GEOSCIENCE STUDIES IN THE WEIR'S POND AREA NORTHEAST OF GANDER, NEWFOUNDLAND

by

A.J. Butler, H.G. Miller[1] and D.G.Vanderveer
Geochemistry and Environmental Geology Sections

Introduction

During the 1983 field season, a geochemical anomaly in the Benton - Indian Bay Pond area (Figure 1) was investigated by geochemical stream sampling, a geophysical gravity survey and Quaternary mapping in order to locate its source. A regional lake sediment geochemistry survey (Butler and Davenport, 1981a,b) had indicated a major geochemical nickel (Ni) anomaly over the Gander River Ultramafic Belt (GRUB) and a less intense multipoint Ni anomaly approximately 20 km to the east near the village of Benton (Figure 2). This latter anomaly is underlain by Middle Ordovician Gander Group psammite, pelite and semipelite and by Square Pond Gneiss. Concentrations of the elements Zn, Co, Pb and to a minor extent Cu are associated with the less intense anomaly but not with the GRUB anomaly. This indicates that the source of the less intense anomaly probably differs from that of the GRUB anomaly,which is the ultramafic rocks of GRUB. A source for the anomaly in the Benton area is presently unknown, although mafic volcanic rocks in the Indian Bay Pond area (Blackwood, 1978) may be more extensive than initially thought.

The area is of low to moderate relief and has fair to good stream development. It is heavily forested in some areas, particularly in the south,and has more open and rocky bog and barren areas to the north with fair to poor bedrock exposure.

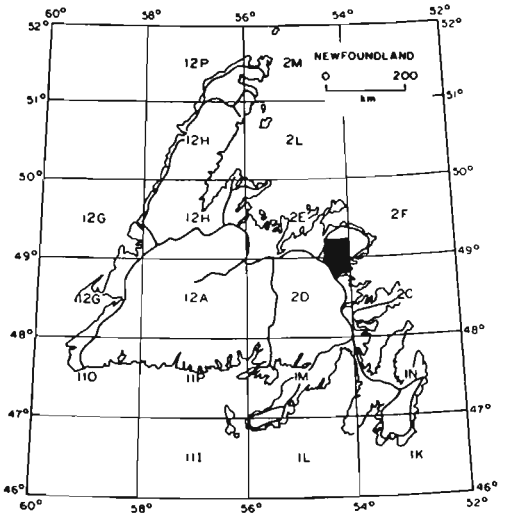

Figure 1: *Index Map.*

Geochemistry

The area was divided into three parts (Figure 2) to facilitate field work, (A) the Soulis Pond area, (B) the Indian Bay Pond area, and (C) the Indian Bay Big Pond area. Each area was sampled independently, but the results of the analyses will be combined for public release.

In total, 239 stream sediment samples were collected at approximately 300 m intervals along all major streams and tributaries within the area. Analyses of these samples have been completed for Cu, Pb, Zn, Co, Ni, Ag, Mn, Fe, Cd, Mo and L.O.I. (loss on ignition) at Mines and Energy's laboratory in the Howley Building. Analysis for F is partially completed. The results are presently being computerized for statistical analysis.

Geophysics

Gravity data were collected using a LaCoste-Romberg land gravity meter, serial number G444. Elevations were obtained from barometric altimeters using survey methods to increase the accuracy of the results

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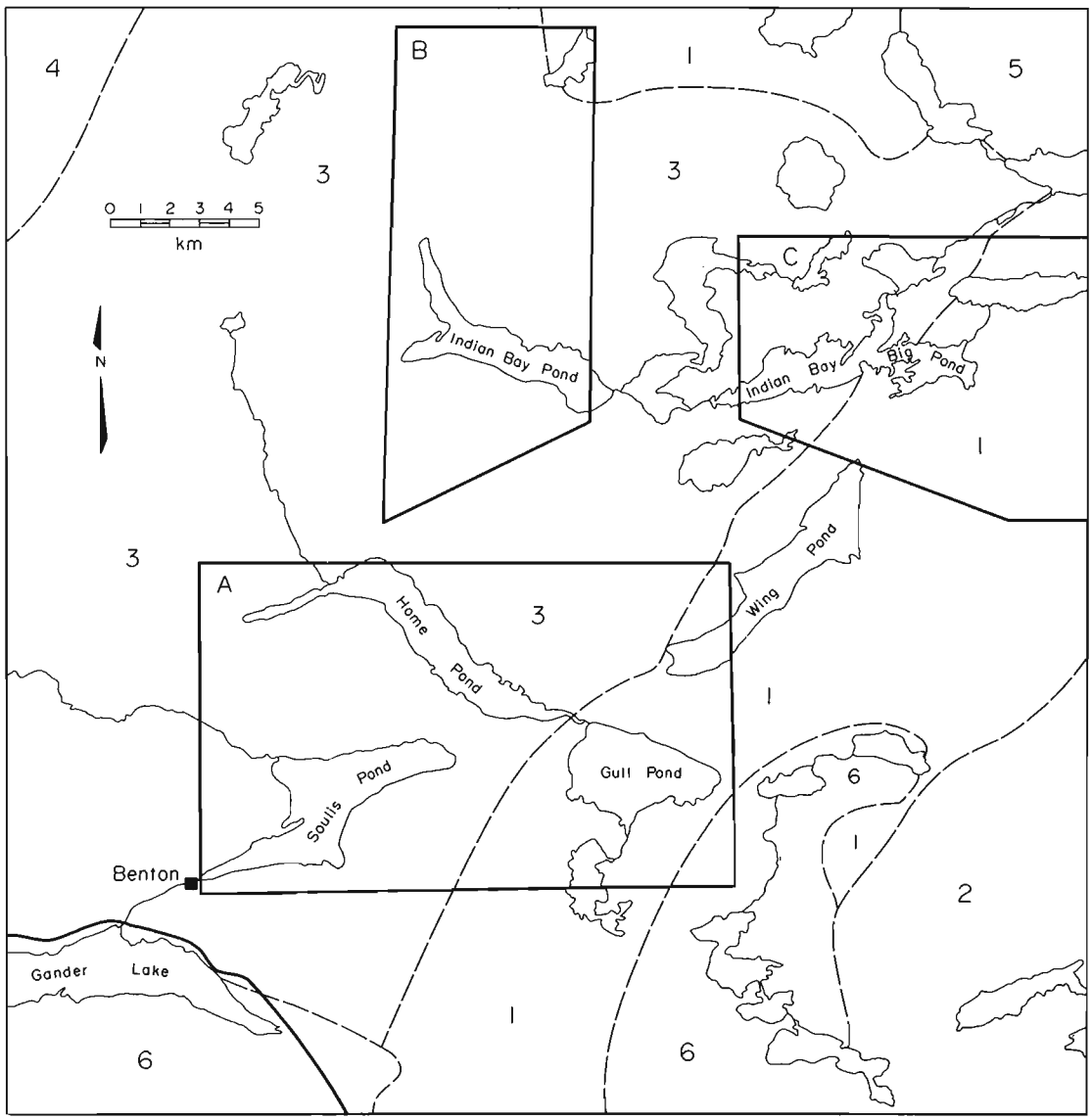
1 Department of Earth Sciences, Memorial University of Newfoundland, St. John's, Newfoundland A1B 3X7



LEGEND

5	Deadman's Bay Granite
4	Davidsville Group
3	Gander Group
2	Hare Bay Gneiss
1	Square Pond Gneiss

Figure 2: *Generalized geology of the Weir's Pond area, Northwest of Gander, Newfoundland. Detailed areas are (A) Soulis Pond; (B) Indian Bay Pond; (C) Indian Bay Big Pond.*

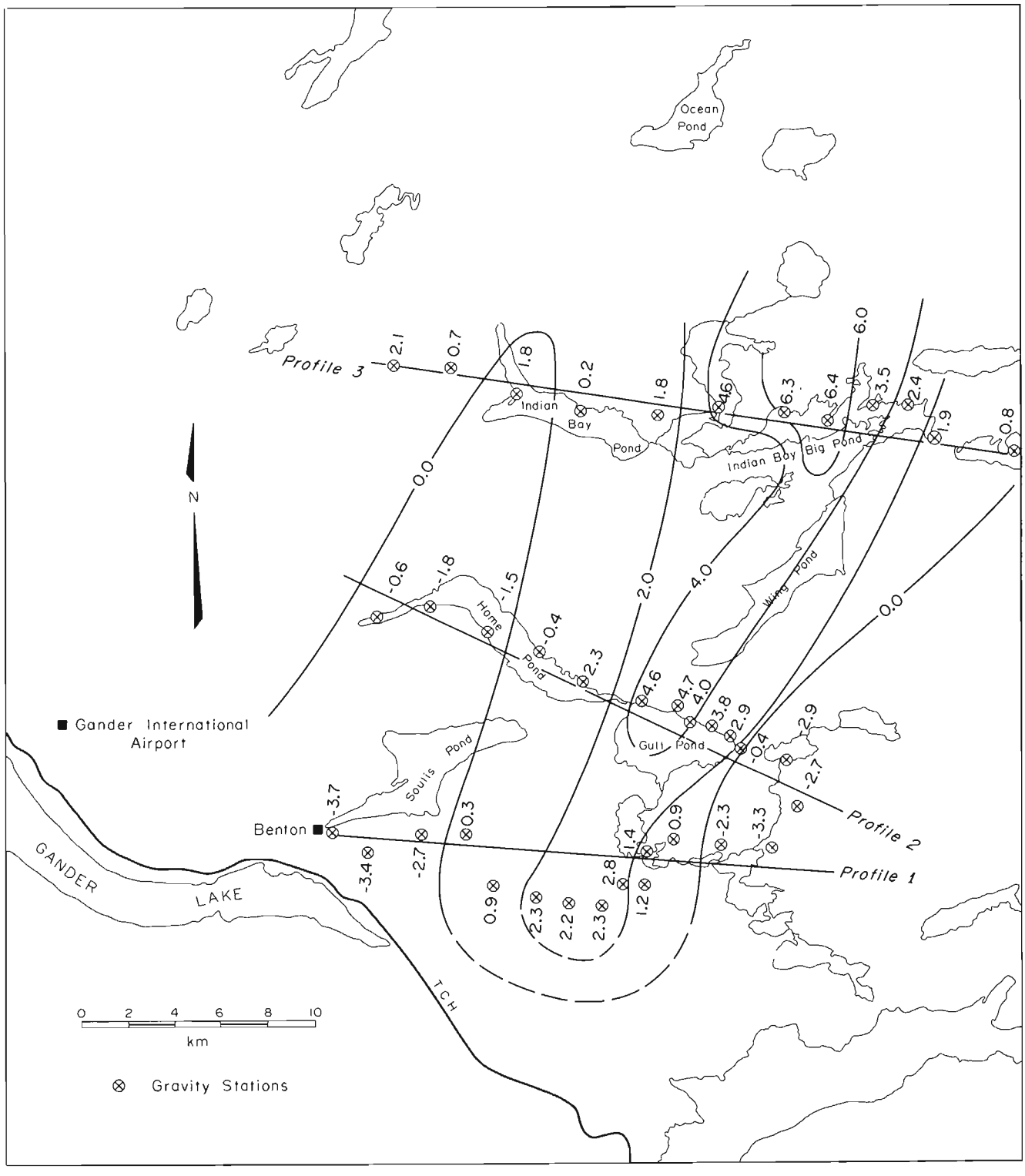


Figure 3: *Location of gravity profiles in Weir's Pond area. Station readings along profiles are in m. Gal.*

(Miller and Deutsch, 1976). Positions were plotted on 1:50,000 topographic maps. The gravity base at Gander is tied to the National Gravity Network which is the worldwide part of IGSN71 (Morelli et al., 1971). Bouguer anomalies at each station were calculated using the appropriate base value, the 1968 International Gravity Formula, and a crustal density of 2.67 $g.cm^{-3}$. These are absolute anomalies similar to those on the Canadian data base, and can be directly compared with other Bouguer anomalies calculated using this reduction system. In order to compare these anomalies with those on the older anomaly maps published for Newfoundland by the Dominion Observatory (Weaver 1967, 1968), approximately 6.3 mGal must be subtracted from the older data. Alternatively, the data collected by Weaver and revised by H.G. Miller (unpublished) on the new international datum may be obtained from the Earth Physics Branch, EMR, Ottawa.

The geophysical survey in the Benton area consisted of a total of 37 gravity stations arranged along three traverses (Figure 3). The traverses were designed to obtain more detailed geophysical information on the nature of the Ocean Pond anomaly, a belt of higher gravity and magnetic anomalies recognized by Miller and Weir (1982) to be coincident with a belt of geochemical anomalies similar to those found in the Gander River Ultramafic Belt to the west.

The data (Figure 4) demonstrate that the Ocean Pond anomaly consists of two parts, the western part termed the Ocean Pond anomaly, and an eastern part termed the Indian Bay Big Pond anomaly. The detailed gravity data of the present survey suggest that the Indian Bay Big Pond anomaly belt contains up to 1.5 km thickness of anomalous material at fairly shallow depth. The source dips westward and the anomaly broadens northward. Its northern extent cannot be interpreted from the available data. The largest anomaly found on the present survey was in the Indian Bay Big Pond area, suggesting an increase in peak anomaly northward. The Indian Bay Big Pond anomaly is consistent with reports of mafic volcanic rocks in the area (Blackwood, 1978) and with the geochemistry. Further interpretation involving modeling methods will be employed to determine the subsurface configuration of the anomalous material.

Quaternary Mapping

From a regional Quaternary perspective, the area lies within the "outer drift zone" described by Jenness (1960). No detailed field work had been conducted in the area prior to the present study, which was designed to provide an insight into the regional Quaternary sequences and the distribution of glacial drift throughout the area. Before 1983, the only systematic Quaternary assessment of the region was an interpretation of map areas 2E/8, 2F/4 and 2F/5 using aerial photographs and limited field investigations by the Environmental Geology Section (Vanderveer, 1977).

For the purposes of Quaternary mapping, the area is bounded by the Gander Bay road to the west, the Trans Canada Highway to the southwest, and the coastline to the east and north (Figure 5). Field work was concentrated on map areas 2E/1 and 2D/16 (north of the Trans Canada Highway), supplemented by some sampling on map areas 2D/9 and 2F/4. Prior to field work, a detailed Quaternary (landform) aerial photographic interpretation was carried out on parts of the study area not previously covered (viz. 2E/1 and 2D/16). Many of the decisions concerning sampling locations and sample densities were based on this interpretation.

The field program concentrated on providing sampling coverage as dense as possible, with the aims of defining the geochemical pattern in the tills, describing the distribution of drift across the area, and assessing the possibility of mineralized float or drift from the Gander River Ultramafic Belt being dispersed throughout the area. The field program consisted of (a) road surveys confined to the margin of the field area, where an adequate road system exists (there are few roads in the center of the region, on the 2E/1 map sheet); (b) 15 backhoe testpits to provide more detail on Quaternary stratigraphy; and (c) a helicopter-borne survey to reach inaccessible areas and to provide data on a systematic basis across 2E/1.

On the basis of the aerial photographic analysis, a grid spacing of 3000 m by 3000 m for sample sites was used where possible. At each site, profile sampling of at least the B soil horizon, B-C transition, and C horizon (parent till) was attempted for grain size and geochemical analyses. During the helicopter survey, the C horizon was rarely sampled due to either the bouldery nature of the upper surface or the wetness of the terrain. In the more northerly parts of 2E/1, frost boils were often sampled because of the bouldery nature of the drift. Pebble samples were also collected from the C horizon wherever possible for lithological analyses. In total, 369 samples were collected from 179 sites across the field area.

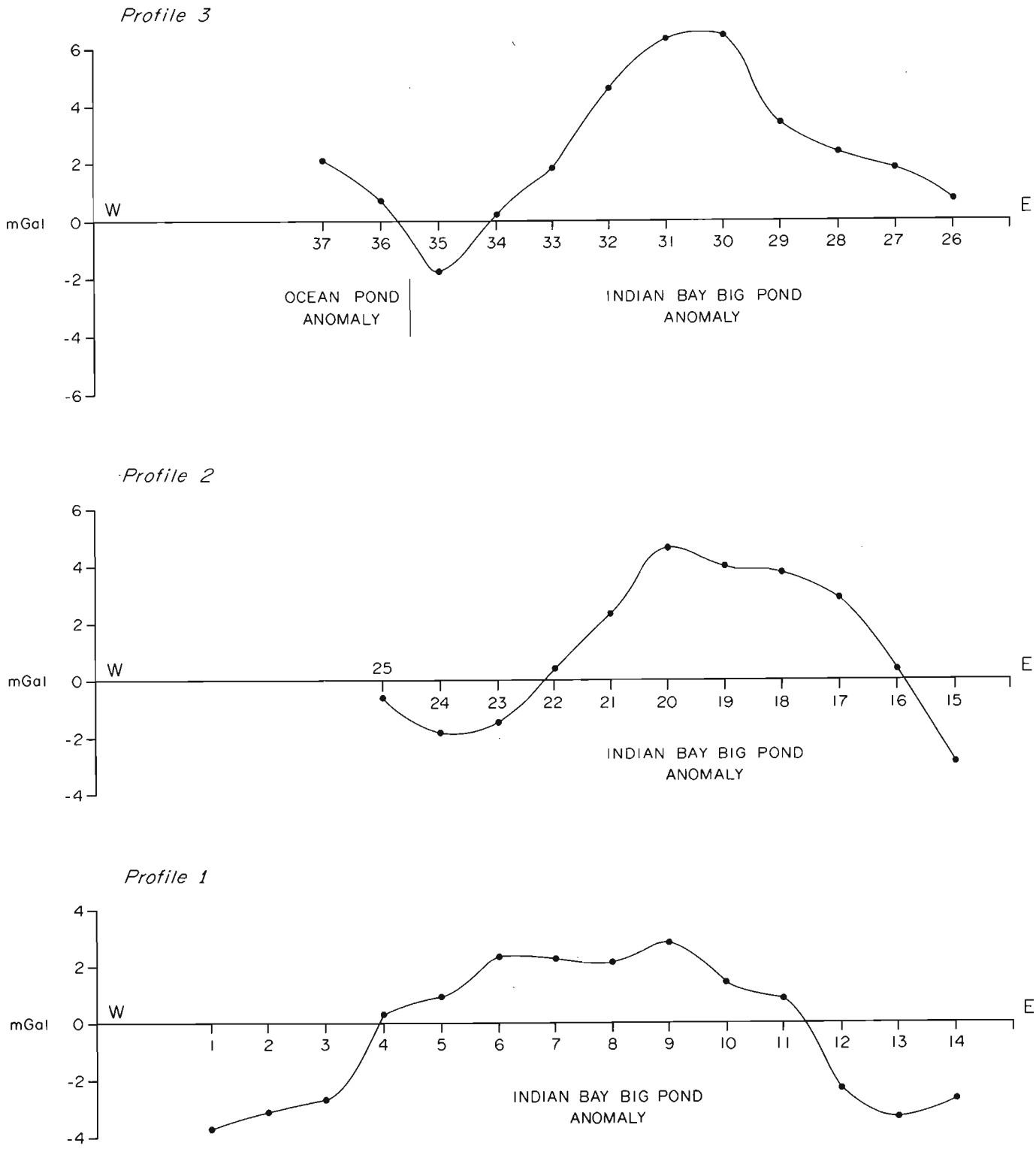


Figure 4: *Profiles from Weir's Pond area. Same scale as Figure 3.*

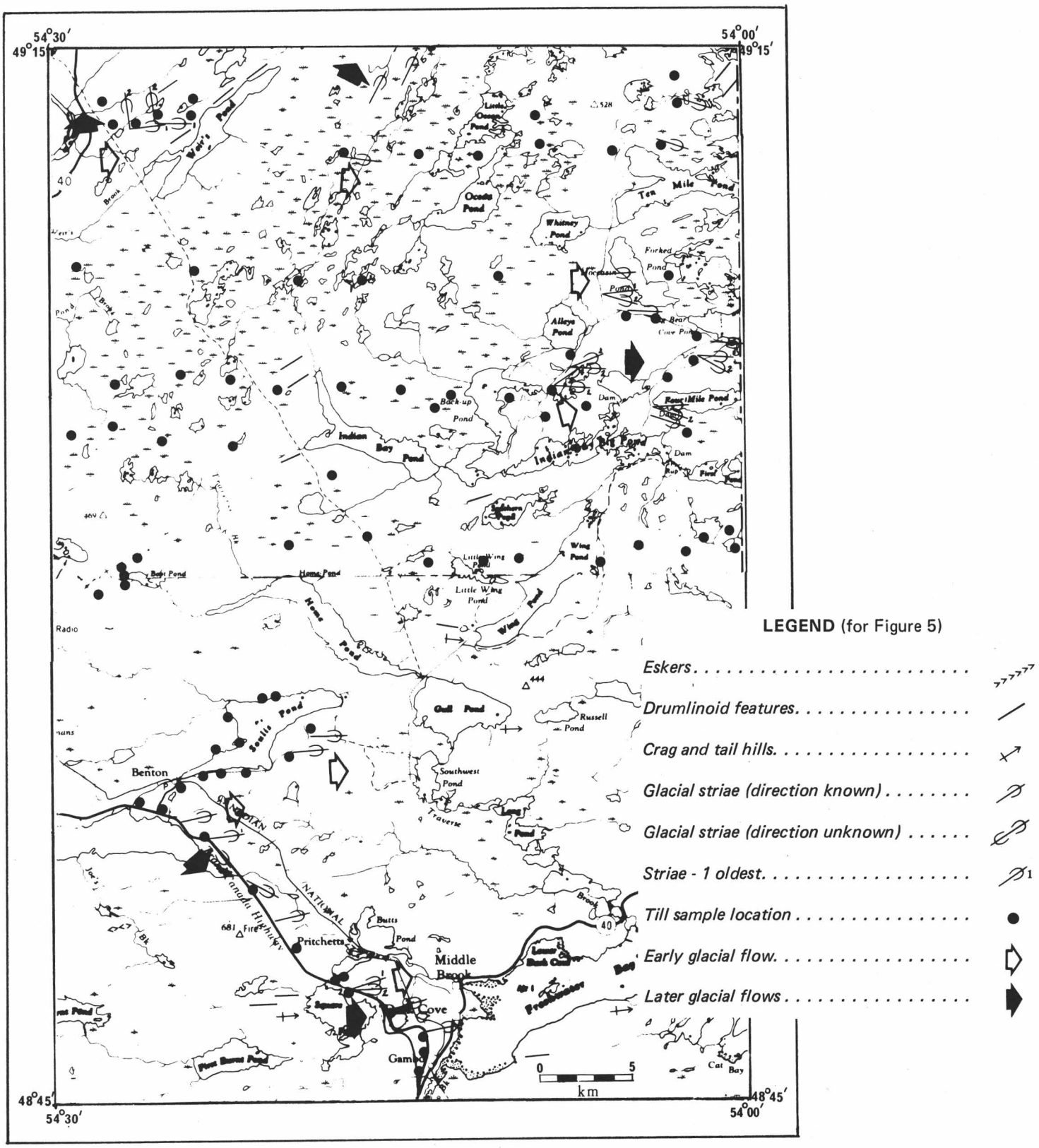


Figure 5: *Sample locations and ice flow directions in the North West Gander area (2E/1, 2D/16).*

Preliminary Observations

Glacial erosion suggests a dominant earlier flow towards the east (090° ± 15°), with a later overprint revealing a radial flow pattern that may be related to a remnant ice cap in the area as suggested by Grant (1974).

There is a lack of overburden towards the coast and in the northern half of the field area. The thickest deposits are those in the Butts Pond area and around Gambo; they are in part related to downwasting of the ice. The tills across the rest of the area may be described as gray to pink-gray in color, and sandy-silty in texture. Some are overconsolidated.

Some of the best stratigraphic sections in the study area are along the Trans Canada Highway (TCH). Between Butts Pond and Gambo Junction, multiple drift units have been identified. These consist of a gray sandy-silty till that overlies a pink, coarse sandy till(?) composed of clasts derived mainly from granitic terrains.

In a backhoe testpit midway between Butts Pond and Gambo Junction, a sequence was exposed of sandy to silty, gray-brown till over rhythmites of fine sand, silt and clay over a gray compact fissile till.

Northwest of the TCH - Gambo junction, a roadcut of approximately 30 m plus a backhoe testpit at the base of the section revealed a mantle (1 to 3 m) of glaciofluvial gravels overlying an alternating sequence (20 to 25 m thick) of sandy, silty gray till and pink sandy till that in turn overlies stratified sands and gravels that extended to depth beyond the reach of the backhoe (i.e. 4 m below the level of the TCH). Just north of the TCH - Gambo Junction, a sequence of sandy tills overlies sand-silt lenses and rhythmites which may be of marine or glaciomarine origin.

The elevation of the presumed marine sediments (rhythmites) indicates that sea level has fallen approximately 30 m since deglaciation. These sequences represent complex marginal/submarginal deposition. Unfortunately, data are not available to permit correlation between depositional units, and therefore an accurate interpretation of the glacial history cannot be presented at this time.

South of Big Bear Cove Pond, hand size fragments of mineralized float containing chalcopyrite in argillite and pyrite in a graphitic pelite were found at Military Grid Reference 179435 in map area 2E/1.

Analysis of the collected samples for grain size distribution, geochemistry (Cu, Pb, Zn, Co, Ni, Ag, Mn, Fe, Cd and Mo) and lithologies is ongoing. Supplementary data are also currently being investigated.

Data Release

Analysis of samples collected during the geochemical and Quaternary studies is nearing completion. More detailed geophysical modeling is being done using an expanded data base of previously collected data. After this has been completed, all the data will be compiled and released as an open file.

Acknowledgements

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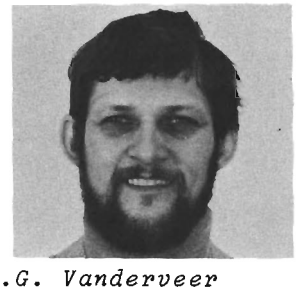
A.J. Butler



D.G. Vanderveer