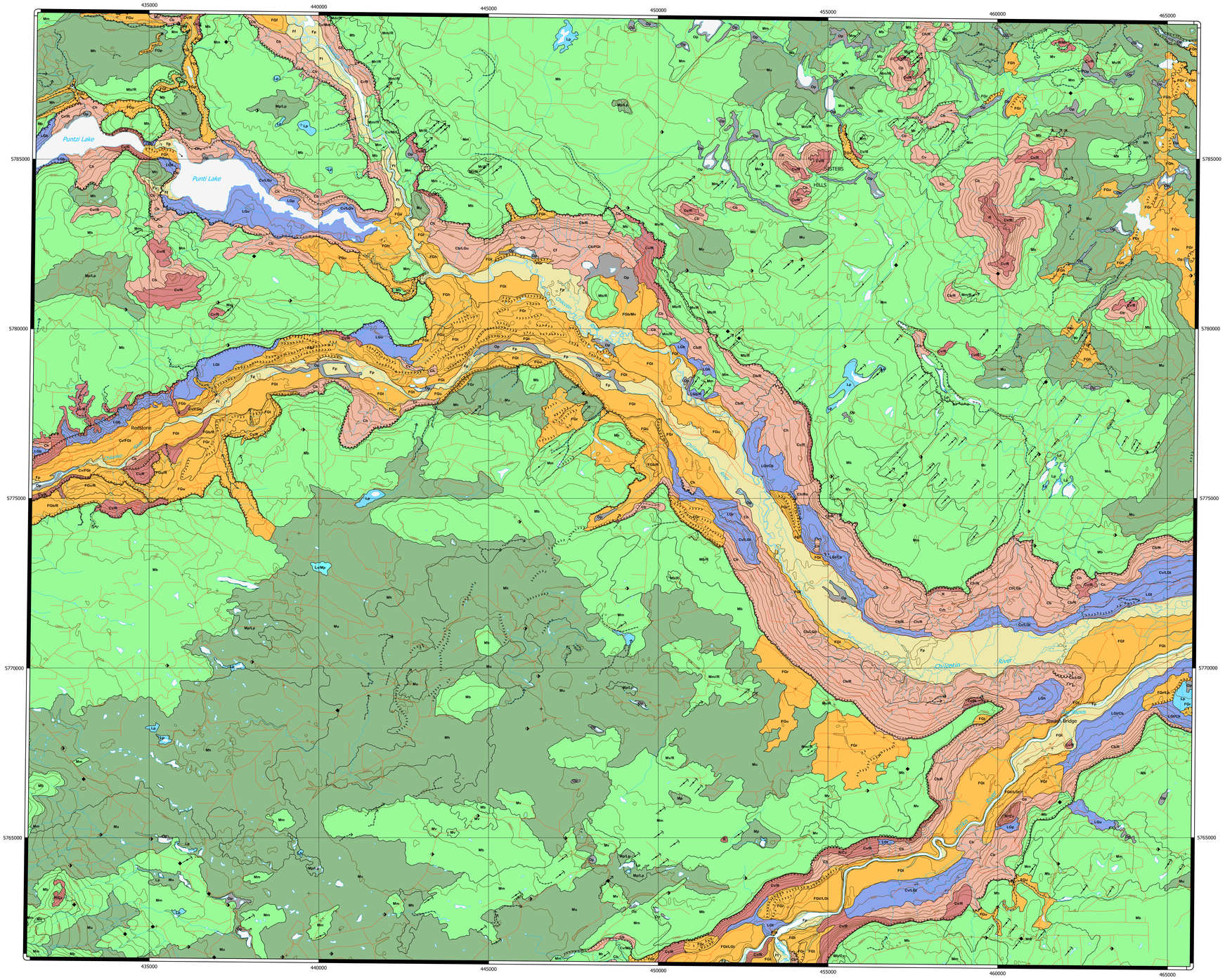

British Columbia Geological Survey

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SURFICIAL GEOLOGY OF THE REDSTONE AREA

NTS 93B/04

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Scale 1:50 000

1 0 1 2 3 4
kilometres

Field survey carried out July to August 2008

SURFICIAL GEOLOGY

HOLOCENE SEDIMENTS

Colluvial deposits: *materials deposited by mass-wasting processes including creep, debris flows, landslides and rockfalls; generally unsorted or very poorly sorted diamicton; massive to crudely stratified and often clast supported; occurs mainly as veneers over bedrock in upland areas and as thick blankets or aprons along, and at the base, of steep slopes.*

Cb — ***Colluvial blanket:*** *colluvial material one to several metres thick that conforms to underlying topography but masks minor irregularities.*

Cv — ***Colluvial veneer:*** *colluvial material <1 m thick; surface expression is derived from topographic irregularities in the underlying unit; occurs mainly on topographic highs and steep valley sides and locally includes exposed bedrock and discontinuous till cover.*

Cf, Cc — ***Colluvial fans and cones:*** *colluvial material that spreads out from an apex; surface gradient from apex to toe may be <15° **(Cf)** or >15° **(Cc)**.*

Ch, Cr — ***Landslide deposit:*** *associated with larger-magnitude mass-wasting events within unconsolidated material that result in chaotic, irregular rises and hollows with slopes >15° **(Ch)**; other deposits are the product of the translational movement of bedrock, and are composed of a series linear ridges oriented perpendicular to slope **(Cr)**.*

Fluvial deposits: *sandy to gravelly sediments deposited by streams and rivers; generally stratified and moderately to well sorted; clasts are typically subrounded to rounded; low-lying floodplains are often capped by silts and fine sands.*

Fp — ***Fluvial Plain:*** *flat to gently sloping fluvial deposits; mainly includes floodplain deposits along modern stream channels and the adjacent valley floors; typically associated with or veneered by organic deposits; can be channelled and (or) containing oxbow lakes, causing an undulating surface **(Fu)**; locally, fluvial terraces **(Ft)** can be elevated slightly above the valley floor.*

Ff — ***Alluvial Fan:*** *mainly pebble to cobble-size gravels and pebbly diamicton; sediments typically a few to tens of metres thick; fans occur at the mouths of confined valleys and have slopes up to 15°.*

Lacustine deposits: *dominantly silt and sand deposited in a nonglacial lake that can seasonally be dry; massive to laminated; unvegetated; may locally include evaporite deposits.*

Lp — ***Lacustrine plain:*** *flat to gently sloping lacustrine deposits; may locally include areas of thin organic deposits aerially too small to be mapped individually; may be included in till plain units where ponding has occurred.*

Organic deposits: *peat or other vegetative materials occurring in bogs, fens, and swamps; formed by the accumulation of organic matter in depressions or poorly drained areas; water table typically at or near surface.*

Op — ***Organic plain:*** *flat to gently sloping organic deposits; locally includes small areas of glaciolacustrine, morainal, fluvial, glaciofluvial, or colluvial deposits aerially too small to be mapped individually.*

LATE PLEISTOCENE SEDIMENTS

Glaciolacustrine deposits*: dominantly fine to medium sands and silts deposited in a glacial lake; sediments are well sorted, laminated or thinly bedded; can be rippled and cross-stratified; moderate to steep slopes are commonly gullied; occur mainly in large river valleys that were dammed by a retreating or downwasting ice sheet during deglaciation or during a minor late-glacial readvance across, or up into, a river valley.*

LGb — ***Glaciolacustrine blanket:*** *silts and sands one to several metres thick that conform to underlying topography but mask minor irregularities.*

LGv — ***Glaciolacustrine veneer:*** *silts and sands <1 m thick; surface expression derived from topographic irregularities in the underlying unit.*

LGt — ***Glaciolacustrine terrace:*** *glaciolacustrine deposit with distinct risers and steps **(LGt)**; typically a few to tens of metres thick; occur along valley sides above modern streams that have dissected them; surface expression can be irregular where sediments have been channelled or gullied **(LGu)**; surface expression can be flat **(LGp)** where **LGt** sediments have been locally isolated from a larger terrace system or feature.*

Glaciofluvial deposits: *mainly sandy gravels and pebble to boulder-sized gravels deposited by meltwater from or in contact with glacial ice; includes glaciofluvial outwash plains, terraces, kames, and eskers; includes ice-contact features such as kettles and slump structures.*

FGp — ***Glaciofluvial outwash plain:*** *sands and gravels that occur mainly as a level plain near valley bottoms **(FGp)**; can have an irregular surface expression with rises and hollows <15° **(FGu)** or >15° **(FGh)**, where channelling has occurred or where kettles have resulted from the melting of stagnant blocks of glacial ice; may be elevated along valley sides as terraces **(FGt)** or outwash fans **(FGf)**.*

FGr — ***Ice contact deposit:*** *medium sand to cobble-sized gravel, typically several to tens of metres thick occurring mainly as esker ridges; hill slopes are generally >15°.*

Morainal deposits*: poorly sorted to unsorted diamicton originally deposited by or from glacial ice; includes basal, meltout and ablation tills, and may locally include glacially-derived debris flow deposits; can be compact; massive or crudely stratified; matrix is clayey-silt to sand; clasts can be up to boulder-size and often striated; usually occurs on the plateau surface but in rare cases may occur within large river valleys (e.g. Chilcotin River valley, above confluence with Chilanko River), overlying valley fill sediments, deposited during a late-glacial readvance.*

Mb — ***Morainal blanket:*** *glacially derived diamicton one to several metres thick that conforms to underlying topography but masks minor irregularities.*

Mv — ***Morainal veneer:*** *glacially derived diamicton <1m thick; surface expression derived from topographic irregularities in the underlying unit; unit includes small areas of exposed rock or discontinuous colluvium, especially in upland areas and in regions with crag-and-tail ridges.*

Mm, Mr — ***Streamlined moraine:*** *flutings, drumlins and crag-and-tails ridges composed of morainal material; topography varies from gently rolling **(Mm)** with slopes <15°, to ridged **(Mr)** in areas with well developed crag-and-tail ridges and drumlins with steep sides (15° to 35°).*

Mp — ***Morainal plain:*** *glacially derived diamicton that varies from a sandy to gravelly diamicton (dominanty melt-out till) to more compact clayey-silt to sand diamicton (basal till); surface expression is level.*

Mu, Mh — ***Resedimented glacial debris:*** *sandy to gravelly diamicton; dominantly melt-out till; surface expression varies from irregular rises and hollows with slopes <15° **(Mu)** to >15° **(Mh)**; small meltwater channels and areas of kettled topography are common; this unit often occurs in association with glaciofluvial, fluvial, and organic deposits, especially in low-lying areas.*

PRE-HOLOCENE BEDROCK

R — ***Bedrock:*** *rock exposed at surface; most common on steep slopes and topographic highs; bedrock outcrop is generally discontinuous and interspersed with discontinuous areas of thin (<1 m) colluvial or morainal deposits; subject to mass-wasting processes such as rockfalls, topples, and translational slides; areas of bedrock that are aerially too small to be mapped occur throughout the region, especially in association with colluvial and morainal veneers (see **Cv** and **Mv**).*

NOTE: Composite unit delimiters separate more extensive (single slash, /) and considerably more extensive (double slash, //) surficial units from those that are less extensive (e.g. in the polygon Cv/R, Cv is considerably more extensive than R).

SYMBOLS

- *till sample site (2-3 kg only)*
- *till sample site (2-3 and 10-15 kg)*
- *ground observation*
- *geologic contact (approximate)*
- *road*
- *river*

GLACIAL FEATURES

- *esker (direction known, unknown)*
- *small meltwater channel*
- *large meltwater channel*
- *flute / ridge*
- *crag and tail*
- *drumlin*
- *striae*
- *landslide*

Approximate mean declination for centre of map decreasing 0°13' annually.

North American Datum 1983
Universal Tranverse Mercator, Zone 10
Contour Interval 40 m

Digital base map from British Columbia Ministry of Environment. Modified from 1:20 000 TRIM data.

INTRODUCTION

This surficial geology map is the product of a 2008 field survey and interpretations of 1:30 000 to 1:40 000-scale aerial photographs. Mapping conventions used here closely follow those outlined by Howes and Kenk (1997). Sedimentologic and stratigraphic observations were made at 155 field stations. Locations of these field stations, and of 23 till samples for heavy mineral concentrate analysis and gold grain counts (10-15 kg) and 154 till samples for major, minor, and trace element analyses (2-3 kg), are included on this map.

The bedrock geology of the map area is described by Tipper (1959) and Massey et al. (2005). There are previous and ongoing regional bedrock mapping and mineral potential assessments taking place in the neighbouring NTS map sheets NTS 93C/01, 08, 09, and 16 (Giles and Kerr, 1993; Proudfoot, 1993; Lett et al., 2006; Mihalynuk et al., 2008a,b, 2009). Previous surficial geology work in the area consists of a glacial features map produced by Tipper (1971), and soils and landform surveys conducted by the British Columbia Ministry of Environment, Lands, and Parks (1976).

The following is a summary of Ferbey et al. (2009), which provides an overview of the 2008 field survey and observations made. The reader is directed to this paper for more detail.

LOCATION AND PHYSIOGRAPHY

The map area is located 100 km east of the Coast Mountains and 90 km west of the Fraser River valley. The study area falls within the Fraser Plateau, a subdivision of the Interior Plateau physiographic region (Holland, 1976). This plateau is flat to gently rolling and has been dissected by the Chilcotin, Chilanko, and Chilko rivers. The relatively flat plateau surface is attributed to the Late Oligocene to Pleistocene-age Chilcotin Group basalt flows that occur in the region. The uplands are covered almost exclusively by till, while the large valleys have been infilled by deglacial sedimentary sequences. Bedrock outcrop is limited mainly to the summits of hills and to the sides of the Chilcotin, Chilanko, and Chilko river valleys. At the time of publication, there are no metallic mineral occurrences within the map area.

ICE-FLOW HISTORY

During the Fraser Glaciation maximum, the Redstone area was covered by the Cordilleran Ice Sheet. Ice from the Coast Mountains flowed northeast through the map area, coalescing near the Fraser River valley where it met northwest-flowing ice from the Cariboo Mountains. Ice-flow indicators observed include drumlins, crag and tails, flutes and striations with orientations that range from 030°-060°. Although the dominant flow direction is towards 048°, it becomes more northward in the northeast corner of the map sheet. It is thought that this subtle change in flow direction is a result of the turning of Coast Mountain ice as it met ice flowing northwest from the Cariboo Mountains.

PRE-LATE WISCONSINAN SEDIMENTS

Pre-late Wisconsinan sediments are exposed in two locations along the north side of Chilcotin River valley. The tallest section (12 m in height) is located approximately 2 km east of Redstone on Highway 20 while a second smaller exposure outcrops 5 km to the east. These sediments consist of stratified sands and gravels capped by laminated silts and tuffs, which are overlain by Late Wisconsinan Fraser Glaciation till and retreat-phase glaciofluvial sands and gravels. There is a lithological contrast between the sands and gravels occurring at this section. The pre-Late Wisconsinan sediments appear to lack intrusive lithologies which is in contrast to the retreat-phase sediments that cap this section which have a high percentage of intrusive lithologies.

LATE WISCONSINAN SEDIMENTS

Glacial

Two till facies occur on the plateau surface. The first is an overconsolidated, massive and fissile diamict with a silty matrix. Its surface expression is typically rolling (Mm) or ridged (Mr), although it can also blanket (Mb) the underlying bedrock surface. This unit is interpreted as basal till and was deposited by actively flowing ice. This basal till is commonly overlain by a looser, sandy, gravelly, clast-rich diamicton. The surface expression of this second unit is typically undulating (Mu) to hummocky (Mh) and this unit is commonly associated with pockets of glaciofluvial sediments and eskers. It is interpreted to be melt-out or supraglacial till, deposited during the waning stages of the Fraser Glaciation.

Deglacial

Eskers and kame deposits (FGr) are common in the northeast corner of the map area. A second esker field is present where the Chilcotin and Chilanko river valleys meet. Thick terraces (FGt) and outwash plains (FGp, FGu) of glaciofluvial sand and gravel fill the major river valleys. These glaciofluvial deposits are typically massive to weakly stratified, and consist of rounded clasts that range in size from granule to cobble.

Glaciolacustrine deposits also occur as terraces (LGt) in the Chilcotin, Chilanko, and Chilko river valleys. These deposits generally consist of silts and sands that are horizontally laminated, and may be locally rippled and cross-stratified. Glaciolacustrine sediments are easily eroded and have been deeply gullied. In many locations their occurrence is only indicated by fine-grained colluvium whose parent material is interpreted to be glaciolacustrine. Colluvial deposits (C) derived from glaciolacustrine sediments often include large boulders of Chilcotin Group basalt that have spalled off scarps that define the larger valleys of the map area. The majority of intact glaciolacustrine sections in the map area have an upper elevation of 900 m, although a silt veneer (LGv) can be found locally up to 1040 m. As proposed by Tipper (1971), these glaciolacustrine sediments are thought to be a product of the damming of Chilcotin River, near its confluence with Fraser River, by a late-glacial readvance of ice across the Fraser Plateau from the Cariboo Mountains. Minimum upper elevation for this glacial lake is 1047 m (Ferbey et al. 2009).

Large eskers up to 50 m high and continuous for 2 km are present in the Chilanko and Chilko river valleys. These esker systems (FGr) consist of sand and pebble to cobble-sized gravel ridges and are often found directly beside, and at a similar elevation to, glaciolacustrine deposits. Fine-grained glaciolacustrine sediments do not mantle these large ridges, indicating that large stagnant ice masses must have been present in the bottoms of the Chilanko and Chilko river valleys at the time of lake formation.

HOLOCENE SEDIMENTS

The Chilcotin, Chilanko, and Chilko river valleys are floored by modern fluvial sediments (Fp, Ft). These deposits are unvegetated and are composed of gravel, sand, and silt. Organic deposits (Op) are commonly associated with modern floodplains in the valleys, as well as on the plateau around the edges of ponds and in the bottoms of meltwater channels. Lacustrine sediments (Lp) composed of silt and fine sand floor the bottoms of seasonally dry lakes, which may also include local areas of organic material. Evaporite deposits can be found in these dry lake beds, particularly along their margins.

In the map area mass-wasting events have been active since deglaciation, and the scarps of old and recent landslides are clearly visible along the walls of major river valleys. Much of the material occurring along valley sides is colluvium (C). Sediments on many of the steeper slopes are unstable.

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