GEOLOGICAL ASSOCIATION OF CANADA
ROAD LOG FOR BAIE D'ESPOIR FIELD TRIP

October, 1983

The 1983 G.A.C. fall field trip will tour the volcanic and sedimentary successions which outcrop throughout south-central Newfoundland and comprise the marginal sequences between the Dunnage Zone (remnants of Iapetus) successions to the west and the Avalonian craton to the east. The first day will take us from the Baie d'Espoir Group, believed to have been deposited near the Avalonian continental margin, northwestward into the volcanic and sedimentary sequences near Cold Spring Pond which are more typical of central Dunnage Zone successions. Our route will follow the North Salmon access road, constructed in the early 1980's to service construction of the Upper Salmon hydroelectric project. Since completion of the project, this road has been closed to visitors and our access is with the permission of Newfoundland Hydro, whose cooperation we gratefully acknowledge. They have also provided us with the project descriptions which you will find in the field trip folio. The second day will be spent looking at aspects of Baie d'Espoir Group geology and at a corner of the "Tim Horton Complex" which outcrops along the Baid d'Espoir highway.

Field trip leaders are Steve Colman-Sadd and Scott Swinden with help from other summer denizens of the south coast. Have a good time, enjoy the nightlife of Baie d'Espoir and pray for sun (while preparing for rain).

Day 1 - Saturday, October 1

Km. 0 - Isadore's, (licenced) Restaurant in downtown St. Alban's. Early risers might take time here for a quick nip or a delicious traditional Bay d'Espoir breakfast (e.g. chips, dressing and gravy).

The Upper Salmon access road begins directly across the street.

Km. 8.2 - Look right for first view of the Long Pond reservoir, principal water storage basin for the Bay d'Espoir hydro project.

Stop 1 Km. 11.9 - Salmon River Dam - named after the famous Salmon River Dam Formation of the Bay d'Espoir Group which outcrops on road cuts beside the dam and in outcrops below the dam.

Follow the creek bed into the gorge below the dam. Watch your step - Colman-Sadd and Swinden assume no personal liability for twisted ankles or broken legs (or necks!).

Outcrops in the gorge, below the dam are medium-bedded sandstone and siltstone of the Salmon River Dam Formation, interpreted to be the basal unit of the Lower - Middle Ordovician Baie d'Espoir Group.

Of particular interest here is a prominent intraformational fault which strikes up the middle of the gorge and passes under the dam! Note intense fracturing and shearing and quartz/calcite-filled veins and fractures related to the fault.

Km. 13.4 - Cross bed of Salmon River.

Stop 2 Km. 20.1 - Top of Witch Hazel Hill. This outcrop is porphyritic biotite granite - part of the eastern end of the extensive North Bay Granite.

Phenocrysts up to 15 cm across are microcline. The North Bay Granite intrudes the Salmon River Dam Formation and was dated by Peter Elias (Rb/Sr) as Siluro-Devonian.

After Km. 20.1 - A historical note - the road is very winding through here. This is because it was designed to follow the higher ground and to stay clear of bogs and caribou as much as possible. So it winds its way from one wooded hill to the next.

Stop 3 Km. 38.0 - Medium to thick bedded purplish sandstone and quartzite of the Salmon River Dam Formation. Note thin calc-silicate interbeds. This exposure is more typical of this formation than those seen at the dam. Biotite metamorphic grade. Note a probable F_1 fold in the outcrop.

Stop 4 Km. 48.0 - Bottom of hill. Outcrop and many large boulders of the White Hills migmatites which outcrop throughout the hills to the right of the road. Abundant granitic sweats occur in various kinds of mica schist. The nature of the protolith is unclear but is probably metasedimentary. The migmatites adjoin the North Bay Granite and are intruded by garnet-tourmaline-muscovite-bearing pegmatites. There is a very sharp metamorphic gradient into surrounding greenschist facies rocks like those at the previous stop.

Km. 52.6 - Cross west Salmon River. Rocks exposed in the river bottom and nearby road cuts are Salmon River Dam Formation sandstones. This is not a stop.

Km. 54.9 - Look to right - This is the remains of the main construction camp for the Upper Salmon Hydro Project. During peak construction periods, it housed over 300 men. Immediately in front of the camp site is the bottom end of the tailrace where it exits into Godaleich Pond.

Stop 5 Km. 55.4 - Exit to tailrace and Godaleich Power House.

The Godaleich Power House is unmanned and operated by remote control from Bay d'Espoir. The tailrace has excavated the only exposed contact between the Salmon River Dam and North Steady Pond Formations of the Baie d'Espoir Group. The latter in this area comprises green, medium bedded volcaniclastic turbidites well exposed at the north end of the outcrops near the Power House. Towards the south (down the tailrace from the Power House), these begin to interfinger with thin purplish sandstone beds similar to typical Salmon River Dam Formation lithologies. The green sandstone and siltstone becomes increasingly subordinate in the roughly 100 m interval exposed along the road across the tailrace and eventually disappear leaving only Salmon River Dam Formation lithologies as exposed in the tailrace south of the road.

Regional considerations suggest that the North Steady Pond Formation overlies the Salmon River Dam Formation. This cannot be demonstrated at this locality because of tight folding and numerous small reverse faults.

If you look carefully, you will note that although strike of bedding is at a high angle to the direction of the tailrace, the geology cannot be traced directly from one side to the other. This is because of a steep fault, parallel to the direction of the tailrace which was well exposed during excavation and apparently controlled the location of the small brook which flowed here prior to excavation. The fault strikes directly beneath the Power House!

Km. 56.2 - Junction of main road with access road (to left) for Cold Spring Pond Dam and power canal. Hump crossing road to right is the penstock which leads water from the dam to the left down to the Power House. The power canal behind the dam is 40'-50' deep and leads water from Cold Spring Pond across to the penstock. During excavation, this canal provided an excellent continuous outcrop several kilometres long which, unfortunately, was exactly parallel to strike.

Km. 58.9 - Somewhere near this bend in the road, we cross a major fault which separates the Baie d'Espoir Group from the Cold Spring Pond Formation (informal name). The latter is interpreted to be an Lower-Middle Ordovician sequence as well, although the abundance of mafic volcanic rocks suggest an affinity with the Victoria Lake Group (Tally Pond volcanics) to the west rather than the Baie d'Espoir Group. In this area, the fault is not well defined as it separates similar sedimentary rocks. Two to three kilometres to the north, it separates distinctively defined lithologies and is marked by a prominent zone of shearing and brecciation.

Stop 6 Km. 62.6 - Green sandstone and siltstone of the Cold Spring Pond Formation. This is the dominant lithology of this formation. It lacks the distinct sandstone beds of the turbidites of the North Steady Pond Formation but is otherwise broadly similar. To the east, it passes into fine grained sediments which include a considerable volume of black argillite. Note that the whole outcrop is chevron folded. Isolated top determinations must be interpreted with some caution throughout this formation!

Polished surfaces in the quarry to the left of the road reveal a variety of fine sedimentary structures. These outcrops need to be wet for best viewing but this is not a good reason to hope for rain!!

This quarry and many others like it in the area were used to get fill for road and dam construction. During mapping here in 1981, they provided excellent and in many cases unique geological exposures which have subsequently been lost as most of the quarries were refilled with gravel, dead trees and assorted garbage according to the requirements of environmental regulations.

Stop 7 Km. 66.8 - Black felsic crystal tuff. This is typical of felsic volcanic lithologies which make up 10-15% of the Cold Spring Pond Formation. Quartz phenocrysts have volcanic embayments and very rarely lithic fragments are seen. No similar lithologies are seen in the Baie d'Espoir Group; however, there are some in the Tally Pond volcanics to the northwest.

Stop 8 Km. 69.1 - Probable fault-bounded slice of ophiolitic material within the Cold Spring Pond Formation. Various lithologies are exposed in the few whaleback outcrops and along the east shore of the pond, including gabbro with some small plagiogranite pods, possible pillow lava and peridotite with visible chromite grains and probable orthopyroxene phenocrysts (along the lake shore). The lithologies are identical to although more sheared and altered than those in the Pipestone Pond - Coy Pond ophiolitic complex to the east (which unfortunately is not exposed on the roads).

There are numerous pods and slices of ophiolitic material similar to this one throughout the Cold Spring Pond Formation. They are interpreted to have been brought up along high angle faults from an underlying ophiolitic layer.

Km. 69.2 - West Diversion road to left. This road provides access for construction of diversion channels which lead water from Great Burnt Lake south to Cold Spring Pond and the Godaleich Power House. There are some good exposures of amphibolite-grade metasediments, migmatites and deformed granite down there but unfortunately, the road crosses a caribou migration route and so was closed immediately following construction.

Stop 9 Km. 73.7 - Only exposure of the western boundary fault of the Cold Spring Pond Formation. Here, there is a sliver of granulated, altered serpentinite which has apparently been brought up along the fault. Pillow lava outcrops immediately to the east and upper greenschist - lower amphibolite grade metasediments to the west.

Stop 10 Km. 74.5 - Metasedimentary rocks west of the Cold Spring Pond Formation boundary fault. Schists carry incipient andalusite porphyroblasts.

Stop 11 Km. 76.4 - North Salmon Dam: This dam blocks the previous outflow from Great Burnt Lake and allows the waters to be diverted southwards into Cold Spring Pond and the Godaleich Power House. They return to their normal course in Round Pond below Godaleich Pond and are subsequently put to work again in the Bay d'Espoir Power House. In the civil service, this is known as working overtime without pay.

Below the dam, in what used to be a good fishing hole, are new and excellent exposures (assuming the sluice gates are closed when we get here) of massive basalt, pillow lava, pillow breccia and mafic pyroclastic rocks. These basalts are host to the Great Burnt Lake and South Pond volcanogenic sulfide deposits to the north. The former deposit is the larger, roughly 750,000 t grading less than 1% Cu. It is a massive, bedded, tabular sulfide body with a well developed footwall chloritic pyritic alteration zone which apparently faces west and is overturned to the east. It lies about 1.5 km north of the dam on the east flank of the large hill visible in this direction. Alteration and sparse mineralization is found along strike for some distance and during construction of the dam, a small occurrence of disseminated to stringer chalcopyrite and pyrite in chloritic basalts was uncovered just south of the dam. This has since been covered again by construction and landscaping efforts.

The west boundary fault of the Cold Spring Pond Formation strikes perpendicular to the road and crosses it a few hundred metres above the dam.

Day 2 - Sunday, October 2

Km. 0 - Motel Bay d'Espoir - Head of the Bay. Meet for trip home.

Km. 3.5 - Dowding's Ultramar. Last gas station before Lewisporte junction on T.C.H. Tank up!

Km. 15.0 - Harbour Breton turnoff. Turn left for T.C.H.

Stop 12 Km. 22.7 - St. Joseph's Cove Formation of Ordovician Baie d'Espoir Group (equivalent to eastern Davidsville Group). Distal turbidites (and/or contourites) that also form all the road cuts around Bay d'Espoir. Deformed twice: first cleavage is parallel to bedding and axial planar to isoclinal folds that are only rarely observed. This cleavage allows rock to be quarried for slate where second folds are not well developed (as here). Second folds form gentle undulations in a few rock faces in this pit - near the Motel Bay d'Espoir they formed the prominent folds seen in road cuts and rendered the rock useless for building slate. The shallowly dipping second cleavage is clearly seen here crosscutting the first cleavage and bedding.

Some of the quartz veins have sulfide mineralization. They may be related to Devonian granites.

Stop 13 Km. 28.3 - Ordovician Twillick Brook felsic pyroclastic member of St.Joseph's Cove Formation, Baie d'Espoir Group. The pyroclastic rocks are bordered on south by graphitic slate and the two units are enclosed in the turbidites seen at previous stop. Note the lensoid development of the tuff in the south end of the pit. The tuff extends over 60 km to the northeast and is shown on the map of Newfoundland (Williams, 1967).

One minor showing of chalcopyrite has been discovered in a drill hole in the tuff member.

Stop 14 Km. 81.8 - Conglomerate of the Ordovician Bay d'Espoir Group. Clasts are mainly sedimentary, volcanic, and plutonic rock types, similar to surrounding units of Baie d'Espoir Group. Conglomerate is probably a channel fill deposit in a turbidite fan. It is closely associated with volcanogenic sandstones seen at last stop.

The volcanic constituents of these rocks contrast with the quartz-rich, nonvolcanic compositions of sandstones of approximately the same age inside the "Tim Horton Complex" (next stop but one).

Stop 15 Km. 90.0 - Great Bend ultramafic belt. Magnesite deposit with quartz veins and chromite pods. The magnesite zone separates massive peridotite to the north from gabbro to the south. Magnesite zones occur at the same stratigraphic level in other ophiolitic bodies of the "Tim Horton Complex" (Pipestone Pond and Coy Pond). It separates the cumulate rocks (gabbro and pyroxenite) from the mantle peridotites, and may represent the critical zone at the petrographic Moho.

Drive on down highway and pass a large pit, on the right, in peridotite. This is what the shoulders of the road are made of.

Just south of the Northwest Gander River we cross the base of the ophiolite into the tectonic windows of the "Tim Horton Complex".

Stop 16 Km. 98.2 - Inside the "Tim Horton Complex", the ophiolitic and volcanic Dunnage Zone rocks are underlain by interbedded quartzite and shale of the Spruce Brook Formation (Lower to Middle Ordovician and approximately the same age as the Baie d'Espoir Group).

Here shale is exposed, but the nearest quartzite bed occurs in an extension of this pit to the north. Note two good cleavages, characteristic of the Spruce Brook Formation close to the ophiolitic bodies. Metamorphic grade: chlorite/biotite.

Stop 17 Km. 151.7 - Silurian Botwood Group - Back in the Dunnage Zone Sequence, these rocks are separated from those of the previous stop by a fault zone with slivers of probable ophiolitic rocks.

Ripple marked and locally mud cracked red and green sandstone and shale deposited in shallow water or subaerial environments. The rocks have one main cleavage oblique to bedding and in places there is a second deformation crenulation.

Km. 156.5 - T.C.H. Turn right for St. John's, floor it, go to sleep for 4 1/2 hours. See you later.

NOTES