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GEOLOGICAL SURVEY OF CANADA
OPEN FILE 8236

Surficial Data Model: the science language of the integrated Geological Survey of Canada data model for surficial geology maps

Version 2.3.14

C. Deblonde, R.B. Cocking, D.E. Kerr, J.E. Campbell, S. Eagles, D. Everett, D.H. Huntley, E. Inglis, M. Parent, A. Plouffe, L. Robertson, I.R. Smith, and A. Weatherston

2018

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Publications in this series have not been edited; they are released as submitted by the author.

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Introduction

The Geological Survey of Canada (GSC) through the Geo-mapping for Energy and Minerals Program (GEM) has undertaken the Geological Map Flow project (GMF) to develop protocols for the collection, management (compilation, interpretation), and dissemination of surficial and bedrock geology data and map information. This document presents the version 2.3.14 of the science language implemented in the GIS data model and workflow for the production of surficial geology maps and datasets at the GSC. It represents an update by the GSC Surficial Geology Legend Committee to the Surficial Data Model (SDM) version 2.2.0 that was published by Cocking et al., 2016.

Background and objective

The science language for surficial geology maps was designed with the aim of facilitating the transition from the traditional way of publishing paper maps to the production of standardized digital data sets with a structured database. Hence, the focus of this document is based on symbolization with an effort to standardize the scientific terminology used to describe the various entities present on a surficial geology map. The GIS data model and workflow are implemented using the ESRI™ ArcGIS™ geodatabase and software.

This Open File contains a summary of additions and modifications (new map units, line and point symbols, feature subtypes, notes on usage, etc.), and a revised suggested order of map units as well as symbols for legends. This Open File includes two posters, Appendix 4: Map Unit Polygons and Appendix 5: Geomorphological Features.

The science language originated from an extensive review of existing geological data models and map legends (Canadian and international). It was then refined by a small working group, known as the GSC Surficial Legend Review Committee, through iterative consultations with GSC surficial geology mappers. The first version of the surficial data model was published as version 1.2 (Deblonde et al., 2012). The working group consists of surficial geology mappers, science editors, and GIS experts.

Following the implementation of version 1.2 of the data model and workflow, all comments and change requests provided by the GSC surficial geology mappers and GIS users were evaluated by the GSC Surficial Legend Review Committee and when required were discussed with the submitters. This Open File presents the resulting updated version of the surficial data model: version 2.3.14. Table A briefly describes how the data model has evolved:

Table A-A brief history of the Surficial Data Model.

Version	Description
1.2	First version available for GSC use
2.0	Minor changes to the geodatabase schema and several additions and modifications to the geomorphological features and map units
2.0.1/2.0.2	Minor typographical edits
2.1.0	Minor additions of new features; addition of geological terms in French in documentation only
2.2.0	Minor additions of new features; removed redundant symbols between geomorphological points and field observations and measurements

Version	Description
2.3.0	Minor additions of new features; addition of new fields to support transferring data to FGP
2.3.14	Minor additions of new features; modification of fields to support FGP

Submitting changes to the Surficial Data Model

The science language for surficial geology maps produced by the GSC will continue to evolve as per the requirements of surficial geology mappers. The science language will be annually updated if required. Submission for additions or changes by GSC mappers should be made using these editable PDF forms:

Surficial Feature Modification Form (English)	PDF	Use this form to submit suggestions for a symbol for a surficial geological feature.
Formulaire visant la modification d'entités superficielles (Français)	PDF	Utilisez ce formulaire pour soumettre des suggestions pour un symbole pour une structure géologique des dépôts meubles.

Completed forms should be sent to the "Surficial Geology Legend/Légende des formations superficielles" email available in the Natural Resources Canada internal email address list. Questions, comments, and suggested changes by collaborators outside the GSC are welcome. They can be sent to any of the authors of this publication. The annual deadline for submitting suggested changes or additions is November 1st.

All submissions will be reviewed by the Surficial Legend Review Committee by December 1st of that year, and approved changes will be implemented in the surficial data model by February 1st of the following year. Requested changes should be submitted as soon as they are identified by mappers to avoid a large number of review requests in November of each year.

Science language and symbolization

As an integral part of the data model, this document presents changes to the science language and data symbolization required to produce standardized surficial geology data and maps at a scale of 1:100 000; however, the same symbols and units are applicable for surficial geology maps at a range of scales.

The science language is divided into three components:

1. Map units (polygons and boundaries)
2. Geomorphological features (polygons, lines, and points)
3. Field observations and measurements (Field observations and measurements are digitally recorded using a field data collection tool (i.e. GanFeld).)

A summary of the additions and modifications is presented in Appendix 1.

Map Units

Map-unit definition

A map unit is defined as an area of ground distinguishable from surrounding areas by field observation and/or remotely sensed data (e.g. aerial photographs). Map units are based on the physical extent and geometry of the unconsolidated sediments lying between the bedrock and the surface, the sediment properties and characteristics (composition, stratigraphy, surface morphology, thickness, and other properties), and their relationship to other map units. Map units are delineated either in the field or on imagery based on, for example, morphology, thickness, tone, texture, patterns, landform association, vegetation, or feature orientation. These attributes are then used to infer environment of deposition, genesis, and relative geological age. Field sites show where the map unit has been verified with ground observations.

Map-unit designators

A map unit is defined as a combination of upper- and lower-case letters that constitute the map-unit designators (e.g. Cz, Ap) (Fig. 1). One or two upper-case letters defines the dominant primary genesis of the sediments, process and/or environment of deposition, for example:

GL = glaciolacustrine sediments
A = alluvial sediments.

The genesis is followed by one or two lower-case letters that define the category and reflect one of the following (Fig. 1a):

- morphology
- environment of deposition
- thickness of deposit
- secondary processes

If required, the category is followed by a number that defines the subcategory of the map unit (Fig. 1b). The subcategory reflects the following:

- a geological process
- a depositional environment
- the sediment composition
- the structure

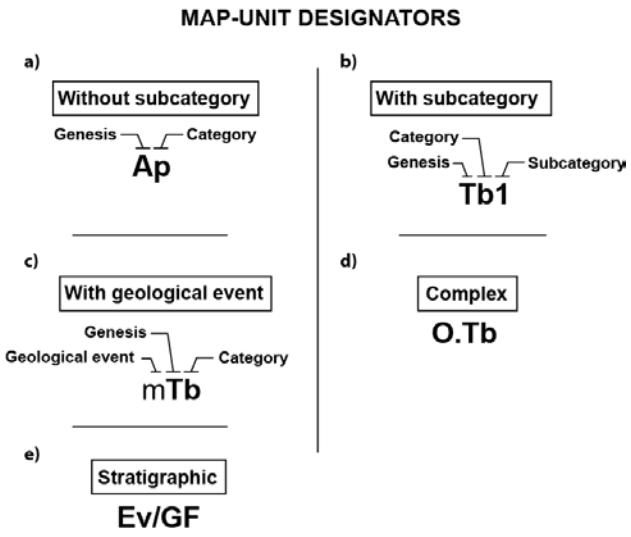

Figure 1 - Map-unit designators as labelled on maps.

If for a given map unit, there is only one subcategory present within the map area (for example, all landslides are retrogressive thaw flow, Cz3), the subcategory is not necessary for the map unit designator but is captured in the database.

In addition to subcategories, map units might need to be differentiated based on geological events. Geological events are defined based on time, provenance, depositional events, or erosional events, and can be divided according to one of the four following characteristics:

1. Chronostratigraphy (e.g. Late Wisconsinan versus Holocene)
2. Ice provenance (e.g. Laurentide versus Cordilleran ice sheets)
3. Glacial and nonglacial intervals of known or unknown absolute age (e.g. Amundsen glaciation and Liverpool Bay interglaciation)

4. Ice readvance (e.g. Tuk Phase ice advance)

The geological-event attribute can be depicted on a map as a prefix in front of the map-unit designator (Fig. 1c). The Appendix 2 presents the current list of geological-event prefixes for map-unit designators. Each prefix is unique.

If a single geological-event attribute is present within a map area, the prefix is not necessary for the map-unit designator but is captured in the database. A prefix is only used for maps with two or more identical map units with different geological-event attribute (e.g. Late Wisconsinan (lw) till versus Neoglacial (n) till). In such a case, the geological-event prefix is mandatory for at least one of the map-unit designators to permit differentiation on the map.

Using the example above, a map with abundant Late Wisconsinan till-blanket polygons and few Neoglacial till-blanket polygons will preferably depict the former as Tb and the latter as nTb. lwTb may not be preferable, as the Late Wisconsinan time and/or provenance attribute (lw) would be the dominant and default geological-event attribute on the map; however, the author has the option to include the attribute prefixes for both types of time and/or provenance polygons, although it is not generally recommended.

As a general principle, the use of a single map-unit designator per polygon is preferred. A maximum of two map-unit designators can be used in cases where the surficial cover forms a complex pattern and the map units are too small to be mapped individually, yet constitute a significant areal extent of the total polygon (e.g. O.Tb designates an area of organic deposits with numerous outcrops of till blanket). In such instances a dot (‘.’) is used to separate the map-unit designators (Fig. 1d).

Also, a stratigraphic relationship can be shown with a maximum of two map-unit designators separated by a slash (‘/’) (e.g. Ev/GF indicates Ev (eolian veneer) overlying GF (glaciofluvial sediments) (Fig. 1e). In both cases of using multiple map-unit designators, the first or the overlying designator determines the map-unit colour. The use of complex designators is not recommended where it is otherwise implicit (e.g. Tv.R or Tv/R). The second designator must also be included in the map legend. **Surficial geology mappers are encouraged to limit the use of complex designators and to avoid mapping large areas with complex designators.**

Examples of map-unit information in the database can be found in Appendix 2.

Map-unit legend description

In the legend, map-unit descriptions should be presented in the following order: map-unit name, grain size, structure, colour, minimum and maximum thickness, morphology, stratigraphic relationships, depositional environment, and other characteristic features.

Map-unit legend order

Map-units in the legend should generally follow a chronological order with the oldest at the bottom and youngest at the top. The order might need to be adapted specifically to a map area.

Map-unit boundaries

Five types of geological boundaries are available to mappers: **defined**, **approximate**, **inferred**, **concealed**, and **arbitrary** through water. Defined, approximate, and inferred boundaries are used, in decreasing order, to define the level of confidence of the location of a map-unit boundary. A concealed boundary can be used, for example, where a defined boundary is now under water since the area was flooded following the construction of a water reservoir. Arbitrary boundaries through water are used during map production to close all polygons under water bodies. This contact type is not shown on the final published map.

Geomorphological features (polygons, lines, and points)

Geomorphological feature definition

Geomorphological features are landforms, sediments, or locations where specific data were collected. Depending on the mapping scale and the size of the feature on the ground, the observation will be represented as a polygon, a line, or a point superimposed on the map-unit polygon. Appendix 5 shows the list of geomorphological features..

Like the map units, geomorphological features are characterized by the environment of deposition, genesis, and relative geological age. These characteristics may be identical or different from the underlying map unit. For example, drumlins (geomorphological feature) could have the same environment of deposition, genesis, and relative age as the underlying till unit, but an active dune field could have different characteristics than the underlying glaciofluvial map unit. Furthermore, for certain features (e.g. terrace scarp, beach crest) the environment of formation generally can be deduced from the underlying and surrounding polygons, but it is also specified in the database.

Similar to map polygons, geological events can be associated with points, lines, overlay polygons, and field observations. They are not labeled on the map but captured in the database in the ‘Geological event name’ field.

Field observations and measurements are separated from other point features in the database to maintain this supplemental data collected in the field.

Overlay Polygon (GEM_POLYS)

An overlay polygon feature can either delineate a grouping of common thematic features that are too small to be mapped individually or a feature that is large enough to be shown as an area. The outline of the feature is digitized to be represented as a patterned symbol.

Line (GEM_LINES)

Use a geomorphology line if the feature is too small to be shown as an area, but long enough to show its true length. The location, length, and orientation of the central axis are shown. The linear axis of the feature is digitized to be represented as a linear symbol. All line symbols are drawn to scale using

the right-side rule: the arrow appears at the end of the line, and the ornamentation appears on the right side of the line as shown in Figure 2.

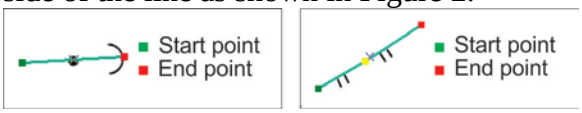

Figure 2 - Line digitizing direction.

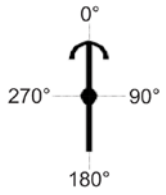

Figure 3 - Point digitizing direction

Point (GEM_POINTS)

Use a geomorphology point if the feature is too small to be shown to scale as an area or a line. The centre location and orientation are shown. The centre location and direction of the feature are digitized to be represented as a point symbol. All point symbols are oriented with zero degrees pointing to the north and based at the centre of the symbol (Fig. 3).

Field observations and measurements symbolized on maps

Field observations and measurement definition

Field observations and measurement information is recorded using a field data collection tool (i.e. GanFeld). Only the information that can be represented as a symbol on a map is shown in the field observations and measurements table. The central location of the field site is digitized to be represented as a point symbol. Figure 4 shows the different data-collection processes.

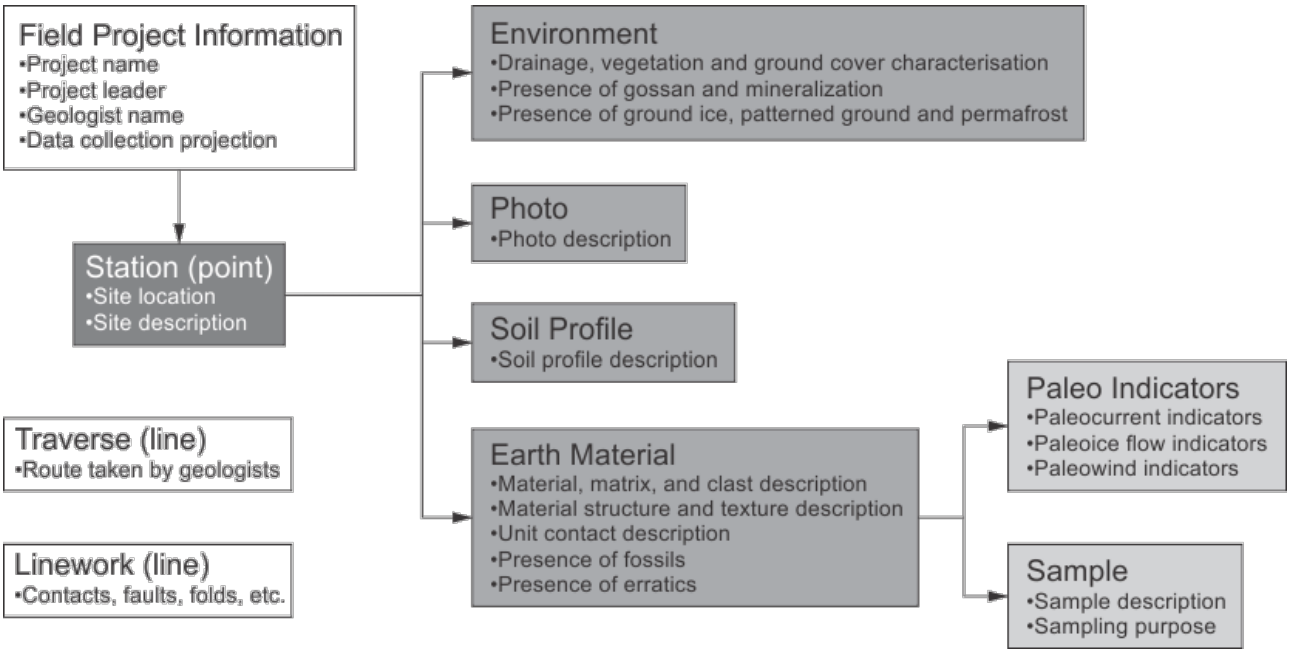

Figure 4 – Field data collection process.

Geomorphological feature order in the map legend

Line and point symbols should be placed below the map units. Like the map units, they should be listed in order of age with the youngest at the top. Generally, features on bedrock are assumed to be oldest. Features formed in subglacial settings are older than those associated with subaerial ice-contact processes, which are assumed to be older than features associated to proglacial sedimentation. Proglacial outwash features are assumed to be older than glacial-lake features. Items that do not have a geological time connotation (e.g. sampling site, gravel pit, field station) are placed at the bottom of the list.

References

Deblonde, C., Plouffe, A., Boisvert, E., Buller, G., Davenport, P., Everett, D., Huntley, D., Inglis, E., Kerr, D., Moore, A., Paradis, S. J., Parent, M., Smith, R., St-Onge, D., and Weatherston, A., 2012. Science language for an integrated Geological Survey of Canada data model for surficial maps, **version 1.2**; Geological Survey of Canada, Open File 7003, 238 p. doi:10.4095/290144

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Cocking, R.B., Deblonde, C., Kerr, D.E., Campbell, J.E., Eagles, S., Everett, D., Huntley, D.H., Inglis, E., Laviolette, A., Parent, M., Plouffe, A., Robertson, L., Smith, I.R., and Weatherston, A., 2016. Surficial Data Model, **version 2.2.0**: Revisions to the science language of the integrated Geological Survey of Canada data model for surficial geology maps; Geological Survey of Canada, Open File 8041, 45 p. doi:10.4095/298767

Acknowledgments

The science language presented here is the result of years of research and collaboration by many research scientists and GIS specialists across the GSC. The GMF project through the GEM program has been the catalyst for the accrued interest and involvement of the GSC community.

The first version of the model (1.2) was reviewed by I. McMartin and J. Bednarski. É. Boisvert, P. Davenport, and S.J. Paradis were major contributors to the initial version of the science language. At one time or another, many people have made a contribution to the model through discussions and comments including J.E. Campbell, A. Duk-Rodkin, A. Dyke, I. McMartin, R. Paulen, and D. Sharpe for the science language, and R. Boivin, M. Boutin, P. Brouillette, V. Dohar, É. Girard, G. Huot-Vézina, G. Lai, D. Lemay, L. MacDonald, K. Shimamura, and S. Williams for the data model.

The current surficial legend review committee includes the surficial geologists A. Plouffe, J.E. Campbell, D.H. Huntley, D.E. Kerr (committee chair), M. Parent, I.R. Smith, and D. St-Onge; the scientific editors E. Inglis, and A. Weatherston; the surficial data model developer C. Deblonde, documentation specialist R. Cocking; and the GIS specialists S. Eagles, D. Everett, and L. Robertson.

Comments and suggestions can be forwarded to any member of the surficial legend review committee.

Appendix 1 Changes since version 2.2.0

New feature class P_INDEX_MAP and related MAP_PID field

Feature class P_INDEXMAP_GSC83:

This new polygon feature class stores publication metadata and is used to assist in porting data into the Federal Geospatial Platform (FGP). This feature class can be related to existing feature classes through the new *MAP_PID* field. P_INDEXMAP_GSC83 has the GCS_North_American_1983 projection.

The following table shows the data structure:

Field Name	Data Type	Length	Domain	Description
MAP_PID	Text	12		Map specific ID that links to feature classes
GEOSCAN_ID	Long integer	10		Map specific GEOSCAN ID given to a publication within the GEOSCAN database
PUB_SERIES_DID	Short integer	5	PUBLICATION _SERIES_DID	The publication series of the map, e.g. Geological Survey of Canada, Canadian Geoscience Map
PUB_ISSUE	Text	10		The publication issue within the series of the map, e.g. 8041
PUB_MAPNUMBER	Short integer	5		The map sheet number within the issue of the map, e.g. 2
PUB_YEAR	Short integer	5		The year up the map's publication
PUB_SCALE_PID	Long integer	10	SCALE_PID	The cartographic scale of the map publication
PUB_TITLE	Text	250		The title of the map publication
PUB _AUTHOR	Text	500		The authors of the map publication
PROV_TERRI_1_DID	Text	10	PROV_TERR_ DID	The first province or territory where the map publication resides
PROV_TERRI_2_DID	Text	10	PROV_TERR_ DID	The second province or territory where the map publication resides (where applicable)
CITATION	Text	~~255~~ 1000 (v2.3.14)		The recommended citation of the map publication
THUMBNAIL_URL	Text	250		The URL of the thumbnail image of the map publication
DOI	Text	~~14~~ 30 (v2.3.14)		The digital object identifier given to the map publication
ISBN	Text	17		The international standard book number given to the map publication
CATALOG_ID	Text	22		The catalog ID given to the map publication
PUB_SERIES_TEXT	Text	100		The text version of the publication series
REMARKS	Text	255		Remarks by an author or technical staff to describe the map publication in further detail
ABSTRACT	Text	2147483647		The English version of the abstract as seen in the map publication
RESUME	Text	2147483647		The French version of the abstract as seen in the map publication

Field Name	Data Type	Length	Domain	Description
SHAPE_Length	Double			
SHAPE_Area	Double			

Field MAP_PID
Field MAP_PID (Text, 12) was added to each of the following nine feature classes:

- F_LINEWORK
- F_STATIONS
- F_TRAVERSE
- GEM_LINES
- GEM_POINTS
- GEM_POLYS
- GEO_BOUND
- GEO_LABELS
- GEO_POLYS

Modified feature class F_STATION and tables F_PHOTO and P_DATA_SOIURCE

Feature class F_STATION
"Coordinates include M values" (to store route data) has been removed

Table F_PHOTO
Field DIRECTION_DID: added DIRECTION_DID domain
This field stores the camera viewing direction.

Table P_DATA_SOURCE

- GEOSCAN_ID: field type text to long integer
- SOURCE_CITATION:
  - field name/alias to CITATION
  - field length from 255 to 1000 characters (v2.3.14)
- DOI field length from 25 to 30 characters (v2.3.14)

New point features Ground Ice and Mineral Occurrence

Notes: **Bold green text** denotes the default value for the field.

Ground ice (all) GEM_POINTS

Field Name	Code	Code Description
Feature-type grouping		Permafrost and periglacial features
Feature-type GIS control field	1891002	Ground ice (all)
Feature type	**189**	Ground ice
Feature-type subset	**283**	Unspecified
	141	Segregated ice
	142	Glacier Ice
Feature-type status	**293**	Not applicable
Feature-type environment	**310**	Not applicable

Field Name	Code	Code Description
Feature-type direction and/or orientation (azimuth)	Range	Not applicable
Feature-type generation	Range	Not applicable
Feature-type GSC symbol code	**3.12.01.019** 	Ground ice (all)
Feature-type notes on symbol usage		Point of observation is based at midpoint of symbol.

Mineral occurrence (all) GEM_POINTS

Field Name	Code	Code Description
Feature-type grouping		Bedrock features
Feature-type GIS control field	1901002	Mineral occurrence (all)
Feature type	**190**	Mineral occurrence
Feature-type subset	**283**	Unspecified
	610	Showing
	611	Prospect
	612	Developed prospect
	613	Deposit
	614	Production
	615	Past production
	616	Unknown
Feature-type status	**293**	Not applicable
Feature-type direction (sense)	**300**	Not applicable
Feature-type environment	**310**	Not applicable
Feature-type direction and/or orientation (azimuth)	Range	Not applicable
Feature-type generation	Range	Not applicable
Feature-type GSC symbol code	**3.04.01.008** 	Mineral occurrence (all)
Feature-type notes on symbol usage		Point of observation is based at midpoint of symbol.

Changes to map unit Weather bedrock or regolith (v2.3.14)

This changes were required in order to add a the new map unit subcategory "Carbonate/calcareous"

Modified map unit W:

1. Modified CONTROL_SID
    - 9201090 W: Weathered bedrock or regolith - Undifferentiated (all) to 9201084 W: Weathered bedrock or regolith - Undifferentiated (unspecified)
    - 9191090 Wv: Weathered bedrock or regolith - Veneer (all) to 9191084 Wv: Weathered bedrock or regolith - Veneer (unspecified)
    - 9151090 - Wb: Weathered bedrock or regolith - Blanket (all) to 9151084 Wb: Weathered bedrock or regolith - Blanket (unspecified)
2. Modified SUBCATEGORY: 909 "Not applicable" to 896 "Unspecified"
3. SYMBOL1_DID stays the same

New map units W1, Wb1. Wv1

- New CONTROL_SID
    - 9201089 W1: Weathered bedrock or regolith - Undifferentiated (carbonate/calcareous)
    - 9191089 Wv1: Weathered bedrock or regolith - Veneer (carbonate/calcareous)
    - 9151089 Wb1: Weathered bedrock or regolith - Blanket (carbonate/calcareous)
- New domains for ULABEL1_DID
    - LABEL_MU1_SID-113: Wv1
    - LABEL_MU1_SID-114: Wb1
    - LABEL_MU1_SID-115: W1
- New values to domain LABEL_MU2_DID for ULABEL2_DID
    - Wv1, Wb1, W1

Short name	Symbol Code	Symbol
Wv: Weathered bedrock or regolith - Veneer (all)	3.01.11.175	RGB: 219 / 145 / 139 CMYK: 14 / 43 / 45 / 0
Wv1: Weathered bedrock or regolith - Veneer (carbonate/calcareous)	3.01.11.175	RGB: 219 / 145 / 139 CMYK: 14 / 43 / 45 / 0
Wb: Weathered bedrock or regolith - Blanket (all)	3.01.11.169	RGB: 218 / 64 / 52 CMYK: 15 / 75 / 80 / 0
Wb1: Weathered bedrock or regolith - Blanket (carbonate/calcareous)	3.01.11.169	RGB: 218 / 64 / 52 CMYK: 15 / 75 / 80 / 0
W: Weathered bedrock or regolith - Undifferentiated (all)	3.01.11.177	RGB: 206 / 108 / 108 CMYK: 19 / 58 / 58 / 0
W1: Weathered bedrock or regolith - Undifferentiated (carbonate/calcareous)	3.01.11.177	RGB: 206 / 108 / 108 CMYK: 19 / 58 / 58 / 0

Renamed "To be defined"

Affects the *F_TYPE_DID*, *CONTROL_SID* and *SYMBOL1_DID* fields.

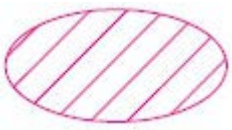
x: Map unit to be defined (all)

Map-unit "x: To be defined (all)" renamed to "**x: Map unit to be defined (all)**"

x: Map unit to be defined (all)	2.01.01.010	

Overlay polygon feature to be defined (all)

Overlay polygon feature "To be defined (all)" renamed to "**Overlay polygon feature to be defined (all)**"

Overlay polygon feature to be defined (all)	2.01.01.009	

Line feature to be defined (all)
Line feature "To be defined (all)" renamed to "**Line feature to be defined (all)**"

Line feature to be defined (all)	2.01.01.009	

Point feature to be defined (all)
Point feature "To be defined (all)" renamed to "**Point feature to be defined (all)**".

Point feature to be defined (all)	2.01.01.006	

Field observation feature to be defined (all)
Field observation feature "To be defined (all)" renamed to "**Field observation feature to be defined (all)**"

Field observation feature to be defined (all)	2.01.01.007	

Modified feature types

Map-unit boundaries (GEO_BOUND): Geological boundary coincident (5341002)
Field LOC_CONF: changed default value from 104 inferred to 287 Defined.

Geomorphological lines (GEM_LINES): Minor meltwater channel central axis (4971064)
Field subset: removed Lateral
Affects the *CONTROL_SID*, *FT_SUBSET_DID* and *SYMBOL1_DID* fields.

Geomorphological points (GEM_POINTS)
Field SENSE_DID: added attributes unknown and unspecified:

- Avalanche track (181002)
- Debris-flow track (1821002)
- Landslide scar (1831002)
- Retrogressive thaw flow (1841002)
- Unspecified slope movement (1851002)
- Gelifluction-lobe or solifluction-lobe (1261002)
- Rock glacier (4311002)
- Alluvial fan (4091002)
- Ice-contact delta (4161002)

Modified field default values

- Fields HYDRO_INTERSECT_DID: set default value to null
- Fields DISPLAY_PUB_DID:
    - Set null allowed to yes
    - Set default value to null

Changes to domains GEO_EVENT_PID and SCALE_PID

GEO_EVENT_PID

- replaced descriptions (the description was repeated twice)
- added pf: Pre-Fraser glaciation”
- renamed pbu: Pre-Buckland to Pre-Buckland glaciation
- renamed r to re: Reid glaciation
- added r: Recent’

SCALE_PID (2.3.14)

Added scales: 5000, 10000, 15000, 20000, 25000, 125000, 200000, 253400, 253440, 500000, 1000000, 5000000

Appendix 2

Geological events domain

Notes: Only items that have changed appear in the columns of version 2.3.14. New (**in blue**) and revised (**in red**) items are highlighted in the table.

Geological event category	Geological event name	Geological event prefix
CHRONOSTRATIGRAPHY	**Recent**	**r**
	Neoglacial	n
	Early Holocene	eh
	Holocene	h
	Pleistocene	p
	Late Pleistocene	lp
	Middle Pleistocene	mp
	Early Pleistocene	ep
	Wisconsin(an)	w
	Late Wisconsin(an)	lw
	Pre-Late Wisconsin(an)	plw
	Middle Wisconsin(an)	mw
	Early Wisconsin(an)	ew
	Pliocene	pi
	Sangamon(ian)	s
	Quaternary	q
	Middle Quaternary	mq
INTERGLACIATION	Liverpool Bay interglaciation	lbi
	Morgan Bluffs interglaciation	mb
	Cape Collinson interglaciation	cc
ICE PROVENANCE	Laurentide Ice Sheet	l
	Pre-Laurentide Ice	pl
	Cordilleran Ice Sheet	c
	Hybrid montane and Laurentide Ice	hy
	Innuitian Ice	i
	Melville Ice	mi
	Keewatin Sector Ice	ks
	Labrador Sector Ice	ls
GLACIATION	Amundsen glaciation	a

Geological event category	Geological event name	Geological event prefix
	Amundsen glaciation (Russell stade)	ar
	Amundsen glaciation (Viscount Melville lobe)	av
	Amundsen glaciation (M'Clure stade)	am
	Amundsen glaciation (M'Clure stade, Prince of Wales lobe)	amw
	Amundsen glaciation (M'Clure stade, Thesiger lobe)	amt
	Amundsen glaciation (M'Clure stade, Prince Alfred lobe)	amp
	Thomsen glaciation	t
	Banks glaciation	b
	McConnell glaciation	m
	Buckland glaciation	bu
	Pre-Buckland **glaciation**	pbu
	Reid glaciation	**re**
	Pre-Reid glaciations	pr
	Klaza glaciation	k
	Nansen glaciation	ns
	Mountain River glaciation	mm
	Gayna River glaciation	gr
	Vashon glaciation	v
	Pre-Vashon glaciation	pv
	Fraser glaciation	f
	Pre-Fraser glaciation	**pf**
	Illinoian glaciation	il
GLACIAL ADVANCE/READVANCE	Fraser glaciation ice advance	fa
	Tutsieta Lake Phase ice advance	tl
	Kelly Lake Phase ice advance	kl
	Katherine Creek Phase ice advance	kc
	Sitidgi Stade ice advance	si
	Tuk Phase ice advance	tu
	Toker Point Stade/Member ice advance	tp
	Franklin Bay Stade ice advance	fb
	Mason River glaciation ice advance	mr
	Hadley Bay readvance	hb
Other	Uncertain; Uncorrelated; Undifferentiated age	un

Examples of map-unit information in the geodatabase

Database fields	Map-unit designators as labeled on maps				
	Ap	**O.Tb**	**Cz2**	**Ev/GF**	**GFt**
Primary unit. Map-unit GIS control field.	Ap: Alluvial sediments - Floodplain sediments (All)	O: Organic deposits - Undifferentiated deposits (All)	Cz2: Colluvial and mass-wasting deposits - Landslide deposits (Mud flow)	Ev: Eolian sediments - Veneer (All)	GFt: Glaciofluvial sediments - Terraced sediments (All)
Primary unit. Map-unit type.	Alluvial sediments - Floodplain sediments	Organic deposits - Undifferentiated deposits	Colluvial and mass-wasting deposits - Landslide deposits	Eolian sediments - Veneer	Glaciofluvial sediments - Terraced sediments
Primary unit. Map-unit subcategory.	Not applicable	Not applicable	Mud flow	Not applicable	Not applicable
Primary unit. Map-unit label.	Ap	O	Cz2	Ev	GFt
Primary unit. Map-unit geological event.		Holocene			Neoglacial
Primary unit. Map-unit GSC symbol code.	3.01.04.265	3.02.02.012	3.01.01.155	3.01.03.292	3.01.07.249
Relation between primary and secondary units	None	Complex	None	Stratigraphic	None
Secondary unit. Map-unit type.		Glacial sediments - Blanket		Glaciofluvial sediments - Undifferentiated sediments	
Secondary unit. Map-unit subcategory.		Unspecified		Not applicable	
Secondary unit. Map-unit label.		Tb		GF	
Secondary unit. Map-unit geological event.		Reid Glaciation			
Map-unit remarks.	Last flooded in 2006				

Appendix 3 Map unit and features in legend order

Short name	Symbol Code	Symbol
Glacier ice or snowpack		
Isn: Glacial Ice or Snowpack - Snowpacks (all)	3.01.15.001	
I: Glacial Ice or Snowpack - Glacier or icefield or icecap (all)	3.01.15.002	
Anthropogenic		
H: Anthropogenic deposits - Undifferentiated (all)	3.01.14.715	RGB: 193 / 139 / 138 CMYK: 24 / 45 / 46 / 0
Organic		
Owf: Organic deposits - Fen deposits (all)	3.01.02.011	RGB: 231 / 231 / 232 CMYK: 9 / 9 / 9 / 0
Owb: Organic deposits - Bog deposits (all)	3.01.02.013	RGB: 189 / 190 / 193 CMYK: 26 / 25 / 24 / 0
Ows: Organic deposits - Salt marsh (all)	3.01.02.015	RGB: 148 / 149 / 153 CMYK: 42 / 42 / 40 / 0
Ov: Organic deposits - Veneer (all)	3.01.02.023	RGB: 181 / 171 / 179 CMYK: 29 / 33 / 30 / 0
Ob: Organic deposits - Blanket (all)	3.01.02.025	RGB: 142 / 129 / 140 CMYK: 44 / 49 / 45 / 0
O: Organic deposits - Undifferentiated deposits (all)	3.01.02.012	RGB: 210 / 211 / 213 CMYK: 18 / 17 / 16 / 0
Eolian		
El: Eolian sediments - Loess (all)	3.01.03.295	RGB: 226 / 211 / 147 CMYK: 11 / 17 / 42 / 0
Er: Eolian sediments - Dunes (all)	3.01.03.299	RGB: 206 / 184 / 65 CMYK: 19 / 28 / 75 / 0
Ev: Eolian sediments - Veneer (all)	3.01.03.292	RGB: 242 / 236 / 208 CMYK: 5 / 7 / 18 / 0
E: Eolian sediments - Undifferentiated sediments (all)	3.01.03.297	RGB: 214 / 195 / 107 CMYK: 16 / 24 / 58 / 0
Colluvial		
Cf: Colluvial and mass-wasting deposits - Fan sediments (all)	3.01.01.107	RGB: 175 / 130 / 96 CMYK: 31 / 49 / 62 / 0
Ca1: Colluvial and mass-wasting deposits - Apron or talus scree deposits (stratified)	3.01.01.097	RGB: 176 / 104 / 89 CMYK: 31 / 59 / 65 / 0
Ca2: Colluvial and mass-wasting deposits - Apron or talus scree deposits (unstratified)	3.01.01.097	RGB: 176 / 104 / 89 CMYK: 31 / 59 / 65 / 0

Short name	Symbol Code	Symbol
Ca: Colluvial and mass-wasting deposits - Apron or talus scree deposits (unspecified)	3.01.01.097	RGB: 176 / 104 / 89 CMYK: 31 / 59 / 65 / 0
Cz1: Colluvial and mass-wasting deposits - Landslide deposits (avalanche)	3.01.01.155	RGB: 220 / 145 / 122 CMYK: 14 / 43 / 52 / 0
Cz2: Colluvial and mass-wasting deposits - Landslide deposits (mud flow)	3.01.01.155	RGB: 220 / 145 / 122 CMYK: 14 / 43 / 52 / 0
Cz3: Colluvial and mass-wasting deposits - Landslide deposits (retrogressive thaw flow)	3.01.01.155	RGB: 220 / 145 / 122 CMYK: 14 / 43 / 52 / 0
Cz4: Colluvial and mass-wasting deposits - Landslide deposits (rotational landslide)	3.01.01.155	RGB: 220 / 145 / 122 CMYK: 14 / 43 / 52 / 0
Cz5: Colluvial and mass-wasting deposits - Landslide deposits (translational landslide)	3.01.01.155	RGB: 220 / 145 / 122 CMYK: 14 / 43 / 52 / 0
Cz: Colluvial and mass-wasting deposits - Landslide deposits (unspecified)	3.01.01.155	RGB: 220 / 145 / 122 CMYK: 14 / 43 / 52 / 0
Cg: Colluvial and mass-wasting deposits - Rock glacier (all)	3.01.01.139	RGB: 209 / 137 / 93 CMYK: 18 / 46 / 64 / 0
Cv: Colluvial and mass-wasting deposits - Veneer (all)	3.01.01.092	RGB: 227 / 202 / 192 CMYK: 11 / 21 / 25 / 0
Cb: Colluvial and mass-wasting deposits - Blanket (all)	3.01.01.095	RGB: 194 / 139 / 123 CMYK: 24 / 45 / 52 / 0
C: Colluvial and mass-wasting deposits - Undifferentiated deposits (all)	3.01.01.152	RGB: 240 / 207 / 192 CMYK: 6 / 19 / 25 / 0
Alluvial		
Ap: Alluvial sediments - Floodplain sediments (all)	3.01.04.265	RGB: 255 / 247 / 153 CMYK: 0 / 3 / 40 / 0
Af: Alluvial sediments - Fan sediments (all)	3.01.04.257	RGB: 255 / 229 / 107 CMYK: 0 / 10 / 58 / 0
Ai: Alluvial sediments - Intertidal or estuarine sediments (all)	3.01.04.255	RGB: 255 / 234 / 149 CMYK: 0 / 8 / 42 / 0
At: Alluvial sediments - Terraced sediments (all)	3.01.04.269	RGB: 255 / 242 / 42 CMYK: 0 / 5 / 84 / 0
Av: Alluvial sediments - Veneer (all)	3.01.04.252	RGB: 255 / 248 / 212 CMYK: 0 / 3 / 17 / 0
Ab: Alluvial sediments - Blanket (all)	3.01.04.267	RGB: 255 / 245 / 108 CMYK: 0 / 4 / 58 / 0

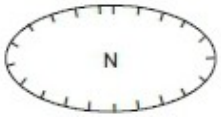
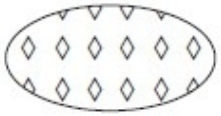
Short name	Symbol Code	Symbol
A: Alluvial sediments - Undifferentiated sediments (all)	3.01.04.263	RGB: 255 / 250 / 194 CMYK: 0 / 2 / 24 / 0
Lacustrine		
Lr: Lacustrine sediments - Beach sediments (all)	3.01.05.582	RGB: 199 / 197 / 226 CMYK: 22 / 23 / 11 / 0
Ld: Lacustrine sediments - Deltaic sediments (all)	3.01.05.585	RGB: 136 / 130 / 189 CMYK: 47 / 49 / 26 / 0
Ln: Lacustrine sediments - Littoral and nearshore sediments (all)	3.01.05.573	RGB: 174 / 185 / 223 CMYK: 32 / 27 / 13 / 0
Lo: Lacustrine sediments - Offshore sediments (all)	3.01.05.577	RGB: 89 / 120 / 186 CMYK: 65 / 53 / 27 / 0
Lv: Lacustrine sediments - Veneer (all)	3.01.05.572	RGB: 199 / 205 / 232 CMYK: 22 / 20 / 9 / 0
Lb: Lacustrine sediments - Blanket (all)	3.01.05.575	RGB: 132 / 147 / 202 CMYK: 48 / 42 / 21 / 0
L: Lacustrine sediments - Undifferentiated sediments (all)	3.01.05.583	RGB: 175 / 172 / 213 CMYK: 31 / 33 / 16 / 0
Marine		
Mt: Marine sediments - Terraced sediments (all)	3.01.06.497	RGB: 117 / 206 / 223 CMYK: 54 / 19 / 13 / 0
Mr: Marine sediments - Beach sediments (all)	3.01.06.497	RGB: 27 / 190 / 210 CMYK: 89 / 25 / 18 / 0
Md: Marine sediments - Deltaic sediments (all)	3.01.05.507	RGB: 22 / 192 / 243 CMYK: 91 / 25 / 5 / 0
Mi: Marine sediments - Intertidal sediments (all)	3.01.06.492	RGB: 200 / 234 / 241 CMYK: 22 / 8 / 5 / 0
Mn: Marine sediments - Littoral and nearshore sediments (all)	3.01.06.493	RGB: 173 / 224 / 234 CMYK: 32 / 12 / 8 / 0
Mo: Marine sediments - Offshore sediments (all)	3.01.06.509	RGB: 0 / 179 / 240 CMYK: 100 / 30 / 6 / 0
Mv: Marine sediments - Veneer (all)	3.01.05.502	RGB: 199 / 235 / 252 CMYK: 22 / 8 / 1 / 0
Mb: Marine sediments - Blanket (all)	3.01.05.505	RGB: 111 / 208 / 246 CMYK: 56 / 18 / 4 / 0
M: Marine sediments - Undifferentiated sediments (all)	3.01.05.503	RGB: 170 / 225 / 250 CMYK: 33 / 12 / 2 / 0
Glaciomarine		
GMr: Glaciomarine sediments - Beach sediments (all)	3.01.09.487	RGB: 59 / 165 / 193 CMYK: 77 / 35 / 24 / 0
GMd: Glaciomarine sediments - Deltaic sediments (all)	3.01.09.525	RGB: 130 / 167 / 196 CMYK: 49 / 35 / 23 / 0

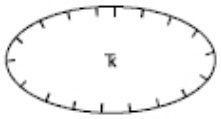
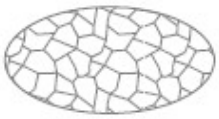
Short name	Symbol Code	Symbol
GMi: Glaciomarine sediments - Intertidal sediments (all)	3.01.09.512	RGB: 199 / 225 / 245 CMYK: 22 / 12 / 4 / 0
GMn: Glaciomarine sediments - Littoral and nearshore sediments (all)	3.01.09.513	RGB: 172 / 211 / 240 CMYK: 33 / 17 / 6 / 0
GMo: Glaciomarine sediments - Offshore sediments (all)	3.01.09.519	RGB: 0 / 151 / 217 CMYK: 100 / 41 / 15 / 0
GMf: Glaciomarine sediments - Submarine outwash fan sediments (all)	3.01.09.527	RGB: 82 / 142 / 178 CMYK: 68 / 44 / 30 / 0
GMm: Glaciomarine sediments - Submarine moraine complex (all)	3.01.09.483	RGB: 45 / 166 / 222 CMYK: 82 / 35 / 13 / 0
GMv: Glaciomarine sediments - Veneer (all)	3.01.09.483	RGB: 175 / 210 / 225 CMYK: 31 / 18 / 12 / 0
GMb: Glaciomarine sediments - Blanket (all)	3.01.09.485	RGB: 125 / 186 / 209 CMYK: 51 / 27 / 18 / 0
GM: Glaciomarine sediments - Undifferentiated sediments (all)	3.01.09.515	RGB: 119 / 187 / 231 CMYK: 53 / 27 / 9 / 0
Glaciolacustrine		
GLr: Glaciolacustrine sediments - Beach sediments (all)	3.01.08.645	RGB: 191 / 140 / 173 CMYK: 25 / 45 / 32 / 0
GLd: Glaciolacustrine sediments - Deltaic sediments (all)	3.01.08.613	RGB: 197 / 176 / 201 CMYK: 23 / 31 / 21 / 0
GLn: Glaciolacustrine sediments - Littoral and nearshore sediments (all)	3.01.08.612	RGB: 213 / 200 / 218 CMYK: 16 / 22 / 15 / 0
GLo: Glaciolacustrine sediments - Offshore sediments (all)	3.01.08.637	RGB: 169 / 103 / 170 CMYK: 34 / 60 / 33 / 0
GLf: Glaciolacustrine sediments - Subaqueous outwash fan sediments (all)	3.01.08.615	RGB: 164 / 134 / 173 CMYK: 36 / 47 / 32 / 0
GLm: Glaciolacustrine sediments - Subaqueous moraine complex (all)	3.01.08.617	RGB: 140 / 99 / 149 CMYK: 45 / 61 / 42 / 0
GLh: Glaciolacustrine sediments - Hummocky sediments (all)	3.01.08.635	RGB: 188 / 140 / 191 CMYK: 26 / 45 / 25 / 0
GLv: Glaciolacustrine sediments - Veneer (all)	3.01.08.642	RGB: 225 / 203 / 218 CMYK: 12 / 20 / 15 / 0
GLb: Glaciolacustrine sediments - Blanket (all)	3.01.08.647	RGB: 172 / 104 / 149 CMYK: 33 / 59 / 42 / 0
GL: Glaciolacustrine sediments - Undifferentiated sediments (all)	3.01.08.643	RGB: 213 / 181 / 201 CMYK: 16 / 29 / 21 / 0
Glaciofluvial		

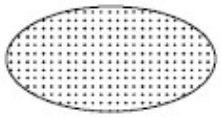
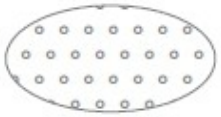
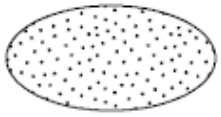
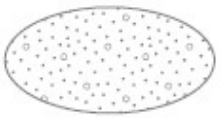
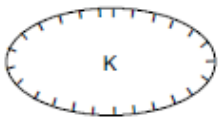
Short name	Symbol Code	Symbol
GFp: Glaciofluvial sediments - Outwash plain sediments (all)	3.01.07.249	RGB: 254 / 200 / 48 CMYK: 0 / 22 / 81 / 0
GFt: Glaciofluvial sediments - Terraced sediments (all)	3.01.07.237	RGB: 253 / 189 / 99 CMYK: 1 / 26 / 61 / 0
GFf1: Glaciofluvial sediments - Outwash fan sediments (subaerial)	3.01.07.225	RGB: 252 / 190 / 135 CMYK: 1 / 25 / 47 / 0
GFf2: Glaciofluvial sediments - Outwash fan sediments (subaqueous)	3.01.07.225	RGB: 252 / 190 / 135 CMYK: 1 / 25 / 47 / 0
GFf: Glaciofluvial sediments - Outwash fan sediments (unspecified)	3.01.07.225	RGB: 252 / 190 / 135 CMYK: 1 / 25 / 47 / 0
GFh: Glaciofluvial sediments - Hummocky sediments (all)	3.01.07.215	RGB: 249 / 173 / 129 CMYK: 2 / 32 / 49 / 0
GFc: Glaciofluvial sediments - Ice-contact sediments (all)	3.01.07.217	RGB: 247 / 145 / 90 CMYK: 3 / 43 / 65 / 0
GFk: Glaciofluvial sediments - Kame terrace (all)	3.01.07.219	RGB: 244 / 116 / 52 CMYK: 4 / 55 / 80 / 0
GFr: Glaciofluvial sediments - Esker (all)	3.01.07.229	RGB: 247 / 144 / 52 CMYK: 3 / 44 / 80 / 0
GFv: Glaciofluvial sediments - Veneer (all)	3.01.07.223	RGB: 254 / 215 / 178 CMYK: 0 / 16 / 30 / 0
GFb: Glaciofluvial sediments - Blanket (all)	3.01.07.247	RGB: 255 / 209 / 103 CMYK: 0 / 18 / 60 / 0
GF: Glaciofluvial sediments - Undifferentiated sediments (all)	3.01.07.235	RGB: 254 / 207 / 140 CMYK: 0 / 19 / 45 / 0
Glacial		
Tg: Glacial sediments - Rock-glacierized moraines (all)	3.01.10.357	RGB: 157 / 206 / 119 CMYK: 38 / 19 / 53 / 0
Th1: Glacial sediments - Hummocky till (carbonate/calcareous)	3.01.10.375	RGB: 163 / 202 / 153 CMYK: 36 / 21 / 40 / 0
Th: Glacial sediments - Hummocky till (unspecified)	3.01.10.375	RGB: 163 / 202 / 153 CMYK: 36 / 21 / 40 / 0
Tm1: Glacial sediments - Moraine complex (carbonate/calcareous)	3.01.10.377	RGB: 132 / 187 / 118 CMYK: 48 / 27 / 54 / 0
Tm: Glacial sediments - Moraine complex (unspecified)	3.01.10.377	RGB: 132 / 187 / 118 CMYK: 48 / 27 / 54 / 0
Tr1: Glacial sediments - Ridged till; moraine (carbonate/calcareous)	3.01.10.385	RGB: 162 / 212 / 157 CMYK: 36 / 17 / 38 / 0
Tr: Glacial sediments - Ridged till; moraine (unspecified)	3.01.10.385	RGB: 162 / 212 / 157 CMYK: 36 / 17 / 38 / 0

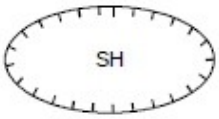
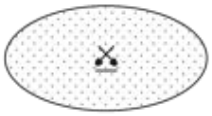
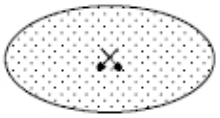
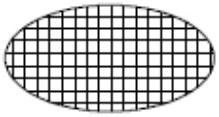
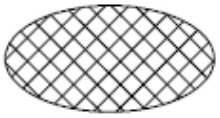
Short name	Symbol Code	Symbol
Ts1: Glacial sediments - Streamlined till (carbonate/calcareous)	3.01.10.387	RGB: 128 / 198 / 121 CMYK: 50 / 22 / 53 / 0
Ts: Glacial sediments - Streamlined till (unspecified)	3.01.10.387	RGB: 128 / 198 / 121 CMYK: 50 / 22 / 53 / 0
Tp1: Glacial sediments - Till plain (carboncarbonate/calcareous)	3.01.10.439	RGB: 40 / 120 / 79 CMYK: 84 / 53 / 69 / 0
Tp: Glacial sediments - Till plain (unspecified)	3.01.10.439	RGB: 40 / 120 / 79 CMYK: 84 / 53 / 69 / 0
Tx1: Glacial sediments - Weathered till (carbonate/calcareous)	3.01.10.057	RGB: 141 / 124 / 98 CMYK: 45 / 51 / 62 / 0
Tx: Glacial sediments - Weathered till (unspecified)	3.01.10.057	RGB: 141 / 124 / 98 CMYK: 45 / 51 / 62 / 0
Tv1: Glacial sediments - Veneer (carbonate/calcareous)	3.01.10.355	RGB: 185 / 219 / 157 CMYK: 27 / 14 / 38 / 0
Tv: Glacial sediments - Veneer (unspecified)	3.01.10.355	RGB: 185 / 219 / 157 CMYK: 27 / 14 / 38 / 0
Tb1: Glacial sediments - Blanket (carbonate/calcareous)	3.01.10.359	RGB: 133 / 197 / 83 CMYK: 48 / 23 / 67 / 0
Tb: Glacial sediments - Blanket (unspecified)	3.01.10.359	RGB: 133 / 197 / 83 CMYK: 48 / 23 / 67 / 0
T: Glacial sediments - Undifferentiated sediments (all)	3.01.10.373	RGB: 200 / 221 / 189 CMYK: 22 / 13 / 26 / 0
Weathered bedrock or regolith		
Wv: Weathered bedrock or regolith - Veneer (all)	3.01.11.175	RGB: 219 / 145 / 139 CMYK: 14 / 43 / 45 / 0
Wv1: Weathered bedrock or regolith - Veneer (carbonate/calcareous)	3.01.11.175	RGB: 219 / 145 / 139 CMYK: 14 / 43 / 45 / 0
Wb: Weathered bedrock or regolith - Blanket (all)	3.01.11.169	RGB: 218 / 64 / 52 CMYK: 15 / 75 / 80 / 0
Wb1: Weathered bedrock or regolith - Blanket (carbonate/calcareous)	3.01.11.169	RGB: 218 / 64 / 52 CMYK: 15 / 75 / 80 / 0
W: Weathered bedrock or regolith - Undifferentiated (all)	3.01.11.177	RGB: 206 / 108 / 108 CMYK: 19 / 58 / 58 / 0
W1: Weathered bedrock or regolith - Undifferentiated (carbonate/calcareous)	3.01.11.177	RGB: 206 / 108 / 108 CMYK: 19 / 58 / 58 / 0
Volcanic deposits		
Vpy: Volcanic deposits - Pyroclastic sediments (all)	3.01.16.705	RGB: 192 / 140 / 156 CMYK: 25 / 45 / 39 / 0

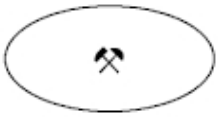
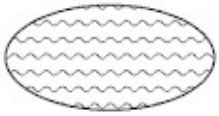
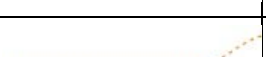
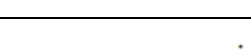
Short name	Symbol Code	Symbol
V: Volcanic deposits - Undifferentiated (all)	3.01.16.707	RGB: 174 / 104 / 130 CMYK: 32 / 59 / 49 / 0
Undifferentiated deposits		
U: Undifferentiated deposits - Undifferentiated deposits (all)	3.01.12.082	RGB: 216 / 198 / 192 CMYK: 15 / 22 / 25 / 0
Bedrock		
R1: Bedrock - Sedimentary (all)	3.01.13.192	RGB: 252 / 211 / 201 CMYK: 1 / 17 / 21 / 0
R2: Bedrock - Igneous (all)	3.01.13.187	RGB: 242 / 113 / 128 CMYK: 5 / 56 / 50 / 0
R3: Bedrock - Metamorphic (all)	3.01.13.183	RGB: 250 / 191 / 190 CMYK: 2 / 25 / 25 / 0
R: Bedrock - Undifferentiated (all)	3.01.13.185	RGB: 246 / 152 / 158 CMYK: 4 / 40 / 38 / 0
Other (0 and x will not appear on a final map)		
0: Unmapped Area (all)	2.01.01.008	no colour no outline
x: Map unit to be defined (all)	2.01.01.010	

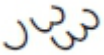
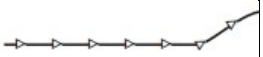
Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Annular Depression (all)	3.14.01.023		
Annular Depression (all)	3.14.01.024		
Nivation Hollow (all)	3.12.01.020 Centroid must be added with CartoRepresentation		
Evaporites (all)	3.14.01.017		
Recently deglaciated area (all)	3.06.01.014		

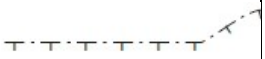
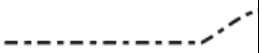
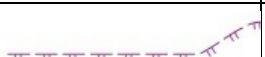
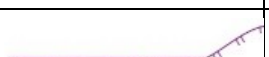
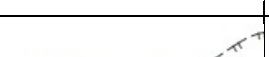
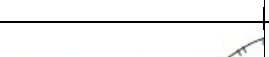
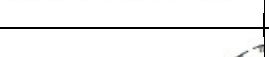
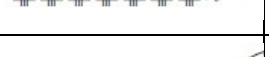
Control	Symbol Code	Symbol Representation	Legend Symbol Representation
	White pattern over colour of geological unit.		
Thermokarst depression (all)	3.12.01.006 Centroid must be added with CartoRepresentation		
Thermokarst depression (all)	3.12.01.006		
Thermokarst-depression observation location (all) (F_ENVIRON)	3.12.01.006		
Patterned ground (all)	3.12.01.016		
Patterned ground (all)	3.12.01.002		
Patterned-ground observation location (all) (F_ENVIRON)	3.12.01.002		
Felsenmeer (all)	3.12.01.023		
Felsenmeer (all)	3.12.01.024		
Felsenmeer Observation Location (all) (F_ENVIRON)	3.05.01.005		

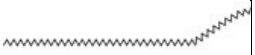
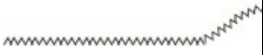
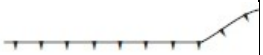
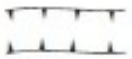
Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Active Dune Field (all)	3.05.01.009		
Dune (direction unknown or unspecified)	3.05.01.008		
Dune (direction known)	3.05.01.009		
Dune observation location (direction known) (F_PFLOW)	3.05.01.008		
Dune observation location (direction known) (F_PFLOW)	3.05.01.008		
Extensive gullied terrain (all)	3.14.01.005		
Eolian Lag Deposit (deflation surface)	3.05.01.006		
Lag deposits (all)	3.14.01.013		
Reworked Sediments (all)	3.14.01.014		
Surface-boulder concentration (all)	3.14.01.015		
Kettle (all)	3.06.01.013 Centroid must be added with CartoRepresentation		

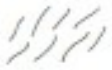
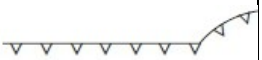
Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Kettle (all)	3.06.01.001		
Area of Sinkholes (all)	3.04.01.007 Centroid must be added with CartoRepresentation		
Sinkhole (all)	3.04.01.001		
Pit: large inactive (all)	3.03.01.009 Centroid must be added with CartoRepresentation		
Pit: large active (all)	3.03.01.009 Centroid must be added with CartoRepresentation		
Pit (status inactive or unspecified)	3.03.01.003		
Pit (status active)	3.03.01.002		
Mine tailing (all)	3.03.01.007		
Made Ground (fill) (all)	3.03.01.006		
Quarry: large (inactive) (all)	3.03.01.010 Centroid must be added with CartoRepresentation		

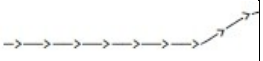
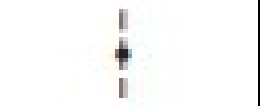
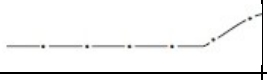
Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Quarry: large (active) (all)	3.03.01.010 Centroid must be added with CartoRepresentation		
Quarry (status inactive or unspecified)	3.03.01.005		
Quarry (status active)	3.03.01.004		
Peat-bog mining (all)	3.03.01.008		
Overlay polygon feature to be defined (all)	2.01.01.009		
Geological boundary (confidence defined)	3.02.01.001		
Geological boundary (confidence approximate)	3.02.01.002		
Geological boundary (confidence inferred)	3.02.01.003		
Geological boundary (confidence concealed)	3.02.01.004		
Geological boundary (confidence arbitrary)	2.01.01.011		
Limit of mapping (limit of mapping)	3.02.01.005		
Geological boundary coincident with other line feature (confidence defined) (all)	2.01.01.002		
Geological boundary coincident with other line feature (confidence approximate) (all)	2.01.01.003		
Geological boundary coincident with other line feature (confidence inferred) (all)	2.01.01.004		
Geological boundary coincident with other line feature (confidence concealed) (all)	2.01.01.005		
Limit of mapping (neatline)	3.02.01.006		

Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Dune Crest (all)	3.05.01.003		 3.15.01.002
Tension fracture (all)	3.02.01.006		
Avalanche track (all)	3.09.01.008		
Avalanche Track (all)	3.09.01.001		
Debris-flow track (all)	3.09.01.009		
Debris-flow track (all)	3.09.01.002		
Landslide escarpment (status inactive or unspecified)	3.09.01.007		 3.15.01.005
Landslide escarpment (status active)	3.09.01.006		 3.15.01.004
Landslide scar, unknown (all)	3.09.01.003		
Landslide scar, known (all)	3.09.01.003		
Retrogressive thaw flow, unknown (all)	3.09.01.004		
Retrogressive thaw flow, known (all)	3.09.01.004		

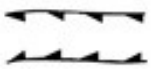
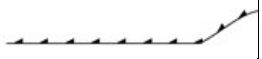
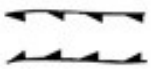
Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Unspecified slope-movement (all)	3.09.01.005		
Cryoplanation terrace scarp (all)	3.12.01.014		
Limit of permafrost (all)	3.12.01.015		
Sediment transport direction (direction unknown or unspecified)	3.14.01.022		
Sediment transport direction (direction known)	3.14.01.021		
Pre-existing coastline (all)	3.13.01.011		
Alluvial bar or levee ridge (all)	3.14.01.009		
Terrace scarp (all)	3.13.01.004		
Ravine scarp (all)	3.14.01.011		
Erosional crest (all)	3.14.01.020		
Beach crest (all)	3.13.01.0021		
Limit of submergence (confidence approximate; environment lacustrine)	3.11.01.012		
Limit of submergence (confidence defined; environment lacustrine)	3.11.01.011		
Limit of submergence (confidence approximate; environment marine)	3.11.01.014		
Limit of submergence (confidence defined; environment marine)	3.11.01.013		
Limit of submergence (confidence approximate; environment glaciomarine)	3.11.01.010		
Limit of submergence (confidence defined; environment glaciomarine)	3.11.01.009		
Limit of submergence (confidence approximate; environment glaciolacustrine)	3.11.01.008		
Limit of submergence (confidence defined; environment glaciolacustrine)	3.11.01.007		

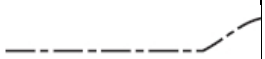
Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Iceberg scour central axis (all)	3.14.01.010		
Iceberg scour (all)	3.14.01.001		
Spillway central axis (direction unknown or unspecified)	-3.10.01.017		
Spillway central axis (direction known)	-3.10.01.012		
Paleodrainage direction (all)	3.10.01.010		
Minor meltwater channel central axis (lateral, marginal, overflow, subglacial, supraglacial or unspecified; direction unknown or unspecified)	3.10.01.009		
Minor meltwater channel central axis (lateral, marginal, overflow, subglacial, supraglacial or unspecified; direction known)	3.10.01.008		
Minor meltwater channel central axis (lateral uphill right)	3.10.01.007		
Minor meltwater channel central axis (lateral uphill left)	3.10.01.006		
Major meltwater channel scarp (all)	3.10.01.005		 Unknown paleodrainage direction: 3.15.01.007  Known paleodrainage direction: 3.15.01.007 + 3.10.01.010
Subglacial meltwater corridor margin (confidence approximate)	3.10.01.016		 3.15.01.013
Subglacial meltwater corridor margin (confidence defined)	3.10.01.015		

Control	Symbol Code	Symbol Representation	Legend Symbol Representation
			3.15.01.012
Partly buried channel scarp (all)	3.10.01.011		 3.15.01.008
Buried valley central axis (direction unknown or unspecified)	3.10.01.014		
Buried valley central axis (direction known)	3.10.01.013		
Other moraine ridge (minor)	3.06.01.012		 3.15.01.003
Minor moraine (orientation unknown or unspecified)	3.06.01.017		
Minor moraine (orientation known) (F_PFLOW)	3.06.01.015		
Major moraine ridge (lateral or laterofrontal)	3.06.01.006		
Major moraine ridge (medial)	3.06.01.008		
Major moraine ridge (end, interlobate, or unspecified)	3.06.01.010		
Major moraine ridge (lateral ice-cored or laterofrontal ice-cored)	3.06.01.007		
Major moraine ridge (medial ice-cored)	3.06.01.009		
Major moraine ridge (end ice-cored, interlobate ice-cored, or unspecified ice-cored)	3.06.01.011		
Ice-contact scarp (all)	3.07.01.007		
Ice-pushed ridge (all)	3.07.01.008		
Ice-thrust ridge (all)	3.07.01.009		
Buried esker ridge (direction unknown or unspecified)	3.07.01.004		

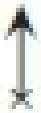
Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Buried esker ridge (direction known or inferred)	3.07.01.003		
Esker ridge (direction unknown or unspecified)	3.07.01.006		
Esker ridge (direction known or inferred)	3.07.01.005		
Esker ridge (with beach ridges/strandlines; direction unknown or unspecified)	3.07.01.011		
Esker ridge (with beach ridges/strandlines; direction known or inferred)	3.07.01.010		
Crevasse-fill ridge (all)	3.06.01.005		
Buried drumlinoid ridge (all)	3.08.01.015		
Buried drumlinoid (all)	3.08.01.002		
Drumlinoid ridge (all)	3.08.01.018		
Drumlinoid (all)	3.08.01.005		
Buried drumlin ridge (all)	3.08.01.014		
Buried drumlin (all)	3.08.01.001		
Drumlin ridge (all)	3.08.01.017		
Drumlin (all)	3.08.01.004		
Crag-and-tail ridge (all)	3.08.01.016		
Crag-and-tail (all)	3.08.01.003		

Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Pre-crag ridge (all)	3.08.01.040		
Pre-crag (all)	3.08.01.0039		
Pre-crag observation location (all) (F_STATION)	3.08.01.039		
Large groove central long axis (direction unknown or unspecified)	3.08.01.022		
Large groove central long axis (direction known)	3.08.01.021		
Fluted bedrock or drift, central long axis (poorly defined; direction unknown or unspecified)	3.08.01.034		
Fluted bedrock or drift (poorly defined; direction unknown or unspecified)	3.08.01.030		
Fluted bedrock or drift, measurement location (poorly defined; direction unknown or unspecified) (F_PFLOW)	3.08.01.030		 3.15.01.001
Fluted bedrock or drift, central long axis (poorly defined; direction known)	3.08.01.033		
Fluted bedrock or drift (poorly defined; direction known)	3.08.01.029		
Fluted bedrock or drift, measurement location (poorly defined; direction known) (F_PFLOW)	3.08.01.029		 3.15.01.001
Fluted bedrock or drift, central long axis(well defined; direction unknown or unspecified)	3.08.01.020		
Fluted bedrock or drift (well defined or unspecified; direction unknown or unspecified)	3.08.01.007		

Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Fluted bedrock or drift, measurement location (well defined or unspecified; direction unknown or unspecified) (F_PFLOW)	3.08.01.007		 3.15.01.001
Fluted bedrock or drift, central long axis (well defined; direction known)	3.08.01.019		
Fluted bedrock or drift (well defined or unspecified; direction known)	3.08.01.006		
Fluted bedrock or drift, measurement location (well defined or unspecified; direction known) (F_PFLOW)	3.08.01.006		 3.15.01.001
Cirque headwall (all)	3.06.01.004		
Arête (all)	3.06.01.003		
Ice-flow direction (direction unknown or unspecified)	3.08.01.025		
Ice-flow direction (direction known)	3.08.01.024		
Limit of glaciation (confidence approximate)	3.11.01.006		
Limit of glaciation (confidence defined)	3.11.01.005		
Dispersal train margin (confidence approximate; left side)	3.08.01.043		 3.15.01.010
Dispersal train margin (confidence approximate; right side)	3.08.01.044		 3.15.01.010
Dispersal train margin (confidence defined; left side)	3.08.01.041		 3.15.01.011
Dispersal train margin (confidence defined; right side)	3.08.01.042		 3.15.01.011

Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Ice-stream margin (confidence approximate)	3.11.01.004		
Ice-stream margin (confidence defined)	3.11.01.003		
Ice-divide (confidence approximate)	3.11.01.002		
Ice-divide (confidence defined)	3.11.01.001		
Bedrock scarp (all)	3.04.01.005		
Lineament or lineation in bedrock (all)	3.04.01.006		
Line feature to be defined (all)	2.01.01.001		
Palsa or lithalsa (all)	3.12.01.001		
Hummock (all)	3.14.01.019		
Hummock observation location (all) (F_STATION)	3.14.01.019		
Pingo (all)	3.12.01.003		
Pingo observation location (all) (F_ENVIRON)	3.12.01.003		
Gelifluction-lobe or solifluction-lobe (all)	3.12.01.022		
Gelifluction-lobe or solifluction-lobe observation location (all) (F_ENVIRON)	3.12.01.022		

Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Rock glacier (all)	3.12.01.004		
Rock-glacier observation location (all) (F_ENVIRON)	3.12.01.004		
Rock pingo (all)	3.12.01.005		
Rock pingo observation location (all) (F_ENVIRON)	3.12.01.005		
Rock-blister observation location (all) (F_ENVIRON)	3.12.01.012		
Rock-burst observation location (all) (F_ENVIRON)	3.12.01.013		
Paleowind measurements location (all) (F_PFLOW)	3.05.01.002		
Deflation landform (direction known)	3.05.01.001		
Deflation landform (direction unknown or unspecified)	3.05.01.007		
Spring observation location (all) (F_STATION)	3.14.01.012		

Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Piping depression (all)	3.10.01.002		
Alluvial fan (all)	3.10.01.001		
Delta (direction unknown or unspecified)	3.13.01.010		
Delta (direction known)	3.13.01.001		
Paleocurrent measurement location (sediments) (F_PFLOW)	3.10.01.003		
Paleocurrent measurement location (bedrock erosional forms) (F_PFLOW)	3.10.01.004		
Ground ice (all)	3.12.01.019		
Ground-ice observation location (all) (F_ENVIRON)	3.12.01.019		
Erratic observation location (all) (F_EARTHMAT)	3.14.01.002		
Kame (all)	3.07.01.002		

Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Till fabric measurement location (direction unknown or unspecified) (F_PFLOW)	3.08.01.026		
Till fabric measurement location (direction known) (F_PFLOW)	3.08.01.012		 3.15.01.001
Striation measurement location (poorly defined; direction unknown or unspecified) (F_PFLOW)	3.08.01.009		
Striation measurement location (poorly defined; direction known) (F_PFLOW)	3.08.01.008		 3.15.01.001
Striation measurement location (well defined; direction unknown or unspecified) (F_PFLOW)	3.08.01.011		
Striation measurement location (well defined or unspecified; direction known) (F_PFLOW)	3.08.01.010		 3.15.01.001
Striation measurement location from legacy data (poorly defined; direction unknown or unspecified) (F_PFLOW)	3.08.01.036		
Striation measurement location from legacy data (poorly defined; direction known) (F_PFLOW)	3.08.01.035		 3.15.01.001
Striation measurement location from legacy data (well defined or unspecified; direction unknown or unspecified) (F_PFLOW)	3.08.01.038		

Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Striation measurement location from legacy data (well defined or unspecified; direction known) (F_PFLOW)	3.08.01.037		 3.15.01.001
Tor (all)	3.04.01.003		
Mineral occurrence (all)	3.04.01.008		
Gossan observation location (all) (F_ENVIRON)	3.14.01.004		
Small outcrop (all)	3.04.01.002		
Drillhole location (all)	3.03.01.001		
Fossil observation location (all) (F_EARTHMAT)	3.14.01.003		
Station location (remote observation, waypoint, or unspecified) (F_STATION)	3.14.01.008		
Station location (ground observation or stratigraphic section) (F_STATION)	3.14.01.007		
Sample analysis results (dating) (F_SAMPLE)	3.14.01.018		

Control	Symbol Code	Symbol Representation	Legend Symbol Representation
Sample location (all) (F_SAMPLE)	3.14.01.006		
Point feature to be defined (all)	2.01.01.006		
Field observation feature to be defined (all) (F_STATION)	2.01.01.007		

Appendix 4 Map unit polygons poster

Appendix 5 Geomorphological features poster