Ministry of Mining and Critical Minerals

British Columbia Geological Survey Geoscience Map 2025-03

Surficial geology of the Carruthers Pass area, British Columbia (NTS 94D/8)

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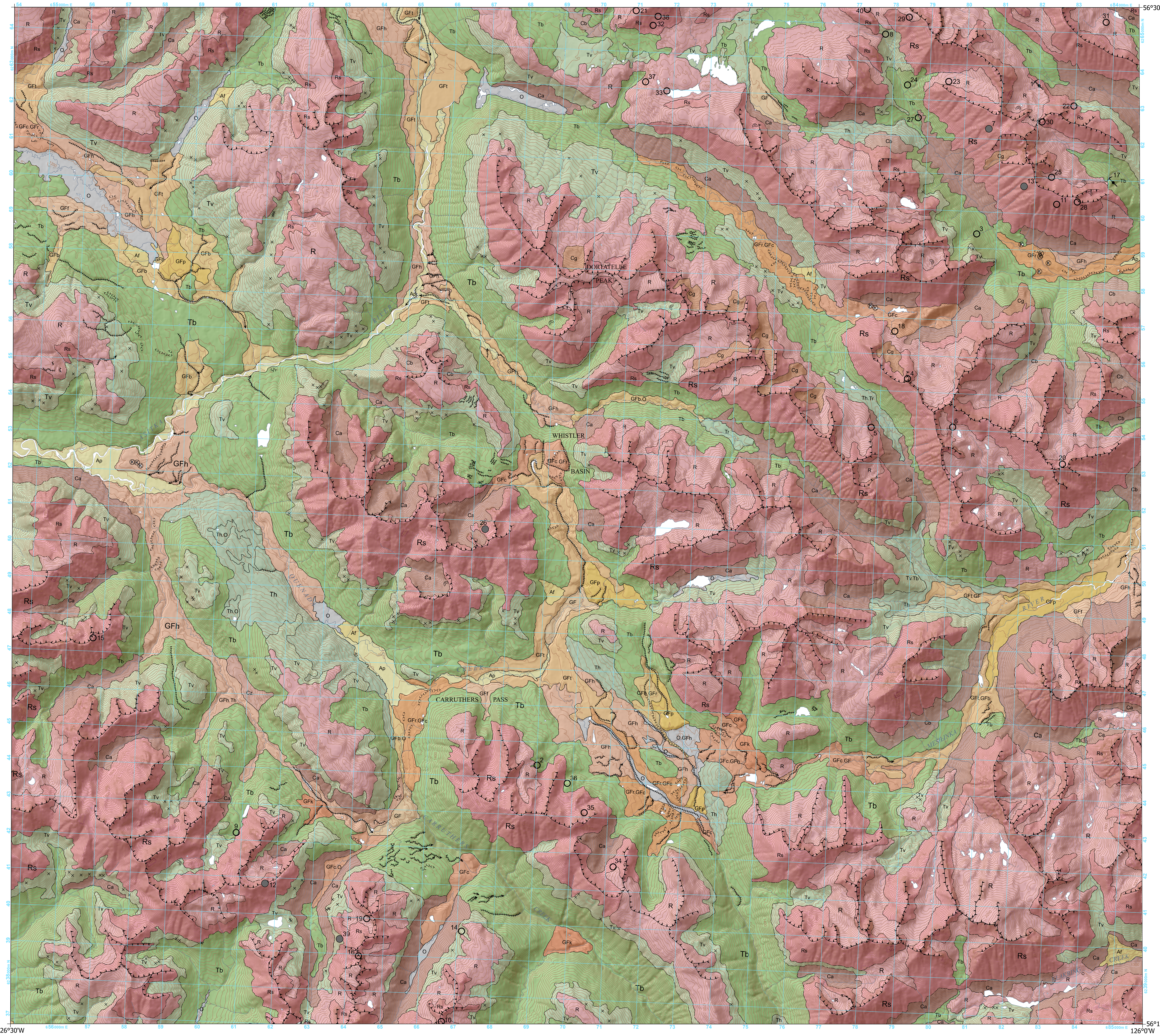
0 1 2 3 4 5
Kilometres

Scale 1:50,000

Cartography by K. Szponarski.

Note: Where surficial geology map units consist of multiple materials, a compound map unit designator is used. These compound designators note areally more extensive and less extensive surficial materials joined with a '.' (e.g., Cv.R where Cv is more extensive than R). We used the surficial geology data model of Deblonde et al. (2024) and definitions for surficial materials and surface expressions in Howes and Kenk (1997).



QUATERNARY SURFICIAL DEPOSITS
NONGLACIAL ENVIRONMENT

O — ***Organic deposits:*** peat and other plant material in various stages of decomposition; generally in flat and wet terrain over poorly drained substrates; may include minor fluvial and lacustrine sediments; most common in valley bottoms in transition zones between tree stands and water bodies; rare at high elevations.

Colluvial and mass wasting deposits:
Rubble and diamicton, poorly sorted, massive to stratified. Composition is dependent on source material. Deposited directly by gravity-induced movement.

Ca — ***Colluvial apron and talus slope:*** diamicton and rubble sourced from steep upslope bedrock exposures; 1 to 10 m thick but locally >10 m near the base of tall slopes; typically a series of colluvial cones (slope gradient >15°) that have merged into a relatively homogeneous slope.

Cz — ***Landslide deposit:*** diamicton, rubble, and blocks; hummocky and ridged topography; can be >10 m thick; typically forms hummocky topography; includes inactive and active landslides.

Cg — ***Rock glacier:*** rubble and blocks with interstitial ice; hummocky and ridged topography; lobed surface expression due to flow; common in high elevation, north-facing cirques.

Cb — ***Colluvial blanket:*** sand, rubble, and diamicton; >2 m thick; topography is predominantly controlled by the underlying material and masks minor irregularities; typically overlies till or bedrock; occurs on moderate to steep slopes.

Alluvial deposits: Gravel, sand, minor silt, and organic material, commonly stratified. Deposited by modern streams.

Ap — ***Alluvial floodplain:*** sorted sand and gravel with minor silt; >2 m thick; local and discontinuous organic veneers; forms low-relief planar surfaces near modern rivers; prone to flooding.

Af — ***Alluvial fan:*** poorly sorted gravel, sand, and diamicton; >2 m thick; stratified; slope gradient <15°; occur where a stream issues from a narrow valley onto a plain or valley floor; a potential aggregate source.

PROGLACIAL AND GLACIAL ENVIRONMENTS

Glaciofluvial Deposits: Sand and gravel with minor diamicton, well to poorly stratified. Deposited by glacial meltwater. All deposit types are potential aggregate sources.

GFp — ***Glaciofluvial outwash plain:*** sand and gravel; 1 to >10 m thick; massive to bedded; generally forms flat surfaces sloping away from direction of glacier retreat.

GFt — ***Glaciofluvial terrace:*** sand and gravel; 1 to 10 m thick; forming gently sloping flat surfaces perched above meltwater channels or modern streams and alluvial deposits.

GFf — ***Glaciofluvial fan:*** sand and gravel; bedded; 1 to >10 m thick with a slope gradient <15°; deposited at the mouth of meltwater channels immediately following deglaciation.

GFh — ***Hummocky glaciofluvial:*** poorly sorted sand and gravel with minor diamicton; bedded to massive; 1 to >20 m thick; deposited in contact with a retreating glacier; forms hummocky topography related to melting of buried ice.

GFc — ***Glaciofluvial ice-contact:*** poorly sorted sand and gravel; >2 m thick; hummocky ridged and kettled surface expressions; locally with discontinuous glaciolacustrine sediments in areas that were ponded; a product of ice stagnation, typically in low-relief valley bottoms.

GFk — ***Glaciofluvial kame:*** poorly sorted sand and gravel with minor diamicton; bedded to massive; 1 to >20 m thick; deposited in contact with a retreating glacier and valley wall; can form unpaired terraces, perched above modern valley floor.

GFr — ***Esker:*** sand and gravel; massive to bedded; 3 to >5 m thick; deposited by meltwater flowing in tunnels in interior of glacier or in channels at base; forms sinuous ridges.

GFb — ***Glaciofluvial blanket:*** sand and gravel; >2 m thick; occurs near the margins and at the mouth of meltwater channels; forms gently undulating to flat surfaces.

GF — ***Glaciofluvial undifferentiated:*** sand and gravel units too small to be represented at the scale of mapping.

Till Deposits: Diamicton consisting of clasts of all sizes and diverse rock types in a sandy to silty sand matrix. Deposited directly by glaciers and may be modified by modern periglacial processes. On steep slopes, primary features may be modified by slope creep. Mostly deposited by the Cordilleran Ice Sheet during the Late Wisconsinan Fraser Glaciation. Holocene tills deposited by cirque glaciers are included in this unit.

Th — ***Hummocky till:*** sand- and gravel-rich diamicton; >2 m thick; hummocky to rolling surface with moderate to steep slopes and local relief of 1 to 10 m; locally may contain glaciolacustrine and glaciofluvial sediments between hummocks; a product of ice stagnation.

Tr — ***Ridged till:*** diamicton; >2 m thick; includes discontinuous elongate ridges interpreted as moraines, roughly oriented perpendicular to ice-flow direction; local relief of 1 to 2 m.

Tv — ***Till veneer:*** diamicton; <2 m thick; surface expression mimics underlying topography; on moderately steep slopes and at high elevations; may be modified by creep processes; can be discontinuous and include abundant bedrock outcrops.

Tb — ***Till blanket:*** diamicton; >2 m thick; continuous till cover forming undulating topography that locally obscures underlying units; rare bedrock outcrops.

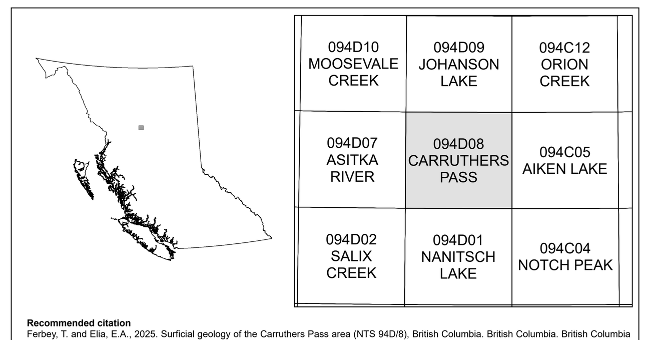
PRE-QUATERNARY

Bedrock: Mainly igneous intrusive rocks of northern Hogem batholith (Jurassic to Cretaceous). Also metamorphosed volcanic and sedimentary rocks and less common intrusive rocks of Quesnel and Stikine terranes and metamorphic and ultramafic rocks of Cache Creek terrane (Ootes et al., 2020a).

R — ***Bedrock:*** bedrock outcrop; locally includes areas of colluvium and till generally <2 m thick; extensively frost shattered at higher elevations; commonly exposed on steep slopes and in alpine environments.

Rs — ***Steep bedrock slopes:*** bedrock outcrop with loose blocks of local bedrock on steeply sloping terrain (>30°); patchy cover of till and colluvium (<2 m thick) increases downslope.

Rock glacier
Kettle
Meltwater Channel:
Minor (flow direction unknown)
Minor (flow direction known)
Esker ridge
Glacial striations:
Paleo ice-flow direction indicated
Cirque headwall
Arête
Small bedrock outcrop in thick drift
Station (ground observation)
Geological contact (defined)
Mineral occurrence (see Table 1; numbers indicate Map ID)
Developed Prospect 2
Prospect 5
Showing 33



Recommended citation
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North American Datum 1983 (CSRS)
Universal Transverse Mercator Zone 9 North
Shaded relief image derived from the digital elevation model supplied by Natural Resources Canada.
Illumination: azimuth 315°, altitude 45°, vertical factor 1x.
Base map at the scale of 1:50 000 from GeoBC, with modifications.
Contour interval 20 metres. Elevations in metres above mean sea level.

Table 1. Mineral occurrences from MINFILE database (MINFILE, 2025). Abbreviated deposit type designations (e.g., L03) follow deposit descriptions detailed in Lefebure and Jones (2020).

Map ID	MINFILE No.	Name	Status	Commodity	Deposit Type
1	094D 015	CROY	Developed prospect	Au, Cu, Ag, Mo, Zn, Pb	I01: Au quartz veins
2	094D 018	CAR	Showing	Ag, Pb, Cu, Zn, Au	I05: Polymetallic veins Ag-Pb-Zn-Au
3	094D 019	KLI	Showing	Cu	K01: Cu skarn
4	094D 020	RINGO	Showing	Mo, Cu	L05: Porphyry Mo (Low F- type)
5	094D 021	DORTATELLE	Showing	Mo, Cu, Ag	L05: Porphyry Mo (Low F- type)
6	094D 022	MESILINKA RIVER	Showing	Cr	M05: Alaskan-type Pt-Os-Rh-Ir
7	094D 025	SOUP	Prospect	Au, Cu, Fe, Ma	K01: Cu skarn
8	094D 029	BANJO	Showing	Au, Cu, Ag, Pb, Zn	I05: Polymetallic veins Ag-Pb-ZnAu
9	094D 076	LIZ	Showing	Cu	D03: Volcanic redbed Cu
10	094D 086	PAD	Showing	Cu	D03: Volcanic redbed Cu
11	094D 092	LADY DIANA	Showing	Au, Ag, Cu, Pb, Zn	L03: Alkalic porphyry Cu-Au
12	094D 093	MAR	Prospect	Cu	D03: Volcanic redbed Cu
13	094D 105	SOUTH SOUP	Prospect	Au, Cu, Fe, Ma	K01: Cu skarn
14	094D 106	MONA JEAN	Showing	Cu, Ag	D03: Volcanic redbed Cu
15	094D 107	BANDY	Showing	Cu	D03: Volcanic redbed Cu
16	094D 108	LAKE	Showing	Cu, Ag	D03: Volcanic redbed Cu
17	094D 113	DAVIE CREEK MOLY	Developed prospect	Mo, Cu, Wo	L05: Porphyry Mo (Low F- type)
18	094D 114	MCCONNELL BERYL	Showing	Be	O01: Rare element pegmatite - LCT family
19	094D 124	TOM	Showing	Cu	D03: Volcanic redbed Cu
20	094D 125	KELLY	Showing	Mo	L05: Porphyry Mo (Low F- type)
21	094D 137	JOHAN	Showing	Au, Ag	I01: Au quartz veins
22	094D 139	AUPPER	Showing	Au, Cu, Ag	L01: Subvolcanic Cu-Ag-Au (As-Sb)
23	094D 140	KC	Showing	Au, Ag, Pb, Zn, Ma	I05: Polymetallic veins Ag-Pb-Zn-Au
24	094D 141	MAL	Showing	Cu, Au, Ag	L04: Porphyry Cu-Mo-Au
25	094D 145	KAREN CREEK	Showing	Au, Ag, Cu	L01: Subvolcanic Cu-Ag-Au (As-Sb)
26	094D 172	CARRUTHERS PASS	Prospect	Cu, Zn, Ag, Au, Co	G04: Besshi massive sulphide Cu-Zn
27	094D 176	CRO 2	Showing	Ag, Au, Cu	unknown
28	094D 177	DBC	Showing	Au, Ag, Cu, Pt, Pd	I01: Au quartz veins
29	094D 180	KC 1	Showing	Au, Ag	I05: Polymetallic veins Ag-Pb-Zn-Au
30	094D 183	UPC	Showing	Au, Ag, Cu	I01: Au quartz veins
31	094D 188	04SEN-230	Showing	Pb, Cu, Ag, Au	I05: Polymetallic veins Ag-Pb-Zn-Au
32	094D 203	DORT 3 EAST	Showing	Au	I01: Au quartz veins
33	094D 204	DORT 2	Showing	Au, Ag	I01: Au quartz veins
34	094D 235	PASS 3	Showing	Cu, Ag	I06: Cu-Ag quartz veins
35	094D 236	PASS2 SOUTH	Showing	Cu, Ag	E04: Sediment-hosted Cu
36	094D 237	PASS2 WEST	Showing	Au, Ag, Cu	I05: Polymetallic veins Ag-Pb-Zn-Au
37	094D 252	RED BLUFFS	Showing	Au	I01: Au quartz veins
38	094D 253	TF	Showing	Au	I01: Au quartz veins
39	094D 254	FOG	Prospect	Cu, Ag	D03: Volcanic redbed Cu
40	094D 255	PARISH HILL	Showing	Cu, Au, Ag	K01: Cu skarn

Descriptive notes

In 2018, the British Columbia Geological Survey initiated a multi-year program integrating 1:50,000-scale bedrock and surficial geological mapping for northern Hogem batholith. New bedrock mapping refined the origin and timing of batholith emplacement and base- and precious-metal mineralization (Ootes et al., 2019a, b, 2020a; Jones et al., 2021), and new surficial geology mapping detailed the ice-flow history (Ferbey and Elia , 2021). The present series of 1:50,000-scale surficial geology maps is for the Notch Peak (NTS 94C/4), Aiken Lake (NTS 94C/5), Nanitsch Lake (NTS 94D/1), and Carruthers Pass (NTS 94D/8) map areas.

The Cordilleran Ice Sheet covered the Hogem batholith area during the Late Wisconsinan glacial maximum when ice flowed east and southeast across the region from an ice divide above the Skeena Mountains. During this stage, ice flow was independent of valley floor topography and glaciers were able to move over low-elevation topographic divides, transporting glacial debris into adjacent drainages (Ryder and Maynard, 1991; Clague and Ward, 2011). Glacially streamlined or eroded landform- and outcrop-scale indicators are commonly aligned parallel with valleys, indicating that ice flow direction was still controlled by steep, high-elevation valley walls for most of the Late Wisconsinan.

Overconsolidated subglacial tills were deposited in the area during full-glacial conditions as till blankets, streamlined tills, and till veneers. During deglaciation, less consolidated melt-out tills were deposited as hummocky tills. Significant volumes of glacial meltwater flowed through the area during deglaciation, transporting coarse-grained sands and gravels. Much of this transport and deposition was subaerial (forming extensive outwash plains and terraces) but a component was subglacial (forming eskers) or in contact with stagnant ice blocks (producing hummocky sands and gravels). Colluvial deposits are common along the base of steep slopes and are now vegetated and stable, but talus aprons and cones are still actively being constructed. Solifluction lobes and rock glaciers are currently active, predominantly on north-facing slopes. Organic deposits occur throughout the study area, mostly as narrow transition zones between tree stands and water bodies. These deposits can be extensive along the floors of retreat-phase glaciofluvial meltwater channels.

Subglacial till, the ideal sample medium for till geochemistry and mineralogy surveys in mineral exploration (Levson, 2001), is common in valley bottoms and covering lower hillslopes. Although bedrock is well-exposed at high elevation, small, isolated outcrops, which may be overlooked, are common along valley bottoms and on forested hill flanks.

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