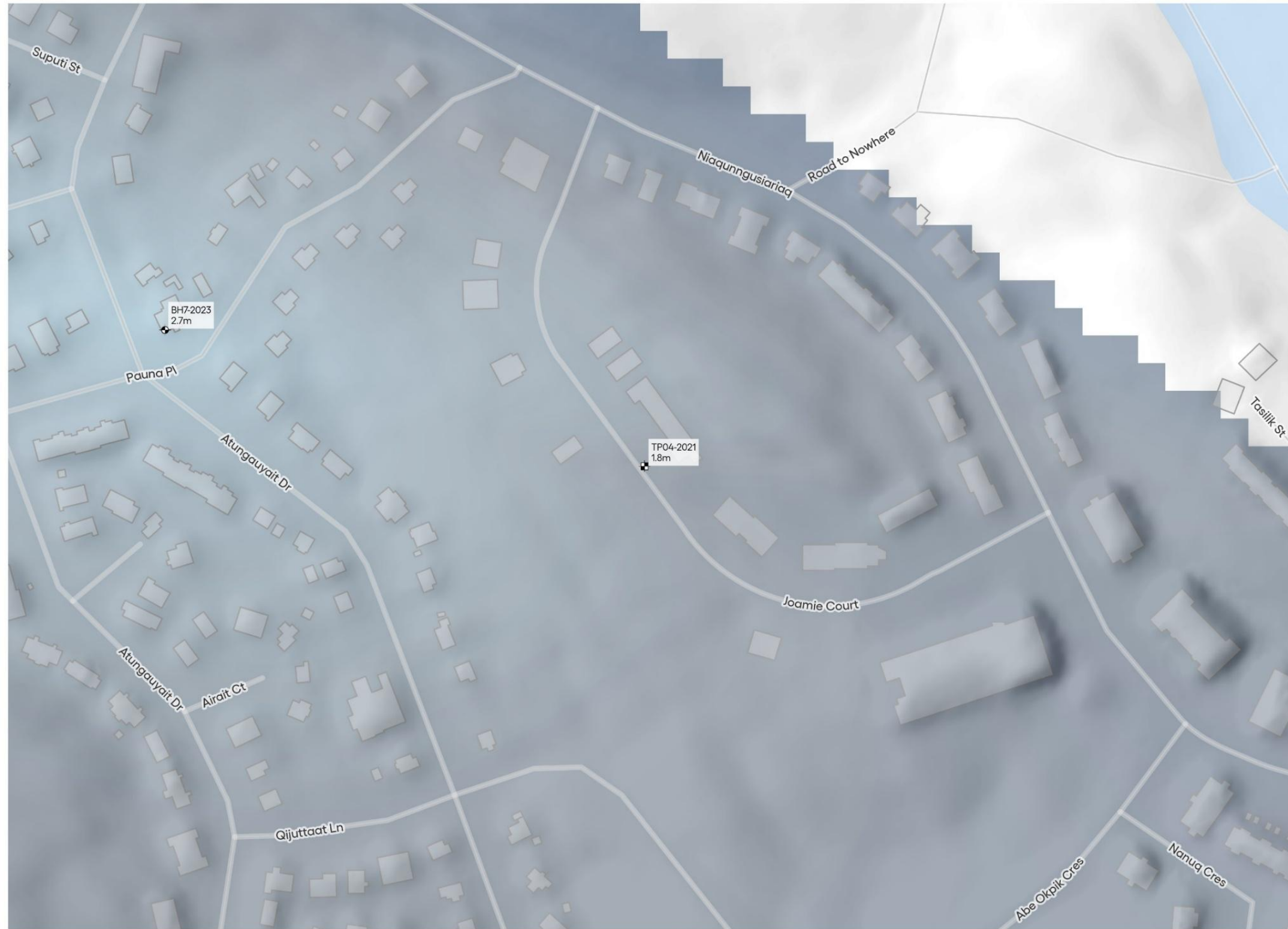
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvia, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Negrete, Adelaide; Yedav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloulier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 3 - Frozen ground**  
Aquatic Center

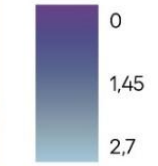
November 14, 2025



**LEGEND**

- ✚ Test pit
- ✚ Borehole

**Depth to frozen ground (m)**



**NOTES**

For most locations, the true depth of the permafrost table could not be identified since the overburden was generally completely frozen during the investigations.

Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvia, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Negrete, Adelaide; Yedav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloulier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1

1:2,000



**BC2**

**Appendix 3 - Frozen ground**  
Joamie Ct

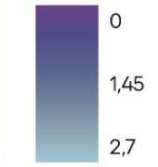
November 14, 2025



**LEGEND**

Test pit

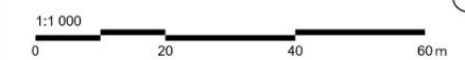
**Depth to frozen ground (m)**



**NOTES**

For most locations, the true depth of the permafrost table could not be identified since the overburden was generally completely frozen during the investigations.

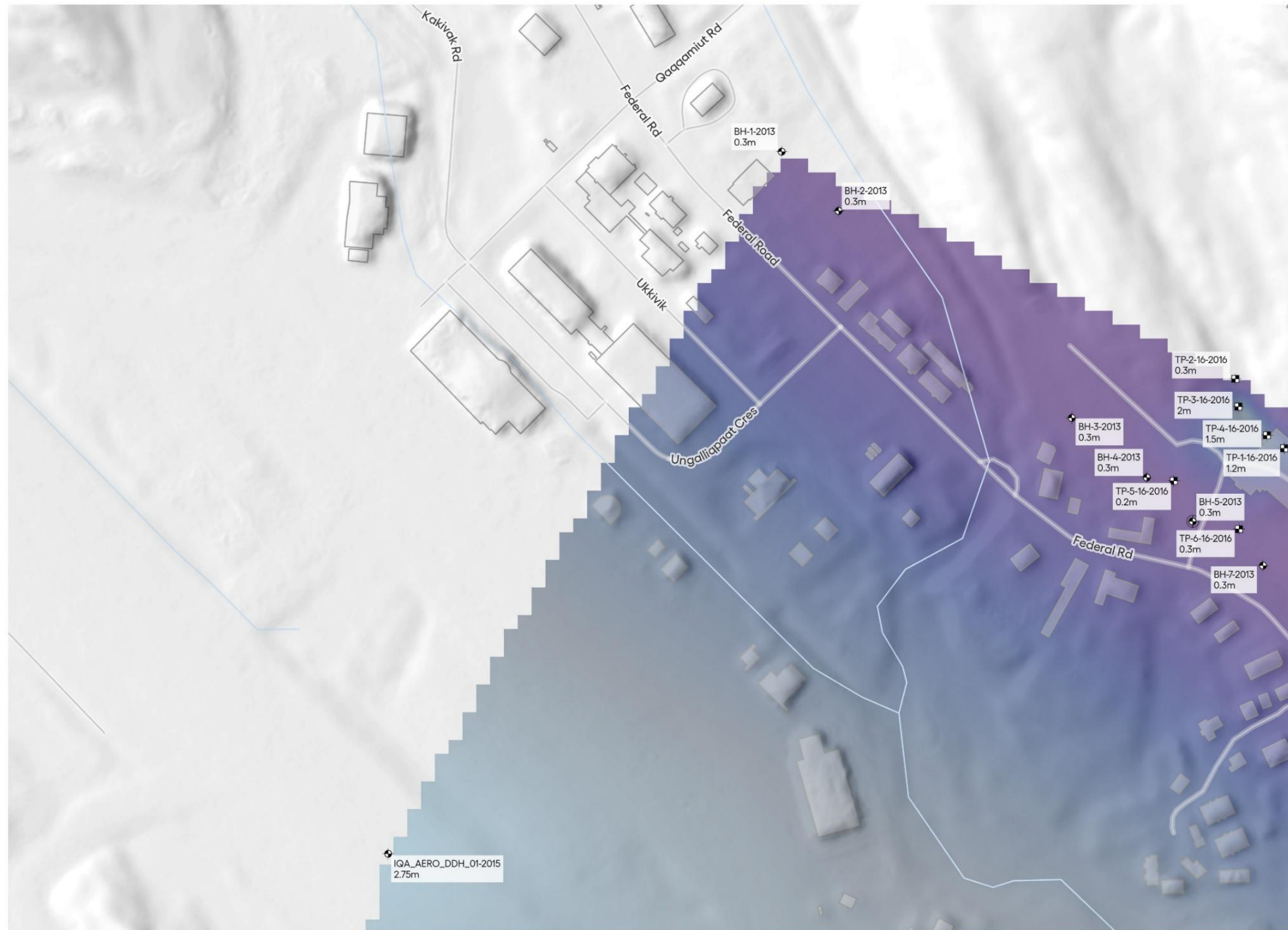
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvia, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Negrete, Adelaide; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloulier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 3 - Frozen ground**  
Nunavut Brewing Company

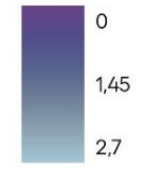
November 14, 2025



**LEGEND**

- ✦ Test pit
- ◆ Borehole
- ⊙ Borehole with thermistor

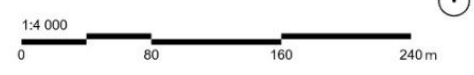
**Depth to frozen ground (m)**



**NOTES**

For most locations, the true depth of the permafrost table could not be identified since the overburden was generally completely frozen during the investigations.

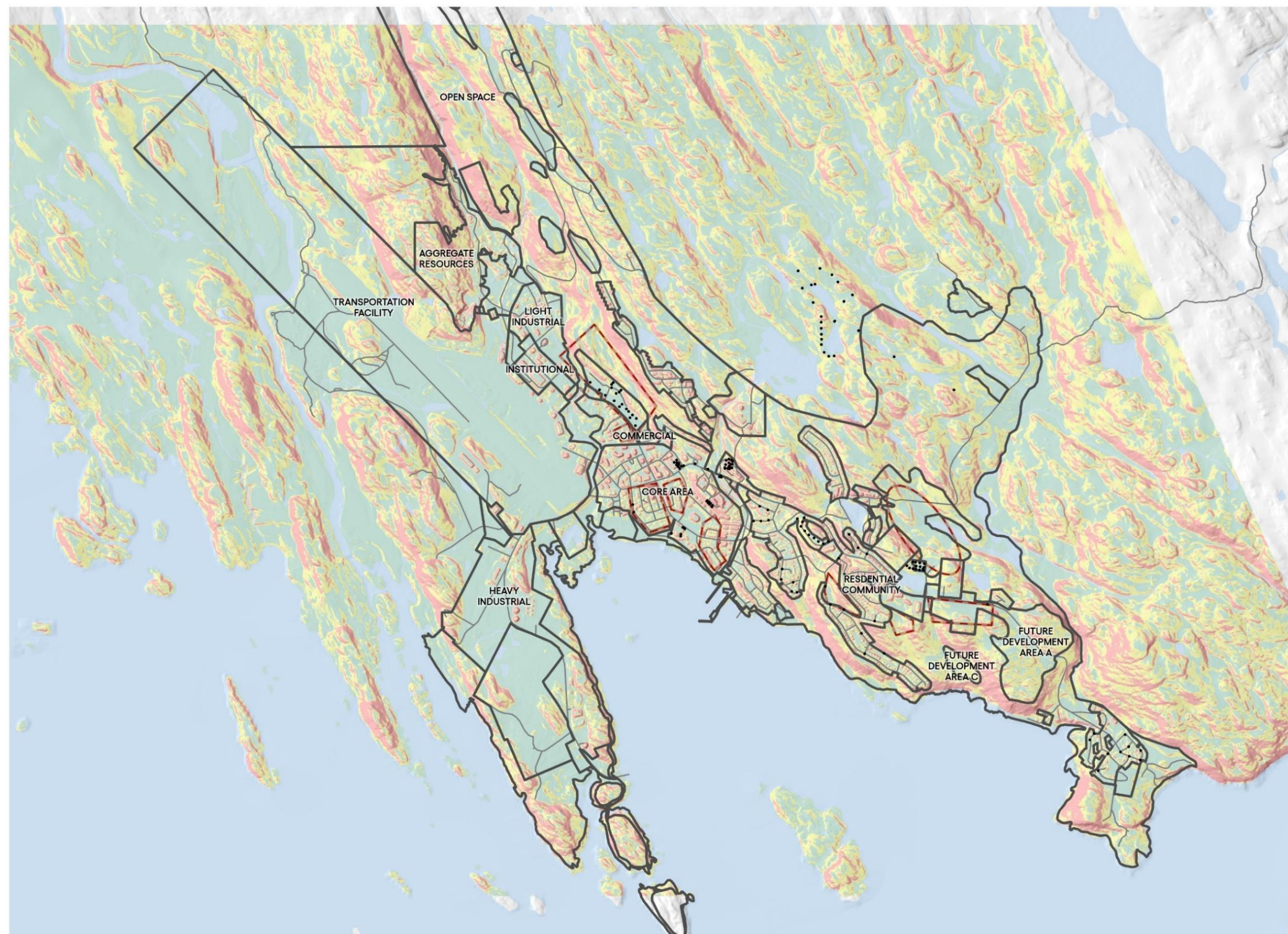
Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvie, Samuel; Danish, Evan; Tomko, Karen; Gardiner, Judith; Negrete, Adelaide; Yedav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloulier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 3 - Frozen ground**  
Ungalliqaat Cres

November 14, 2025



**LEGEND**

- Land Use Zone
- Planned or Future Development Area
- Test Site Containing Bedrock Data

**Slope**

- 0 - 10 %
- 10 - 20 %
- 20 - 25 %
- 25 % +

**NOTES**

Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuvis, Samuel; Danish, Evan; Tomko, Karen; Gardner, Judith; Negrete, Adelaide; Yadav, Bidhyamanda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1

1

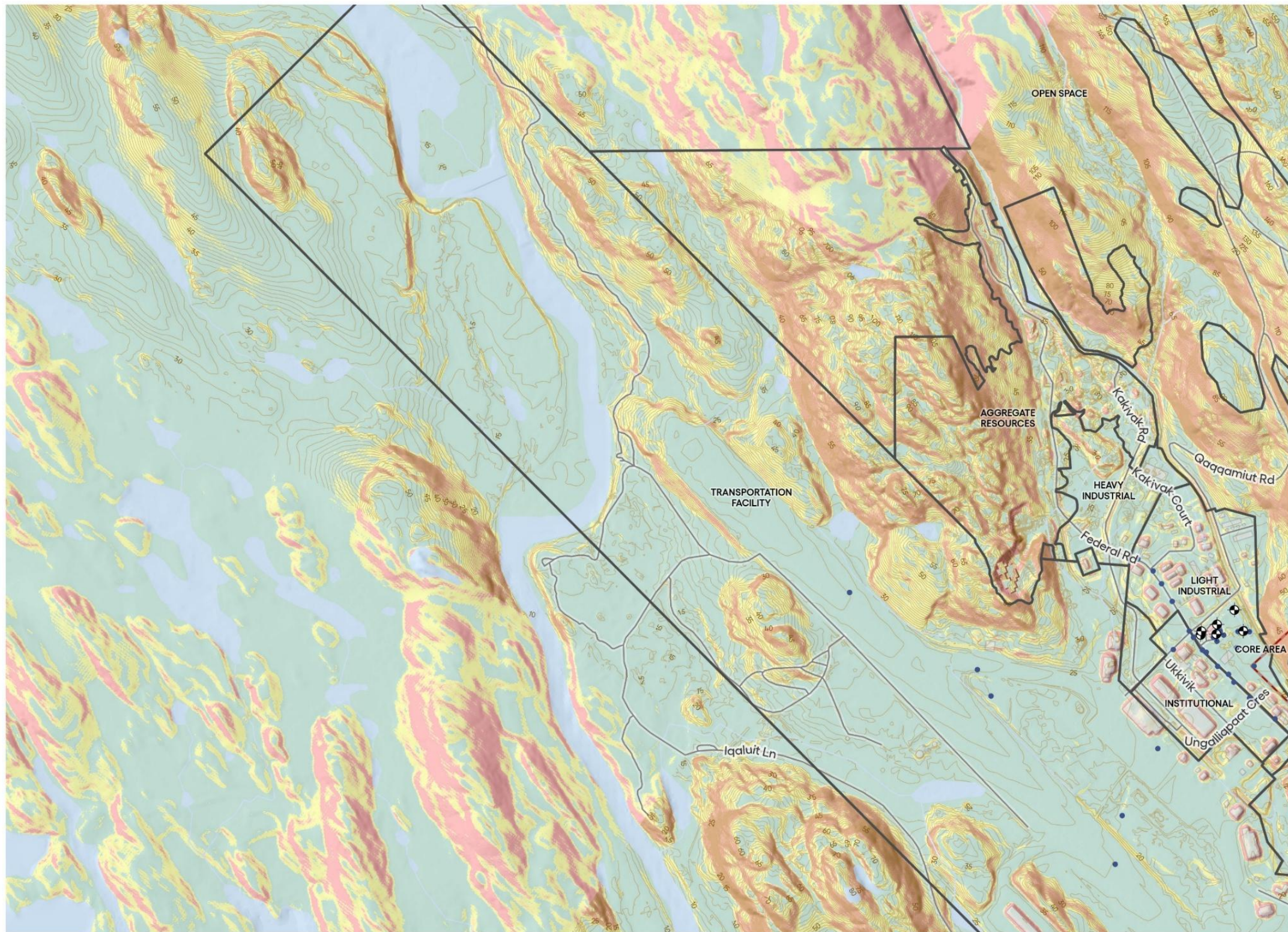
1:32 000

0 670 1 340 2 010 m

**BC2**

Appendix 4 - Slopes  
City of Iqaluit - General

November 14, 2025



**LEGEND**

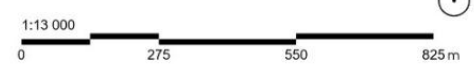
- Land Use Zone
- Planned or Future Development Area
- Contours 1m
- Borehole or Test Pit
- Other investigations

**Slope**

- 0 - 10 %
- 10 - 20 %
- 20 - 25 %
- 25 % +

**NOTES**

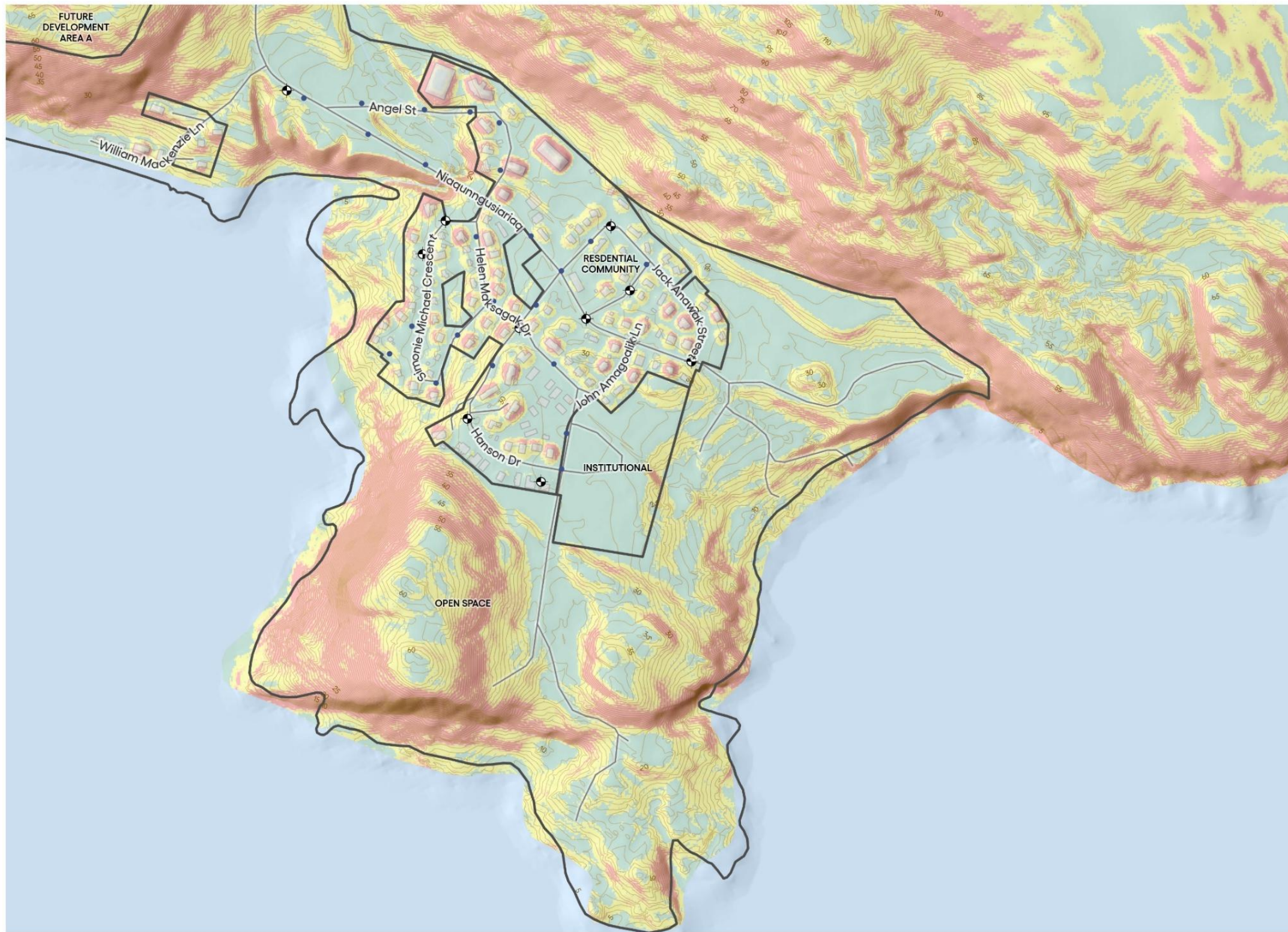
Source: Porter, Claire; Howat, Ian; Noh, Myoung-jun; Husby, Erik; Khuyis, Samuel; Danish, Evan; Torrico, Karen; Gardiner, Judith; Negrete, Adelaide; Vadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 4 - Slopes**  
Airport

November 14, 2025



**LEGEND**

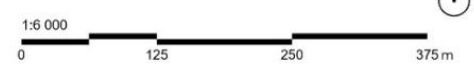
- Land Use Zone
- Contours 1m
- Borehole or Test Pit
- Other investigations

**Slope**

- 0 - 10 %
- 10 - 20 %
- 20 - 25 %
- 25 % +

**NOTES**

Source: Porter, Claire; Howat, Ian; Noh, Myoung-jun; Husby, Erik; Khuyis, Samuel; Danish, Evan; Toriko, Karen; Gardiner, Judith; Negrete, Adelaide; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 4 - Slopes**  
Apex

November 14, 2025



**LEGEND**

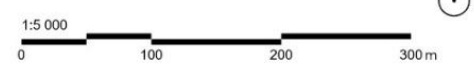
- Land Use Zone
- Planned or Future Development Area
- Contours 1m
- Borehole or Test Pit
- Other investigations

**Slope**

- 0 - 10 %
- 10 - 20 %
- 20 - 25 %
- 25 % +

**NOTES**

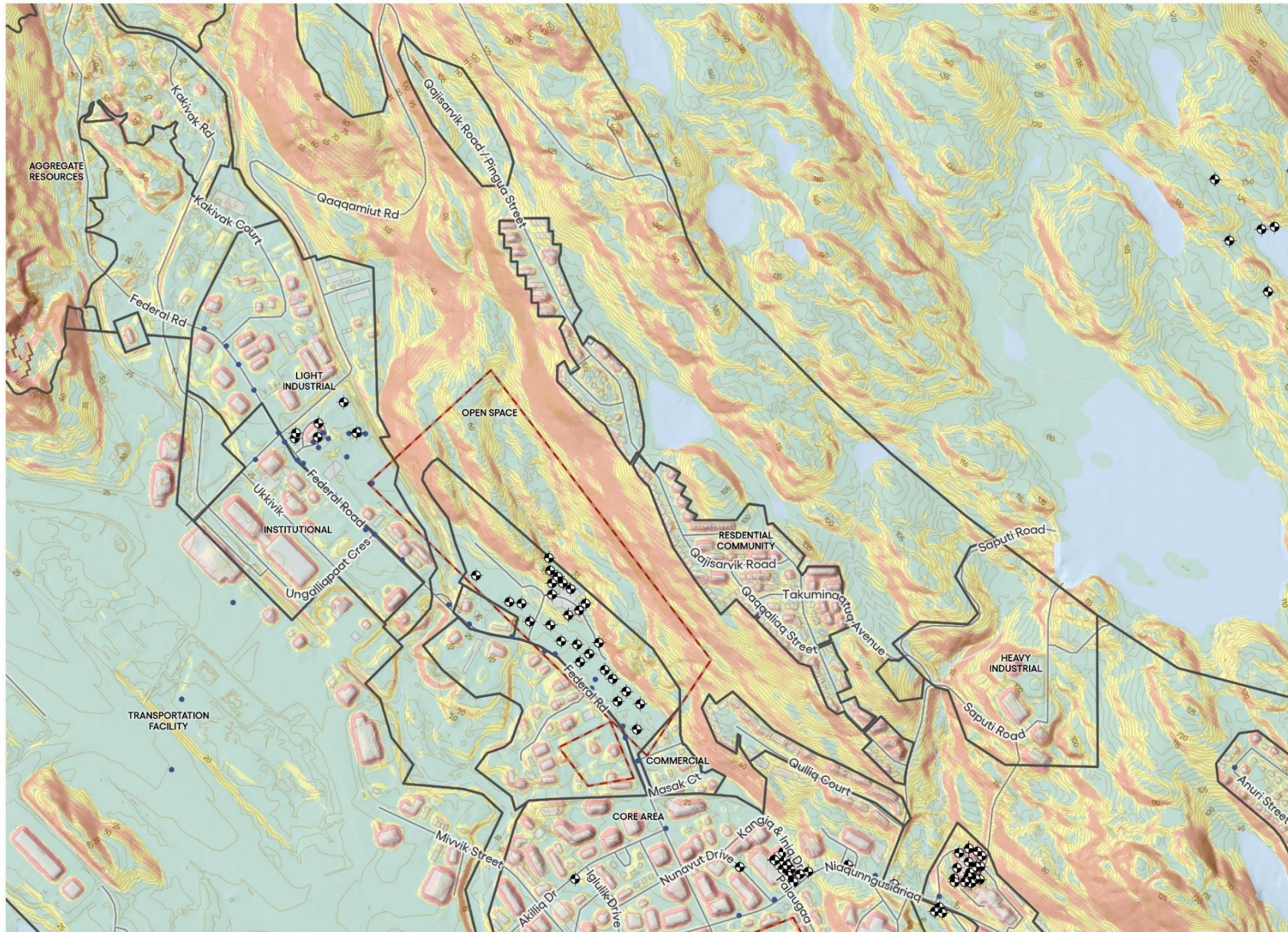
Source: Porter, Claire; Howat, Ian; Noh, Myoung-jun; Husby, Erik; Khuyis, Samuel; Danish, Evan; Torrico, Karen; Gardiner, Judith; Negrete, Adelaide; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 4 - Slopes**  
Core Area

November 14, 2025



**LEGEND**

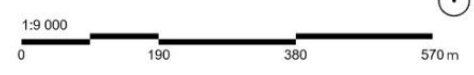
- Land Use Zone
- Planned or Future Development Area
- Contours 1m
- Borehole or Test Pit
- Other investigations

**Slope**

- 0 - 10 %
- 10 - 20 %
- 20 - 25 %
- 25 % +

**NOTES**

Source: Porter, Claire; Howat, Ian; Noh, Myoung-Jon; Husby, Erik; Khuyis, Samuel; Danish, Evan; Torrico, Karen; Gardiner, Judith; Negrete, Adelaide; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1





**LEGEND**

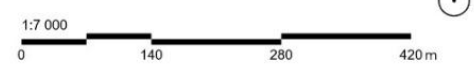
- Land Use Zone
- Planned or Future Development Area
- Contours 1m
- Borehole or Test Pit
- Other investigations

**Slope**

- 0 - 10 %
- 10 - 20 %
- 20 - 25 %
- 25 % +

**NOTES**

Source: Porter, Claire; Howat, Ian; Noh, Myoung-jun; Husby, Erik; Khuyk, Samuel; Danish, Evan; Torrico, Karen; Gardiner, Judith; Negrete, Adelaide; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



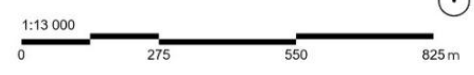


**LEGEND**

- Land Use Zone
  - Planned or Future Development Area
  - Contours 1m
  - Test Site Containing Bedrock Data
  - Borehole or Test Pit
  - Other investigations
- Slope**
- 0 - 10 %
  - 10 - 20 %
  - 20 - 25 %
  - 25 % +

**NOTES**

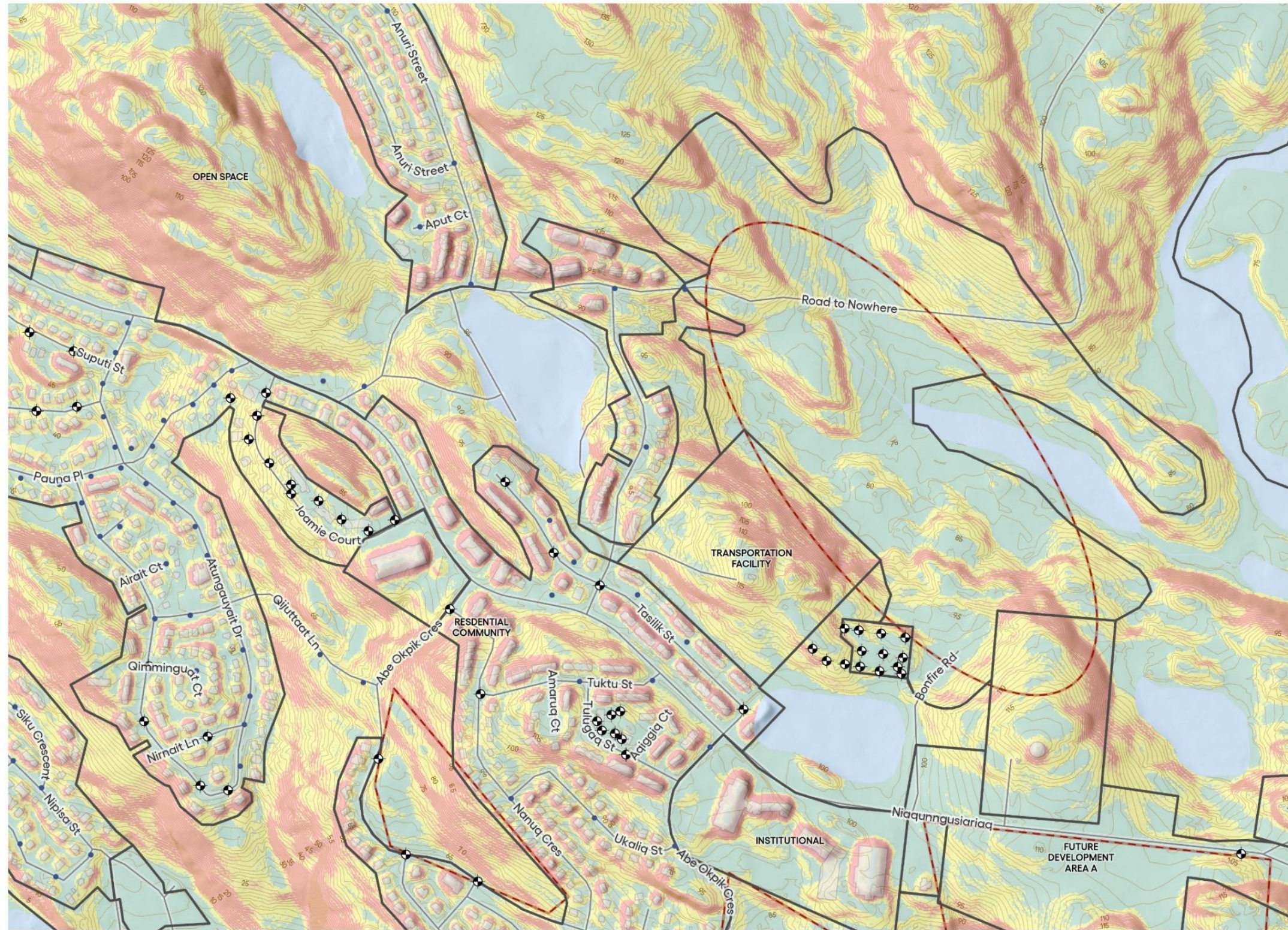
Source: Porter, Claire; Howat, Ian; Noh, Myoung-jun; Husby, Erik; Khuyk, Samuel; Danish, Evan; Torrico, Karen; Gardiner, Judith; Negrete, Adelaide; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



**BC2**

**Appendix 4 - Slopes**  
Port

November 14, 2025



**LEGEND**

- Land Use Zone
- Planned or Future Development Area
- Contours 1m
- Borehole or Test Pit
- Other investigations

**Slope**

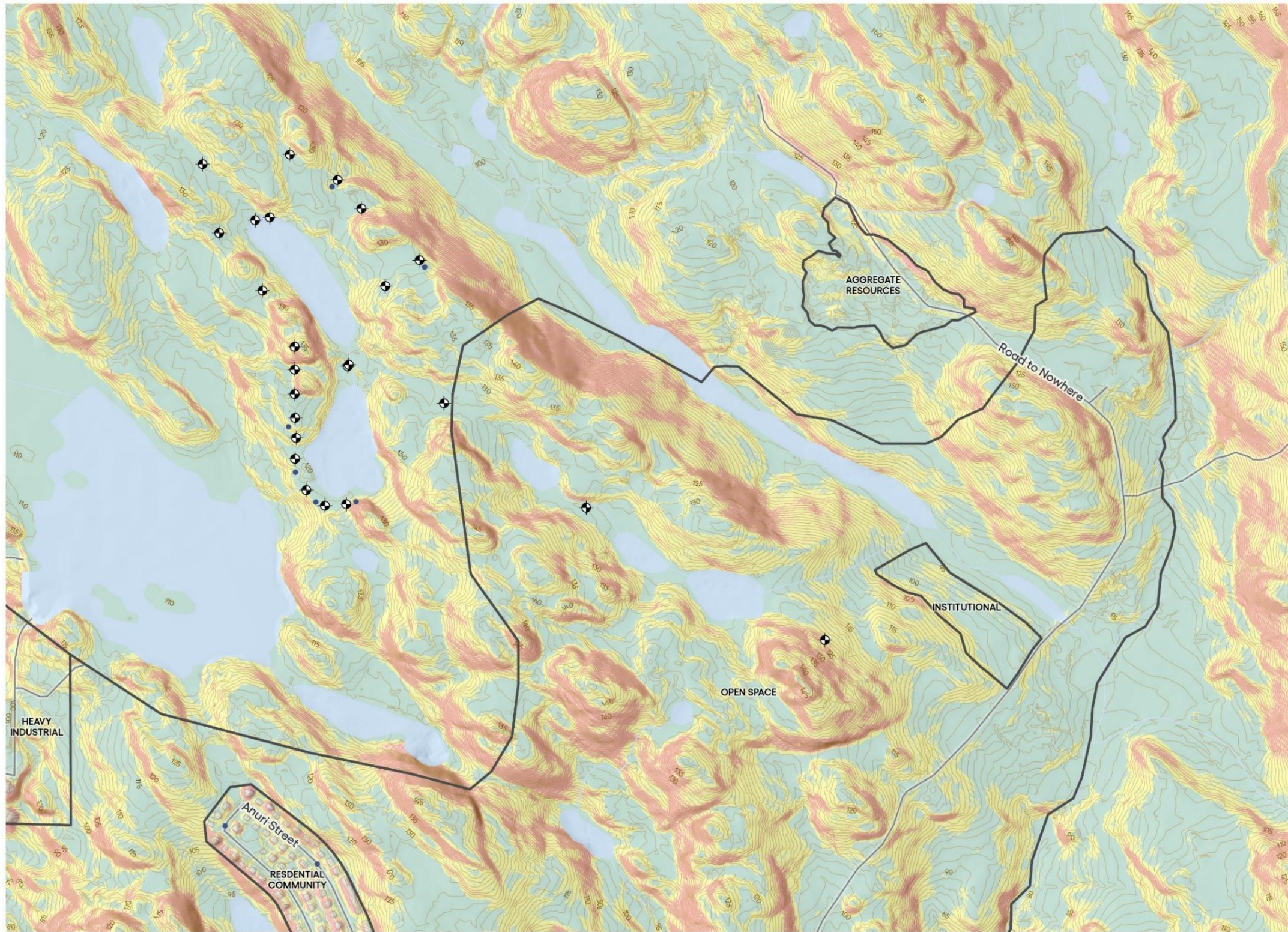
- 0 - 10 %
- 10 - 20 %
- 20 - 25 %
- 25 % +

**NOTES**

Source: Porter, Claire; Howat, Ian; Noh, Myoung-jun; Husby, Erik; Khuyis, Samuel; Danish, Evan; Torrico, Karen; Gardiner, Judith; Negrete, Adelaide; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1

1:6 000

0 125 250 375 m



**LEGEND**

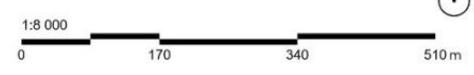
- Land Use Zone
- Contours 1m
- Borehole or Test Pit
- Other investigations

**Slope**

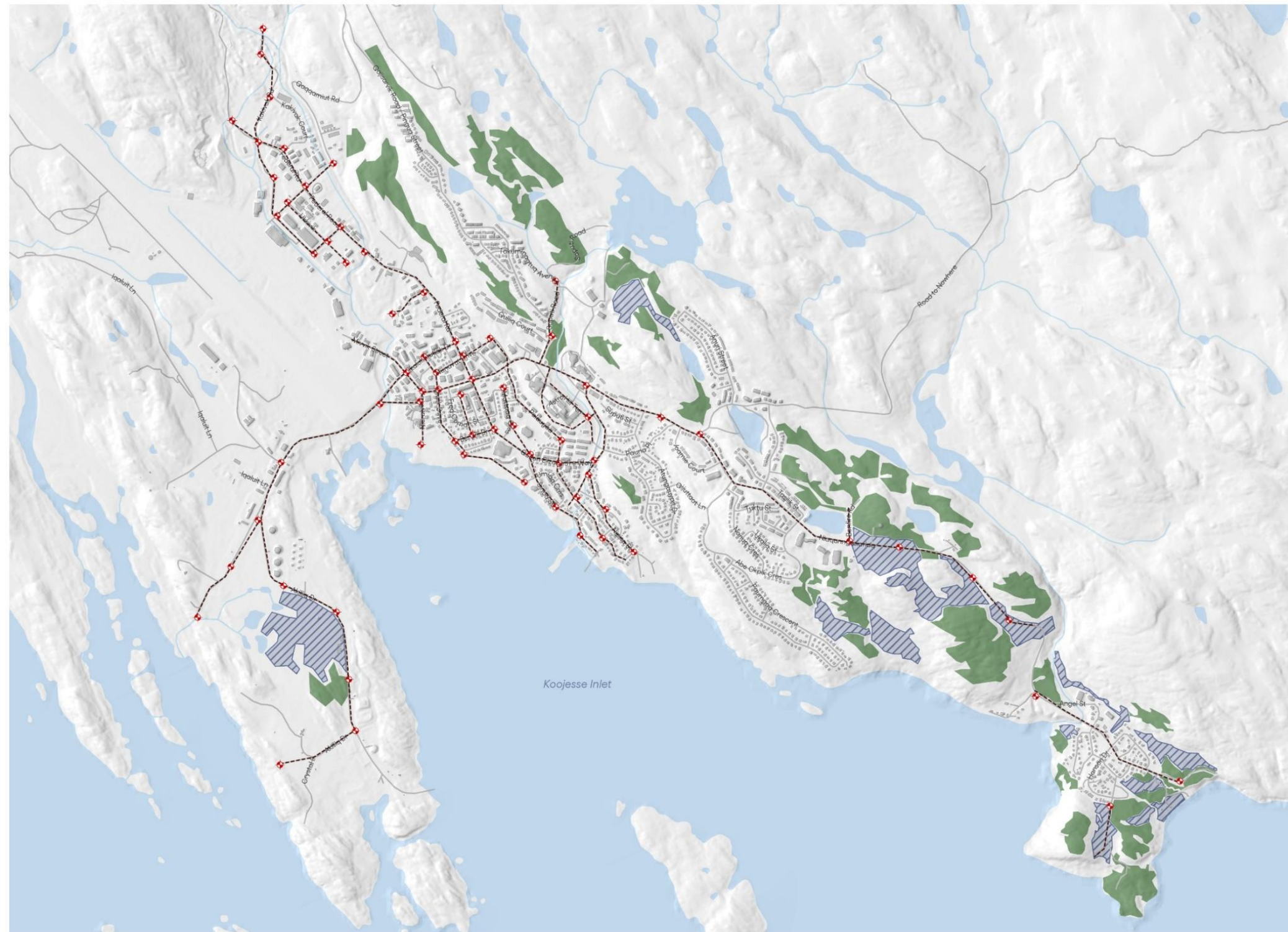
- 0 - 10 %
- 10 - 20 %
- 20 - 25 %
- 25 % +

**NOTES**

Source: Porter, Claire; Howat, Ian; Noh, Myoung-jun; Husby, Erik; Khuyis, Samuel; Danish, Evan; Torrico, Karen; Gardiner, Judith; Negrete, Adelaide; Yadav, Bidhyaranda; Klassen, James; Kelleher, Cole; Cloutier, Michael; Bakker, Jesse; Enos, Jeremy; Arnold, Galen; Bauer, Greg; Morin, Paul, 2023, "ArcticDEM - Mosaics, Version 4.1", <https://doi.org/10.7910/DVN/3VDC4W>, Harvard Dataverse, V1



APPENDIX 5 - Map - Construction Potential



**LEGEND**

- ◆ Geotechnical Investigation
- Land Streamer Survey
- ▨ Unknown Construction Potential
- Favorable Construction Potential



BC2

Appendix 5 - Construction Potential

November 14, 2025

## **APPENDIX 6 - Geotechnical Work – Clarification of services rendered**

CIMA+ prepared the site description, inventory mapping of existing geotechnical data and geotechnical recommendations sections of the report for the account of the City of Iqaluit. The project team was composed of Caroline Richard, Eng., M.Sc. and Nicolas Néron, Eng., M.A.Sc.. The material in these sections reflects the judgement of CIMA+ staff in light of the information available at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it is the responsibility of such third party. CIMA+ accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

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COLLABORATION**  
NORTHERN  
INDIGENOUS  
SOUTHERN

-  ENVIRONMENTAL RESILIENCE
-  SUSTAINABLE URBANIZATION
-  SOCIAL SUSTAINABILITY
-  HOUSING
-  CULTURE AND LEISURE