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SURFICIAL GEOLOGY AND DRIFT EXPLORATION OF COMFORT COVE–NEWSTEAD AND GANDER RIVER MAP AREAS (NTS 2E/7 AND 2E/2)

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ABSTRACT

At least four ice-flow events affected the Comfort Cove–Newstead and Gander River areas of central Newfoundland. The first was a regional east to southeastward flow from a source west of Mount Peyton. This was followed by a regional north to northeastward flow and two local flows; a northeastward flow in the west and a northwestward flow in the east. Crag-and-tail hills, rôches moutonées and rogen moraines were formed by the northeastward ice-flow event. However, rogen moraines, located in the southeast, were formed by southeastward ice flow.

Diamictons (generally till) are common throughout the region. Generally, they have a sandy matrix, contain between 25 and 70 percent clasts of pebble to cobble size, and range from internally massive to stratified and have sand or silt lenses. These diamictons were deposited widely by basal meltout or glacigenic debris flows. The study area is dominated by till veneers, hummocks and ridges with veneers and concealed bedrock common on uplands and areas near the coast. The central part of the study area contains abundant hummocky till and ridged till is located in the southwest. Glaciofluvial material is found in valleys near the coast. Modern fluvial sediments are located along the Gander River, whereas bog and fen are common in poorly drained areas.

Clast fabrics and lithological studies suggest that sediment dispersal in the central part of the region was controlled by the east-southeastward flow, whereas to the north, the northeastward ice flow was the main dispersal agent.

Work to identify possible sources and transport paths of gold found within sediment is still in progress. Detailed study and measurement of glaciofluvial gravels at Birchy Bay indicate material was fluvially transported to the northwest. This suggests a source to the south or southeast. Samples of till matrix were taken at a 2 km spacing over the region and were analyzed for element composition.

INTRODUCTION

The Comfort Cove–Newstead (NTS 2E/7) and Gander River (NTS 2E/2) map areas have been the subject of geological investigations since the time of Murray and Howley (1881). Exploration has centred on gold following the discovery of quartz-vein-hosted gold mineralization near Jonathan's Pond (Blackwood, 1979, 1982). More recent attention has been paid to gold located in the Davidsville Group near Duder Lake (Green, 1989; Tallman, 1989).

In 1992, field work resulted in the location of gold in glaciofluvial deposits in the Birchy Bay region; ice-flow indicators suggest fluvial transport from the south or southeast (Scott, 1993). Although mining companies have identified several gold prospects and regional soil geochemical studies have been completed, tracing the gold grains in the tills to a source has not always been successful.

The objectives of the 1993 field work were:

1. to locate possible gold transport paths,
2. to determine the transport history,
3. to determine the source of the gold grains found within till and glaciofluvial materials, and
4. to map the distribution of gold and pathfinders in basal till.

Attaining these objectives required mapping of the surficial geology, implementing a regional sampling program of tills and analyzing for grain size, clast lithology, mineralogy, geochemistry and heavy-mineral content.

LOCATION AND TOPOGRAPHY

The study area is located in north central Newfoundland between 49°00'N and 49°30'N latitude and 54°30'W and

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55°00'W longitude (Figure 1). It lies approximately 11 km west of the community of Lewisporte and 5 km northwest of Gander, and extends from Michael's Harbour in the west to Clarkes Head in the east, and from Summerford in the north to the Trans-Canada Highway near Glenwood in the south (Figure 2).

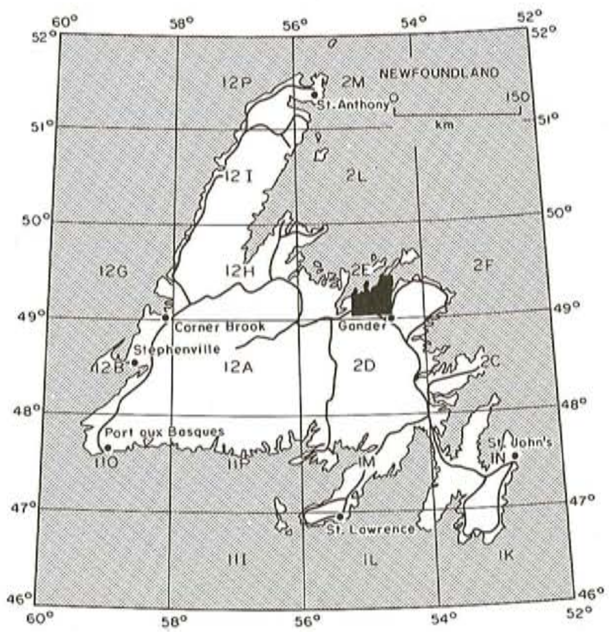

Figure 1. *Location of study area.*

Access within the area is mostly along paved roads and an extensive network of well-maintained forest-access roads leading south from Loon Bay, Horwood and Gander Bay and north and northeast from Glenwood. The area northwest of Dan's Pond, and southeast of Gander River had little access.

The region is characterized by a gently undulating topography that is strongly influenced by bedrock. Areas underlain by resistant rock generally form higher ground and are covered by thin sediment and bog. Areas underlain by softer rocks are low lying and have thicker sediment covers. Drainage and lake basins are controlled by the northeast–southwest bedrock structure.

BEDROCK GEOLOGY

The study area lies within the Dunnage zone, which contains vestiges of the (opening and closing) early Paleozoic Iapetus Ocean (Williams, 1979). Rocks here range from Early Ordovician to Jurassic (Williams, 1964; Evans *et al.*, 1992).

Blackwood (1982) interpreted the Lower Ordovician Gander River Ultrabasic Belt (Unit 18; Figure 3) (redefined as the Gander River Complex by O'Neill and Blackwood, 1989) as dismembered sections of an ophiolitic basement. Rock types include psammite, pyroxenite, serpentinite, magnesite, gabbro, various mafic flows, volcaniclastic rocks, trondhjemite, and quartz-feldspar porphyry. These rocks are found on the southeast side of the study area to the south and southeast of First Pond. The Middle Ordovician Davidsville Group (Units 15, 16, and 17; Figure 3) consists of siltstones, sandstones, conglomerates and slates (Blackwood, 1982). These rocks outcrop in a northeast–southwest band across the map area from east of Salmon Pond to a major fault east of Birchy Bay. The Davidsville Group hosts the Corvette, Goldstash and Stinger gold showings east of Duder Lake (Figure 3).

The Botwood Group (Units 6, 7, and 8; Figure 3) comprises red, grey and green sandstone and minor calcareous beds, polymictic conglomerates and vesicular mafic breccias (Evans *et al.*, 1992). These rocks extend from the southwestern corner of the map area to just north of Duder Lake. The Indian Islands Group (Units 9 and 10; Figure 3) is composed of phyllite, slate, sandstones and felsic volcanic rocks (Patrick, 1956; Baird, 1958) and extends from southeast of Second Pond to Horwood Bay (Figure 3).

Devonian and Jurassic gabbros and granite (Units 1 to 5) intrude the Davidsville and Botwood groups (Figure 3). Blackwood (1982) correlated these Devonian intrusions with the Mount Peyton Batholith to the south.

Sixteen gold prospects or showings have been found in the study region (Figure 3). These include Jonathan's Pond–Jonathan's Second Pond (Morris showing) and Cripple Creek in the Gander River Ultrabasic Belt (GRUB) zone; Third Pond, Knob Hill, Glenwood Site C, Panhandler, Burnt Lake, Corvette, Goldstash, Stinger, and Flirt in the Davidsville Group; and Clutha, Big Pond (Blue Peter), Loon Bay–Rat Pond–Fitz, Charles Cove–Tim Harbour, and Charles Cove South (Tuach, 1992). Of these, only three contain visible gold: Big Pond, Clutha, and Panhandler (D. Evans, personal communication, October 1993).

PREVIOUS WORK

Vanderveer and Taylor (1987) mapped the surficial sediment in the Gander River area at a 1:50 000 scale. Kirby *et al.* (1983, 1989) completed 1:50 000-scale aerial-photograph reconnaissance mapping of granular aggregate resources adjacent to major transportation routes. Ricketts and McGrath (1990) mapped sand and gravel deposits located in the area as part of a detailed regional assessment of aggregate resources. This mapping indicated that the northern part of the study area is dominated by bedrock and till veneers. Surficial sediments in the south are mostly till plains and hummocky terrain. Several linear glacial features, northeast to southwest trending, were noted in the southwestern part of the study area and a crag-and-tail hill in the south-central region has a northeast orientation.

Detailed striation mapping of the region was undertaken by St. Croix and Taylor (1991). Their results suggested a complex ice-flow history for the area with four separate ice-flow events. The earliest was an east-southeastward flow followed by a north-northeastward ice flow. This was then followed by a northeastward flow in the west part of the

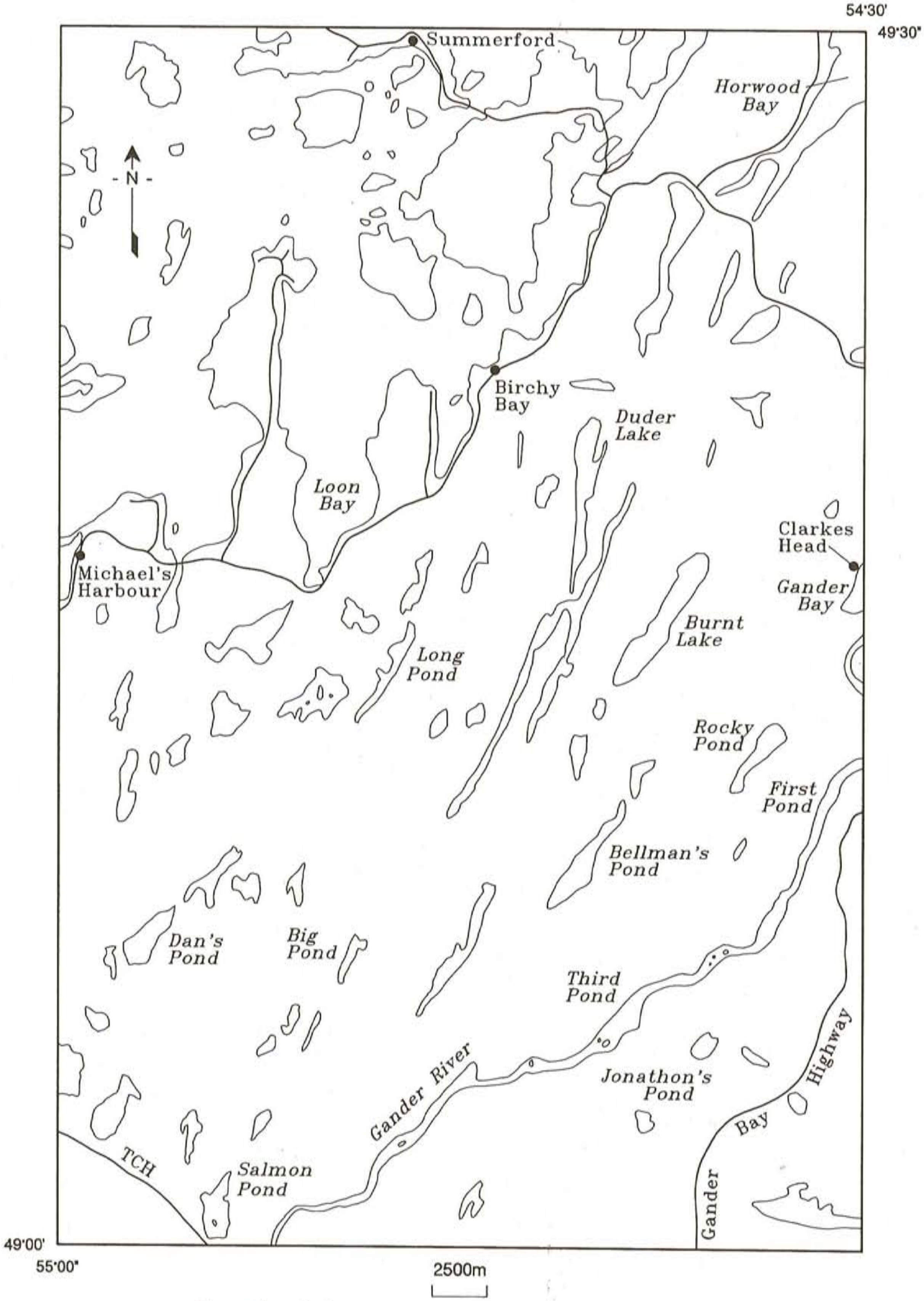

Figure 2. *Study area with place names and drainage labelled.*

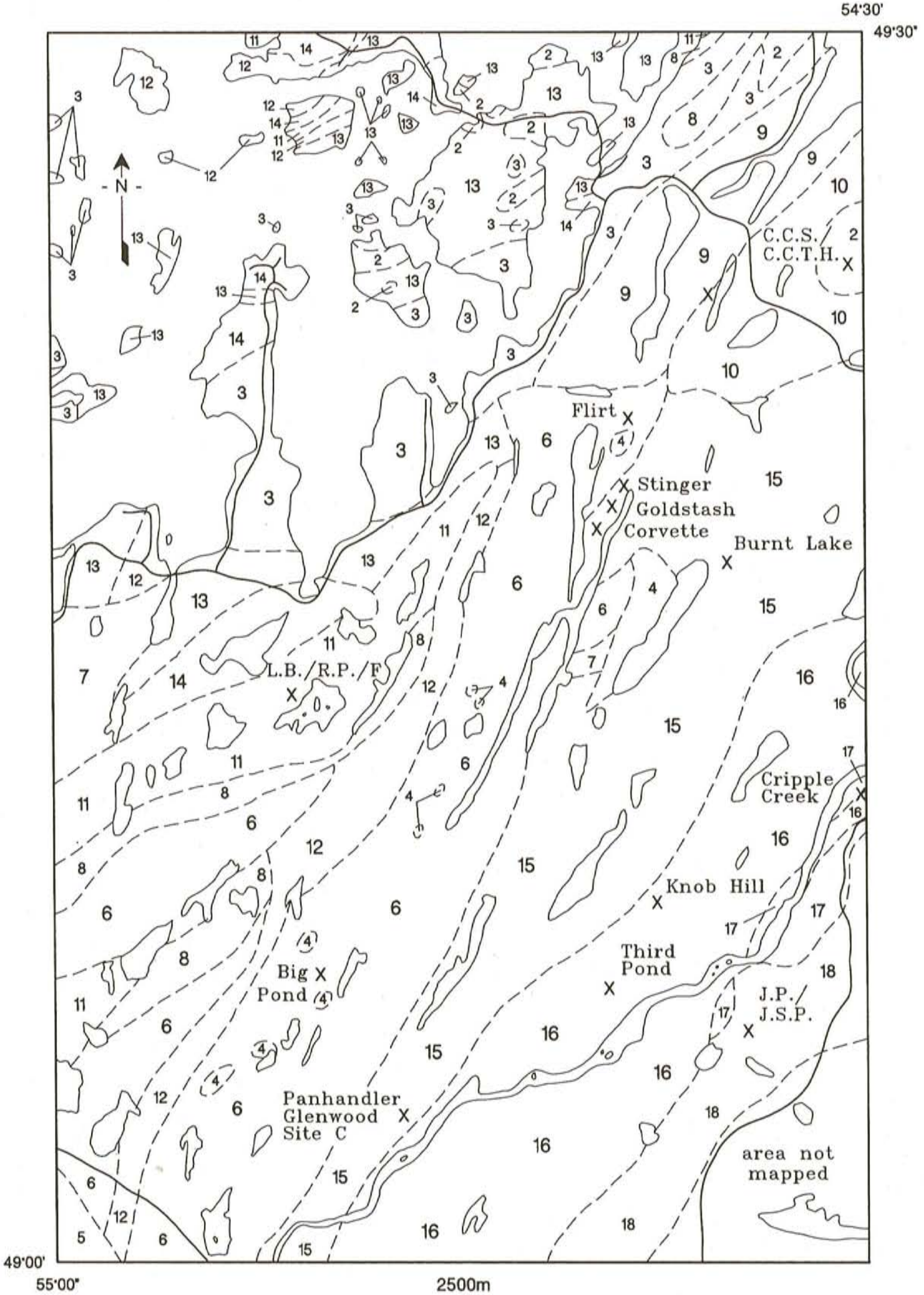

Figure 3. *Simplified geology map with gold prospects and showings labelled (from Williams, 1964; Dean, 1977; Evans* et al., *1992). C.C.S./C.C.T.H.—Charles Cove South/Charles Cove—Tims Harbour; J.P./J.S.P.—Jonathan's Pond/Jonathan's Second Pond; L.B./R.P.F.—Loon Bay/Ray Pond/Fitz.*

LEGEND (for Figure 3)

EARLY ORDOVICIAN OR EARLIER

Gander River Complex

18 *Quartz and feldspar porphyry; trondhjemite, fine to medium grained volcaniclastic rocks; mafic flows, gabbro, diorite, tonalite, basalt, serpentinite, magnesite, talc/tremolite schist, pyroxenite, magnesite, amphibolite, and hornblendite*

MIDDLE ORDOVICIAN AND LATER

Davidsville Group

Weir's Pond Formation

17 *Fine to coarse grained grey sandstone, calcareous siltstone, minor sandstone, limestone, quartzite, black slate; polymictic conglomerate and minor sandstone*

Hunts Cove Formation

16 *Grey to black slate and siltstone, minor sandstone*

Outflow Formation

15 *Fine to coarse grained sandstone, locally with shale intraclasts, interbedded with grey to black siltstone and slate; congomerate*

ORDOVICIAN

Exploits Group

14 *Altered green lava and basaltic pillow lava, pyroclastic rocks, chert, slate, minor limestone*

13 *Grey to black slate, slatey conglomerate, greywacke, siltstone, and grey conglomerate*

ORDOVICIAN TO SILURIAN

12 *Greywacke, conglomerate, siltstone, and slate*

11 *Polymictic conglomerate and sandstone*

SILURIAN

Indian Islands Group

10 *Dark grey cherty siltstone, grey to pink sandstone, slate, minor limestone*

9 *Sheared grey conglomerate and grey phyllite, sandstone, siltstone, and minor coralline shale and limestone*

Botwood Group

8 *Purple, green and red, vesicular mafic breccia and minor sandstone*

7 *Conglomerate*

6 *Red, grey and minor green sandstone and slate, locally micaceous; minor fossiliferous calcareous beds*

DEVONIAN

5 *Fine to medium grained pink granite*

4 *Gabbro and diorite*

3 *Medium grained massive grey to pink granite, granodiorite, quartz diorite*

2 *Porphyritic grey to pink quartz diorite and granodiorite*

JURRASIC

Dildo Pond Stock

1 *Pyroxene gabbro*

region, and a northwest flow in the east. The last event was a localized east-southeastward flow in the western part of the study area.

A regional, lake-sediment sampling program yielded data on gold and related elements (Davenport and Nolan, 1988). In addition, a number of companies completed detailed soil-survey grids over and near several gold prospects (Green, 1989; Tallman, 1989).

FIELD AND LABORATORY METHODS

Field work consisted of sampling both natural and man-made exposures across the region. Two hundred and thirty-six sites were investigated with 264 texture, 237 element, 134 clast lithology, 121 heavy mineral and 12 rock samples taken. Of the 236 sites, 21 were backhoe pits, 80 were natural and man-made exposures, and the remaining 135 were hand-dug pits up to 1.2 m deep. A sampling grid across the whole area was used to maintain a fairly uniform 1 to 2 km spacing between sites, excluding those areas with poor access northwest of Dan's Pond and southeast of the Gander River.

Detailed sedimentological descriptions were made of the surficial sediments with texture, sedimentary structures, and clast lithology noted. Clast-fabric measurements were obtained from 102 diamicton exposures. This entailed measuring the strike and dip of the a-axes of 25 clasts with an a:b ratio of greater than 3:2. The mean orientation and strength of alignment were calculated by the eigenvector method outlined by Mark (1973, 1974) and Woodcock (1977). Results were then plotted and analyzed using the Stereo™ software package for the Apple Macintosh computer (MacEachran, 1989).

A similar till-sampling project was conducted over the southeast part of NTS 2E/2 by D.G.Vanderveer and D.M. Taylor in 1987 using a similar sample spacing. They also collected samples at 50 to 200 m intervals on a grid over the Jonathon's Pond showing. These samples have been included in the present study.

Bedrock outcrops were examined for striae and other ice-flow indicators. At 134 sites, 100 pebbles were collected, washed and cracked for identification. Texture samples will be analyzed in the Geological Survey Branch laboratory by wet sieving and particle counting on a Coulter Counter. Geochemical samples are being analyzed by instrumental neutron-activation analysis at Becquerel Laboratories of Missisauga, Ontario, and by atomic-absorption spectrophotometry at the Geological Survey Branch laboratory in St. John's.

RESULTS

ICE FLOW

Five new striation sites were found in the region. These are consistent with the ice-flow pattern indicated by St. Croix and Taylor (1991) (Figure 4).

GEOMORPHOLOGY

Several large-scale geomorphic features indicating ice flow were also found. These included northeastward-trending crag-and-tail hills located south of First Pond on Gander River, and rôche moutonnées with similar trends located northwest of Big Pond. In addition, a series of till ridges is developed in the southwestern corner of the map area. These ridges are crescent-shaped with horns pointing northeast. They range from 4 to 5 m high; are up to 500 m long and are 50 to 75 m wide. There is a regular spacing between ridges, roughly equal to their widths. They occur in regions that are relatively flat or in valleys. The ridges consist of sandy diamicton to pebbly sand, sometimes stratified and containing lenses of sorted medium sand. These ridges exhibit characteristics associated with rogen moraine, as defined by Lundqvist (1989), and thus are believed to be basally deposited. The northeasterly pointing horns suggest that ice flow was to the northeast. Similar ridges were noted to the south-southeast of Jonathan's Pond and orientation there suggests ice flow was to the southeast. However, Fisher and Shaw (1991) believe that rogen moraines are formed subglacially by water erosion and thus do not suggest ice-flow directions, but only suggest water-flow direction.

CLAST PROVENANCE

Only rocks that are visually distinctive and come from a localized bedrock source can be used as an indicator of ice flow. The rocks in this area are broadly similar, which makes clast provenance studies difficult. An exception is in the Rocky Pond area, where gabbro and serpentine clasts within diamictons could only be derived from the Gander River Complex lying to the south and southeast. This suggests a northwestward sediment dispersal. Clasts derived from the Mount Peyton intrusive suite were found in the southwestern part of the region, indicating a northeast ice flow.

CLAST FABRIC

Clast orientation in diamictons is controlled by depositional processes. It is thus an important tool in determining diamicton genesis and in interpreting ice flow (Lawson 1979; Haldorson and Shaw, 1982).

As part of the fabric analysis, certain statistical parameters must be examined. The principal eigenvector, S_1 (eigenvalue divided by the sample size) is a measure of the strength of clast orientation and can range from 0.33 to 1.0. A strong clast orientation will have an S_1 value close to 1, whereas a random orientation will give a value of 0.33. Following the criteria outlined by Liverman *et al.* (1990), only fabrics with $S_1 > 0.6$ are considered to provide a reliable indication of ice flow. Another statistical parameter is K. This value differentiates between unimodal distributions and girdle-type fabrics. Fabrics with $K < 1.0$ suggest girdle distributions, atypical of tills deposited basally (Dreimanis, 1988). For this reason, only fabrics with K values > 1.0 were interpreted to represent the direction of ice movement. Thirty-five of the 102 clast fabric measurements meet the above requirements,

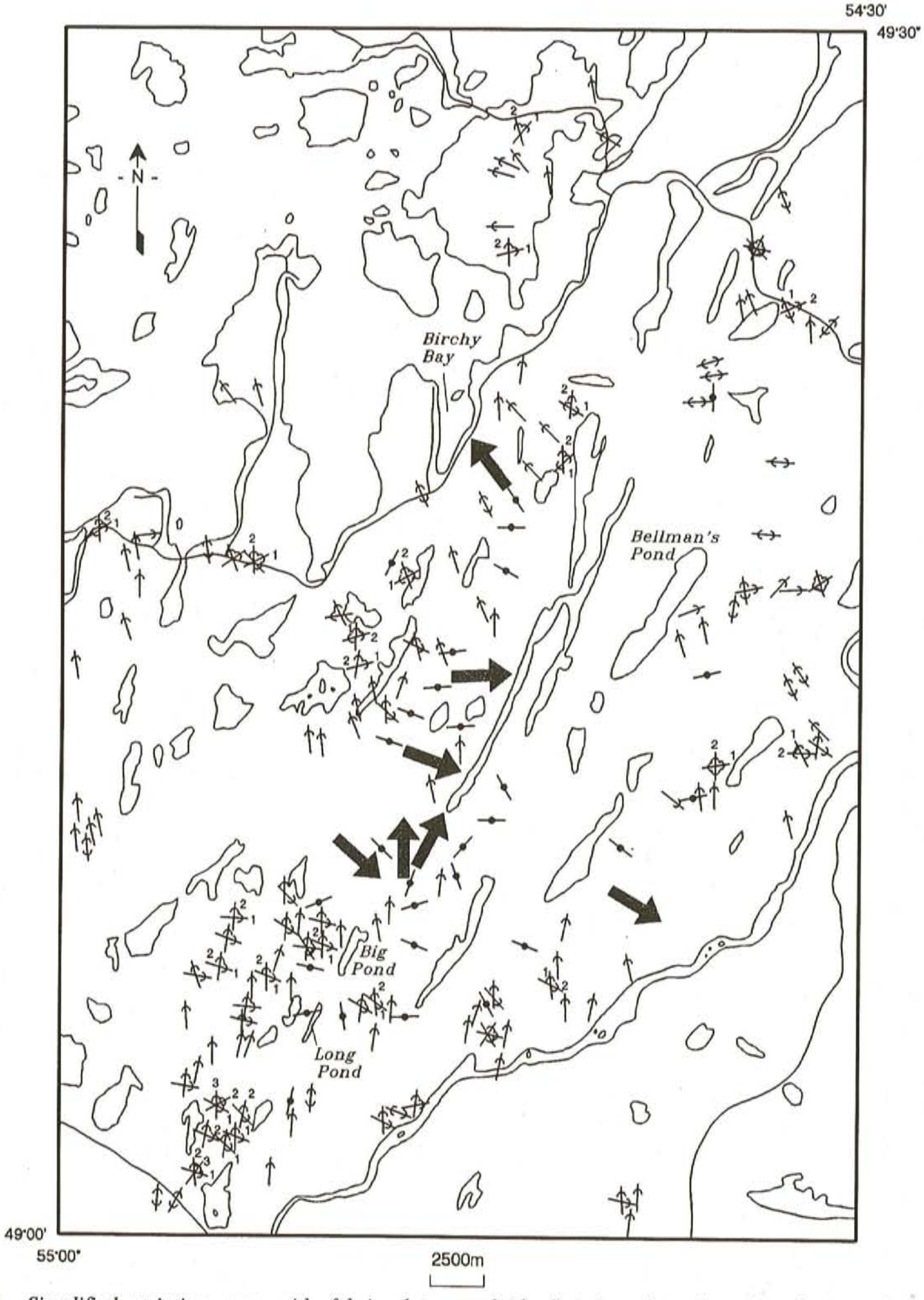

Figure 4. *Simplified striation map with fabric data overlaid. Striation data from St. Croix and Taylor (1991). —•— fabric; striation direction known, unknown, age relationship; ⟶ sediment dispersal direction.*

which suggests that they were deposited as undisturbed basal tills. These fabrics may then be used to indicate ice flow and sediment genesis.

Figure 5 is a diagram of fabric data following the method of Mark (1974), Woodcock (1977) and Rappol (1985), which was modified by Liverman and Vatcher (1992). When $S_1 > 0.6$, $Ln(S_2/S_2)$ must be > 0.51 and $Ln(S_2/S_3) < 0.51$. Therefore, the area to the left of 0.51 on the a-axis and above the 0.51 mark on the y-axis is the area where undisturbed basal till fabrics should lie.

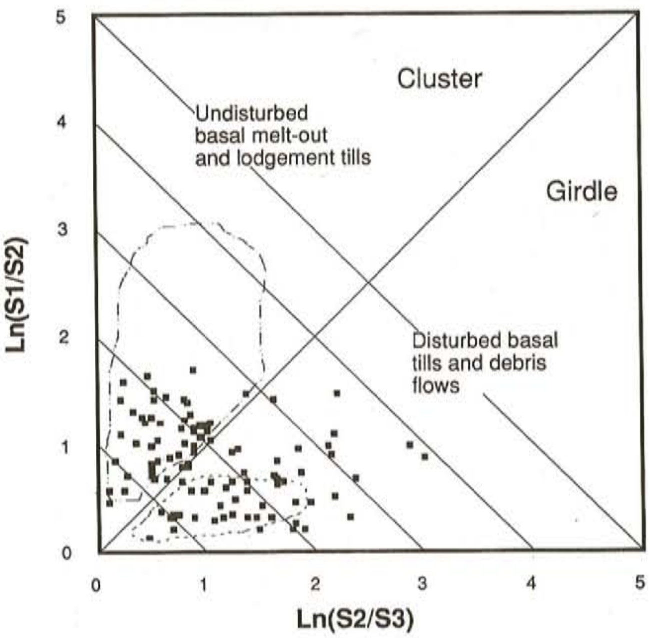

Figure 5. *Diagram of fabric data of 102 clast-fabric measurements. 51 plot in the upper left whereas 51 plot in the lower left. Only 35 fabrics meet the requirements for indicating ice flow.*

A histogram of the orientations of the fabrics is shown in Figure 6. A plot of all the fabrics shows a strong east–west orientation with secondary northeast–southwest and northwest–southeast trends (Figure 6a). A plot of only strong fabrics (i.e., $S_1 > 0.6$, $K > 1.0$) shows a strong west-northwest and east-southeast orientation with a minor secondary orientation north-northwest and south-southeast (Figure 6b). The trend of the fabrics is consistent with the nearest striation recorded. The directions of sediment dispersal are not the same across the area. Southeast of Birchy Bay (Figure 4), fabrics are oriented north and northwest, which is similar to striations in the area. This suggests a localized north and northwest ice flow affected sediment dispersal in that area. This is important because several gold prospects are located just east of Birchy Bay. South of Bellman's Pond (Figure 4), in the southeastern part of the field area, fabrics have orientations to the southeast whereas striation data show a north and north to northeast ice flow. This suggests that the sediment dispersal was mainly controlled by the earlier southeast ice flow, and the later north and northeast ice-flow phase did not affect sediment dispersal in this area. Northeast of Big Pond (Figure 4), striation evidence shows only the north ice flow, yet fabric data shows a wide range of orientations including southeast, northeast and northwest. Around Long Pond (Figure 4), striation evidence shows northeast and northwest orientations, although fabric data shows a southeast and east-northeast pattern. This suggests that the southeast and east-northeast flows played more major roles in sediment dispersal for this particular region.

In the central and southeast portion of the map area, the fabrics suggest that the earliest east-southeast ice flow was the primary agent responsible for sediment deposition (Figure 4). To the north, the fabric tends to have a north or northeast orientation indicating that the second ice flow of north-northeast was more important to sediment deposition.

The variation between the striae record and dispersal directions is important to consider when prospecting. Clast-fabric analysis from basal tills is useful in this situation as a complex ice-flow history is apparent (St. Croix and Taylor, 1991). Striations are erosional records of ice passage and they can not be related directly to sediment dispersal. Fabrics give an indication of ice-flow conditions occurring during deposition of material. As the material being sampled for geochemical analysis is the same as that from which the fabrics have been obtained, dispersal direction may be inferred. It must be understood here that only strong fabrics (i.e., $S_1 > 0.6$; $K > 1.0$) can be used for this purpose.

SURFICIAL GEOLOGY

A wide range of surficial sediments was found across the region (Figure 7). These included glacigenic, bedrock, organic, glaciofluvial, marine, fluvial and colluvial deposits.

Glacigenic

Five till types were identified throughout the region and cover approximately 68 percent of the area. Till veneers and eroded till are the most extensive, dominating the upland regions, and near the coast. The central and south-central regions are dominated by hummocky till (up to 7 m high) and veneers, whereas the southwest corner contains abundant ridged and lineated till.

Diamictons are common throughout the area and range from 1 to 5 m thick. The region contains few exposures of complex stratigraphy. The larger diamicton exposures are in hummocks and they are generally similar in character throughout. The diamicton matrix in the study ranges from sandy in the south to silty in the north, and varies from reddish-brown (5 YR 5/3) to grey-brown (10 YR 5/2). The colour variation may reflect changes in underlying bedrock type. The reddish-brown diamictons are located overlying red sandstones of the Botwood Group, whereas grey-brown diamictons are generally found overlying grey slate, siltstone and sandstone of the Davidsville Group.

The clast content of the diamictons ranges from 25 to 75 percent and have an average content of 45 percent. The clasts range from pebble to cobble and are generally subangular to subrounded in shape. Some angular clasts are located in diamictons directly overlying shale or slate bedrock. The clasts within the diamictons are of mainly local bedrock, although some farther-travelled stones are present. Many of the clasts are striated or faceted and commonly had a coating of silt on their upper surfaces. Clast fabrics obtained from the diamictons are variable.

Although where poorly exposed diamictons generally appear massive, in larger exposures and backhoe pits a

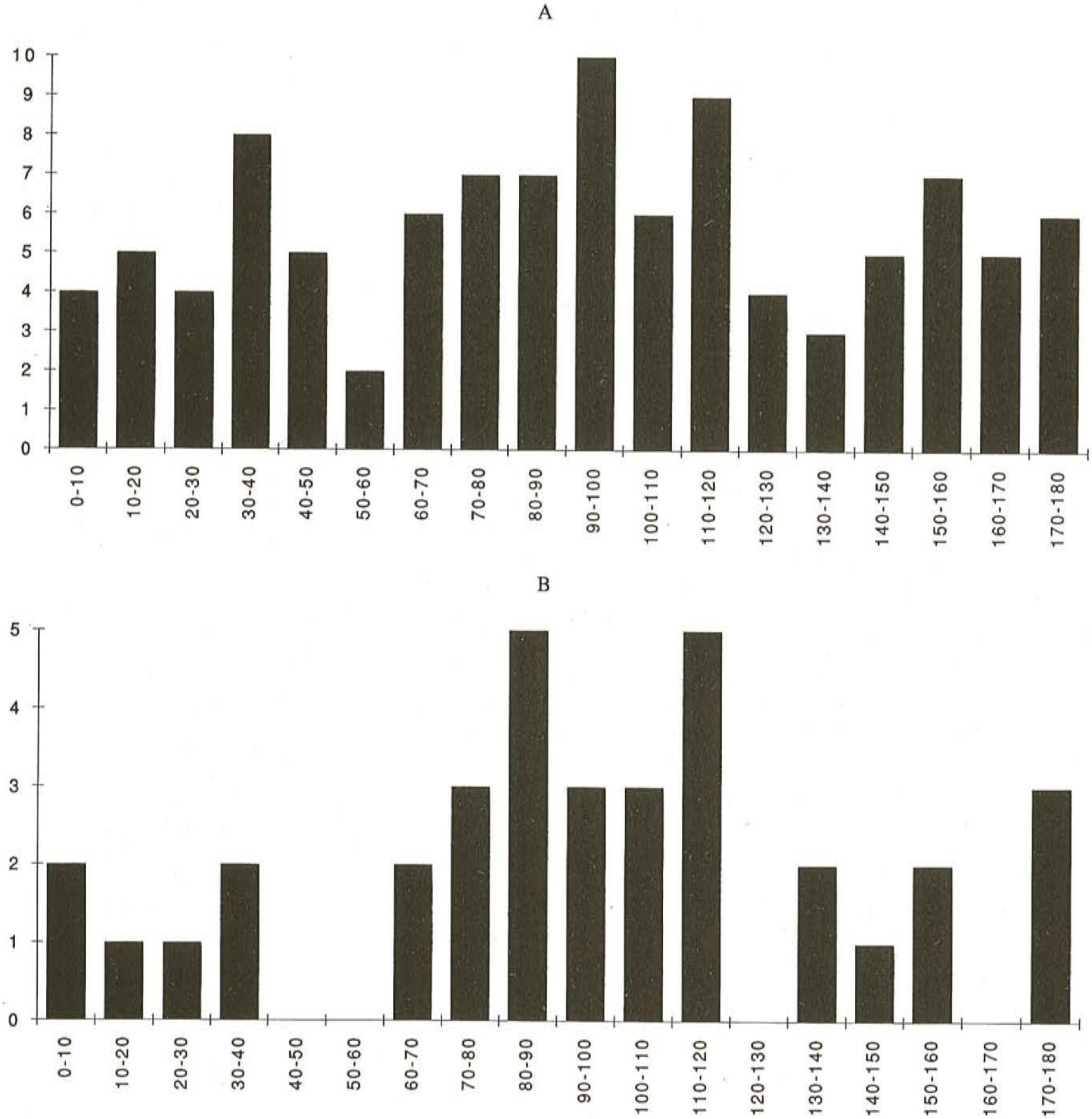

Figure 6. *Histograms of orientation of fabrics.* **a**—*Plot of all fabric orientations.* **b**—*Plot of 35 fabric orientations meeting the statistical criteria for indicating ice flow.* $S_1 \geq 0.6$ & $K \geq 1.0$. *X axis = number of sites; Y axis = fabric orientations (from 0 to 180°).*

number of the diamictons showed stratification and lenses. Lenses visible in the diamictons range from 1 by 1 cm to 3 by 5 cm in size and have either plano-convex, biconvex or irregular shapes. These diamictons also contain sorted sand beneath clasts and beds of granule gravel to fining upward sand. Some of the diamictons contain structures interpreted to indicate loading. Generally, these loading features are found at the base of units.

The diamictons described above contain characteristics consistent with an origin by subglacial meltout or by glacigenic debris flow (Lawson, 1981; Shaw, 1982; Haldorsen and Shaw, 1982; Dowdeswell and Sharp, 1986; Dreimanis, 1988). Striated and faceted subrounded clasts and well-oriented fabrics indicate subglacial transport. The presence of sorted beds and lenses indicate that water was present during deposition. Diamictons located throughout the region

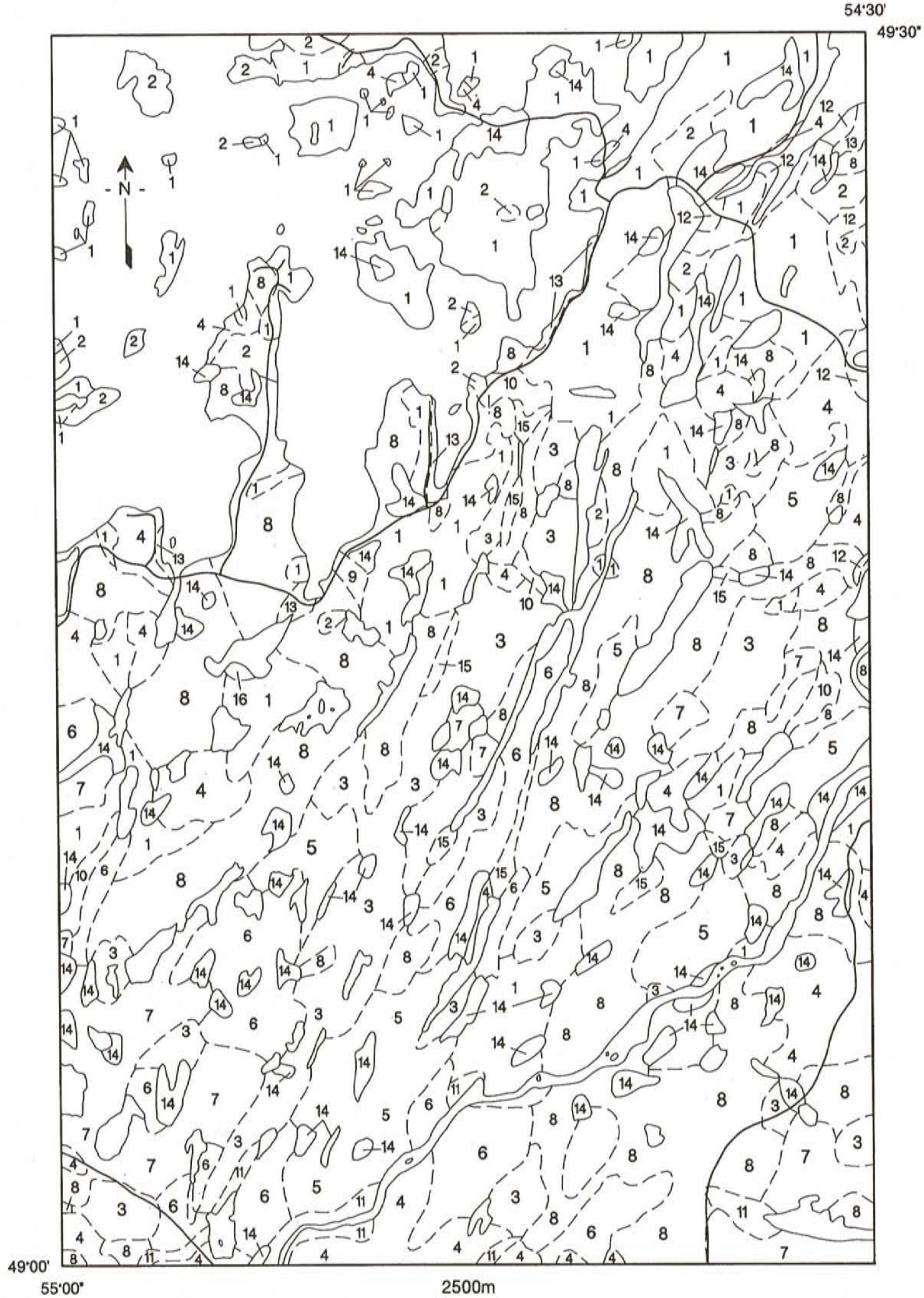

Figure 7. *Simplified surficial geology map.*

LEGEND (for Figure 7)

16	*Colluvium*
15	*Alluvium*
14	*Organic*
13	*Marine terrace*
12	*Marine, marine veneer and eroded*
11	*Glaciofluvial and glaciofluvial veneer*
10	*Glaciofluvial terrace and fan*
9	*Till undifferentiated*
8	*Eroded till*
7	*Ridged till*
6	*Till lineated*
5	*Till veneer*
4	*Till plain*
3	*Hummocky till*
2	*Concealed bedrock*
1	*Exposed bedrock*

are similar in character except for the fabrics. The fabrics are not always well oriented. This may be explained by the presence of two diamicton types: basal meltout and glacigenic debris flows. Debris-flow diamictons and basal meltout tills have similar physical characteristics (Dreimanis, 1988) except for their fabrics. Debris flows have weak to moderate girdle fabrics and basal meltout till have strong unimodal fabrics (Lawson, 1981). Diamictons described here are similar to those described south of the study area by Batterson and Vatcher (1991). Diamictons interpreted as a basal meltout till are located in the region covered by the lineated till and on the till plains whereas glacigenic debris flows appear to be located in areas of till veneer although they are also found in the hummocky till.

Bedrock

Exposed and covered bedrock occupies approximately 10 percent of the region. It is prominent on upland areas and near the coast. The bedrock controls the topography in the region due to the strong northwest–southeast-trending faults and bedding.

Organic Sediments

Several large bogs are found near the coast and numerous smaller wetland areas are located in low-lying areas in the interior of the region. They cover approximately 15 percent of the area.

Glaciofluvial, Fluvial, Marine and Colluvial

Glaciofluvial sediments are found in valleys near the coast. Deltas and kame terraces are found near Birchy Bay, Wing's Point and the community of Clarkes Head (Scott, 1993) and cover approximately 3 percent of the region. Modern river deposits (fluvial) cover 2 percent of the region.

Marine sediments (beaches and beach ridges) are found near the coast. They cover 1 percent of the region and generally consist of sand and gravel. Colluvium is rare, covering less than 1 percent of the region and is restricted to hillsides at the base of slopes.

GEOCHEMISTRY AND TRANSPORT PATHS

From 236 sites, 237 samples were collected for geochemical analysis and 121 for heavy mineral analysis. The samples were taken over the entire region on a grid that yielded one sample every 1 to 2 km. This geochemical survey complements and completes a regional sampling grid started by Vanderveer and Taylor in 1987. These samples were taken in an effort to locate possible gold transport paths and to locate possible gold sources. Geochemical analysis of these samples for Au, Ag, As, Ba, Be, Br, Cd, Ce, Co, Cr, Cs, Cu, Dy, Eu, Fe, Ga, Hf, K, La, Lu, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Rb, Sb, Sc, Se, Sm, Sr, Ta, Tb, Th, Ti, U, V, W, Y, Yb, Zn, and Zr is continuing. The analysis of the surficial sediments helps with understanding the dispersal of sediment and thus the dispersal of the gold grains. Once analysis is complete conclusions on transport paths and history can be made.

Gold grains located in samples of sand and gravel near Birchy Bay are irregular-rounded to flaky-rounded, which suggests transport distances of greater than 80 km (Hallbauer and Utter, 1977; Hallbauer, 1981). Gold grains located in tills south and southeast of Birchy Bay are delicate to abraded suggesting transport distances of up to >1000 m (Averill and Zimmerman, 1986). Microprobe analysis of the gold grains and on gold from bedrock sources is still in progress. Conclusions as to the transport paths, sources and history of transport of the gold grains cannot be made until this analysis is completed.

SUMMARY AND CONCLUSIONS

The regions of Comfort Cove–Newstead and Gander River has evidence of four ice-flow events. Striation evidence is consistent with the orientation of crag-and-tail hills, rôches moutonées and rogen moraines. The first ice flow was east-southeastward flow, followed by a north to northeastward and then a northeastward ice flow in the west and a northwestward ice flow in the east (St. Croix and Taylor, 1991). Analysis of clast fabrics from basal tills indicates that east to southeast, northeast, and north-northwest trends are evident. This demonstrates that all ice-flow events have played a role in the present dispersal of material, which has important implications for mineral exploration. The east-southeastward trend of fabrics is found mostly in the south and south-central region of the map sheet. The north and northeastward trends of fabrics in diamictons are located in the south, south-central and northern areas of study, whereas the northwestward orientations are found just southeast of Birchy Bay.

Gold grains observed in tills are delicate to abraded, suggesting transport of up to 1000 m. The transport path, source and history of gold grains is still under study. Once microprobe analysis and till geochemistry have been completed this aspect of the study can be finalized.

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