GEOLOGICAL SURVEY OF CANADA
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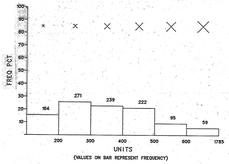
DEPARTMENT OF ENERGY, MINES AND RESOURCES
MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES

N POINTS	1050	MEAN	353
MEDIAN	335	STD DEV	170
MINIMUM	20	MAXIMUM	1785



MANGANESE (PPM)

TILL GEOCHEMISTRY BAKER LAKE AREA DISTRICT OF KEEWATIN NTS 55M AND NTS 65P

R.A. KLASSEN, R.K. BURNS

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GEOCHEMISTRY OF TILL; BAKER LAKE AREA, DISTRICT OF KEEWATIN

R.A. Klassen and R.K. Burns

Geochemical analysis of about 2000 till samples collected from an area of about 6250 km² south of Baker Lake, District of Keewatin are presented here. The samples were collected during 1973 and 1974 by the Geological Survey of Canada as part of a study to determine drift composition and to establish models of glacial dispersal in the region (Klassen and Shilts, 1977). The sample spacing (1 per 3-4 km²) is suited for definition of local-scale (kilometres to tens of kilometres) glacial dispersal trains (Shilts, 1984) derived from bedrock sources of significant areal extent. Single or paired samples containing trace metals at above-background levels could represent 'tail' parts of trains derived from smaller mineralized sources. Samples were routinely collected at depths of 20 to 40 cm from the centres of mudboils, which are periglacial features commonly associated with till in the region (Shilts, 1977).

Bedrock geology of the study area has been described by Donaldson (1965), Le Cheminant et al. (1970), Le Cheminant et al. (1977), Le Cheminant et al. (1979), Blake (1980), and Miller (1980). Most of the area is underlain by Paleohelikian sedimentary and volcanic rocks of Dubawnt Group; the southern third is underlain by crystalline basement rocks of Archean and/or Aphebian age. Uranium mineralization is known throughout the area (Miller, 1980).

The clay-size (<.002 mm) fraction of till was analyzed for copper, lead and zinc (1973, 74) and for manganese and iron (1973) by atomic absorption methods (hot nitric acid – hydrochloric acid leach), and for uranium by fluorimetric and by delayed neutron activation methods. Neutron activation analyses were done by Atomic Energy of Canada, Ltd., and all other analyses were done by Bondar-Clegg Co. Ltd., Ottawa. Analytical reproducibility is estimated by replicate analysis to be about ±20% for samples having uranium contents <2.0 ppm; bias is estimated to be ±20%. Neutron activation analysis provided slightly higher uranium contents (by typically 1 to 2 ppm) than fluorimetric analysis and provided greater reproducibility, particularly for samples having low metal levels (<4 ppm).

There has been marked variation in the directions of ice flow during glaciation as the position of the Keewatin Ice Divide changed (Shilts et al., 1979), and changing direction of ice flow are recorded on the map. The most commonly observed glacial flow trends are oriented approximately south to southeast. East-west trends are recorded in the southwest of the area, and southwest trends are recorded in the northeast that are thought to be the product of late-glacial phases of flow.

The geological setting of the study area with regard to regional-scale patterns (tens to hundreds of km) of glacial dispersal, defined by geochemistry and lithology, has been described by Shilts (1984). Till in the study area is characterized by low trace element contents as a result of glacial erosion of metal-poor sedimentary rocks of the Dubawnt Group. A regional-scale dispersal train that is geochemically characterized by elevated trace metal contents extends from north of Baker Lake across the northeast part of the study area and is the reason for the relatively high geochemical analysis in the northeast corner. High trace metal levels in the southwest corner are the result of eastward transport of crystalline debris into the study area, possibly as a result of late-glacial change in the position of the Keewatin Ice Divide.

At a local scale, a prominant dispersal train characterized by a relative absence of metals extends southeastward from the area of Pitz Lake (Klassen and Shilts, 1977). The metal poor train is the result of preferential glacial erosion of kaolin-cemented sandstone of the Thelon Formation. The train extends over fifty kilometres downwash from its source area, masking the expression crystalline bedrock to the south, and is 10 to 20 km in width. The long axis of the train has a southeastward orientation that approximates glacial trends indicated by streamlined landforms seen on aerial photographs.

Glacial drift forming the regional and local-scale dispersal trains can affect the geochemical and lithological expression of detailed-scale trains resulting from erosion of mineralized sources. Detailed-scale (hundreds of metres) glacial dispersal at three sites of uranium and uranium-copper mineralization near Kazan River (sites 9, 10, 11; Miller, 1980) are limited in extent (up to 2 km) and are geochemically poorly-defined. The greater part of the detailed trains is characterized by metal contents of 2-3 ppm U and 20-30 ppm Cu, and these metal levels are only slightly greater than local background. In comparison, the levels are much less than those within the segment of the regional train that extends across the northeastern corner of the study area. Analytic variation combined with the variation associated with both local and regional trains would make identification of detailed-scale trains from mineralization by sampling density used here difficult. None of the single and clustered 'anomalies' scattered throughout the study area are clearly associated with the known sites of mineralization indicated by Miller (1980) (Fig. 1), although some could be related to unknown mineralized sources.

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HELIKIAN	12	Mackenzie diabase (observed, interpreted from aeromagnetic maps)
		DUBAWNT GROUP
	11	THELON FORMATION: sandstone, pebbly sandstone conglomerate
	10	PITZ FORMATION: acid lavas with abundant large feldspar phenocrysts (commonly pseudomorphed by kaolinite) and sub-ordinate quartz and altered ferromagnesian phenocrysts; minor hyaloclastites
	9	MARTELL SYENITE: syenite, porphyritic microsyenite, minor monzonite
	8	CHRISTOPHER ISLAND FORMATION: interbedded volcaniclastic sandstone, silt-stone, mudstone, conglomerate, minor inter-bedded tuff
	7	Agglomerate, tuff; minor lava flows
	6	Rhyolite lava and associated breccia; mainly non-porphyritic
	5	Felsic trachyte lava - phenocrysts of sodic plagioclase and/or alkali feldspar and sub-ordinate clinopyroxene, mica and/or amphibole
	4	Mafic trachyte lava- phenocrysts of phlogo-pite biotite, clinopyroxene; subordinate alkali feldspar, plagioclase and/or pseudo-morphed olivine; minor interlayered agglomerate and tuff
	3	KAZAN FORMATION: arkose; minor pebbly arkose, conglomerate, siltstone
	2	SOUTH CHANNEL FORMATION: polymictic conglomerate; minor sandstone lenses
ARCHEAN APHEBIAN	1	Crystalline basement rocks: granitoid gneiss, migmatite, amphibolite, paragneiss, schist, anorthosite, granulite

Geological boundary (defined, approximate, assumed)
Bedding, tops known (horizontal, inclined)
Fault (defined, approximate, assumed)

TYPES OF URANIUM MINERALIZATION
Fracture controlled
Red bed
Disseminated and pegmatic
Glacial striae (direction known, unknown)

Geology compiled by D.H. Blake and A.N. Le Cheminant, 1977 (Blake, 1980)
Mineralization recorded by Miller (1980)

Till Geochemistry BAKER LAKE, N.W.T.

Scale 1:125 000

Kilometres 2 0 2 4 6 8 10 Kilometres

Universal Transverse Mercator Projection

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COLUMBIA
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