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NATMAP
CARTNAT
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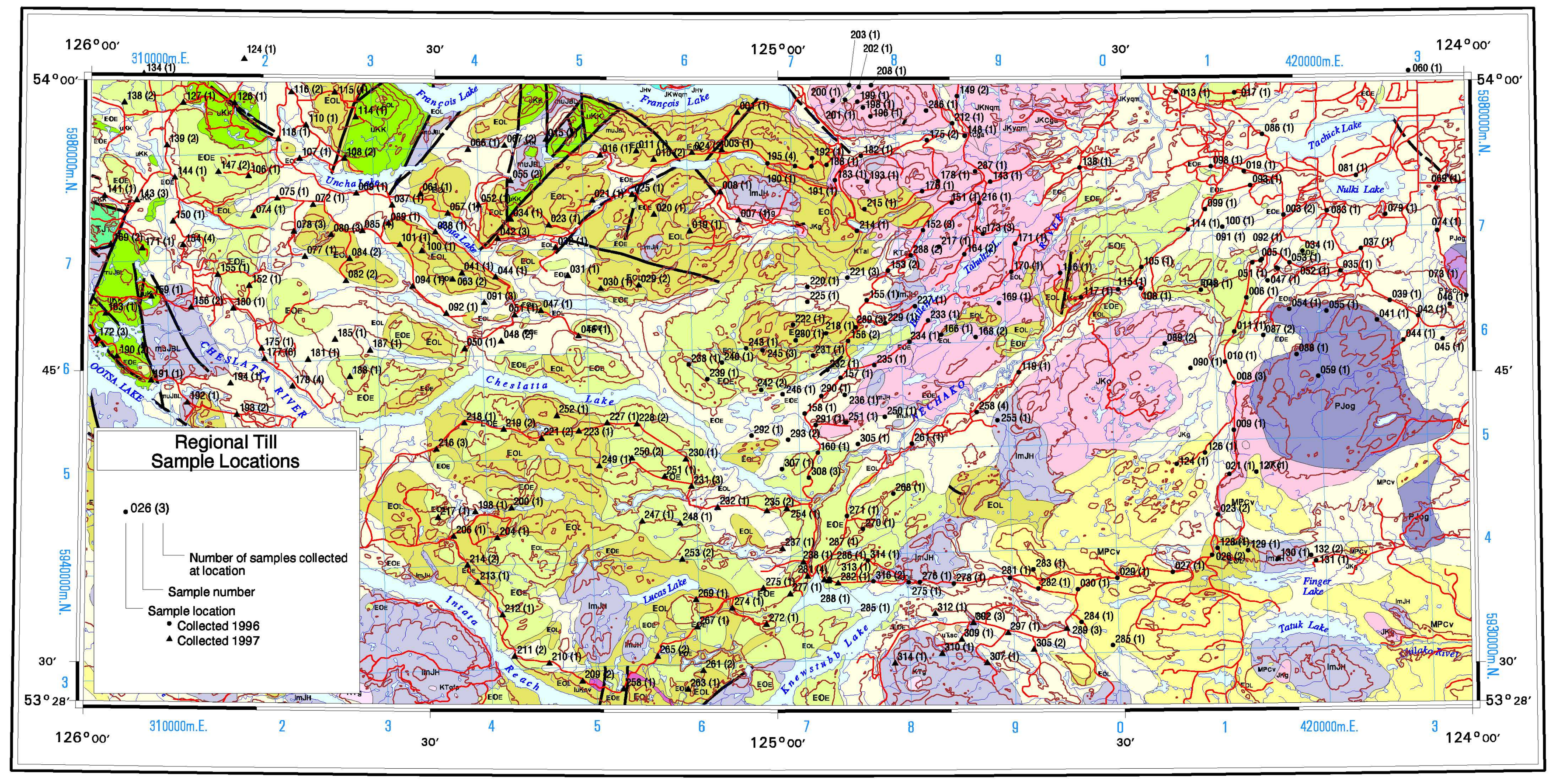

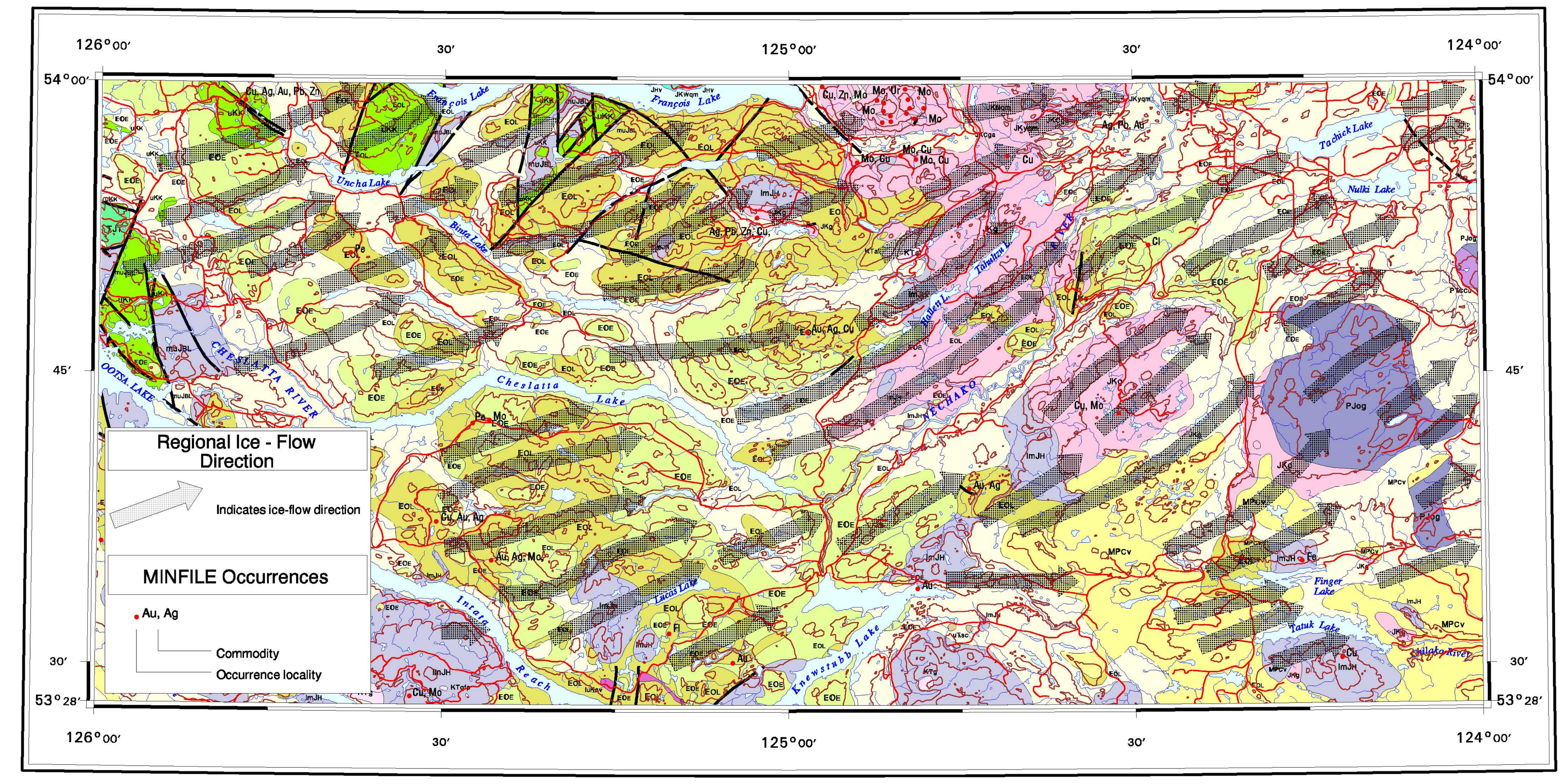

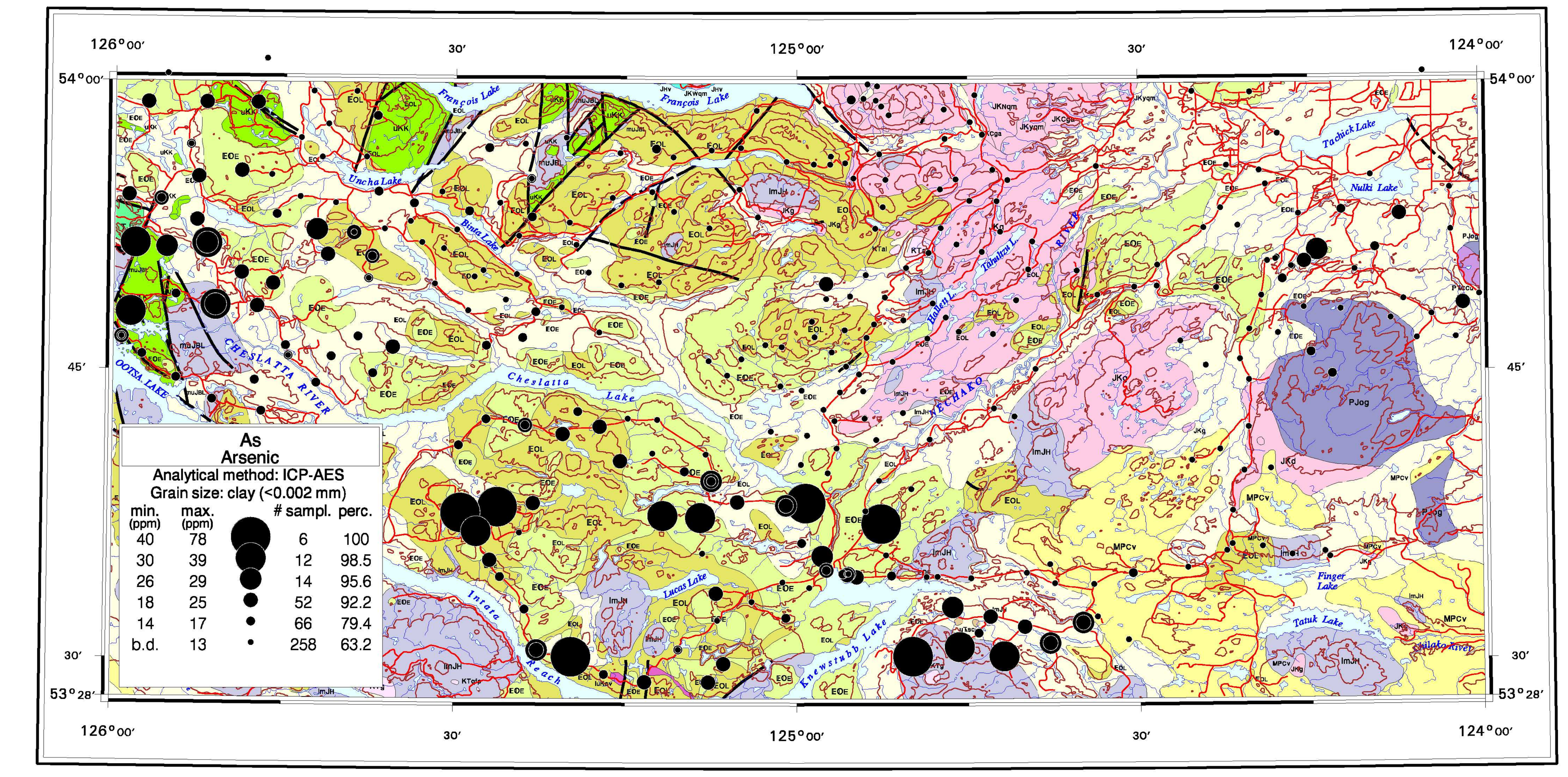

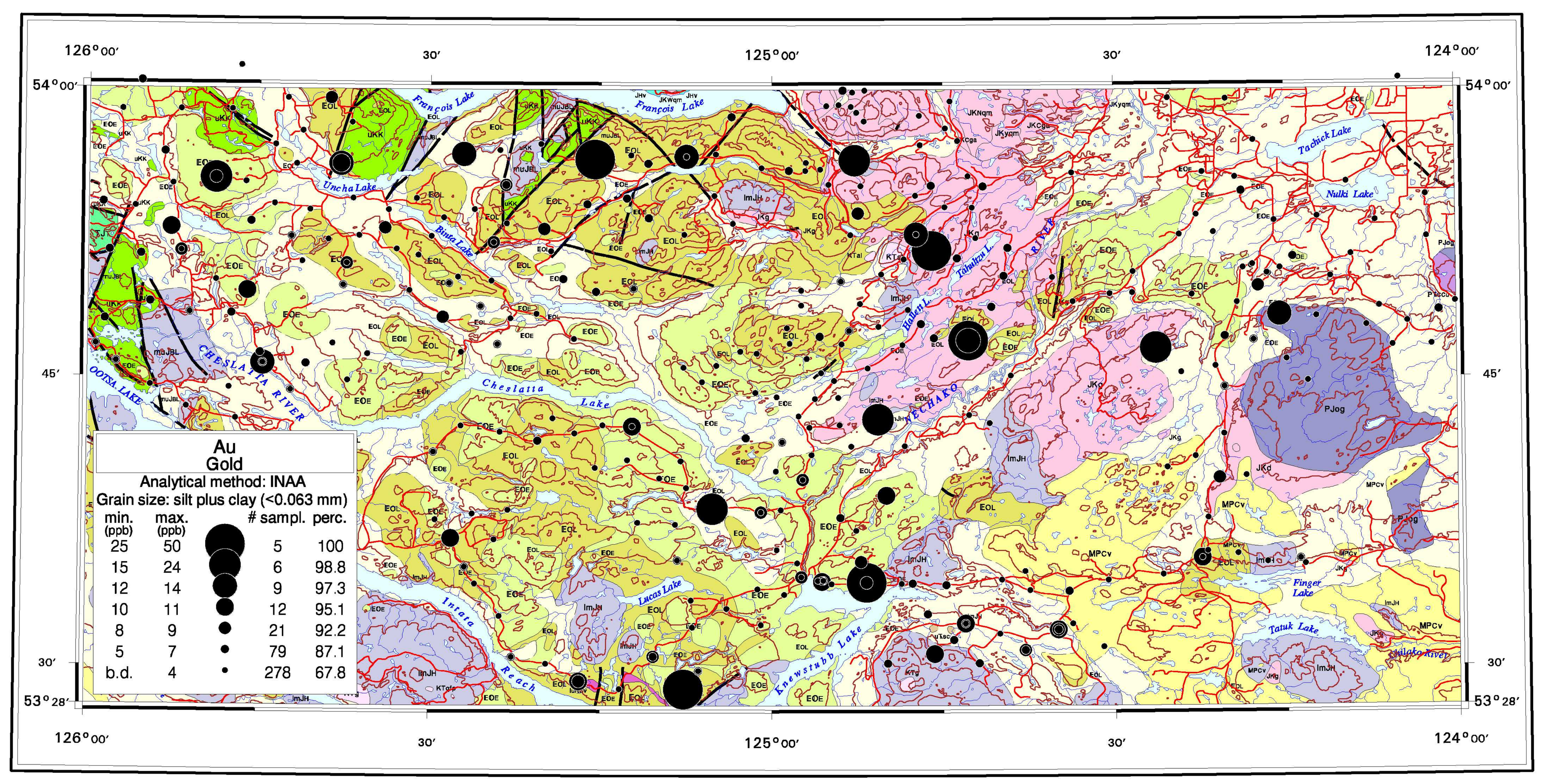

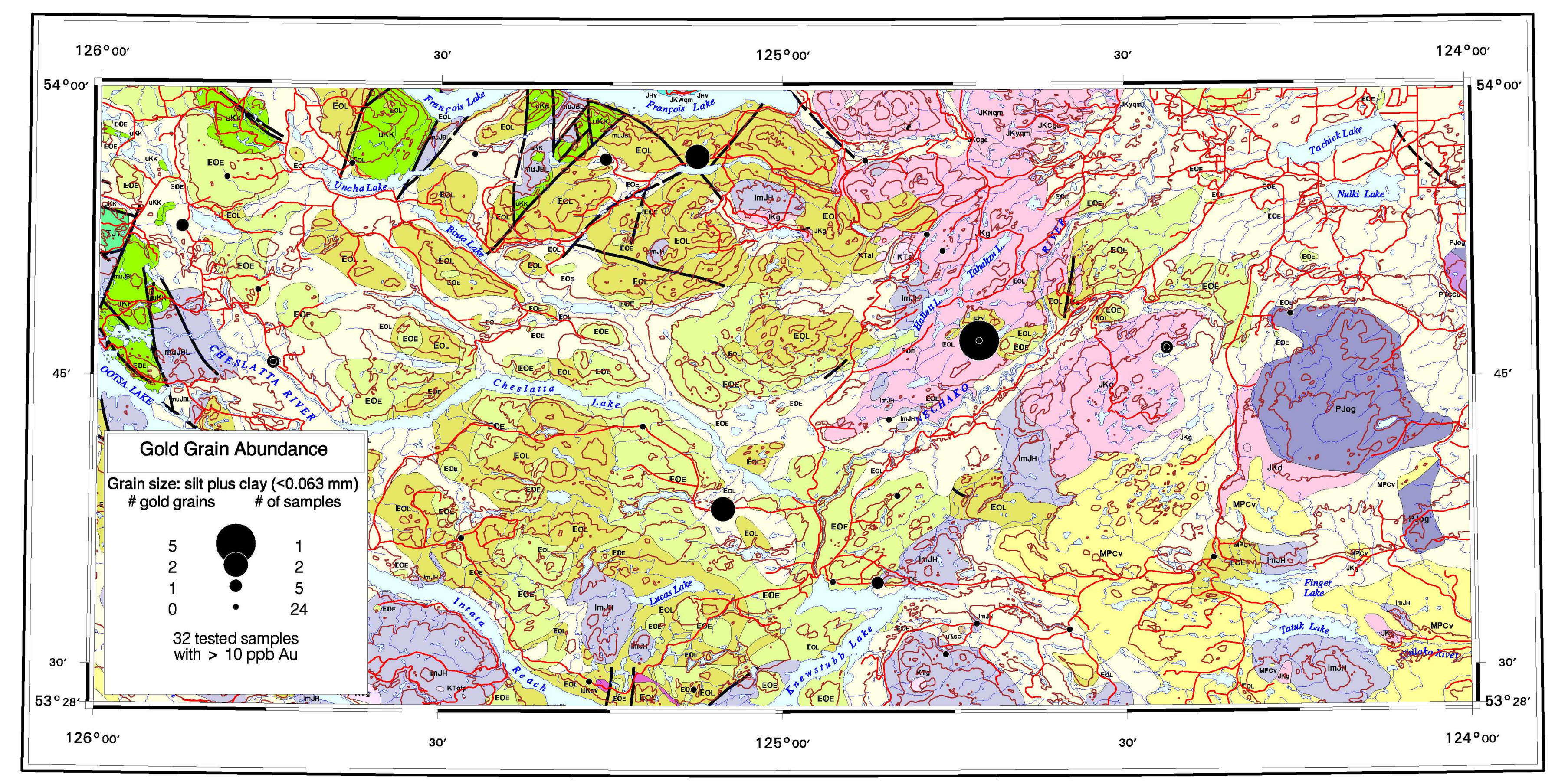

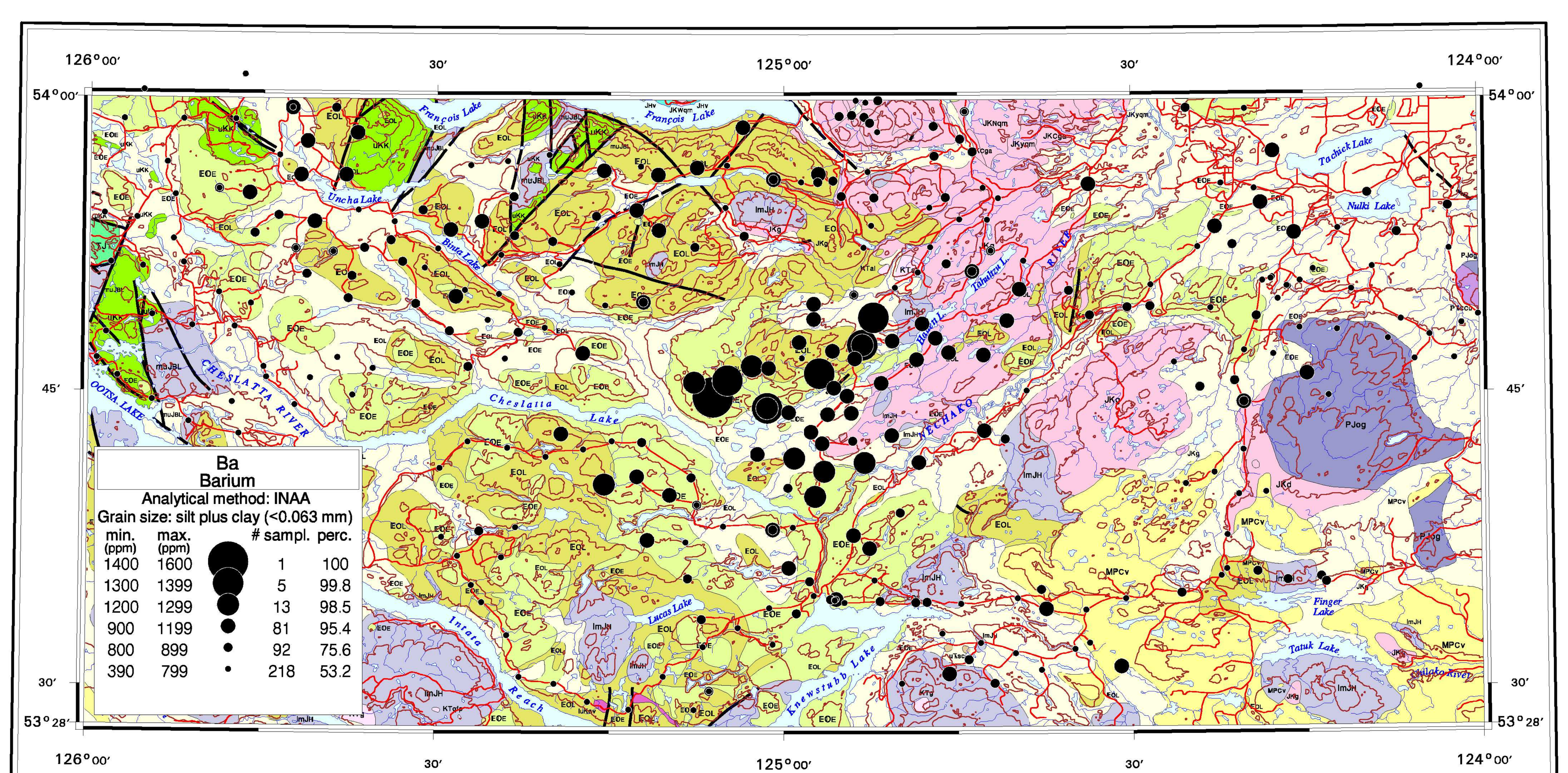

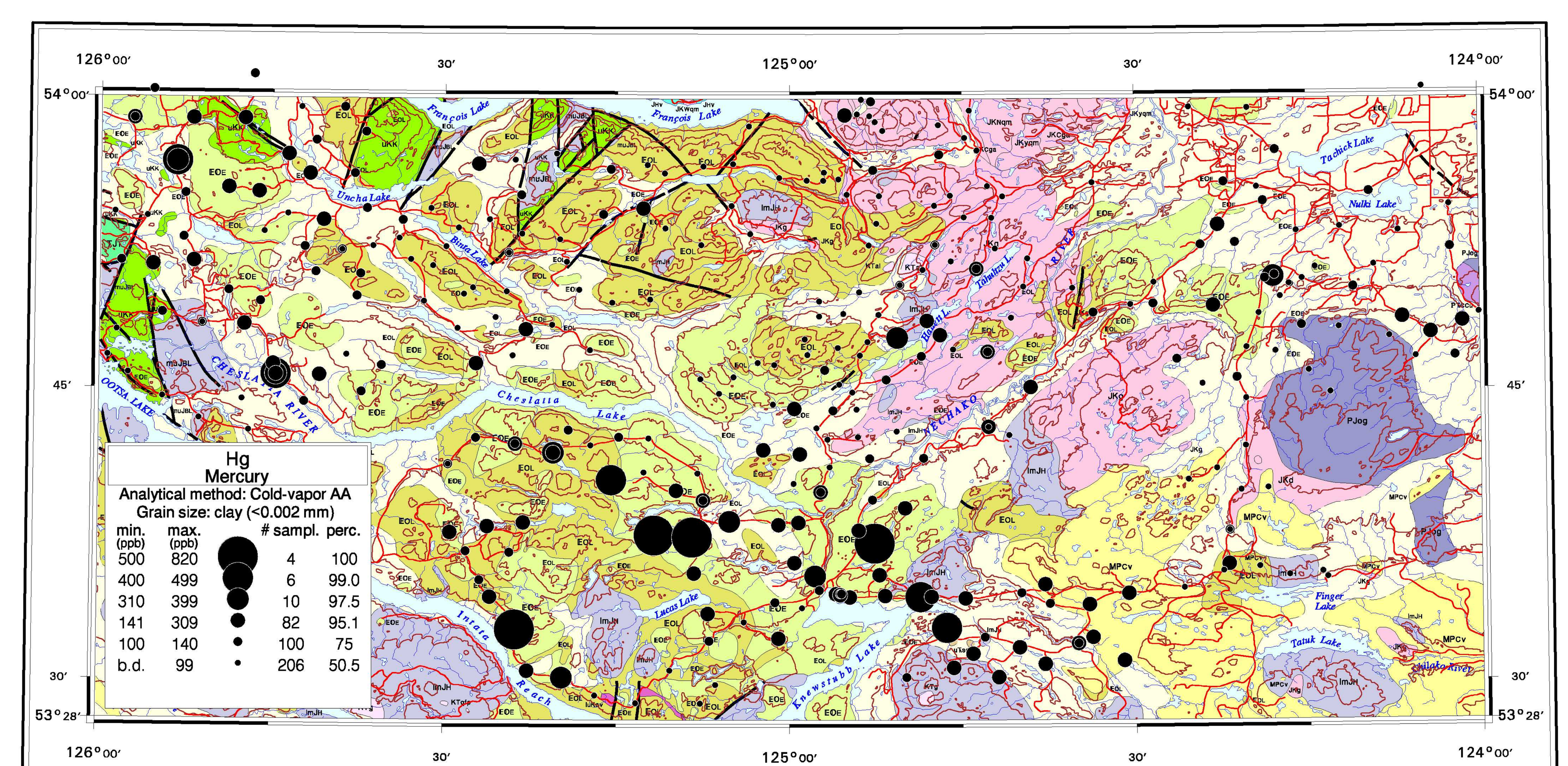

MARGINAL NOTES

Introduction

A surficial geology mapping project along with a reconnaissance till geochemistry sampling program have been implemented by the Geological Survey of Canada in central British Columbia, on Nechako River map sheet (NTS 93 F), as part of the Nechako NATMAP project. Till sampling has been completed for the two first years of this project (1996 and 1997) and geochemical results are reported here. The objectives of the till geochemistry component of this project are to provide baseline information on (1) the mineral potential of this region, and (2) the natural variability of metal concentrations in the surficial environment over various bedrock lithologies. The till sampling program will be completed in 1998, and by the end of the Nechako NATMAP project (2000), the area represented by the Nechako River map sheet will be completely covered following a joint effort of the British Columbia Geological Survey Branch and the Geological Survey of Canada.

This Open File presents dot-value geochemical maps for twelve metals divided into two sheets: (1) gold and pathfinders, and (2) base metals and rare earth element. Three other maps are depicting sample numbers, ice-flow indicators, and number of gold grains. The bedrock geology compiled by Williams (1997) is used as the underlay for all maps. This Open File includes a diskette which contains results of all geochemical analyses conducted on the till samples. Files format and content are given in a README.txt file. These files contain latitude and longitude coordinates so that similar geochemical maps can be produced in a geographic information system or similar software.

Similar publications on till geochemistry are also available for surrounding regions: to the north on Fort Fraser and Manson River map sheets (93K and N) (Plouffe, 1995) and to the south on Fawnie Creek map sheet (93 F/3) (Levson et al., 1994). A recent regional lake sediment geochemical survey has also been completed for a sector of Nechako River map sheet (Cook and Jackaman, 1994).

Methods

Field methods - Till samples were collected from road side sections, natural river bank exposures and hand-dug pits at a minimum depth of one meter, below the depth of most intense soil weathering. In the most prominent exposures, samples were collected at one to two meters depth intervals to assess vertical compositional variations. Field duplicate samples were collected at every tenth site. Sample interval averages five kilometers along roads but is much greater in areas of limited access.

Laboratory methods - Geochemical analyses were conducted on two grain-sized fractions of till: the silt-plus-clay (< 0.063 mm or -250 mesh) and the clay (<0.002 mm) sized fractions. All separations were completed in the Sedimentology Laboratory of the Geological Survey of Canada, under the supervision of P.J. Lindsay and M. Wygergangs, following procedures outlined in Lindsay and Shilts (1995).

Both grain-sized fractions were analyzed by inductively coupled plasma - atomic emission spectrometry (ICP-AES) after an Aqua Regia digestion at Chemex Labs, Mississauga, Ontario for the following elements: Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, Hg, K, La, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Sc, Sr, Ti, Tl, U, V, W, and Zn. The clay-sized fraction only was analyzed for Hg by cold-vapor atomic absorption, which has a lower detection limit than the ICP-AES analyses, in the same laboratory and following the same digestion. The silt-plus-clay sized-fraction was analyzed by instrumental neutron activation (INA) at Activation Laboratories Ltd., Ancaster, Ontario for the following elements: Ag, As, Au, Ba, Br, Ca, Co, Cr, Cs, Fe, Hg, Hg, Ir, Mo, Na, Ni, Rb, Sb, Sc, Se, Sn, Sr, Ta, Th,U, W, Zn, La, Ce, Nd, Sm, Eu, Tb, Yb, and Lu. Precision and accuracy of analytical methods have been tested by inserting duplicates (field and laboratory) and standards. These quality control tests have demonstrated that the analytical results are of acceptable quality and will be presented and discussed in a following publication (Plouffe, in press). Gold grain counts were completed at Overburden Drilling Management, Nepean, Ontario, on the exact same samples analyzed by INA.

Ice-flow history

Because till is composed of debris eroded, transported, and deposited by glaciers, it is of primary importance to understand ice-flow direction to identify the source of geochemical anomalies. Central British Columbia was last glaciated during the Late Wisconsinan Fraser Glaciation, during which glaciers derived from accumulation zones located in the Coast and Cariboo mountains advanced onto the Interior Plateaus. The northern sector of Nechako River map sheet was overridden by glaciers derived from the Coasts Mountains, to the west of the region. Consequently, ice flow was dominantly to the east-northeast and northeast. The deflection of ice flow to the northeast, particularly noticeable in the eastern part of the region can be accounted by northwesterly flowing ice derived from the Cariboo Mountains to the southeast, which exerted a pressure on the easterly flowing ice.

The generalized regional ice-flow patterns depicted in this Open File were derived from Plouffe (1998b; 1998c).

Mineral potential

The mineral potential of this region is demonstrated by the presence of epithermal showings throughout the area and the Endako Mine (Mo-porphyry) located a few kilometers to the north of the map boundary. The purpose of this section is not to give an exhaustive interpretation of the geochemical data, but to underline potentially significant anomalies from a mineral exploration point of view.

Au - Most of the highest gold concentrations are not located close to known showings except for the high gold level measured due north of Knewstubb Lake which is in the vicinity of the Stubb showing. The high gold concentration (29 ppb) measured in till south of Lucas Lake certainly represents a mineral exploration target because high arsenic and gold concentrations have also been detected in a nearby lake sediment sample (Cook and Jackaman, 1994). A portion of the gold in till resides as free gold particles and only in one sample could it be present as inclusions within sulfides. Indeed, sulfides have been found in only one sample. The limited correlation between the measured gold concentrations and the gold grain counts could be related to non-recovery of gold grains during the separation process or the presence of gold inclusions in other mineral phases.

Ba - Barium concentrations are often high in mineralized bedrock of an epithermal system. The presence of high barium concentrations in the central part of the region could either be indicative of such a system or reflect an unmineralized bedrock source with a higher barium background concentration.

Mo - The highest molybdenum concentrations are all located in the vicinity of Nithi Mountain, east of François Lake where fifteen molybdenum showings are known. These are likely the source of molybdenum in till.

Hg - Mercury is a potential pathfinder element for epithermal gold mineralization and has been found to be enriched in till down-ice from certain faults, including Pinchi Fault (Plouffe, 1998a). All high mercury levels are in the vicinity of newly mapped faults (see Diakow and Levson, 1997; Anderson et al., 1998).

References

Anderson, R. G., Snyder, L. D., Resnick, J. and Barnes, E. 1998:
Geology of the Big Bend Creek map area, central British Columbia; in Current Research 1998-A, Geological Survey of Canada, Ottawa, p. 145-154.

Cook, S. J. and Jackaman, W. 1994:
Regional lake sediment and water geochemistry of part of the Nechako River map area (93F/02, 03; 93F/06, 11, 12, 13, 14); British Columbia Ministry of Energy, Mines and Petroleum Resources, Victoria, Open file 1994-19, 31 p. plus appendices

Diakow, L. J. and Levson, V. M. 1997:
Bedrock and surficial geology of the southern Nechako Plateau, central British Columbia, Ministry of Employment and Investment, Geoscience map 1997-2, scale 1:100 000.

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Till geochemistry of the Fawnie Creek map area (NTS 93 F/3); British Columbia Ministry of Energy, Mines and Petroleum Resources, Open File 1994-18, 34 p.

Lindsay, P. J. and Shilts, W. W. 1995:
A standard laboratory procedure for separating clay-sized detritus from unconsolidated glacial sediments and their derivatives; in Drift Exploration in the Canadian Cordillera, (eds.) P. T. Bobrowsky, S. J. Sibbick, J. M. Newell and P. F. Matysek, British Columbia Ministry of Energy, Mines and Petroleum Resources, Paper 1995-2, p. 165-166.

Plouffe, A. 1995:
Geochemistry, lithology, mineralogy and visible gold grain content of till in the Manson River and Fort Fraser map areas, central British Columbia (NTS 93K and N); Geological Survey of Canada, Open File 3194, 119 p.

Plouffe, A. 1998a:
Detrital transport of metals by glaciers, an example from the Pinchi Mine site, central British Columbia; Environmental Geology, v. 33, p. 183-196.

Plouffe, A. 1998b:
Surficial geology, Binta Lake, British Columbia (93 F/NW), Geological Survey of Canada, Open file 3640, scale 1:100 000.

Plouffe, A. 1998c:
Surficial geology, Tahultzu Lake, British Columbia (93 F/NE), Geological Survey of Canada, Open File 3620, scale 1:100 000.

Plouffe, A. in press:
New data on till geochemistry in the northern sector of the Nechako River map sheet (NTS 93 F), British Columbia; in Current Research 1999-A, Geological Survey of Canada.

Williams, S. P. 1997:
Geological compilation of the Nechako River (93F) map area, British Columbia, Geological Survey of Canada, Open File 3429, scale 1:250,000.

LEGEND

Unconsolidated Cover

QUATERNARY
PLEISTOCENE AND HOLOCENE

Unit	Description
Qal	*Unconsolidated glacial till, fluvial deposits and poorly sorted alluvium*

Layered Rocks

TERTIARY AND QUATERNARY
MIOCENE AND PLEISTOCENE

Unit	Description
MPCv	*Flat-lying, vesicular, columnar-jointed olivine basalt; contains xenoliths of dunite and leucogneiss in easternmost exposures derived from North American basement and mantle*

TERTIARY
UPPER EOCENE TO OLIGOCENE
Endako Group

Unit	Description
EOE	*Massive, vesicular and amygdaloidal varieties of basalt and andesite; minor breccia, tuff, feeders of gabbro, necks, plugs and dykes, minor dacite, rhyolite, conglomerate, sandstone and shale*

LOWER TO MIDDLE EOCENE
Ootsa Lake Group

Unit	Description
EOL	*Buff to white coloured flow banded rhyolite and purplish dacites; quartz, and biotite phyric phases, fine grained rocks with abundant spherulites, medium to dark grey plagioclase-biotite porphyritic andesites, locally with vesicles and amygdules of quartz, calcite and chlorite; basalt, volcanic conglomerates, sediments, breccias and tuffs*

CRETACEOUS
LOWER TO UPPER CRETACEOUS
Kasalka Group

Unit	Description
uKK	*Predominantly hornblende-feldspar porphyritic andesite flows and related lahars, debris flows, volcanic breccias and epiclastic beds; also includes lesser hornblende-biotite-feldspar phyric dacite to rhyodacite, aphyric to augite-phyric basaltic andesite, flow-banded quartz phyric rhyolite, bladed feldspar porphyry flows, hornblende-biotite-bearing lapilli tuff, crystal tuff and volcanic sandstone and siltstone; overlies older rocks with angular discordance*

LOWER AND/OR UPPER CRETACEOUS

Unit	Description
luKsv	*Basalt, andesite, and related tuffs and breccias; minor rhyolite, argillite, arkose and conglomerate*

JURASSIC
MIDDLE JURASSIC
Bowser Lake Group

Unit	Description
muJBL	*Chert pebble conglomerate, siltstone, minor argillite*

LOWER TO UPPER JURASSIC
Hazelton Group (ImJH - JHv)

Unit	Description
ImJH	*Andesite, basalt and related tuff and breccia; lesser dacitic to rhyolitic tuffs, breccias and flows; conglomerate, greywacke, shale; argillite, tuffaceous argillite, limy argillite; limestone*
JHv	*Green, maroon and purple, marine and sub-aerial basaltic, andesitic and dacitic pyroclastics and flow; feldspar-phyric andesite, augite-phyric basalt; lapilli, crystal and ash tuffs, ignimbrite, lahar, volcanic breccia and agglomerate, epiclastic sediment*

TRIASSIC AND JURASSIC
UPPER TRIASSIC AND LOWER JURASSIC
Takla Group

Unit	Description
TJT	*Andesite, basalt, breccia, tuff; minor argillite and limestone*

TRIASSIC
UPPER TRIASSIC

Unit	Description
uTsc	*Limestone*

PENNSYLVANIAN TO TRIASSIC
Cache Creek Group

Unit	Description
PTCCu	*Ultramafic rocks: includes variably serpentinized medium to coarse grained harzburgite with lessor dunite as dykes and pods, peridotite; minor ultramafic cumulates; serpentinized and carbonatized equivalents*

Intrusive Rocks

CRETACEOUS AND/OR TERTIARY
LATE CRETACEOUS AND/OR EARLY TERTIARY

Unit	Description
KTqfp	*Quartz-feldspar porphyry*
KTg	*Granite, granodiorite, tonalite*

CRETACEOUS AND/OR TERTIARY

Unit	Description
KTal	*Alaskite*

JURASSIC TO CRETACEOUS
MIDDLE JURASSIC TO EARLY CRETACEOUS
Francois Intrusions (JKf - JKWqm)

Unit	Description
JKf	*Felsite*
JKg	*Granite and granodiorite*
JKgd	*Predominantly granodiorite*
JKd	*Diorite*
JKyqm	*Younger quartz monzonites and quartz diorites; includes Limit, Leg Lake and Stellako quartz monzonites*
JKCga	*Casey granite and alaskite; fine to medium grained, sugary textured, leucocratic granite and alaskite*
JKGg	*Glenannan granite; coarse grained granite to quartz monzonite, mainly equigranular to slightly feldspar porphyritic with 5-10% biotite; also includes the Tatin, Triangle, Rex and Caledonia quartz monzonites and granite*
JKNqm	*Nithi quartz monzonite; probably very similar age to the Endako quartz monzonite*
JKqdc	*Quartz diorite complex*
JKWqm	*Wheeler quartz monzonite; coarse grained leucocratic quartz monzonite with local orthoclase porphyritic varieties; also called Menard stock*

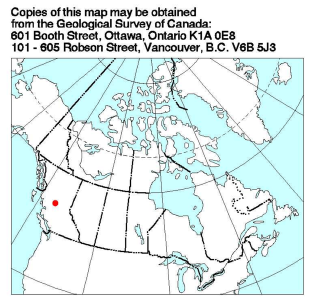
PERMIAN TO JURASSIC (?)

Unit	Description
PJog	*Granodioritic orthogneiss*

Symbols

Geological boundary (bedrock / surficial)
Faults (exposed / covered by drift)
Roads (unclassified)

Copies of this map may be obtained from the Geological Survey of Canada:
601 Booth Street, Ottawa, Ontario K1A 0E8
101 - 605 Robson Street, Vancouver, B.C. V6B 5J3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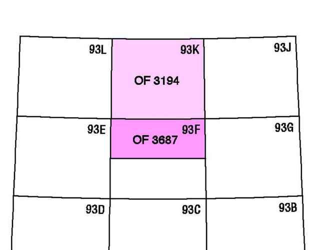

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

Till geochemical data by A. Plouffe (1997), Terrain Sciences Division

Digital cartography by S.P. Williams, Cordilleran Division

Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

Digital base map from Geomatics Canada published at a different scale. Generalized and modified by the Geological Survey of Canada.

OPEN FILE 3687

Regional Till Geochemistry

GOLD AND PATHFINDER ELEMENTS

NORTHERN NECHAKO RIVER

BRITISH COLUMBIA

Scale 1:400 000 - Échelle 1/400 000

Kilometres 10 0 10 20 30 40 Kilomètres

Transverse Mercator Projection
CM -125°, Scale Factor 1.0

Projection transverse de Mercator
M.C. -125°, facteur d'échelle 1.0

Magnetic declination 1998, 22°39´ East, decreasing 8.5´ annually. Readings vary from 22°20´E in the SE corner to 22°58´E in the NW corner of the map.

North American Datum 1927

Elevation in feet above mean sea level

Contour interval 500 feet

Bedrock geology obtained from:
Williams, S.P. (compiler)
1997: Geological compilaton of the Nechako River (93F) map area, British Columbia; Geological Survey of Canada, Open File 3429, scale 1:250 000

OPEN FILE
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3687
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
OTTAWA
Dec 1998

SHEET 1 OF 2
FEUILLET 1 DE 2

Recommended citation:
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1998: Regional till geochemistry of the northern sector of Nechako River map area (NTS 93F), British Columbia; Geological Survey of Canada, Open File 3687, scale 1 : 400 000

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