

Yukon Permafrost Database

The Yukon Permafrost Database is a compilation of ground thermal and geotechnical data in Yukon, including related reports. Further background and details on the database structure and its contents will be available in January 2022 (Lipovsky *et al.*, 2022).

In referring to information included in this download please use the following citation:
Yukon Geological Survey, current year. Web application user's guide. *In*: Yukon Permafrost Database. Government of Yukon, <https://service.yukon.ca/permafrost>, accessed [month day, year].

Web application user's guide

The home page (Fig. 1) of the Yukon Permafrost Database has a grid menu with links to six items which are described in the following pages:

- Geotechnical data
- Temperature data
- Reports and publications
- Download data
- Permafrost model
- Landform atlas

Separate interactive web maps are available for the Geotechnical Data, Temperature Data, Permafrost Model and Landform Atlas components. A compilation interactive web map (Fig. 2) that displays all of the geotechnical and temperature data, reports and the permafrost probability model is accessed from the "Explore data" button or from the "Map" button in the top right corner of the header banner.



Explore geotechnical data

Soil and ground ice descriptions collected from borehole drilling investigations.

[View data »](#)

Explore temperature data

Temperature data measured at hourly or daily intervals by thermistor strings inserted into boreholes.

[View data »](#)

Reports and publications

Published papers; theses; geotechnical reports; and maps that describe permafrost in the Yukon.

[View reports »](#)

Download data

Download our entire datasets in a variety of formats.

[Learn more »](#)

Permafrost model

View or download a high-resolution (30 by 30 metres raster data) permafrost probability model for the southern half of Yukon, produced by Bonnaventure et al. (2012).

[View map »](#)

Landform atlas

Landforms commonly associated with permafrost in Yukon, such as landslides; rock glaciers; pingos; palsas; tors; cryoplanation; terraces; solifluction; ice-wedge polygons; patterned ground; and thermokarst lakes.

[View map »](#)

Figure 1. Home page of the Yukon Permafrost Database web application. Users may return to this page from other pages at any time by clicking on the “Yukon” logo or “Yukon Permafrost Database” text in the top banner.

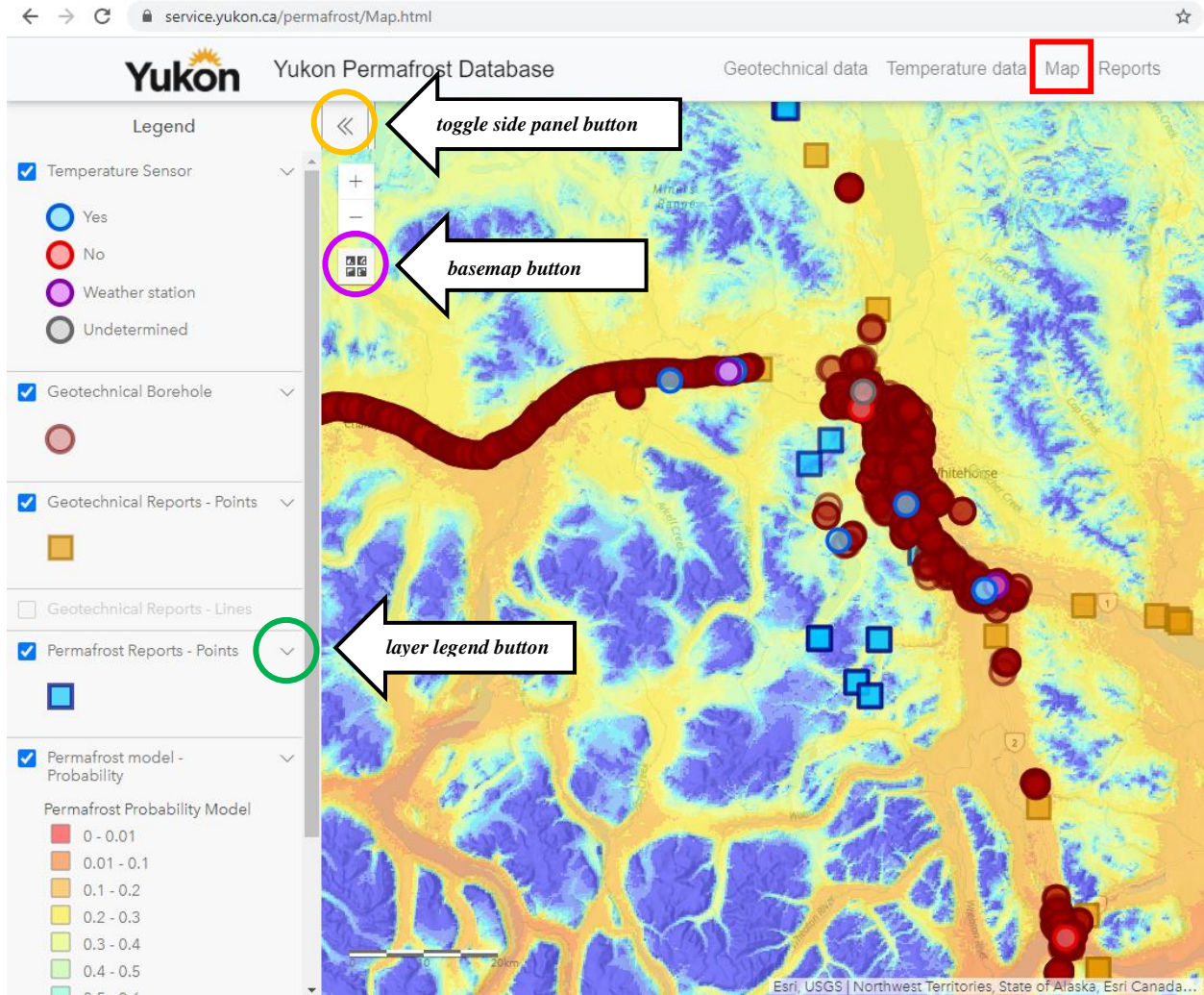


Figure 2. Yukon Permafrost Database compilation web map. The legend side panel may be turned on or off using the “toggle side panel” button (circled in orange). A variety of basemaps, including satellite imagery, can be displayed in the background using the “basemap” button (circled in purple). Legends for individual layers may be expanded or collapsed using the layer legend buttons (circled in green).

Geotechnical data

The location of each site where geotechnical data were collected is displayed through an online interactive web map using a Leaflet mapping library and an ESRI basemap (Fig. 3).

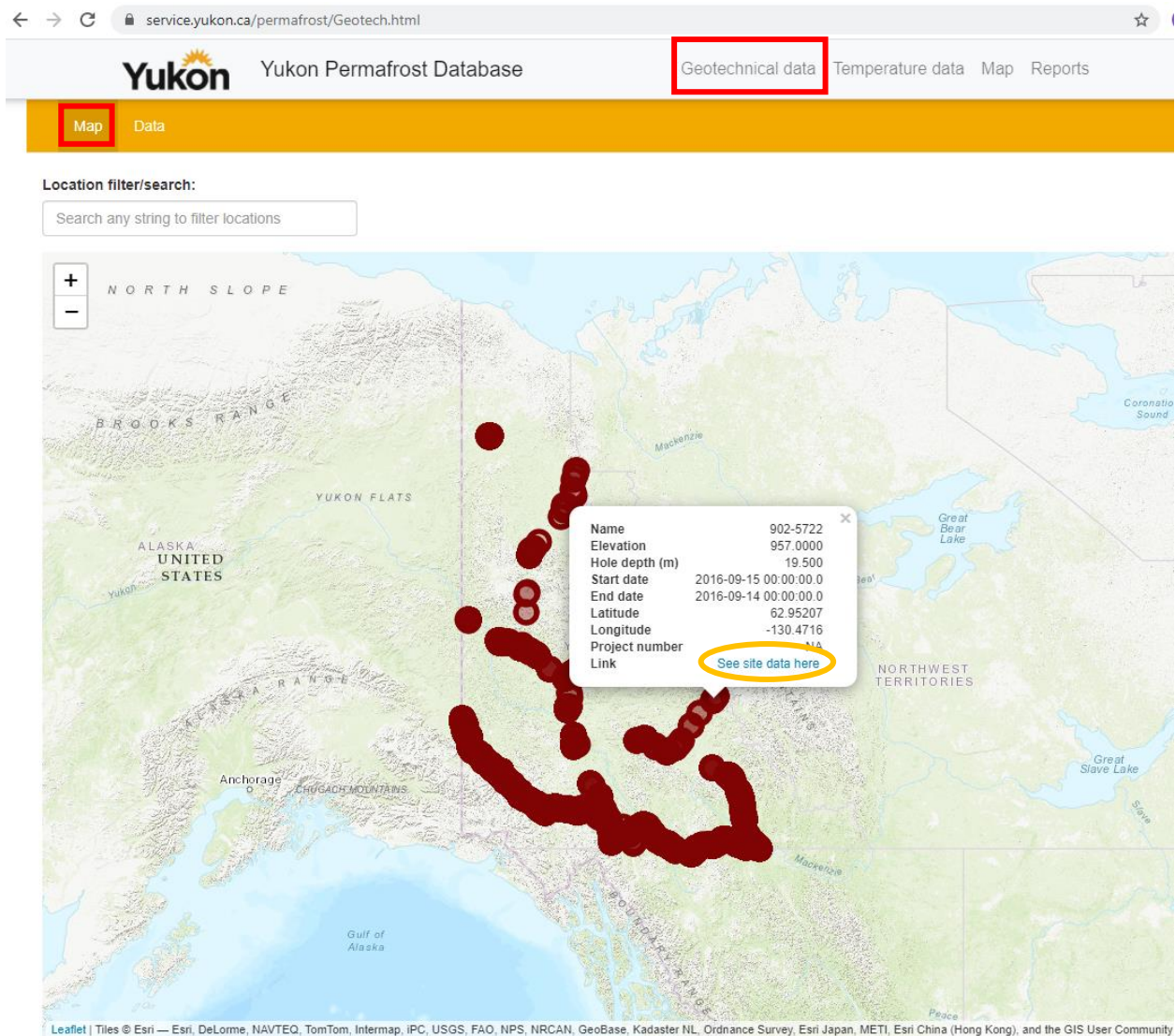


Figure 3. Interactive web map showing locations of all geotechnical data, as of November 2021. When a site location is clicked, a small popup table displays basic site information, including elevation, borehole depth, date of data collection, and coordinates. Clicking the “See site data here” link (circled in orange) will bring you to the “Data” interface shown in Figure 4, where you can browse more detailed geotechnical information for that site.

service.yukon.ca/permafrost/Geotech.html

Yukon Permafrost Database **Geotechnical data** Temperature data Map Reports

Map **Data**

Site: 127-09

Leaflet | Tiles © Esri — Esri, DeLorme, NAVTEQ, TomTom, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

Soil description Permafrost description Samples Metadata

Top depth (m)	Bottom depth (m)	Soil description	USC code
0.00	0.40	ORGANIC MATERIAL	NA
0.40	2.10	SILT WITH SAND (ML), brown, frozen with visible ice	ML
1.60	1.60	-free water	NA
2.10	4.60	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), free water, grindy drilling, maximum 25mm material augered up	SP-SM
4.60	4.60	END HOLE at 4.6m	NA

Soil description **Permafrost description** Samples Metadata

Top depth (m)	Bottom depth (m)	Ice code
0.40	2.10	VX

Soil description Permafrost description **Samples** Metadata

Sample

Sample number	Top depth (m)	Bottom depth (m)	Type	USC code	Comments
1	1.30	1.50	A	ML	SAMPLE_NO: 19, Comments: 2992
2	2.80	3.00	A	SP-SM	SAMPLE_NO: 20, Comments: 2993

Geotech testing

Sample number	Moisture content (%)	Gravel (%)	Sand (%)	Silt (%)	
2		13.00	43.00	49.00	8.00
1		153.00	NA	15.00	85.00

Soil description Permafrost description Samples **Metadata**

Site id	Project name	Hole depth (m)	Start date	End date	Client	Groundwater table
127-09	ALASKA HIGHWAY RECONSTRUCTION	4.60	1991-03-20 00:00:00	1991-03-20 00:00:00	SHAKWAK PROJECT	1.60

Figure 4. Detailed geotechnical data, if available, are presented in a series of up to 4 tabs (outlined in orange): Soil Description, Permafrost Description, Samples and Metadata. Note that where a large number of samples are listed in the “Samples” tab, one may need to scroll down to see all available geotechnical, permafrost and/or environmental laboratory testing results.

Temperature data

The locations of each site where ground temperature or weather data were collected are displayed through an online interactive map using Leaflet mapping library and an ESRI basemap (Figure 5). Coordinates and names of all sites are downloadable in three file types: CSV, shapefile, and KML. The CSV file includes more detailed information for each site including years data collection began and ended, minimum and maximum sensor depths, and if permafrost was present.

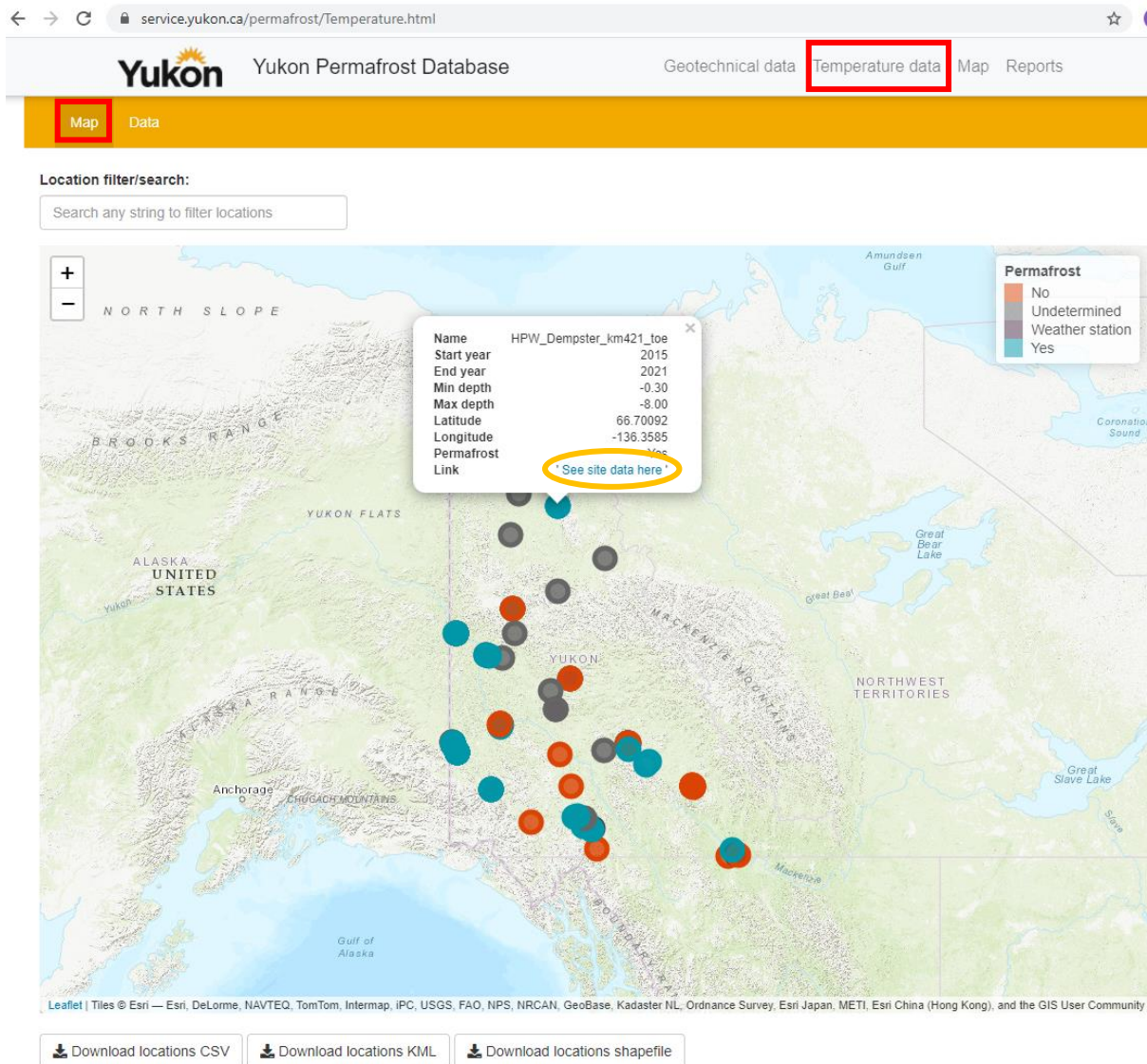


Figure 5. Interactive web map showing locations of ground temperature and weather station sites, as of November 2021. Please note that this map will change as new data are added. When a site location is clicked, a small popup table displays basic site information, including: site name, coordinates, the years data have been collected, minimum and maximum depths of data collection (a negative number indicates below ground surface), and whether or not permafrost has been confirmed there. Clicking the “See site data here” link (circled in orange) will bring you to the “Data” interface shown in Figure 6, where you can browse more detailed temperature information for that site.

Upon selection of a site, ground temperature data can be displayed through the web application interface in a variety of formats by selecting the appropriate tab: time series graph (Fig. 6), table (Fig. 7), and ground temperature envelope (Fig. 8). Time series graphs and tables can be customized using interactive tools to specify depths, dates or aggregation values. The table and temperature envelope are available for download as CSV and PNG files, respectively. Two additional tabs display a large-scale map indicating nearby ground temperature sites, and basic metadata including data source and instrumentation details.



Figure 6. Ground temperature data displayed as a time series graph, produced from the Yukon Permafrost Database’s interactive web application. The sliding scales in the top right corner allow one to customize the depth and years displayed. An aggregation value may also be selected to display daily, monthly or yearly averages.

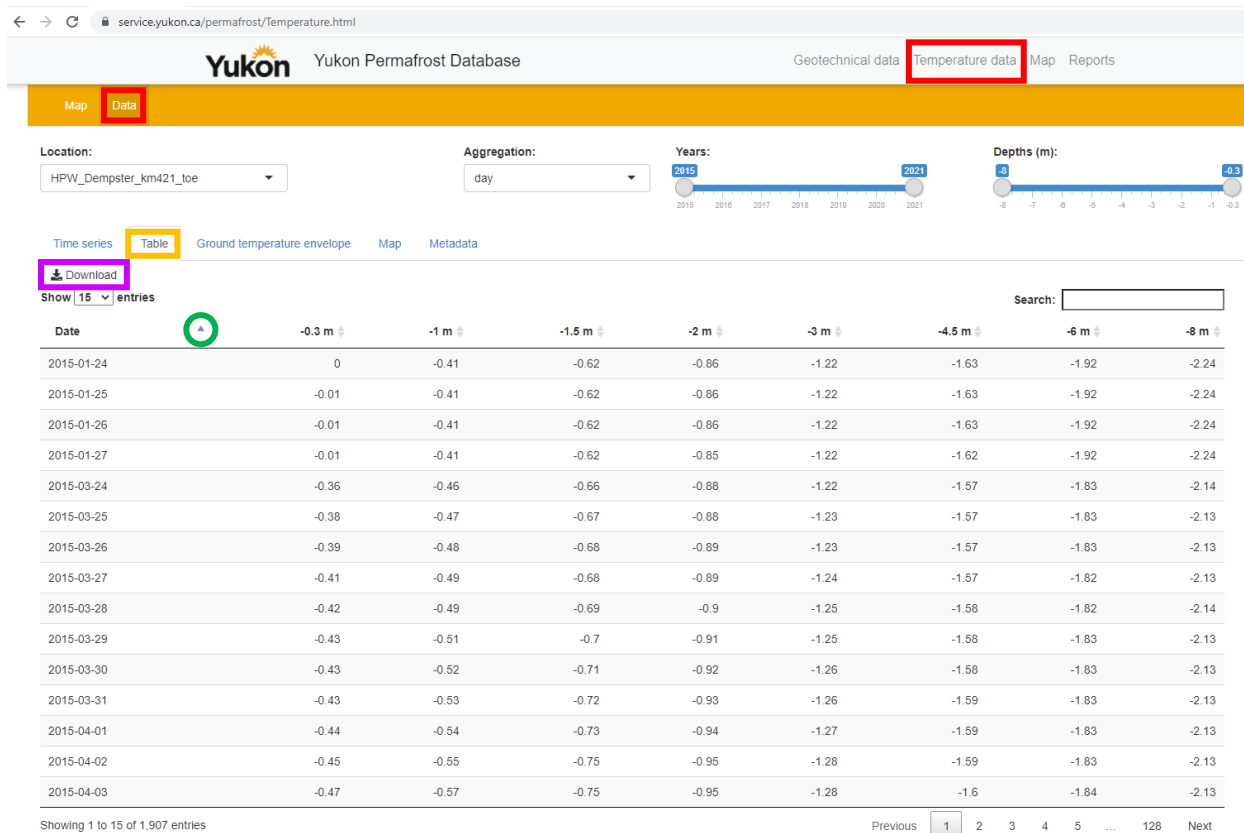


Figure 7. Ground temperature data displayed as a simple data table, produced from the Yukon Permafrost Database’s interactive web application. The sliding scales in the top right corner allow one to customize the depth and years displayed. An aggregation value may also be selected to display daily, monthly or yearly averages. Table columns can be sorted in ascending or descending order using the small arrow buttons (circled in green). The data table can be downloaded in CSV format by pressing the “Download” button (outlined in purple).

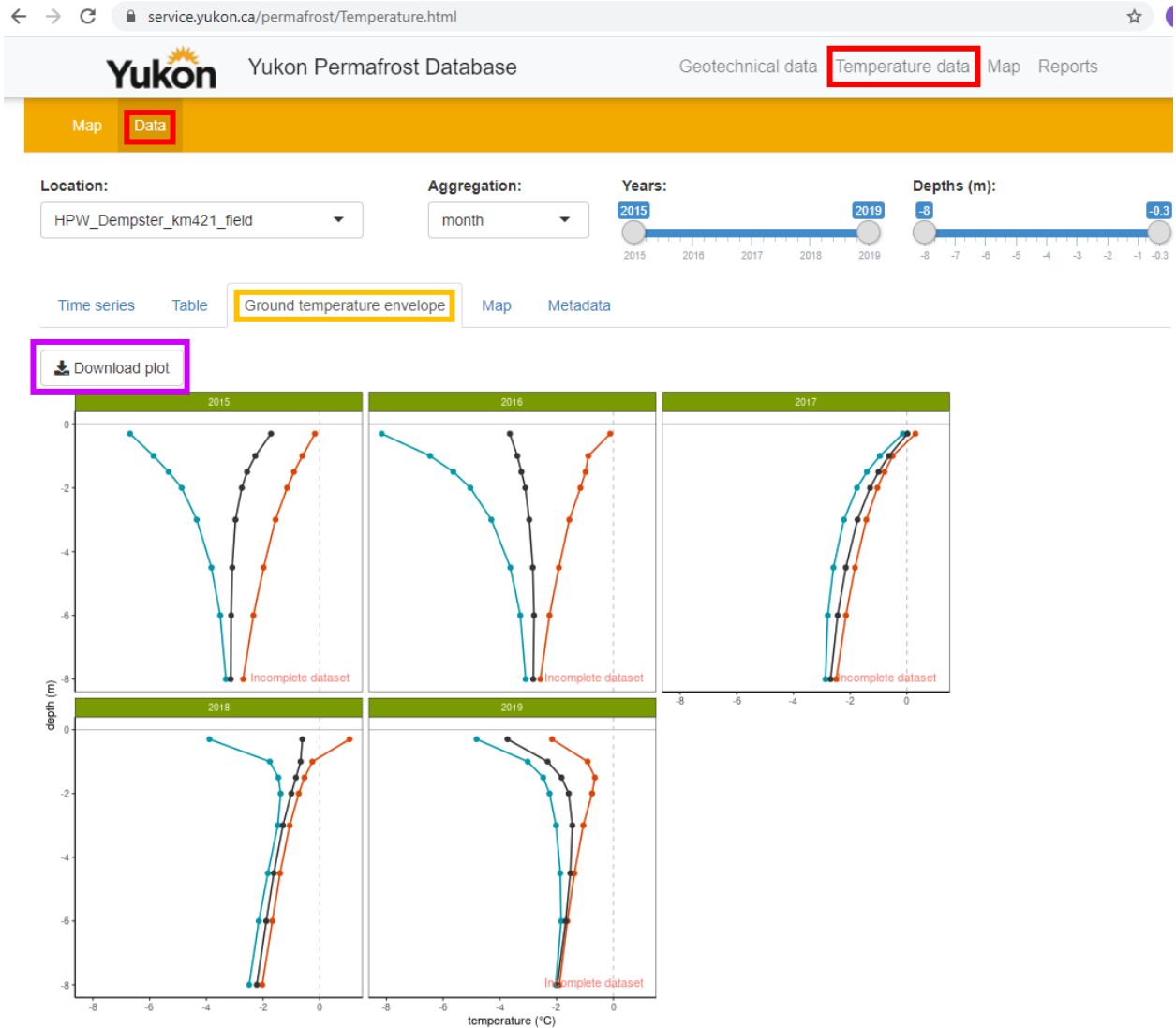


Figure 8. Ground temperature data displayed as yearly ground temperature envelopes (also known as trumpet curves), produced through the Yukon Permafrost Database’s interactive web application. The figures can be downloaded in PNG format by pressing the “Download” button (outlined in purple). “Incomplete dataset” (written in red in the lower right corner of a plot) indicates that some gaps were present in the data from a particular year.

Reports

The reports component of the database is a comprehensive compilation of Yukon permafrost-related documents (e.g., geotechnical reports, academic theses, maps, journal articles, etc.) that will be updated on an annual basis. Point locations and road segments referenced in these documents may be viewed in the geotechnical and permafrost reports layers found in the compilation map (Fig. 9). A list of these reports may also be viewed in tabular format (Fig. 10) from the “View reports” button on the opening Yukon Permafrost Database web page.

An index table, as well as spatial locations of various reports are available for download in a variety of formats (e.g., CSV, file geodatabase, shapefile and KMZ) from the “Download data” section on the opening page of the web application.

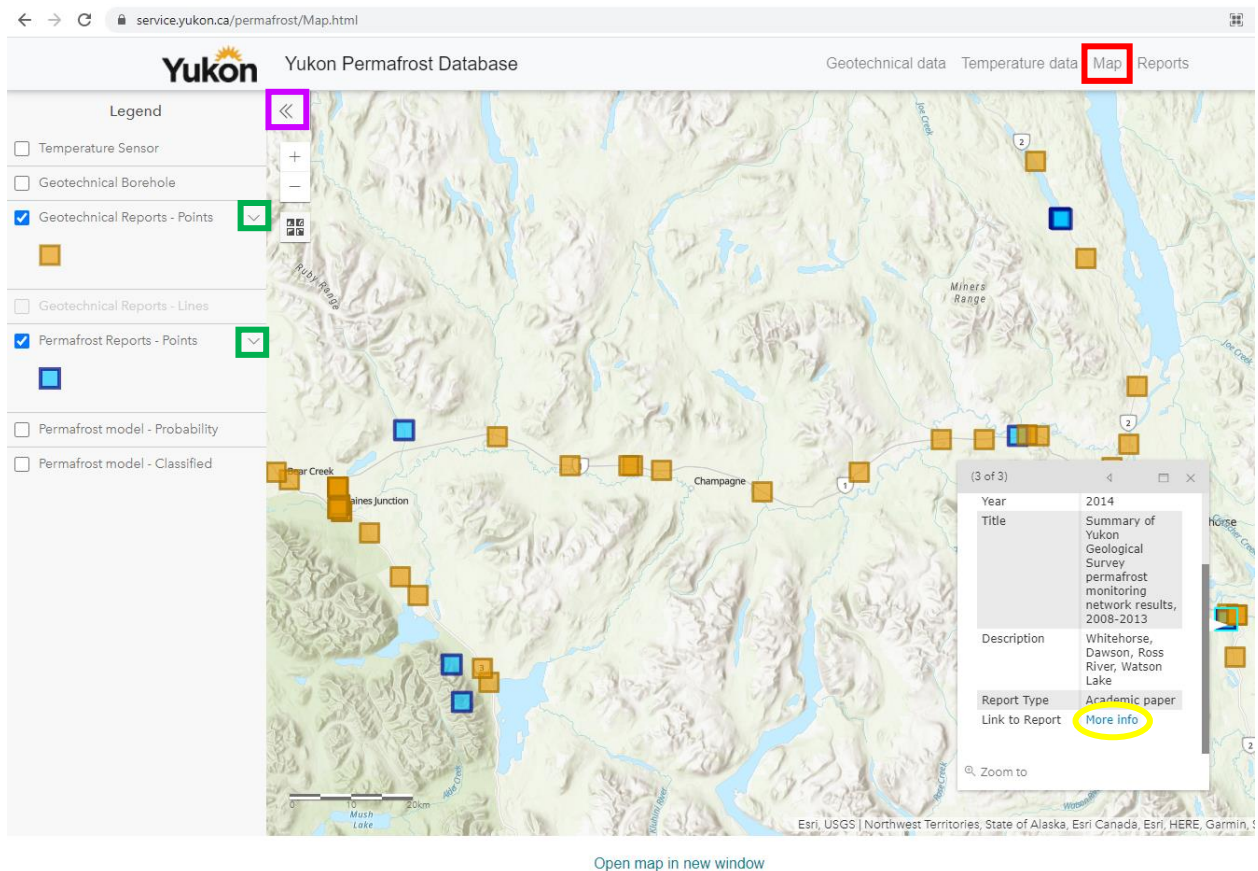


Figure 9. Permafrost-related reports relevant to Yukon can be spatially browsed from the “Map” button on the header banner of the Yukon Permafrost Database web page. To turn the reports layers on, press the “toggle side bar” button (outlined in purple), check on or off the layer(s) of interest, and expand or collapse each layer’s legend using the buttons outlined in green. Clicking on a point will open a popup table where you can view basic metadata and link to a digital copy of the report (if available) by clicking on the “More info” link (circled in yellow).

← → ↻ service.yukon.ca/permafrost/Reports.html

Yukon Yukon Permafrost Database Geotechnical data Temperature data Map **Reports**

Permafrost **Geotechnical**

Show **10** entries Search:

YEAR	TITLE	AUTHOR	REPORT_TYPE	DESCRIPTION
1	2020 Holocene pore-ice 18O and 2H records from drained thermokarst lake basins in the Old Crow Flats, Yukon, Canada	Bandara, Froese, Porter and Calmels	Report	Old Crow Flats
2	2020 Icings and groundwater conditions in permafrost catchments of northwestern Canada	Crites, Kokej and Lacelle	Report	Northern Yukon, ranges from 62 to 69°N and from 118 to 140°W
3	2020 The distribution and dynamics of aufeis in permafrost regions	Ensom et al.	Report	Entire Yukon (Yukon, NWT, Alaska and Russia)
4	2020 Drivers of Holocene palsa distribution in North America	Fewster et al.	Report	North America
5	2020 Ice-wedge polygons distribution, morphometry and state in the Tombstone Territorial Park, Central Yukon, Canada	Frapplier and Lacelle	Report	Tombstone Territorial Park
6	2020 Impact of wildfire on permafrost landscapes: A review of recent advances and future prospects	Holloway et al.	Academic paper	Entire Yukon (Alaska, Canada, Russia and China)
7	2020 Hydrodynamic sorting and degradation of permafrost organic matter in the nearshore zone of Herschel Island (Yukon, Canada)	Jong et al	Academic paper	Herschel Island
8	2020 The Expedition to the Peel River in 2019: Fluvial Transport Across a Permafrost Landscape	Miesner	Report	Peel River
9	2020 The Canadian Water Resource Vulnerability Index - Permafrost Thaw (CWRVIPT)	Spence et al.	Report	Canadian Arctic
10	2020 Landscape-related ground ice variability on the Yukon coastal plain inferred from computed tomography and potential implications on lateral permafrost carbon release	Tanski et al	Academic paper	Yukon Coastal Plain

Showing 1 to 10 of 410 entries Previous **1** 2 3 4 5 ... 41 Next

Figure 10. Permafrost-related reports relevant to Yukon can be browsed in tabular format from the “View reports” button on the opening Yukon Permafrost Database web page. Note that geotechnical reports must be searched separately using the “Geotechnical” tab (outlined in purple). Clicking on the title will redirect the user to a download location, if available.

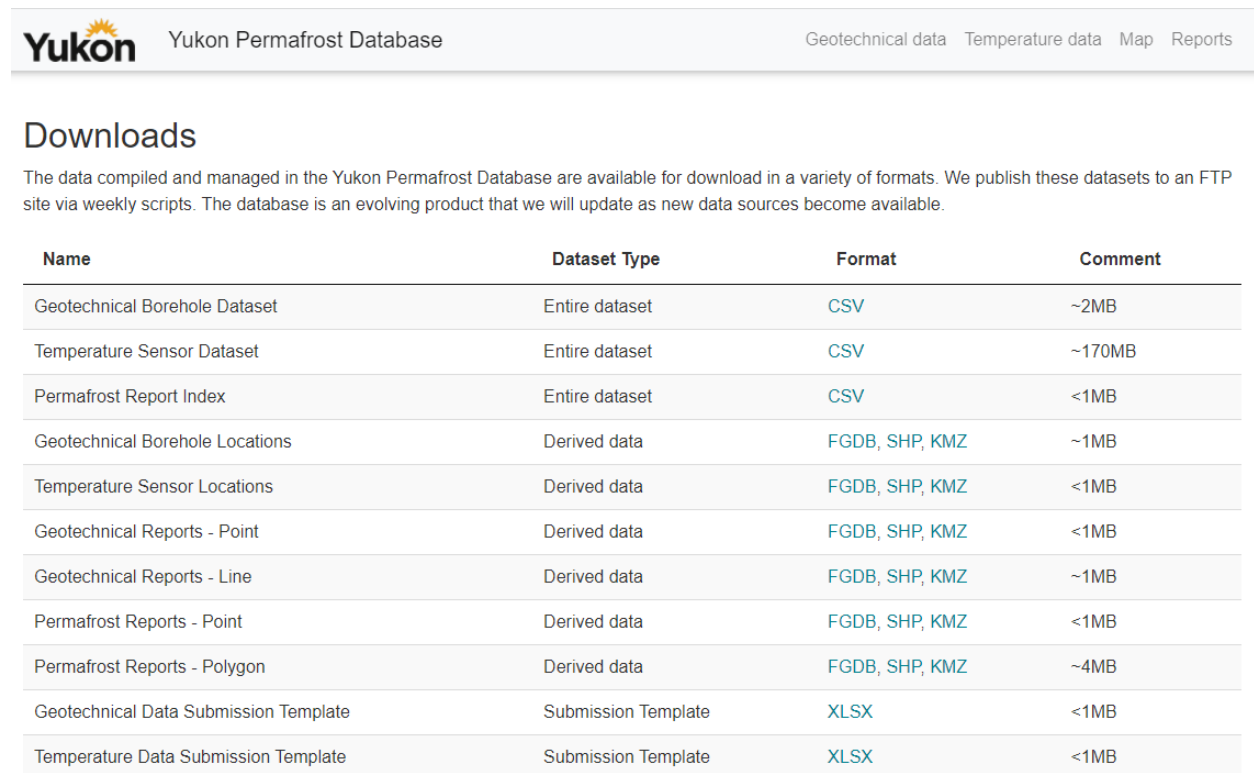
Downloads

A variety of database products are available for download (Fig. 11).

The entire database contents (*i.e.*, individual database tables) are available in CSV format, along with an accompanying PDF file that documents field definitions and data types.

Subsets of the data, including geotechnical borehole locations, temperature sensor locations, and reports are available to download in a variety of spatial data formats, including ESRI file geodatabase (FGDB), ESRI shapefile (SHP) and Google Earth (KMZ).

Geotechnical and temperature data submission forms are also available in MS Excel (XLSX) format. These templates include a detailed description of field types and standards that should be followed for new contributions to the database.



Name	Dataset Type	Format	Comment
Geotechnical Borehole Dataset	Entire dataset	CSV	~2MB
Temperature Sensor Dataset	Entire dataset	CSV	~170MB
Permafrost Report Index	Entire dataset	CSV	<1MB
Geotechnical Borehole Locations	Derived data	FGDB, SHP, KMZ	~1MB
Temperature Sensor Locations	Derived data	FGDB, SHP, KMZ	<1MB
Geotechnical Reports - Point	Derived data	FGDB, SHP, KMZ	<1MB
Geotechnical Reports - Line	Derived data	FGDB, SHP, KMZ	~1MB
Permafrost Reports - Point	Derived data	FGDB, SHP, KMZ	<1MB
Permafrost Reports - Polygon	Derived data	FGDB, SHP, KMZ	~4MB
Geotechnical Data Submission Template	Submission Template	XLSX	<1MB
Temperature Data Submission Template	Submission Template	XLSX	<1MB

Recommended citation: Yukon Geological Survey, year accessed. Yukon Permafrost Database. Government of Yukon, <https://service.yukon.ca/permafrost/>, [accessed (date indicated in readme file)].

For more information, please contact ygs-surficial@yukon.ca.

Figure 11. Downloads available within the Yukon Permafrost Database.

Permafrost model

A high-resolution (30 × 30 m grid cell) permafrost probability model (Fig. 12) covering Yukon south of 65° N latitude was produced by Bonnaventure *et al.* (2012). The model was generated by integrating regional slope, potential incoming solar radiation, and equivalent elevation with the results of field measurements in selected representative areas.

The permafrost model is presented in two separate layers, which may be toggled interactively by swiping a slider bar (circled in red). The probability model provides the raw statistical probability that permafrost is present within a grid cell, in percent. The classified model is generalized into traditional permafrost zones: continuous (permafrost present in greater than 90% of the area); extensive discontinuous (permafrost present in 50–90% of the area); sporadic discontinuous (permafrost present in 10–50% of the area); and isolated patches (permafrost present in less than 10% of the area).

Both the classified model and probability model are available for download in raster format from the links provided in the sidebar.

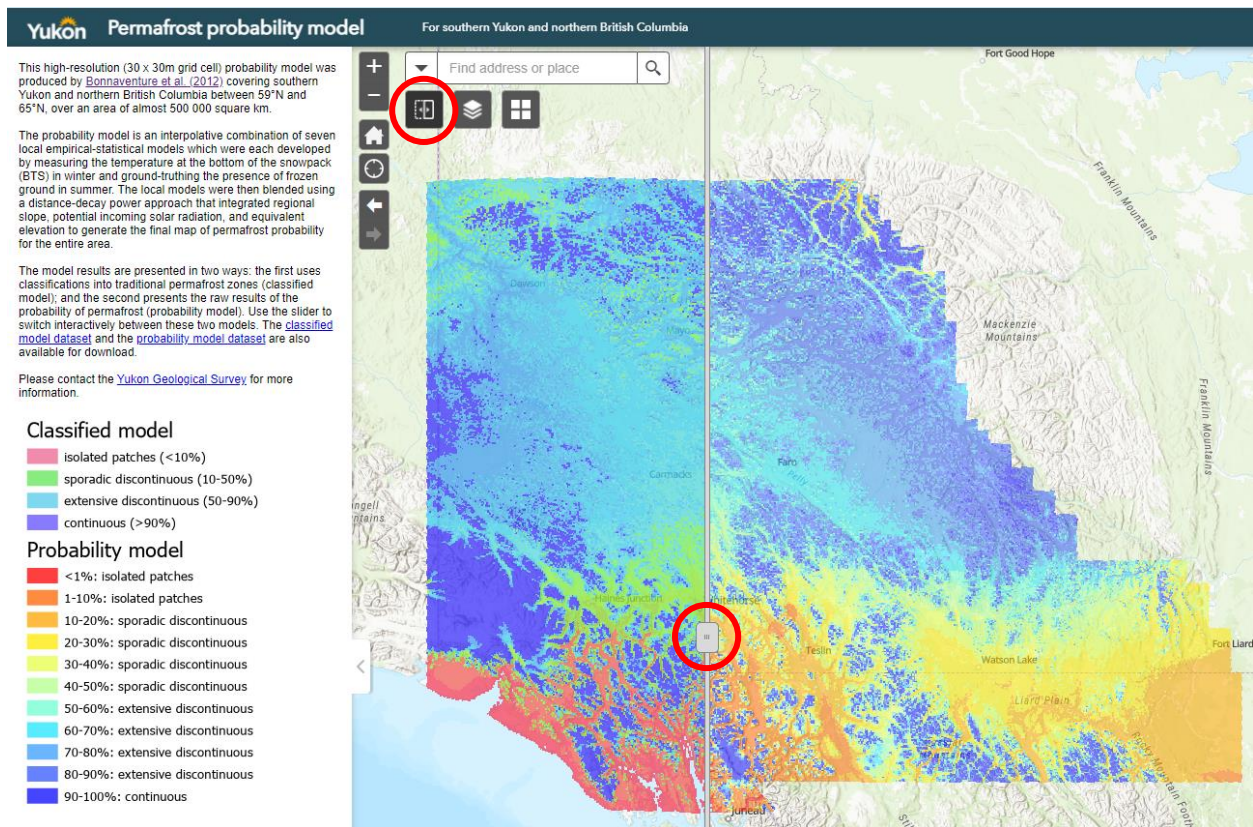


Figure 12. Bonnaventure *et al.* (2012) permafrost probability model for southern Yukon. The model is presented in two separate layers (permafrost zone classified model and raw probability model) which can be toggled by swiping the slider bar (circled in red).

Landform atlas

The Yukon landform atlas highlights permafrost landforms that commonly occur in Yukon, including active layer detachment and retrogressive thaw slump landslides, rock glaciers, pingos, palsas, tors, cryoplanation terraces, solifluction features, ice wedge polygons, patterned ground and thermokarst lakes.

Each class of landform is featured on a separate tab (Fig. 13). Multiple examples of each landform are presented in an interactive storymap format, with links to further information and references provided where available. Links are also provided to download landform locations in a variety of spatial data formats (Google Earth, ESRI file geodatabase and ESRI shapefile).

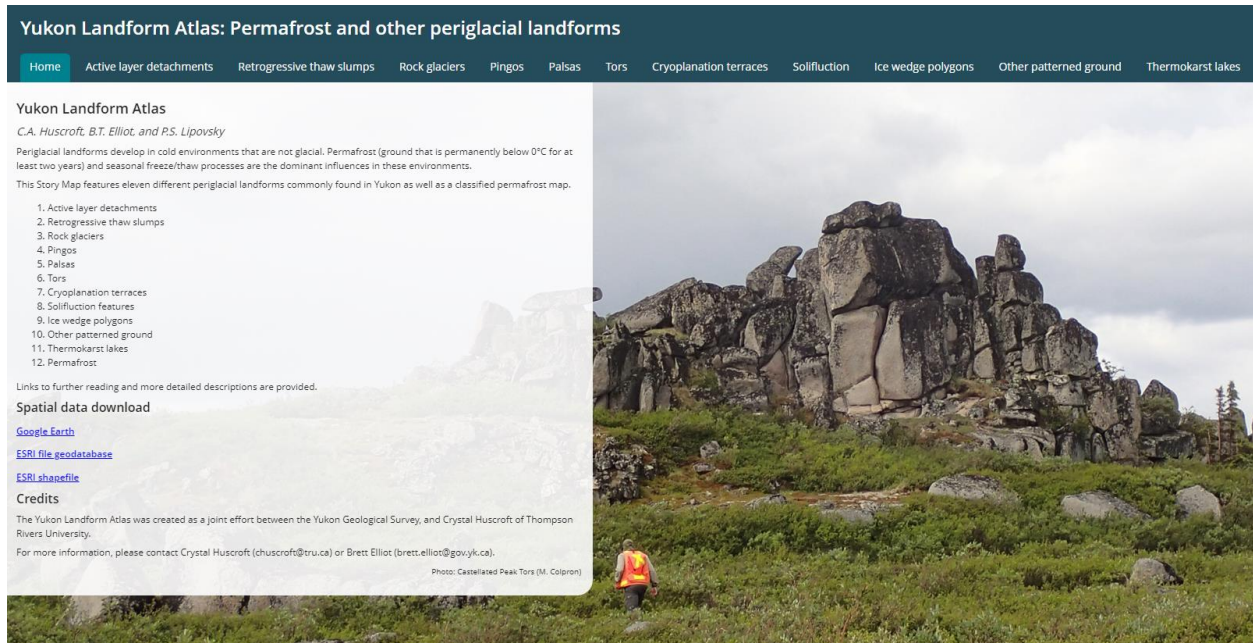


Figure 13. Yukon landform atlas home page. Examples and locations of permafrost landforms commonly found in Yukon may be accessed by clicking on the appropriate tab in the top banner.

References

Bonnaventure, P.P., Lewkowicz, A.G., Kremer, M. and Sawada, M.C., 2012. A permafrost probability model for the southern Yukon and northern British Columbia, Canada. *Permafrost and Periglacial Processes*, vol. 23, p. 52–68, <https://doi.org/10.1002/ppp.1733>.

Lipovsky, P., Humphries, J., Stewart-Jones, E.T and Cronmiller, D., 2022 (*in press*). Yukon Permafrost Database: a new baseline data resource. *In: Yukon Exploration and Geology 2021*. Yukon Geological Survey.