GEOCHEMICAL ORIENTATION STUDIES AND QUATERNARY MAPPING AROUND THE STRANGE LAKE DEPOSIT, NORTHERN LABRADOR

by

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Introduction

An intensive ten-day field study was undertaken over and around the Strange Lake Zr-Nb-Y-Be-rare earth element deposit in Northern Labrador about 130 km west of Nain near the Labrador-Quebec border (Figure 1). The deposit was discovered by the Iron Ore Company of Canada as a result of following up a geochemical anomaly in the regional lake sediment and water survey carried out under the Canada-Newfoundland Uranium Reconnaissance Program (Geological Survey of Canada, 1979).

In the regional geochemical data, the deposit is reflected by a pronounced F anomaly in lake water with associated U in lake water and Pb in the lake sediments. As the deposit itself lies to the west of the regional survey area, the lake sediment and water anomalies are due to a combination of glacial and hydromorphic dispersion.

The objectives of this preliminary study are to characterize the geochemical signature of this type of deposit, and to begin the development of effective follow-up strategies for evaluating other similar regional geochemical anomalies in the province. An additional goal is to provide data on the Quaternary deposits of the area for future geotechnical and environmental assessments.

Description of Area

The area lies within the Nain - George River Plateau, and the terrain is undulating with east-west trending broad valleys and intervening narrow ridges. The maximum elevation is a little over 600 m, with local relief of up to 75 m. The area is covered by a tundra flora, and it lies within the permafrost zone. The local fauna include abundant caribou (which belong to the George River Herd) and wolves.

The area is heavily drift-covered and rock exposure is scarce (1-2%). The mineral deposit occurs in a suite of peralkaline granites which intrude both Paleohelikian adamellite and high grade biotite gneiss of Aphebian age (Hlava and Krishnan, 1980; Taylor, 1975). The peralkaline granites are composed of K-feldspar, quartz, albite and riebeckite with or without aegerine, together with accessory zircon, gittinsite, fluorite, hematite, pyrochlore and allanite (Hlava and Krishnan, 1980). Locally peralkaline pegmatites are present. The location of the eastern boundary of peralkaline granite (Figure 1) is approximate, based on very limited outcrop and diamond drilling results contained in Hlava and Krishnan (1980).

Geochemical Sampling

Samples of lake sediment and water, stream sediment and water and till were collected from parts of NTS sheets 24A/8 and 14D/5 (Figure 1), as detailed below:

1) high density lake sediment and water sampling from 107 sites;

2) stream sediment and water sampling from 140 sites;

3) till and frost boil sampling from about 200 sites, with the sample density decreasing away from the deposit.

The lake waters are being analyzed for Y, F, U and pH. The lake sediments are being analyzed for U, Cu, Pb, Zn, Co, Ni, Cd, Ag, Mo, F, Mn, Fe and LOI (the suite determined on the regional sample set). In addition, they will be analyzed for W, Be, Th, Y, Li and rare earth elements. In a recent survey by the Quebec Department of Energy and Resources in the adjacent area of Quebec, it appears that Be, Th and Y, together with Ce, Eu, La and Sm in lake sediment may be useful guides in locating this type of deposit (Beaumier, 1982). From the samples collected this summer, it should be possible to characterize fully the geochemical signature of the deposit in lake sediments. A similar range of elements is being determined on the stream sediments and waters; in addition, Sn will be included for the stream sediments.

For the till and frost boil samples, a similar wide range of elements (including Sn) will be determined to find the most

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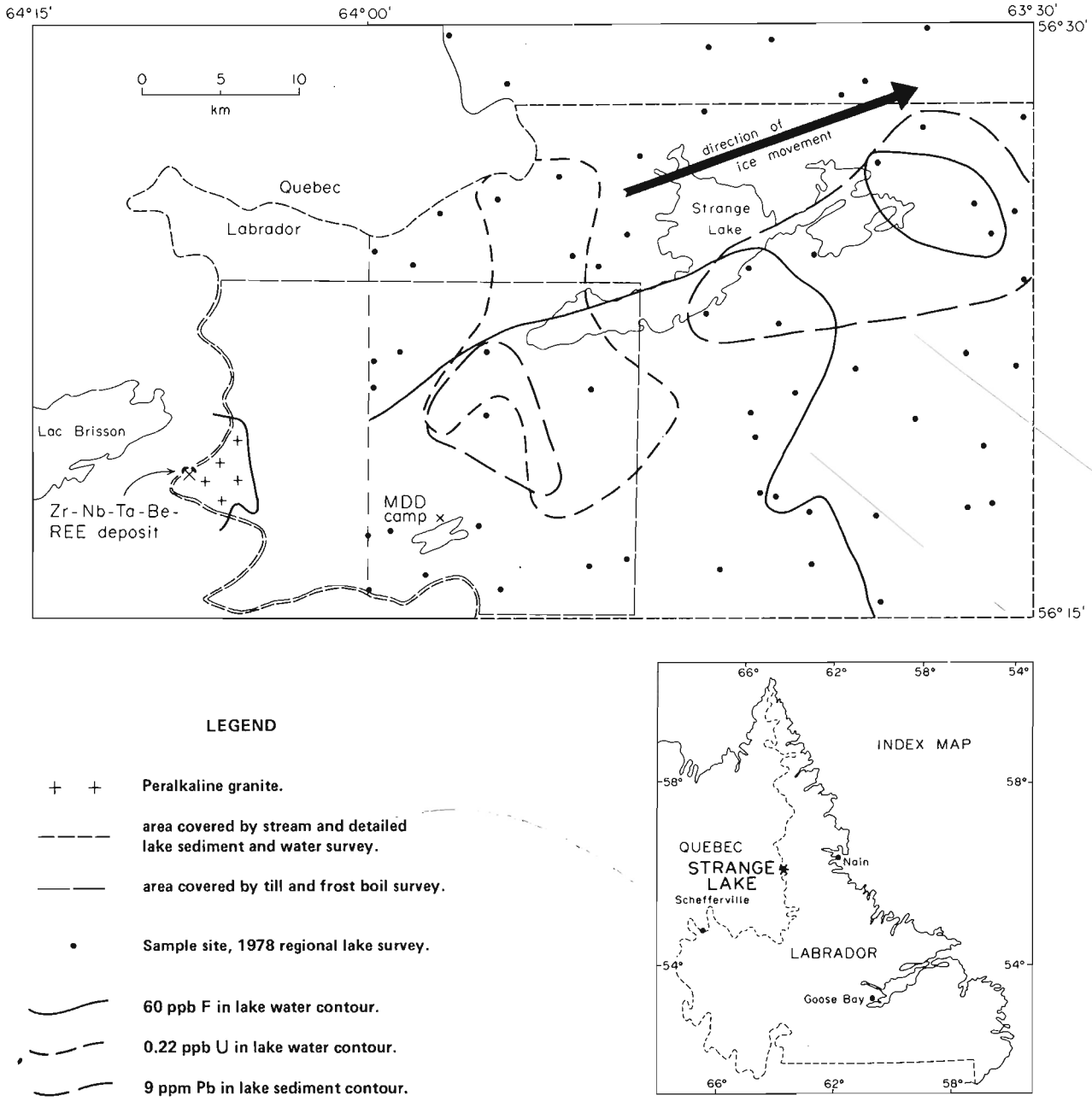

Figure 1: *Area of till, frost boil, stream sediment and water, and detailed lake sediment and water sampling in the "Strange Lake" area, Labrador. Also shown are the regional geochemical survey sample sites and anomalies in F, Pb and U related to the deposit, and the extent of the host peralkaline granite.*

useful suite of elements with which to map the glacial dispersion train from the deposit. In addition, lithologic and particle size analyses of tills will be conducted. In conjunction with more detailed till sampling being carried out by R.N.W. DiLabio of the Geological Survey of Canada, we should be able to provide a well documented example of the application of till and frost boil sampling at both semi-regional and detailed scales in exploration for this type of deposit.

Preliminary Geochemical Results

Although most analytical work is still in progress some analyses have been completed including F in lake and stream waters and Be in stream sediments. Both elements have distinctive dispersion patterns. The patterns of F in lake and stream waters are very similar with a broad zone of high values occurring over the entire peralkaline complex; values drop gradually in a down-ice direction (east-northeast) away from the peralkaline granite, and drop sharply to the northwest and southeast. The pattern of Be in stream sediments, by contrast, is more linear forming a narrow belt of anomalous values which transects the peralkaline complex and extends down-ice for at least 30 km. The highest values are concentrated in the area of known mineralization.

Quaternary Mapping

Further to the assessment of geochemical follow-up on the Strange Lake deposit, and as part of the continuing effort by the Department (Vanderveer and Sparkes, 1982) to provide Quaternary data to the mineral exploration industry, Quaternary mapping was carried out in conjunction with the geochemical follow-up studies.

Prior to the field season, 1:50,000 scale Quaternary geology maps were compiled from airphotos for map areas 24A/8 and 14D/5. In addition portions of map sheets 14D/1,2,3,6,7,8,9,10,11 and 12 were interpreted, in order to provide geotechnical and environmental data to assess the selection of routes to the coast and to provide background data for any future environmental assessment. Mapping and sampling of the Quaternary geology of 24A/8 and 14D/5, while useful for geotechnical and environmental assessments, were primarily designed to provide a framework for the interpretation of both geochemical data and the results of the airborne gamma-ray survey of N.T.S. map sheets 24A/1 and 24A/8 released by the Geological Survey of Canada (1983).

As part of the Quaternary mapping field program, till and frost boil sampling was carried out on 24A/8 and 14D/5. In total 271 samples were collected from 200 sites and in most cases a collection of pebbles (+ 16 mm to - 32 mm size) was made for lithological studies. In the vicinity of the Strange Lake orebody, samples were collected at 500 m intervals on north-south grid lines spaced at 1000 m. Outside the main claim area on map area 24A/8 samples were collected at 1000 m intervals on north-south grid lines spaced at 2000 m intervals. On map area 14D/5, samples were collected at 2000 m intervals on lines spaced 2000 m apart.

Some profile sampling was carried out which involved a B horizon soil (Fe, oxidize stained, red-brown) sample and a transition B-C horizon soil sample. The latter was usually richer in silt or fine sand due to the percolation of water through the soil (i.e. a hybrid or gradational zone between the B horizon and the parent soil material). This transition zone was usually about 0.5 m thick, whereas the B horizon was only about 0.1 m thick. A parent soil (till) sample was taken wherever exposed.

Preliminary Observations

Glacial drift in the area is extensive and the main elements are shown in Figure 2. The only outcrops are confined to small patches on the topmost parts of the hills or to scattered exposures along the major rivers.

The overburden consists of a compact gray basal till unit that has a mixed silt and sand matrix. Overall, characteristics of the unit are consistent with those of a lodgement till. This unit is overlain by a sandy till deposit which is less compacted than the underlying unit and which exhibits evidence of sorting and washing. Deposition was probably by a melt-out process. The washed matrix of pink sand (medium to coarse grained) is a distinctive feature of this unit that aids in its identification during frost boil sampling.

Glacial transport directions are remarkably consistent across the area, and from the valley to the hilltops no discernible transport differences were observed. The general trend of ice movement was 070°. Some local variations on a particular outcrop may be observed as the glacier ice moved either up and over or around the sides of the bedrock obstruction.

The most conspicuous landform features of the area are the numerous well developed crag and tail hills and drumlinoid features, 1 to 4 km in length, which parallel the direction of glacial transport. The valleys between these features are gener-

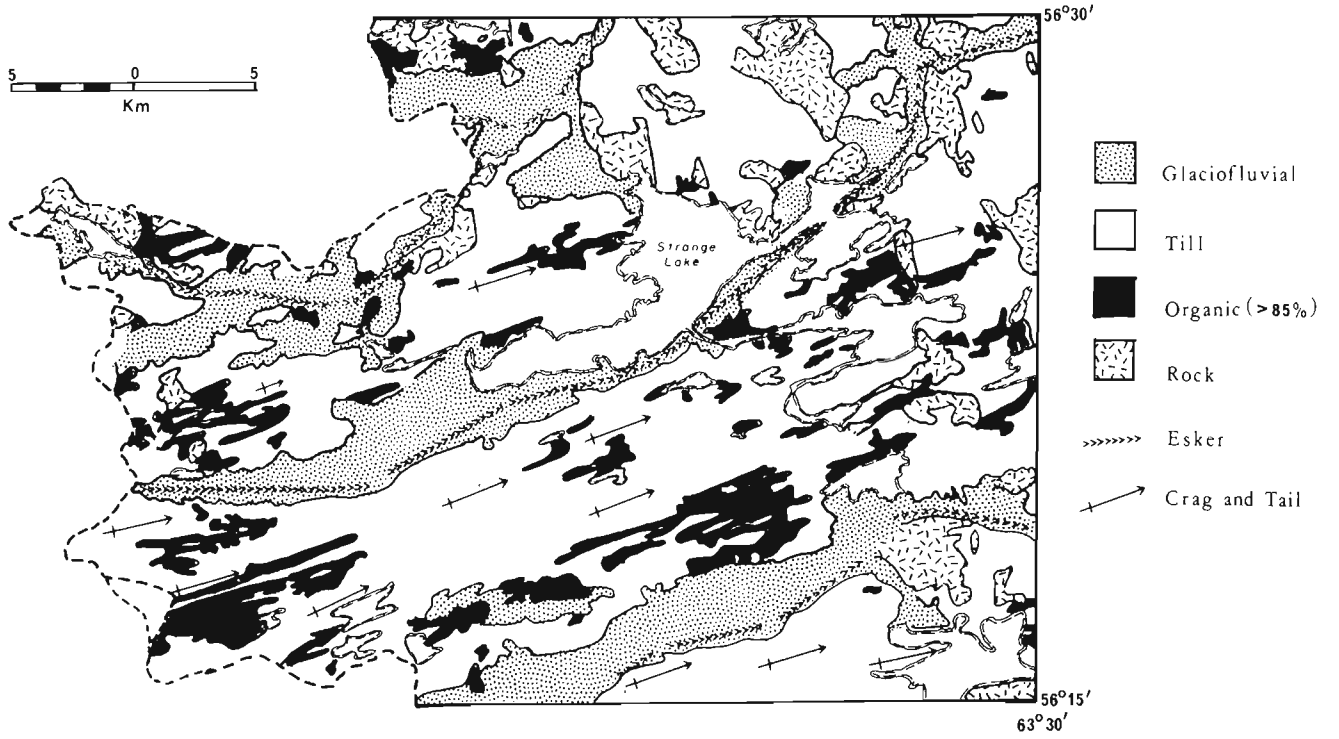

Figure 2: *Surficial landforms, Strange Lake (24A/8, 14D/5).*

ally shallow and slope towards the east. These shallow valleys are frequently the site of boulder pavements due to a combination of postglacial washing (meltwater channels) and present day erosion, particularly during spring breakup. The south-facing side of the crag and tail and drumlinoid hills are often steeper and less well vegetated than the north slopes. This may be the result of periglacial action and present day semipermanent or seasonal ice and snow accumulations.

The major river valleys (e.g. that occupied by (Strange) Esker Lake) are the sites of extensive expanses of ribbed moraine, as well as esker and other glaciofluvial and/or glaciolacustrine deposits. These materials generally have shallower thickness than the till deposits at higher elevations.

Conclusion

Pebble lithology and grain size data for the till and frost boil samples will be evaluated, with the geochemical data, to find the most useful parameters, or suite of elements, with which to map the glacial dispersion train from the deposit. In conjunction with the more detailed till sampling being carried out by R.N.W. DiLabio of the Geological Survey of Canada, we should be able to provide a well documented example of the application of till and frost boil sampling at both semi-regional and detailed scales in exploration for this type of deposit.

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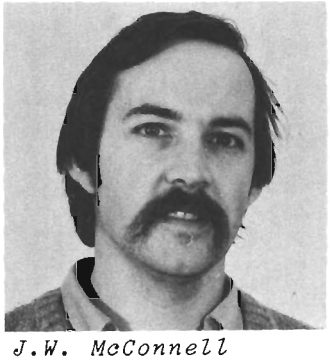

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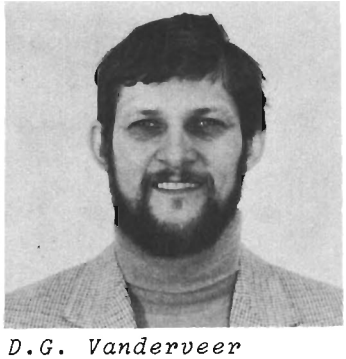

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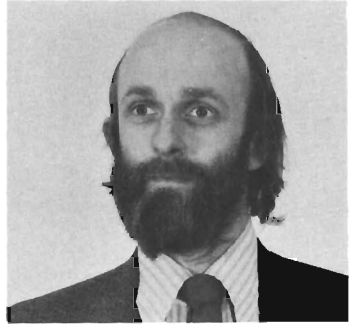

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