5551a (PT 1 OF 2)

and

94G/5W (PT 2 OF 2)

VESTOR OPTION CLAIMS
REDFERN LAKE AREA
BRITISH COLUMBIA
NTS 94G/5W

GEOLOGICAL REPORT
STRATIGRAPHY & MINERAL OCCURRENCES

August 1975. D. T. Cosgrove

GEOLOGICAL REPORT

on the

STRATIGRAPHY AND MINERAL OCCURRENCES

of the

VESTOR OPTION CLAIMS

in the

REDFERN LAKE AREA

Liard Mining Division
of
Northeastern British Columbia

Approximately Lat. 57°22' Long 123°47'
Map NTS 94G/5W

June 5 - July 3, 1975

Tyr (1-43); Chilly (1-36); Vista (1-5);
Egg (1-22); Foo (1-25); Damn (1-20)

Prepared for: Rio Tinto Canadian Exploration, Ltd.

By: Donald T. Cosgrove, P.Geol. (Alberta)
Consulting Geologist

Calgary, Alberta
August, 1975.

Plate 1

High altitude view of Redfern Lake. Fairy Lake to south separated by Fairy Ridge. Jagged Pine Point reefal beds at near end of ridge. Fairy Creek at left with Fairy Falls (white spot) in Pine Point beds. Rio camp is at light spot above "north". "Noranda camp" is at light spot part way up lake.

Plate 2

East end of Redfern Lake and Little Redfern from top of Fairy Ridge. Camp is at light spot above Palmer's head.

Plate 3

Campsite. Redfern Plateau in background.

Plate 4

Party personnel. From left: Colin Spence, Larry Haynes, Lois Palmer, Rob Magregar, Susan Shaw and Ted Johnson.

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* Please note: The "plates" were inadvertently labelled "Figure" in the report.

INTRODUCTION

In view of the uncertainties regarding the stratigraphy and mode of occurrence and economic potential of mineralization found previously by surface geology, geochemical surveys and diamond drilling on the Vestor Redfern Option group of claims, Rio Tinto organized a field party to explore the claims. The claims are held by Vestor Exploration and are under option to Rio Tinto Canadian Exploration, Ltd.

The writer, Donald T. Cosgrove, was engaged as a consultant to supervise the project.

The work done consisted of surface geology emphasizing stratigraphic work and examination of mineral occurrences. Soil sampling was undertaken in two critical areas. In addition, one mineral claim (Vista 5) consisting of six units, was staked to tie in two previous claim groups.

The party consisted of Cosgrove, Lois Palmer, geologist, Susan Shaw, geology student, Robert Magregar, student and Helen Gow, cook. Overall supervision, mobilization and logistics were handled by E.W. "Ted" Johnson of Rio Tinto's Prince George office, who spent some time at the camp, as well. George Schwartz of Rio Tinto aided in setting up camp and assisted for a few days. Colin Spence and Larry Haynes of Rio Tinto visited the camp for three days.

Geographic Setting

Redfern Lake, a spectacularly beautiful aqua blue gem, is situated in glaciated country at the east end of the main range (Muskwa Ranges) of the Rocky Mountains, 222 km (138 miles) northwest of Fort St. John, 177 km (110 miles) south-southwest of Fort Nelson and 230 km (143 miles) north of McKenzie. The lake is 64 km (40 miles) west of Mile 170 on the Alaska Highway.

The major portion of the claims lie above timberline on an extensive triangular shaped limestone-capped barren plateau which lies at elevations of 1830 to 1980 meters (6000 to 6500'), cut by coulees on the margins. Cliffs mark the north and south faces of the plateau, labelled "north" and "south faces" in this report. The majority of the Tyr group of claims lie on a gentle tree covered slope and flat which extends to the Besa River at an elevation of approximately 1250 m (4100'). Redfern Lake itself lies at an elevation of approximately 1255 m (4120'). Another glacier carved twin lake, Fairy Lake, lies at an elevation of approximately 1325 m (4350'). A jagged knife-edge ridge, termed "Fairy Ridge" in this report separates the two lakes.

An oil company seismic trail was built from the Alaska Highway to the west end of Redfern Lake in 1962. The trail, used by sportsmen, starts from Mile 175 on the highway, follows the Buckinghorse River and Nevis Creek, crosses over to Trimble Lake then along the Besa River to Redfern Lake. An alternate, drier, trail, starts from Mile 171, follows the Sikanni River to Trimble Lake. These trails, swampy in places, can be used by all-terrain vehicles. Upgrading of these trails, although expensive, would be aided by the large amount of glacial gravel present in the area.

Float planes land easily on Redfern and Fairy Lakes. Balloon-tired fixed-wing craft could land on the plateau top with little trouble, if care is taken in selecting a landing spot.

Figure 2 shows some of the informal geographic names used for convenience in the report.

Mobilization, Weather and Logistics

The party began mobilization on June 5, 1975 and finished the next day. Because of windblown ice cover on the east end of Redfern Lake it was impossible to use fixed wing aircraft for mobilization as planned. An Okanagan Helicopter Bell 206B Jet Ranger II from Fort St. John and flown by Lee Sexsmith, was used for mobilization. Equipment was trucked to Buckinghorse Lodge, Mile 175, and flown in from there.

A very comfortable camp was set up a few hundred meters east of "Brown's Cabin" on Redfern Lake.

Snow cover in the working area was relatively light as there was little snow during the winter. Much of the snow fell in late winter and early spring. The lake had an unusually heavy and late ice cover probably due to the lack of snow cover. The ice did not clear the camp until June 10 and was gone completely on the 11th. The ice disappeared from Fairy Lake six days later.

The weather during the work period ranged from very good to very bad, typical for the area, but can be considered fair on the average. The weather was fairly good during the early portion and very good for the last six days, with frequent showers during the middle portion. Snow fell on the plateau on the 18th of June driving the party off. Snow fell several times above 7000' early in the period.

A very heavy regional rain (which washed out the Alaska Highway) fell on June 27 and 28 and the lake level came up about a half meter (1-1/2 feet).

A total of five days were lost to weather and four days for other reasons.

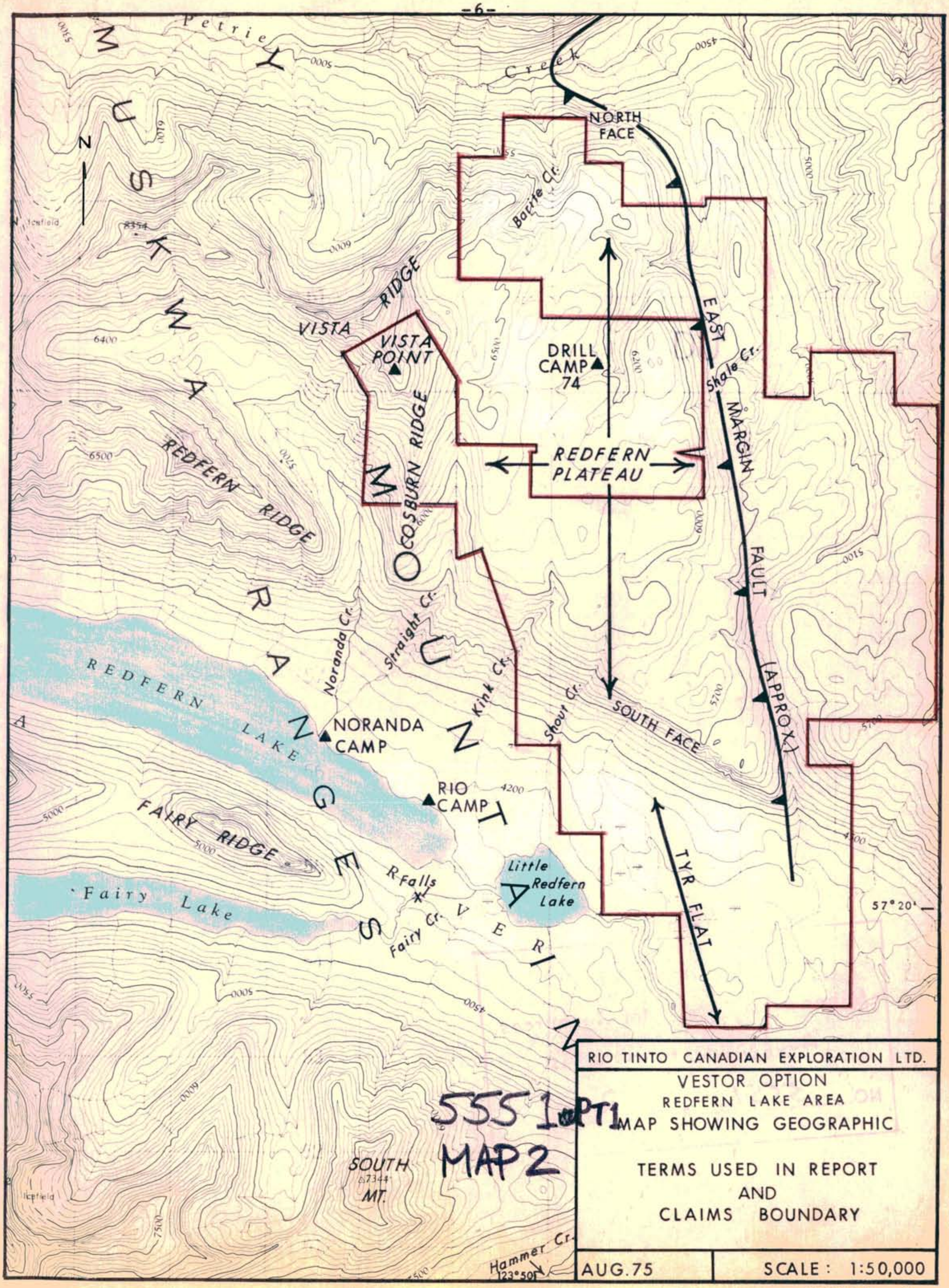
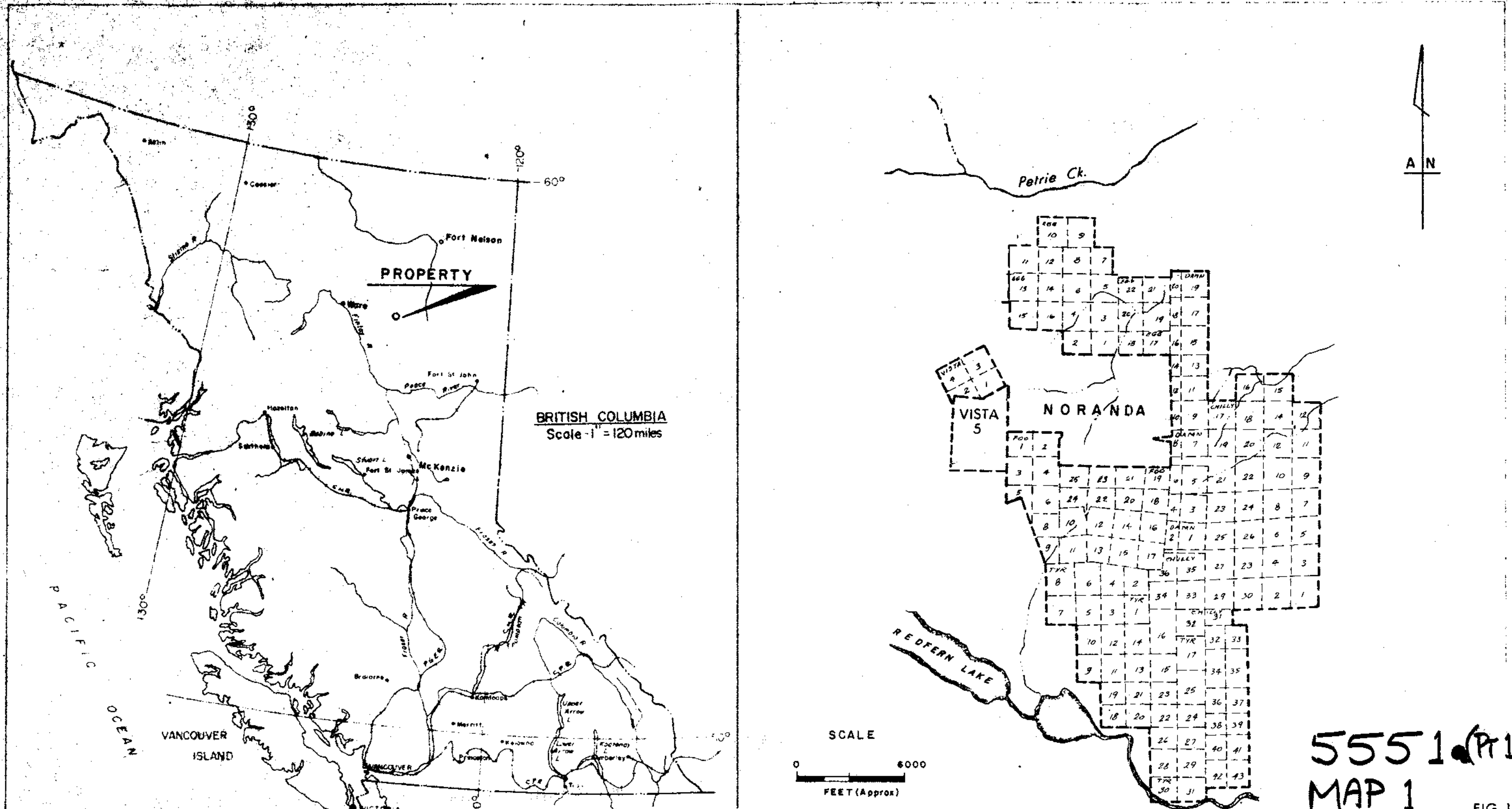

RIO TINTO CANADIAN EXPLORATION LTD.
VESTOR OPTION
REDFERN LAKE AREA
MAP SHOWING GEOGRAPHIC
TERMS USED IN REPORT
AND
CLAIMS BOUNDARY
AUG.75
SCALE: 1:50,000
5551 PT1
MAP2
MUSKWA RANGES
MOUNTAINS
Petrie Creek
NORTH FACE
Barite Cr.
VISTA RIDGE
VISTA POINT
COSBURN RIDGE
DRILL CAMP 74
REDFERN PLATEAU
EAST MARGIN FAULT (APPROX.)
Shale Cr.
REDFERN RIDGE
Noranda Cr.
Straight Cr.
Kink Cr.
Shout Cr.
SOUTH FACE
REDFERN LAKE
NORANDA CAMP
RIO CAMP
FAIRY RIDGE
Fairy Lake
R Falls
Fairy Cr.
Little Redfern Lake
TYR FLAT
VERIN
SOUTH MT.
Hammer Cr.
57°20'
N

FIGURE 2



5551 (Pt 1)
MAP 1

FIG. 1

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 5551 MAP 1

N.T.S.
94-G-5

RIO TINTO CANADIAN EXPLORATION LTD
VESTOR OPTION - B.C.
REDFERN LAKE AREA
LOCATION MAP

Aug. 1975	R.A.B. /e.k.	DWG L-2632-A

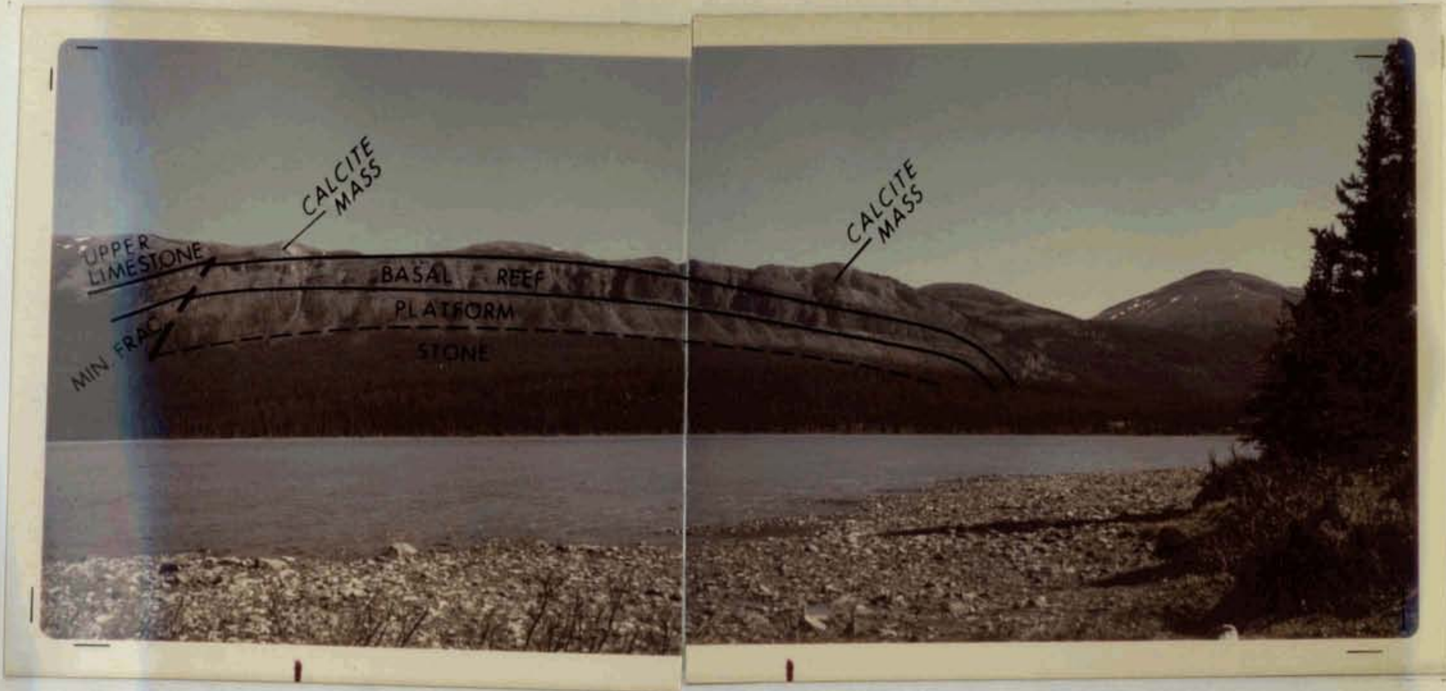


Plate 5

Panoramic view of east end of south face of Redfern plateau, from Little Redfern. Note prominent "south arch" in Pine Point beds and less massive character of basal reef westward.

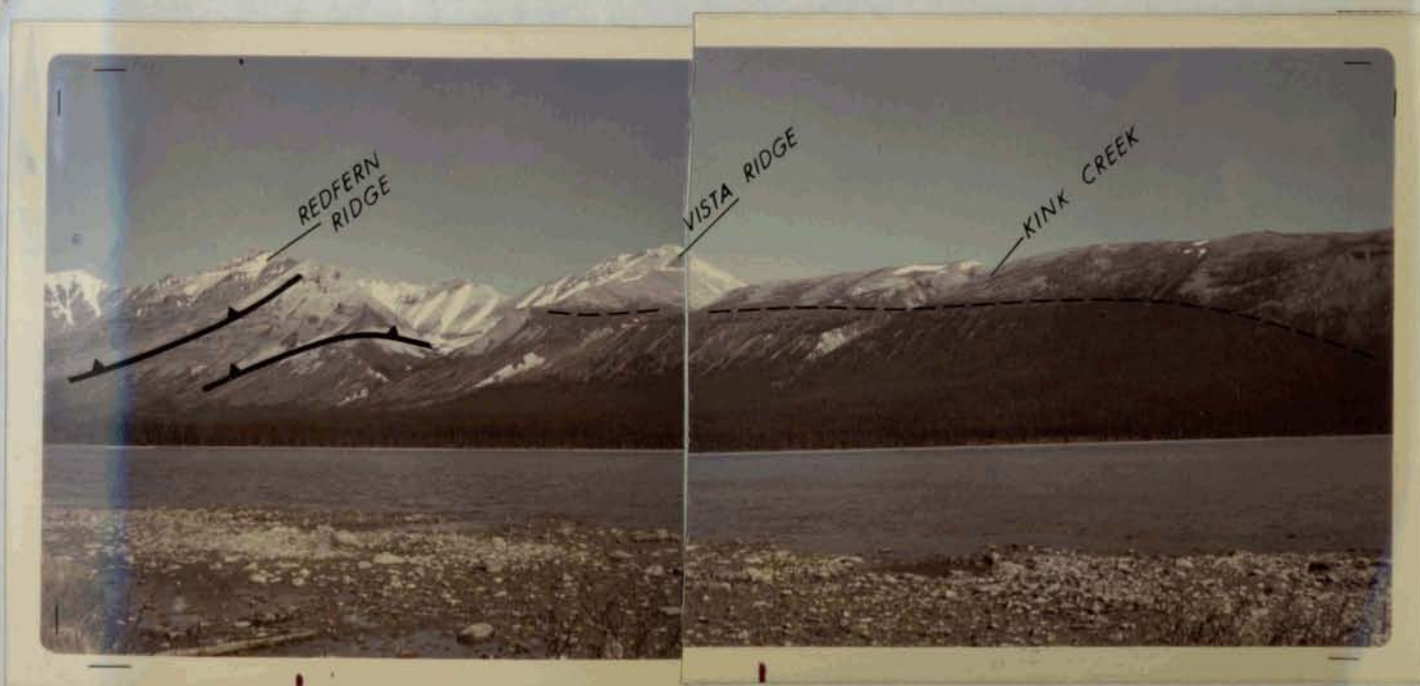


Plate 6

Continuation of panoramic view, west end. Note tree covered glacial moraine at base of cliff.

Plate 7

Redfern plateau from "South Mountain".

Plate 8

Looking south from Vista Ridge toward Redfern and little Redfern. Robb Lake area is in far right background. Standing on basal reef in Pine Point. Dark scree below is in platform rocks. Light colored scree on snow covered Vista Point is Upper Stone. South Mountain is peak with "Y" shaped snow patch, right side. Pine Point has shaled out there. In middle back-ground Cranswick Lake with Mount Bertha behind. Pine Point carbonate development there.

The Okanagan Jet Ranger II was used for some reconnaissance geology the first day and the last day on casual charter when he was working in the area for another company. A Northern Mountain Jet Ranger II from Prince George and flown by Dan Wiebe was used for seven days in the middle portion of the period. The rest of the work was done on foot.

Resupply and visitor flights were flown by NT Air from Prince George and McKenzie in DeHavilland Beaver and Cessna 185 aircraft.

Shaw and Magregar left on June 25 and the remaining three members left on July 3. The remaining portion of the equipment was flown out later.

STRATIGRAPHY

Previous Work

The only Geological Survey of Canada geological map covering the Redfern area is the Trutch Map area (94G) GSC Paper 63-10. In this work Pelletier and Stott have lumped the paleozoic into one unit and little structural information is given. The Halfway map area (94B) to the south is mapped by Irish in GSC Paper 69-11. Stratigraphic terminology there is somewhat generalized but structural information is detailed. The Tuchodi Lakes (94K) map area to the north is mapped by Taylor and Stott (Memoir 373) and both stratigraphic and structural information is detailed.

The most generally accepted reference work for regional stratigraphy is found in Taylor and Mackenzie (GSC Bulletin 186). They have developed a comprehensive stratigraphic nomenclature that is useful in all of N.E.B.C. This terminology is used in the Tuchodi Lakes report.

The stratigraphic terms used in this report are adopted from Taylor and Mackenzie.

In recent years, partly as a result of the extensive mineral exploration, additional detailed work has been done by GSC personnel in the B.C. Rockies, especially by Thompson, Taylor and MacQueen. This may result in revision of some formational names, particularly of the Dunedin formation which underlies most of the claims area and is host for almost all of the mineralization in the Redfern area. Some of this work is included in "Report of Activities" of the GSC and other reports.

In addition to the above mentioned reports, other GSC reports and various reports in other publications give information useful at Redfern Lake.

Several geological studies have been made in the Redfern area by various mineral and oil companies and are available in government and company files. The writer has made use of some of these in addition to his own personal knowledge of the area.

Formations

Beds ranging in age from Lower to Upper Devonian underlie the claims area. Silurian beds outcrop just to the west and south of the claims area. Ordovician rocks outcrop extensively farther west.

Ordovician and Older Beds (1220+ m) (4000'+)

A great thickness of Ordovician and older beds outcrop

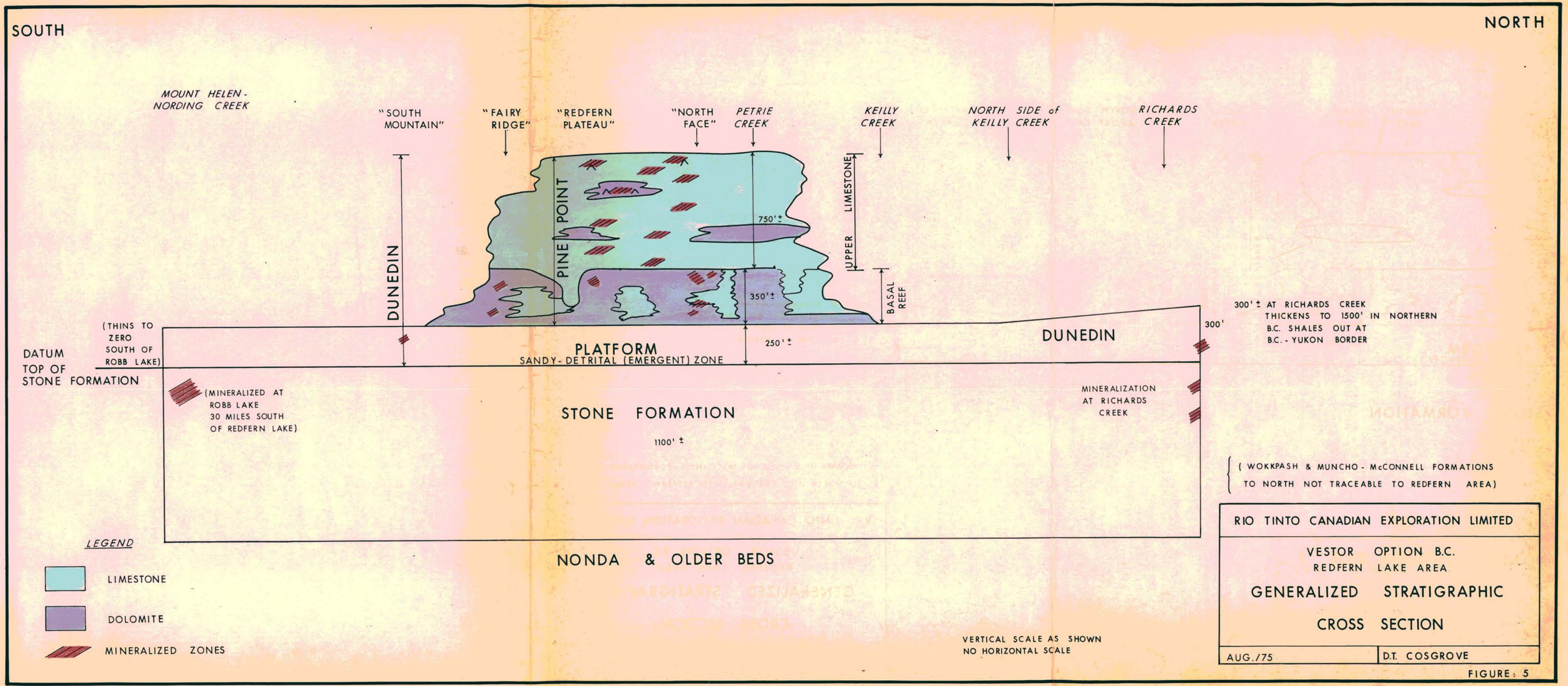
GENERALIZED STRATIGRAPHIC SECTION

IN

REDFERN LAKE AREA

Age	Formation	Member / Min. Zones	Approx. Thickness	Brief Description	Mineralization
M. & U. DEV.	BESA R.		3000' ±	*SHALE.*	LOCAL BARITE NEAR FAULTS.
MIDDLE DEVONIAN	DUNEDIN	PINE POINT: UPPER LIMEST. EQUIV.	750' ±	*LIMESTONE,* LOCALLY DOLOMITIZED AND/OR SILICIFIED. LOCAL BIOSTROMES. THIN TO THICK BEDDED, SLIGHTLY SHALY INTERBEDS. (SHALES OUT TO NORTH, WEST & SOUTH)	LOCAL MINERALIZATION IN PATCHES AND VEINS, LOCALLY STRATABOUND. ZINC, SEC. ZINC, BARITE, SOME GALENA, RARE COPPER.
MIDDLE DEVONIAN	DUNEDIN	PINE POINT: BASAL REEF	350' ±	*DOLOMITE,* LATERAL FACES CHANGES TO *LIMESTONE.* REEFAL, MAINLY CORALS & STROMS, CRINOIDAL NEAR MARGINS. MASSIVE, CLIFF FORMING, RESISTANT. (SHALES OUT TO NORTH, WEST & SOUTH)	MINERALIZED ON NORTH & SOUTH FACES, VISTA RIDGE, FAIRY RIDGE, ALSO ON TYR FLAT. ZINC, SEC. ZINC, LOCAL BARITE, GALENA.
MIDDLE DEVONIAN	DUNEDIN	"PLAT-FORM"	250' ±	*LIMESTONE, DOLOMITE, SHALE. SANDY* IN BASAL PORTION WITH FERRUGINOUS & DETRITAL MATERIAL. EMERGENCE INDICATED.	RARE BARITE NEAR FAULTS
MIDDLE	STONE	UPPER	600' ±	*DOLOMITE,* SANDY BEDS, SOME BRECCIAS. THICK BEDDED, RESISTANT.	MINERALIZED AT ROBB LAKE, RICHARDS CREEK, SOME OTHER AREAS. NO MIN. IN REDFERN AREA.
LOWER (?)	STONE	LOWER	500' ±	*DOLOMITE,* SANDY BEDS. THIN BEDDED, RECESSIVE. (INCLUDES WOKKPASH & MUNCHO-McCONNELL FORMATIONS)	MINERALIZED AT MT. McCUSKER (?) NO MIN. IN REDFERN AREA.
SILURIAN	NONDA		1100' ±	*DOLOMITE,* COMMONLY BIOSTROMAL, *SANDSTONES.*	
CAMB.-ORD.	OLDER BEDS		4000'+	*LIMESTONE, DOLOMITE, SHALE & SANDSTONES.* THICKENS WESTWARD.	

FIGURE: 3


SOUTH
NORTH
MOUNT HELEN - NORDING CREEK
"SOUTH MOUNTAIN"
"FAIRY RIDGE"
"REDFERN PLATEAU"
"NORTH FACE"
PETRIE CREEK
KEILLY CREEK
NORTH SIDE of KEILLY CREEK
RICHARDS CREEK
DUNEDIN
PINE POINT
750' ±
350' ±
UPPER LIMESTONE
BASAL REEF
(THINS TO ZERO SOUTH OF ROBB LAKE)
DATUM
TOP OF STONE FORMATION
PLATFORM
SANDY- DETRITAL (EMERGENT) ZONE
250' ±
DUNEDIN
300'
300' ± AT RICHARDS CREEK THICKENS TO 1500' IN NORTHERN B.C. SHALES OUT AT B.C. - YUKON BORDER
(MINERALIZED AT ROBB LAKE 30 MILES SOUTH OF REDFERN LAKE)
STONE FORMATION
1100' ±
MINERALIZATION AT RICHARDS CREEK
(WOKKPASH & MUNCHO - McCONNELL FORMATIONS TO NORTH NOT TRACEABLE TO REDFERN AREA)
NONDA & OLDER BEDS
LEGEND
LIMESTONE
DOLOMITE
MINERALIZED ZONES
VERTICAL SCALE AS SHOWN
NO HORIZONTAL SCALE
RIO TINTO CANADIAN EXPLORATION LIMITED
VESTOR OPTION B.C.
REDFERN LAKE AREA
GENERALIZED STRATIGRAPHIC CROSS SECTION
AUG./75
D.T. COSGROVE
FIGURE: 5

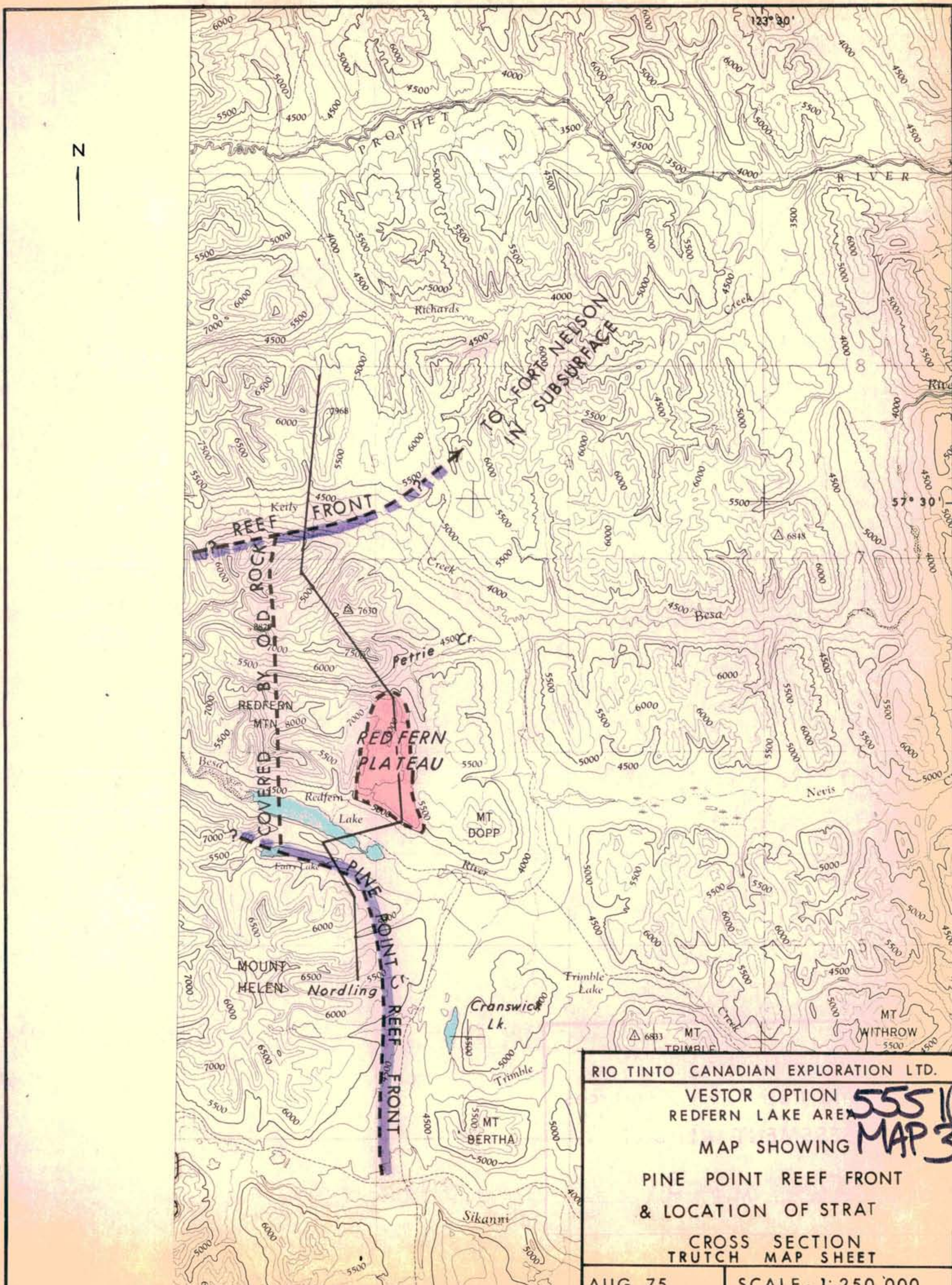

N
PROPHET RIVER
123° 30'
57° 30'
TO FORT NELSON IN SUBSURFACE
REEF FRONT
COVERED BY OLD ROCK
REDFERN MTN
REDFERN PLATEAU
Redfern Lake
PINE POINT REEF FRONT
MOUNT HELEN
Nordling
Cranswick Lk.
MT DOPP
MT BERTHA
MT TRIMBLE
MT WITHROW
Trimble Lake
Besa
Petrie Cr.
Richards
Keily
Nevis
Sikanni
RIO TINTO CANADIAN EXPLORATION LTD.
VESTOR OPTION
REDFERN LAKE AREA
MAP SHOWING
PINE POINT REEF FRONT
& LOCATION OF STRAT
CROSS SECTION
TRUTCH MAP SHEET
AUG. 75
SCALE: 1: 250,000
5551 (PT1)
MAP 3

FIGURE 4

to the west of Redfern Lake. West of a thrust which passes near the west end of Redfern only these older beds outcrop, forming the high rugged glaciated topography of the Rockies crest. The thickness of this monotonous series of limestones dolomites and clastics ranges up to 1220 m (4000') or more. References to these rocks can be found in various GSC and other publications. The names Kechika (Ordovician) and Atan (Cambrian) have been used by the GSC to the north.

These beds were not examined in this study. No extensive mineralization has been found to the west in these rocks although some copper has been reported by hunting guides and others.

A low amplitude (2-3°) angular unconformity can be seen on the cliff on the north side of Redfern Lake in beds near the top of the Ordovician sequence. These unconformities which have been observed elsewhere in the section can be expected in view of the rapid eastward thinning of the total section toward the plains.

<u>Silurian - Nonda Formation</u> (335 m ±) (1100' ±)

The Nonda formation does not outcrop on the claims area but does so about 100 meters to the west of the Vista claims and would be present at various depths under the claims. The formation also outcrops on Fairy Ridge, on "South Mountain" south of Redfern Lake and makes extensive outcrop west and northwest of the claims in several thrust slices.

The Nonda is typically dark and banded in outcrop, is relatively resistant and forms a distinctive mappable unit on the ground and on aerial photos.

The Nonda consists mainly of dark siliceous dolomites with interbeds of sandstones and quartzites, particularly in the lower portion. The dolomites locally have abundant silicified fossils, particularly large corals and stromatoporoids, forming biostromes with vuggy and cavernous porosity. The marker fossil Halysites is the most diagnostic fossil. A thick basal quartzite is present at the base of the formation at Keilly Creek to the north. There are some shaly interbeds and occasional limy bands near the base, often forming a decollement surface for thrusts.

To the writer's knowledge, no mineralization has been found in this formation in the area.

Lower(?) and Middle Devonian - Stone formation (335 m ±) (1100' ±)

The Stone formation can be subdivided in the Redfern area into two mappable units, a thin bedded recessive "Lower Stone" and a thick bedded resistant "Upper Stone".

The Lower Stone is shalier and sandier than the upper unit. In the type area of these formations to the north along the Alaska Highway the Nonda is overlain by a distinctively banded light and dark grey dolomite unit, the Muncho-McConnell formation which is in turn overlain by a distinctively yellow and brown weathering sandy unit, the Wokkpash formation. The Lower-Middle Devonian contact is placed at the top of the Wokkpash by Taylor and McKenzie.

The Muncho-McConnell and Wokkpash, so distinctive along the Alaska Highway, can be traced to the south as far as the general Prophet River area but cannot be traced with certainty beyond that. It is possible that the recessive Lower Stone represents the Wokkpash/Muncho-McConnell equivalents and the more massive Upper Stone the true Stone. This would require facies changes for the Muncho-McConnell/Wokkpash as they do not resemble the formations in the type area.

Due to the uncertainties the entire interval is termed "Stone" in this report with a two-fold breakdown of the two easily mappable units. This breakdown cannot be used in surrounding areas, as again facies changes occur, particularly in the clastic content.

The Stone consists mainly of light brownish grey fine to microcrystalline, commonly arenaceous, partly argillaceous dolomites. The silt and sand content varies from nil to "floating" grains to some dolomitic sandstones. "Floating" quartz sand grains are very common, are commonly frosted and well rounded. Fossils are rare although algal structures have been noted locally and there are occasional darker grey bands which are organic and have relict light colored rounded fossils which appear to be amphiporids. Breccias are common within the Stone formation, consisting of angular blocks of dolomite with a matrix of white dolomite and some calcite. These breccias are the host rock for the extensive mineralization at Robb Lake to the south and Richards Creek to the north and a few other showings.

The origins of the breccias are somewhat controversial and no evidence was seen on this project to help determine their origin. Breccias appear relatively scarce in the Redfern area.

The Stone outcrops on the west side of the claims area on "Vista" and "Cosburn ridges" where it has been thrust over younger beds. Stone also outcrops on Fairy ridge and South Mountain.

At the base of the south face Stone beds outcrop at the east end where the beds come over into the main thrust and also in numerous scattered outcrops in the tree covered upper Tyr slopes. There is a small outcrop of Stone on the Besa River just off the southwest corner of the Tyr claims. Much of the tree and glacial outwash covered Tyr flat would be underlain by Stone formation.

No mineralization was found in Stone beds in the Redfern area and although much of the formation is covered by younger beds, glacial material or treee-cover, the prospects for mineralization in this formation appear minimal in the Redfern area.

Middle Devonian-Dunedin formation

The term Dunedin was proposed by Taylor and Mackenzie for the sequence of carbonates lying above the Stone formation and below Besa River shales. The formation therefore includes the Eifelian blanket carbonate (Nahanni or Hume equivalents) in Northern B.C., beds with Givetian Pine Point fossils in the Redfern area and to the south and beds as young as Frasnian (Slave Point equivalent) in the Nabesche River-Mount Burden area to the south. As such the term Dunedin may be too inclusive and can lead to nomenclature problems. A revision would be useful.

An informal three-fold division is made of the formation in this report as there are three distinctive mappable units in the Redfern area. These are: (a) a basal platform carbonate (Nahanni equivalent); (b) Basal reef (Pine Point equivalent); and (c) Upper limestone (Pine Point) bearing various Stringocephalus species.

(a) Basal Platform (76 m) (250'±)

To the north at the type section near the Alaska Highway the unit (Nahanni equivalent) is 238 m (781') thick, thickening westward. The limestone blanket thins progressively southward to Prophet River, where it is approximately 90 m (300') thick and Richards Creek where it is thinner yet. The blanket deposit is a rather featureless limestone, with poorly preserved fossils, corals, brachiopods and ostracods dominating.

In the Redfern-Keilly Creek area the unit is approximately 75 m (250') thick.

Approaching Keilly Creek the unit changes character, tending to be shaly in the lower half and having a basal clastic interval. At the base is a 15 m (50') thick sandy zone. Siltstones, sandstones, limestone conglomerates and shales are present. Distinctive waxy green shale pods and abundant ferruginous material are present. Rapid lateral facies changes are prominent. A period of emergence is indicated. This clastic unit thickens southward and the sand content increases. The zone weathers prominently yellow to rusty brown and is a good marker.

The upper half is a series of interbedded limestones and dolomites with shaly interbeds, becoming cleaner and more dolomitic upward. Fossils are common, including the distinctive marker giant ostracod Moelleritia canadensis, which is present at Keilly Creek and Fairy Ridge. Other well preserved Hume-age fossils are present, including brachiopods, corals and ostracods. "Zebra stripe" structures are prominent in the dolomites in the upper portion.

This platform (or "basal carbonate blanket") extends south of Redfern Lake continuing to thin progressively southward, disappearing in the general Mt. Lady Laurier area. The platform is Eifelian in age and the limestones are probably open marine.

Interestingly, further south where the basal platform is absent, a thin (1.5-6 m) (5-20') clastic unit is present between Stringocephalus bearing Pine Point beds and Stone dolomites. The lithology of that clastic unit is very similar to that described above.

The basal clastic unit therefore appears to be an onlap deposit, becoming younger southward, possibly indicating the influence of the "Peace River high".

(b) Basal Reef (up to 107 m (350')

The basal reef is usually completely dolomitized although locally limestones are still present. Fossils are very abundant including large reef-building forms. Most prominent are massive colonial corals such as Favosites, Hexagonaria, Syringopora and others, which reach sizes of up to 0.6 m (2') in diameter. Stromatoporoids are abundant, mainly the large "cabbage-head" types. Other fossils are less common. Amphiporids are rare. The reef is usually massive with little or no bedding and is generally resistant. The dolomites are fine to coarse crystalline. Silica is usually present, commonly abundant. White coarse crystal mottling and patches are prominent. Porosities in the unit are fairly low, averaging an estimated 3 to 7%. Large vugs and cavernous porosity are rare. Some porosity can be seen in the various fossil forms, such as Favosites and stromatoporoids.

Pyrobitumen is present in fair to abundant amounts, both soft intergranular types and large vitreous patches, some of which are hard and porcellaneous. Pyrite and other ferruginous material is present, but usually is localized.

The best exposures of the reef in the claim area is on the south face of the plateau. At the east end of the cliff the reef forms a massive, near vertical cliff 70 m (230') thick, and is all dolomite. About half way west across the face the unit tends to lose its massive character, bedding becomes more prominent and somewhat irregular and the cliff much less resistant. At the west end of the cliff the unit is still more recessive and only the uppermost bed, which is locally limestone, is resistant.

At the south face, it is seen that whereas usually the top of the dolomite reef has a sharp interface with the overlying limestones, in other places there is an irregular and gradational or interbedded contact. Frequently there is abundant silica associated with this contact and frequently mineralization as well. This will be covered in more detail later.

In other areas outside the claims area good exposures of the basal reef are also seen, particularly at the north face of the plateau, on Vista Ridge, Fairy Ridge and Hammer Creek. Pine Point dolomites outcrop on Fairy Creek and underlie Fairy Falls. They also outcrop on the Besa River just east of Little Redfern Lake. At the north face the reef is about 45 m (150') thick, and is largely limestone.

At Fairy Ridge the reef facies takes on a different character, crinoids become very abundant and cup corals replace the massive colonial corals of other reef areas. A basal reefy zone has rubbly bedding locally, has abundant fossils, cf. Coenites cup corals and some massive colonial corals, Syringopora and others. There are common brachiopods. Further up in the section are very abundant crinoids and abundant cup corals. There are also abundant angular fragments, appearing to be reef talus. The reef is mainly limestone with silicified dolomite patches. A higher inaccessible cliff-forming pinnacle area is a massive limestone with crinoids and some corals. The total reef thickness is greater than other reef areas, approximately 150 m (500').

Faunal and lithologic parameters, such as the abundance of angular fossils and clasts suggest a fore-reef deposition for portions of the reef at Fairy Ridge. That reef is probably right on the facies front.

Crinoids are also more abundant in western exposures on Vista ridge and western outcrops in the Keilly-Petrie creek area. This would be in agreement with expected conditions, with a shale-out to the west and south.

In most areas the reef has a dark interval in the basal 3 to 9 meters (10-30') due to an increase in argillaceous material and also more finely disseminated pyrobitumen. The reef then becomes cleaner and lighter colored upward. The reef still has occasional thin wispy argillaceous partings throughout.

The base of the reef is locally irregular, with up to 3 m (10') of relief and is locally somewhat interbedded in character. In other places the contact is sharp. Occasionally the upper portion of the platform has beds with amphipora. Where this occurs and where the base of the reef is somewhat gradational it is difficult to pick the platform/reef contact.

Stringocephalus is present in the reef rocks locally, but was not seen at Redfern Lake. That fossil is abundant in the overlying upper limestones. It appears that the fossil is controlled by facies which would explain its absence in reefal rocks. When found in reefal conditions that brachiopod is thick-shelled. Other Givetian fossils are present in the reef. The platform is Eifelian. There is a possible intertonguing relationship of the platform and reef rocks. Only more detailed bio-stratigraphic work would solve any problems about stratigraphic relationships.

In the Keilly Creek area and along Vista Ridge the reef top is seen to be highly irregular, with small massive reef "pinnacles" standing up to the west of thicker reef, surrounded by bedded rock.

(c) Upper Limestones (230 m) (750')

Overlying the basal reef is a back-reef thinner bedded and more recessive limestone sequence. The limestones are light to dark grey, microcrystalline with some coarse mottling. The beds weather light to medium grey in contrast with the basal reef which weathers dark grey. There are some slightly argillaceous bands. Bedding is thin to thick. Very prominent are beds with very abundant amphiporids ("spaghetti-rock"). Interbedded with the amphiporidal beds are beds with abundant Stringocephalus.

No attempt was made to differentiate between the various species present, both thin and thick shelled forms.

There are a few distinctive fairly widespread beds rich with massive corals and stromatoporoids. These beds are usually silicified slightly porous and often mineralized as will be discussed later. These beds are usually darker grey weathering. Some of these beds have dolomitized patches which are silicified as well. Locally the silicified beds grade into dolomite.

Quartz crystals are abundant throughout the upper limestone, about half of them euhedral, commonly double-ended. The rest of the quartz crystals are in rounded form, probably replacing carbonate grains. Thin section work on diamond drill cores and in field samples corroborates this observation. Some of the drill core thin sections show up to 70% quartz, both euhedral and rounded.

The upper limestone caps the Redfern plateau having been eroded down to various levels and forming common "flat irons". Outcrops on the plateau are generally only fair with much tumbled frost-cracked rock and large areas with thin soil cover. There are scattered glacial erratics, usually monolithologic. In the coulees cutting back into the plateau edges there are fair to good outcrops. No complete sections are present.

There is a possibility (but not likely) that limestones younger than Pine Point cap the Redfern plateau and also on Vista ridge and Hammer Creek to the south of the claim area as amphiporidal beds without <u>Stringocephalus</u> cap these areas. Only detailed biostratigraphic work, which was outside the scope of this project, would determine the definite stratigraphic relationships.

Both the basal reef and upper limestone are "Pine Point" in age, using the term "Pine Point group" as used by Skall (1975). In that terminology Skall includes all beds between the Keg River and Watt Mountain as Pine Point. This would include the Presquile and Sulfur Point of other workers within the Pine Point group.

To the south of the claim area on "South Mountain" the entire Pine Point has shaled out. This is only about 2 km (1.3 mile) southeast of the Fairy Ridge reef. In place of the basal reef and upper limestone is a thin, about 45 m (150'), argillaceous limestone sequence with abundant crinoids and cup corals. Further south (5.1 km, 3.2 miles) on Nordling Creek east of Mount Helen, the sequence is thinner and shalier yet and contains extremely abundant crinoids and brachiopods, putting the section more basinward than the South Mountain section.

The north margin of the Pine Point beds near Keilly Creek marks the northernmost occurrence of Pine Point age beds in the Rockies. The reef edge then trends north-northeast and is next seen in the subsurface southwest of Fort Nelson. The front is then traceable in the subsurface to Pine Point.

Middle and Upper Devonian - Besa River shales

Besa River shales outcrop east of the Redfern plateau under and east of the "east margin thrust". They can be seen immediately under the thrust on the north face. They outcrop in a few of the deeper east-west creek bottoms just east of the margin thrust and outcrop extensively further east on Mount Dopp.

Shales outcrop in several places on the west side of "Straight Creek" in complexly folded and overturned beds west of the "C" fault. Some of these shales were apparently caught up in the overthrust. Shales resembling Besa River shales outcrop in one place on Vista Ridge. Some of these western shales could possibly be shaly intervals within Pine Point beds but they closely resemble Besa River shales and probably belong to that formation.

The actual upper limestone/Besa River shale contact can be seen on Hammer Creek south of the claims, the only place in the area where it can be seen on the ground.

The Besa River shales are dark grey, dark rusty brown to dark grey (occasionally greenish tinged) weathering, fissile to platy and slightly to non-calcareous. Ferruginous material is abundant generally as very finely disseminated pyrite and limonite, accounting for the rusty weathering character. Some silty bands and occasional limy bands are seen. They become more abundant upward in the section. The shales near thrusts have been sheared and phylliticized until it is almost impossible to see any relict bedding.

Pleistocene - Glacial deposits

Glaciation was intense in the area. Spectacular glacial features; moraines, U-shaped valleys, hanging valleys, cirques, cols, etc. are present in the Redfern area.

A valley glacier moved down the Besa River valley, carving out Redfern Lake and leaving very prominant lateral moraines along the margins of the valley. These lateral moraines are most prominent on the north side of Redfern Lake in the area from "Noranda Creek" to "Shout Creek" where they form a "plaster" covering all outcrops. This lateral moraine slopes eastward from elevations of 1630 to 1600 m (5350 to 5250'). Another valley glacier moved down Fairy Creek, leaving the sharply serrated Fairy Ridge between the two glaciers. Hanging U-shaped valleys with various types of moraines are prominent south of Fairy Lake.

Apparently a glacier moved south-southeastward across the Redfern plateau leaving some lineations and scattered erratics up to 3 meters (10') in diameter. These erratics are mostly of one lithology, a dark brown siliceous dolomite of unknown age. Some glacial features can be confused with structural lineations on the plateau because of their parallel or near parallel course.

Tyr flat is covered mainly with glacial material.

Calcite Masses

Mention is made of the prominent large calcite filled breccia masses here and they will be discussed later under mineralization. The masses are concentrated in the southern portion of the plateau. All of them are located in the upper limestone. The largest and most prominent one is situated on the hump on the southeastern corner of the plateau. It is approximately 300 m (985') long by 60 m (196') wide and approximately 60 m (196') deep. There are only traces of mineralization on the edges of that mass.

At least six other major calcite masses are seen on the plateau, one being 225 m (740') long by 60 m (200') wide. Some of them can be seen to have fractures leading up to them and others have no visible "roots". The bedding below, above and to the side of the masses is usually undisturbed although some on the south face have vague roots with disturbances below. However, in masses away from the cliff face the roots would not be seen anyway. One calcite mass was drilled on drill hole 2 from the surface to 155', all solid calcite, with no mineralization.

The masses have cores of very coarse white calcite with no relict limestone blocks. Mineralization; barite, zinc, some lead and traces of copper are sometimes present at the margins of the masses associated with a halo of abundant silica and dolomitic brecciated limestones. Some of the masses have no mineralization at all.

The origin of the breccias is uncertain. They are possibly a lit-par-lit lateral replacement feature, possibly localized along fractures. Another possible origin is as a karst infill not long after deposition when only very clean carbonate fluids were available to infill them. The classic karst infill features cannot be seen in these breccias.

STRUCTURE

Structures on this, the easternmost thrust exposing Middle Devonian carbonates, range from simple to very complex.

The main thrust fault, the east margin thrust ("A" fault), forms the east end of the plateau. Beds "come over" into the fault, going to vertical to commonly overturned.

In general in the plateau area, the structures pinch in toward the north and become more complex and causing the triangular shape of the plateau. Because of this pinching in, the north and

Plate 9

Looking down on south end of plateau. Note prominent fractures on top of plateau as indicated by vegetation.

Plate 10

Central and north end of plateau. Note topographic contrast between gentle plateau and rugged cliffs across Petrie Creek where structures pinch in.

Plate 11

West end of plateau and Vista Ridge.

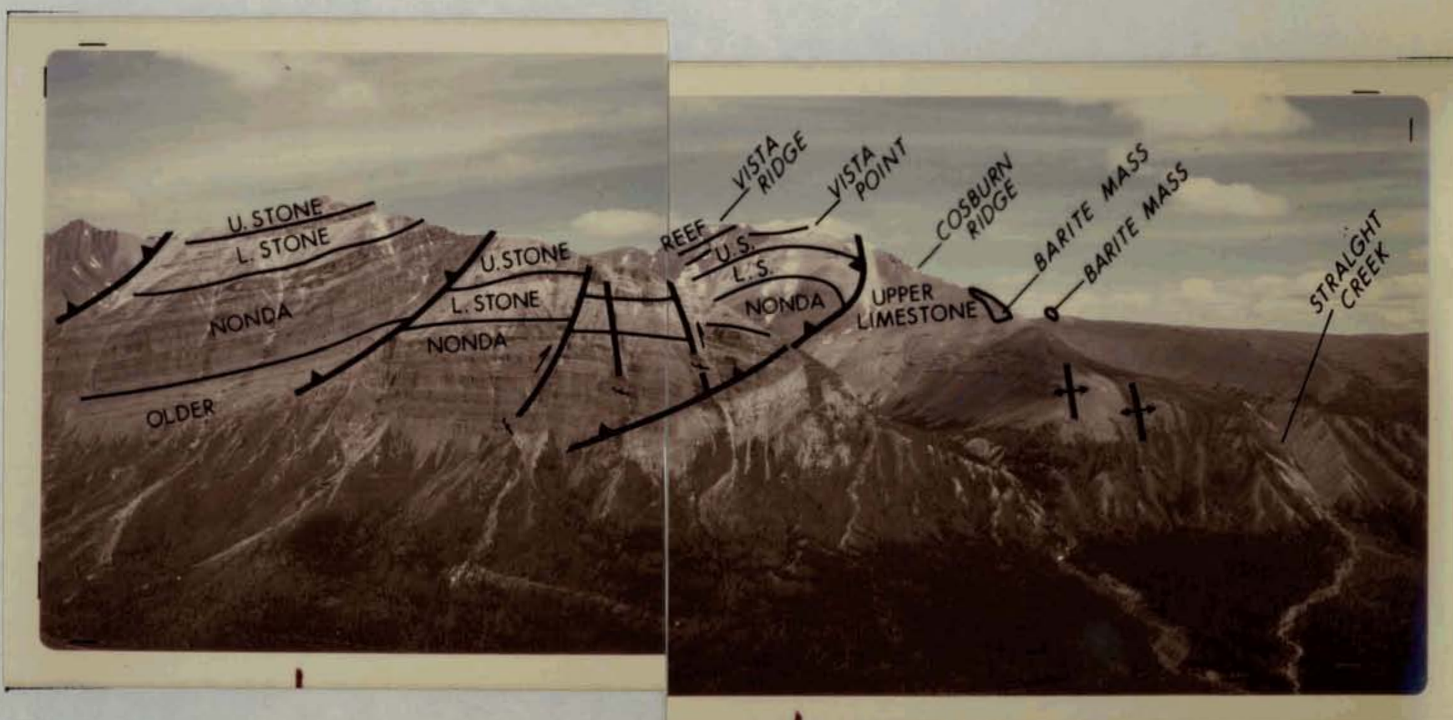


Plate 12

Panoramic view of west end of plateau and east end of "Redfern Ridge". Note "U"-shaped hanging valley of "Noranda Creek".

Plate 13

Shaled out Pine Point beds on Nordling Creek east of Mount Helen. Contrast this with reefal development in plates 14 and 15 . Thrust fault overrides shale.

Plate 14

North face of plateau, complex faulting near east margin fault.

south faces have much different structural character.

Central Plateau

In the central portion of the plateau, beds are generally flat to gently dipping, except approaching the east margin thrust, where the structure becomes complex with sometimes two tight anticlines present, occasionally so tight as to have a secondary thrust. Beds at the main thrust come over sharply to vertical to overturned. No shale can be seen directly under the thrust here. Low-amplitude flexures and fractures and faults are common on the plateau. They are difficult to see because of poor outcrop and bed similarities.

South Face

At the south face beds are flat to gently dipping. The most prominent feature is a broad arching anticline in the eastern third of the face (the "south arch"). Approaching the east margin thrust, the beds dip gently at first, then break suddenly, so sharp as to have secondary faults and cutting out of beds. Approaching the thrust, the beds come over to vertical and overturned 80° at the lowermost outcrops. No shale is exposed under the thrust here.

Beds at the western two-thirds of the face are covered by glacial material at the bottom of the cliff. At the top of the cliff they are flat to gently dipping in regard to east-west component. While no south component can be seen in the eastern arch, at the western portion, a strong south component, up to 25° dip, can be seen. Therefore there is probably a strong plunge to the entire plateau structure, including the arch, toward the Besa River. This is borne out by outcrops along the Besa River and south. The south arch cannot be traced very far north into the plateau.

Two probable small scale faults are seen in the western two-thirds of the face, at "Shout Creek", and the next creek east. Because of lack of outcrop, the exact nature of these faults cannot be determined but they are probably low amplitude thrusts and may be traceable to the south across the valley.

Because of lack of outcrop along the Besa River and Redfern Lake, structures cannot be traced directly across the valley to the south, and only trends can be used in attempting to unravel the structural picture. In general, the gentle nature of the structures on the plateau continues to the south across Hammer Creek to Nordling Creek and south.

North Face

At the north end of the plateau structures are pinched in and there are several thrust faults. In general the beds dip 15^{o} to 50^{o} west. Approaching the east margin thrust the structural picture becomes complex with at least two secondary thrusts and many steep fracture splays being present.

West end of plateau

The west margin of the plateau is bounded by a high angle thrust fault ("B" fault) which goes up "Barite Creek". This thrust can be traced across the plateau on aerial photos to the center of the plateau near Rio Tinto/Noranda's 1974 drill camp.

Structures to the west of the "B" fault become complex. On the eastern end of Vista Ridge there is a series of "Z" folds and faults.

The next thrust, "C" fault, actually a fault "zone", brings Stone beds over Pine Point on Vista Ridge. This fault can be traced south across the plateau divide, passes along the west side of Straight Creek where it brings Pine Point over Pine Point (and shale, possibly Besa River, as discussed earlier). This high angle fault possibly can be traced across Redfern Lake through Fairy Ridge, where it is a bedding plane fault in Dunedin platform beds and appears to line up with a fault on Mt. Helen in Ordovician beds.

West of the "C" fault folding is complex on Cosburn Ridge with the beds coming over to vertical to overturned. The next fault ("D" fault) which passes through Vista and Cosburn ridge brings Stone beds over Pine Point. This fault which is almost vertical on Cosburn Ridge has the classic "flattening out" curve downward as it passes through the east end of "Redfern Ridge".

Several other thrust faults are present further west well off the claims area, usually bringing up Nonda beds over Stone and occasionally over Pine Point. Usually the shaly lower Nonda beds form the decollement surface. This is typical of that formation in the B.C. Rockies.

Fractures

Fractures are common throughout the area. Fractures with little or no displacement are prominent on the south face. Numerous fractures are visible and because of their more easily eroded nature have erosional topographic expressions.

Displacement on these fractures ranges from zero to a maximum of 4.5 m (15'). Some of these fractures can be traced on across the plateau for varying distances, commonly as erosional lows or vegetated lines. One fracture system at the west end of the arch near Shout Creek is mineralized and can be traced on up to the top of the plateau where it is also mineralized.

Fractures are seen in other places on the claims, both associated with major structural features or independently.

A well defined small-scale fracture system is visible on limestone flatirons on the plateau. No attempt was made to obtain preferred orientation figures but NNW/SSE and NNE/SSW seems to be the most common directions.

Other more visible features can be seen on aerial photos. A few prominent near east-west fractures are suggested on photos. It may be interesting to compare fracture systems with mineralization as seen on the surface, by induced polarization or by geochemical surveys, as many of the shows appear to have linear natures.

Sinkholes

A few small sinkholes are present on the plateau top, particularly in the middle and southern portions. A void 15' thick was drilled in diamond drill hole at 83'. There are therefore at least some karsts on the surface, whether recent or ancient is indefinite.

MINERALIZATION

Mineralization in various forms is scattered all over the claims area and some outside as well but no large concentrated accumulations have been found to date.

The use of the secondary zinc indicator chemicals proved invaluable in this project.

Mineralization was found in many different forms:

<u>Forms of Mineralization</u>

(a) Stratabound or semi-stratabound zinc plus some lead in the basal reef at both ends of the plateau and a few places outside the claims.

(b) Non-stratabound zinc and barite with minor lead and traces of copper at the margins of the large calcite masses, inside the claims area.

(c) Similar non-stratabound mineralization at random in the upper limestone inside the claims area, sometimes associated with minor barite ± calcite and usually abundant silica.

(d) Zinc ± barite and minor lead, usually associated with abundant silica in the upper limestone within the claims area, that are least semi-stratabound, following slightly porous silicified stromatoporoid-rich beds.

(e) Non-stratabound large barite masses, occasionally with associated calcite, on the west side of the claims area on Cosburn Ridge, Straight Creek and Vista Ridge, both inside and outside the claims area.

(f) Zinc and some lead along a fracture zone on the south face.

(g) Secondary zinc in numerous pieces of float and possible outcrop along the seismic trail on Tyr flat, both inside and outside the claims area.

Some mineralization areas fall between the various categories above. In detail the categories are:

(a) Stratabound or semi-stratabound mineralization was found at both the north and south faces of the plateau.

South face of plateau

At the south end of the plateau in the south arch secondary zinc sphalerite and some galena were found near the top of the basal reef at or near the reef/upper limestone contact.

All mineralization was found in dolomite with some vuggy and intergranular porosity. Some pyrobitumen and ferruginous material was also present. Silica was rare, locally common. The mineralization was first found in fossiliferous granular dolomites at two different stratigraphic intervals separated by 3 m (10') of barren strata, in a draw 700 m (2300') west of the east margin fault. The thickness of the mineralized zones ranged from 0.5 to 2 m (1.6' to 6.6').

Mineralization was found in place westward in the same beds for 1400 m (4593'). Because of some inaccessible cliffs the mineralized zone could not be traced continually for the entire distance but was found at many places in the same stratigraphic interval. It may not be continual. The upper mineralized zone was much more continuous than the lower.

The assay of grab samples at the first showing gave 7.8% zinc and 0.14% lead (75C-27). The samples showed a medium crystalline dark grey dolomite with light mottling with coarse white dolomite patches. Some ferruginous material was noted. No silica was seen. Mineralization was usually found on the outside edges of the coarse crystalline white dolomite, adjacent to the country rock, with abundant boxworks showing good secondary zinc reactions. Some remaining sphalerite was seen and some of the samples had coarse crystalline galena. Very fine sphalerite was also seen in some of the country rock. The boxworks suggest that the assays would read too low.

Further west about 700 m at the same stratigraphic level the assay showed 1.8% zinc and 0.04% lead (75C-29). The rocks were similar except that some calcite patches were present and there were some euhedral quartz druses in the calcite patches. Occasional pyrite was seen in the center of the coarse patches. Some amphipora were also noted. The dolomite had fair vuggy porosity. Again boxworks were common in the coarse patches.

At the east side of the draw at the original showing at the same stratigraphic level, a patch with very coarse crystalline dark brown sphalerite and intermixed galena was seen, associated with abundant ferruginous material. Again boxworks were prominent. This lens-shaped area was approximately 3 m (10') wide by 1 m (3.3') high. The assay of a grab sample showed 44.0% zinc and 14.6% lead (75C-28), again probably reading too low compared with unweathered rock.

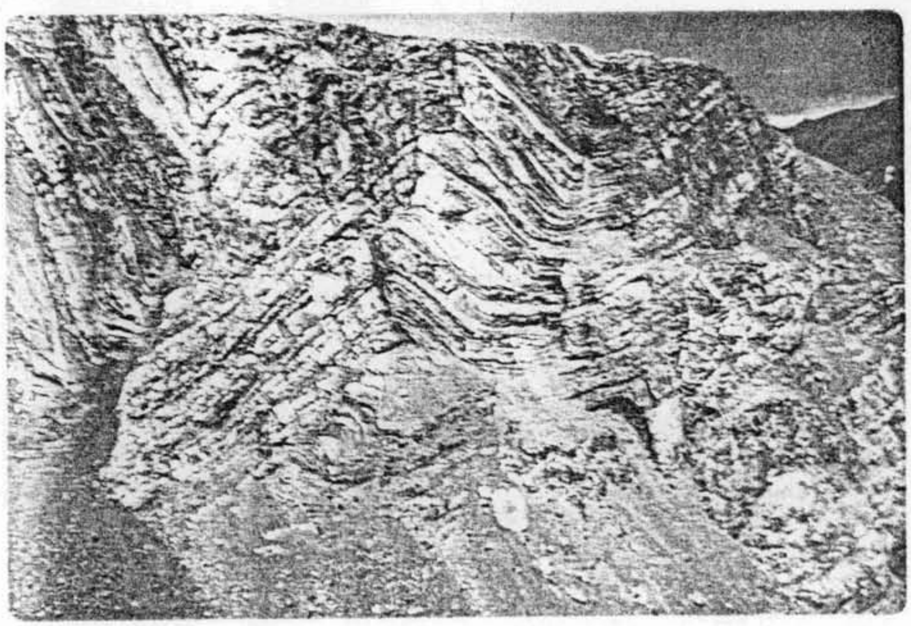
Because of inaccessible cliffs the mineralization could not be traced to the east toward the east margin fault, but previously mineralization had been found in talus samples in similar rocks all along the bottom of the cliff. Mineralization could not be found in place in the cliffs as high as they could be climbed.

The mineralization is therefore likely to be again coming from the top of the reef. The total distance where mineralization is present at the top of the reef is therefore approximately 2000 m (6560').

Plate 15

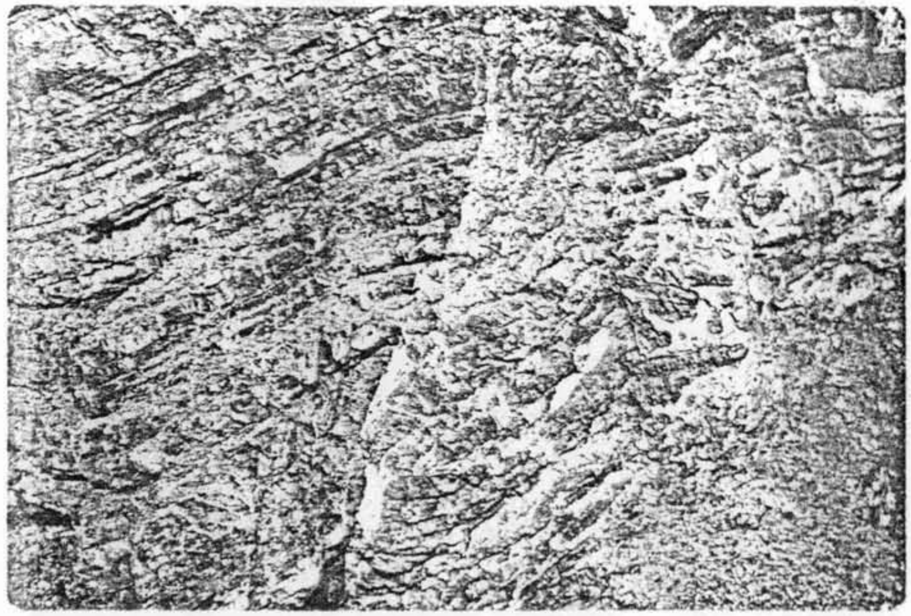
Calcite mass in upper limestone on southeast corner of plateau.

Plate 16



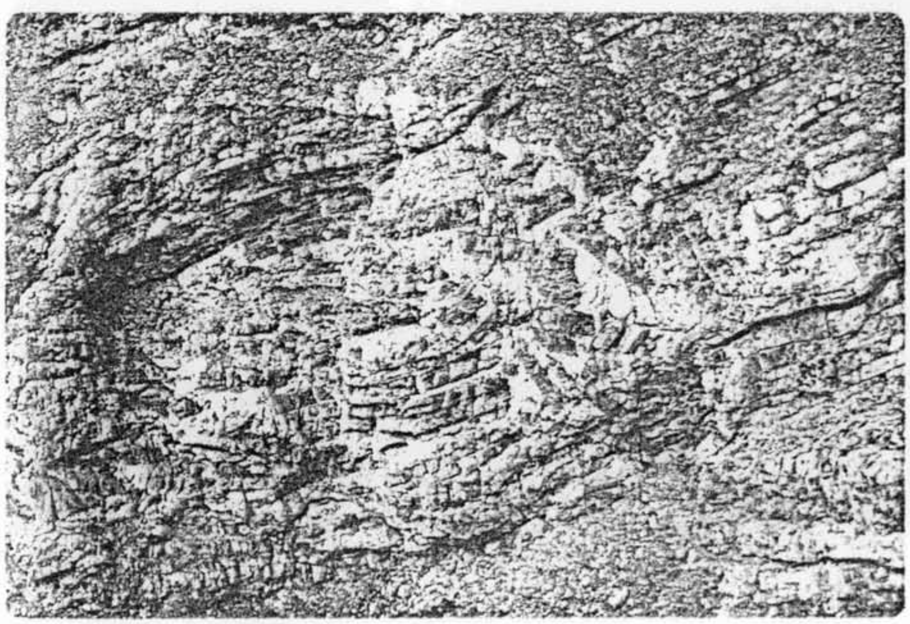
"Z" folds and fractures at east end of Vista Ridge. Barite/calcite patch on right side.

Plate 17



Close-up of barite/calcite breccia in plate 16 . Note sharp margin at left (south) end along fracture.

Plate 18



Close-up of northeastern part of breccia. Note tumbled limestone blocks. Long side of picture covers approximately 100'.

Some talus samples of fine crystalline amphiporidal dolomite gave good secondary zinc reactions, with the best indications in the very fine crystalline matrix, along partings and most abundantly in the center of the white crystalline patches which represent relict amphiporids. These samples probably come from near the limestone/dolomite contact or from dolomitized beds at the base of the upper limestone. There is almost invariably a pore space in the centre of each amphiporid, and the pores are rarely interconnected except by fractures and veins.

At the west end of the eastern arch the beds dip under glacial material and tree cover at Shout Creek. Near the west end a vertical fracture zone about 4-5 m wide is mineralized and mineralization extends laterally into the porous coarse crystalline dolomite at the top of the reef.

A typical sample in the fractured zone showed a medium to coarse crystalline dolomite with abundant coarse white dolomite mottling. Sheared surfaces were common. Quartz, both euhedral druses in vugs and as euhedral and rounded crystals in the country rock, was abundant. Some pyrobitumen and traces of pyrite were noted. Some fine crystalline sphalerite was noted in the country rock and in the coarse mottling. Coarse galena was noted in the coarse mottling and common leached boxworks were seen in the centers of the coarse crystals with associated quartz crystals. The assay of a grab sample showed 3.0% zinc and 0.07% lead.

The dolomite top becomes irregular at the west end of the reef and dolomite beds can be seen to go to limestone laterally.

<u>North face of plateau</u>

Mineralization is present in basal reef rocks at the north end of the plateau just off the northeast corner of Rio Tinto's claims. The showings occur in shaly basal dolomites and cleaner reef rock in a relatively undisturbed sheet overlying the east margin fault. At that location the east margin fault is complex with at least two additional secondary closely spaced thrusts to the west. Abundant fracture slivers splay up into the basal reef from the thrusts.

From the bottom the section begins with a recessive dark grey shaly dolomite interval with a thrust fault within it.

Above this is a slightly cleaner and more resistant shaly dolomite. Above this is a covered interval of 6.1 m (20') probably very shaly dolomite.

A 7 m (23') thick more resistant dolomite follows. It is a dark grey fetid dolomite, fairly argillaceous, fine crystalline with coarse white mottling. Pyrobitumen is fairly abundant as are black graphitic argillaceous patches and partings. The rocks have fairly abundant fossils, amphiporids, corals and possible stromatoporoids. Silica is rare. Pyrite and limonite are locally very abundant. The rock is highly brecciated, probably tectonic, infilled with coarse white dolomite and calcite. Possibly some of the coarse mottling could be early, filling original voids. Mineralization is present, usually in the form of very fine grained disseminated sphalerite in the rock fragments, with good secondary zinc indications on weathered surfaces. The sphalerite replaces carbonate grains and possibly in original intergranular voids. There is minor mineralization in the coarse mottling, usually in the secondary zinc form.

Analysis showed low zinc and lead values, less than 2% zinc. This band can be traced for at least 60 m (200') to the northwest.

The next 15.5 m (51') was covered, probably shaly dolomite.

Overlying is the main reef cliff, clean and massive, with weak rudimentary bedding.

Most of the reef is limestone, microcrystalline to coarse crystalline, with abundant fossils, corals, stromatoporoids and others. Laterally the limestone can be seen to go to dolomite in patches with silica infilling. The reef is commonly shattered, sheared and fractured in slices. The basal few meters is darker and more argillaceous.

At the southeast corner of the outcrop, which dips approximately 20° to the west, the best mineralization was found, over a 6.4 m (21') interval. The mineralization is in coarse granular limestone, light brownish-grey with abundant fine pyrite disseminations. There are coarse crystalline calcite and some dolomite crystals. Pyrobitumen is common in patches and as fine flecking in the coarse crystalline patches. Commonly the pyrobitumen is seen to lie at the tops of coarse crystalline calcite and dolomite patches when viewed in their in-place configuration. Locally quartz crystals are abundant but the overall silica content is fairly low. Some intergranular and vuggy porosity is present.

Mineralization is in the form of very fine sphalerite crystals with rare galena. The limestones have a sheared appearance with mineralization and pyrite in definitely banded relative abundance. The minerals and pyrite have the same and uniform crystal size.

Several assays were run on grab samples. The best assay was 5.0% zinc and 0.09% lead (75C-21).

Laterally in short distances the limestone can be seen to go to dolomite, fine to coarse crystalline, light and dark grey mottled with pyrite, silica, sphalerite, secondary zinc and traces of galena. The dolomite does not have the prominent sheared affect. Fair porosity is present.

The outcrop, which would likely extend up the hill to the southeast toward Rio Tinto property, goes under soil cover and could not be traced.

The mineralization extends at least 200 meters to the northwest along the base of the cliff face where mineralization is seen in a prominent arch eroded back into the cliff face. Further mineralization was seen in other areas further to the northwest, usually found in dark brown highly pyritized patches. The massive reef unit itself is 45 m (150') thick.

Additional mineralization was found at the top of the reef cliff to the northwest in two large patches. The mineralization was found in both dolomite and relict limestone. Silica is very abundant, both euhedral and rounded crystals replacing carbonate grains. Some highly amphiporidal beds were noted. Secondary zinc as well as some fine pale yellow to brown sphalerite crystals are present. Pyrite was abundant in some pieces but overall not too abundant. Pyrobitumen was rare. An assay of a bulk grab sample showed 2.10% zinc and 0.01% lead (75C-30).

The main cliff is unclimbable so it is difficult to see how extensive mineralization is on the entire face. The cliff appears to be mainly limestone but this is also indefinite.

There is a possibility that the mineralization is fracture controlled, the fractures being parallel to the cliff face, which is quite straight, and may be fracture controlled as well. Therefore the mineralization may not extend to the south onto Rio Tinto property. Only drilling would determine this. The mineralized and pyritized arches appear to be erosional features cut back to other fracture planes.

<u>Mineralization in basal reef in other areas</u>

On Vista Ridge a mineralized area is present in basal reef beds below the crest of the ridge just north of the claim area. The host rock is a very highly silicified reefal dolomite with large silicified stromatoporoids, some corals and other fossils including probable abundant crinoids locally. The dolomite is light to medium grey, fine to medium crystalline with some relict silicified limestone patches. Pyrobitumen is fairly common in fine disseminations, pyrite is locally common. The mineralization is mainly secondary zinc with some yellow brown to orange crystalline sphalerite. Some weathered boxworks are present. The assay of a bulk grab sample gave 0.70% zinc and 0.01% lead.

The mineralization is cut off to the west by a near verticle fracture or fault zone with some yellow orange gossan. The mineralization covers approximately 12 m (40') of strata vertically and extends to the northeast around the hill for approximately 40 m (130') falling off gradually in that direction with still abundant silica and having more barite.

Laterally to the north from the mineralized portion of the reef some relict crinoidal limestones are present and the upper portion is very highly crinoidal limestone with some calcite patches. Silica is locally abundant, but no mineralization is present.

This mineralized area, while restricted to one stratigraphic interval, does not have wide lateral extent and could possibly be placed in another category.

Other small mineral shows were found in basal reefs outside the claims area.

(b) Non-stratabound mineralization associated with large calcite patches

As stated in the stratigraphy section mineralization is sometimes present along the margins of the several large calcite masses in the south half of the plateau. Some of the patches are barren but others have a halo of mineralization on the margins, in brecciated very highly silicified dolomitic limestones to some dolomite, with a halo of quartz outside in the unaltered limestone. Mineralization is mainly barite with fairly abundant secondary zinc and some unaltered sphalerite and occasional galena and spotty malachite and azurite. Mineralization is poor to fair grade. Silicified fossils are common, stromatoporoids, amphiporids and corals are visible. Zinc can be seen to replace amphiporids and other fossils in some instances.

The mineralization tends to be in the smaller calcite patches and the larger ones barren. Most of the calcite masses are elongated with a trend a few degrees east of north.

The largest mineralized patch, south of drillhole 9, is approximately 140 m (460') long by 60 m (195') wide. To the west, separated by 15 m (50') of unaltered barren limestone is another patch 60 m (195') long by 60 m (195') wide. From this patch additional small mineralized patches are present on trend to the north for a considerable distance toward drillhole 9.

Other smaller calcite patches with mineralization are scattered around the plateau, mostly in the southern portion.

(c) Non-stratabound mineralization at random

There are numerous patches of mineralization in the upper limestone on the plateau, similar in nature to the above category but lacking in calcite. These patches are usually very highly silicified and darker than the surrounding rock and have a silica halo. They are sometimes dolomitized but commonly have so much quartz that it is difficult to tell whether the rock is limestone or dolomite. Calcite is in minor amounts or not present. The host rock is usually brecciated. Mineralization consists of secondary zinc and some galena as well as common barite. The nature of these mineralized patches is indefinite. They are small sized, rarely exceeding 10 m (33') in length, have no apparent consistent pattern and are concentrated on the north end of the plateau, particularly on the slopes leading down to the north face, especially in the draw west of drillhole 5. This area is one of anomalously high zinc and lead soil sample readings. Fractures or faults may control this mineralization.

(d) Stratabound or semi-stratabound deposits following selective beds.

There are a few cases where mineralization follows certain stratigraphic horizons in the upper portion of the upper limestone, generally strictly following one bed but occasionally jumping down or up to a similar bed. These beds are usually highly silicified, have abundant stromatoporoids and are sometimes dolomitized, partly grading to dolomite. Some porosity is present, and traces of pyrite and pyrobitumen noted. The spotty mineralization tends to follow these beds for fair distances, up to 150 m (492'). Thicknesses range up to 2.3 m (7.5'). An example of this type of mineralization is just north of drillhole 9. Another one is north and east of drillhole 6.

Mineralization, usually secondary zinc with some unaltered sphalerite, some galena and barite, is low grade. The mineralization may follow these beds because of their slightly porous nature. Faults or fractures may be the controlling factor of the mineralization.

Most of the mineralization found in the diamond drillhole program is probably of the above two types ("c" and "d"). In some instances in the core, sphalerite is seen to replace barite roses. In thin sections of the cores quartz and sphalerite commonly appear to replace carbonate grains. Quartz, sphalerite and carbonate grains are all the same size.

(e) Non-stratabound barite patches

One of the most prominent types of mineralization is the large barite patches. Most of the barite patches are located on the west side of the claims area in the Straight Creek, Vista Ridge and Cosburn Ridge areas. Only barite is present in the patches, with one exception.

The largest deposit is on Cosburn Ridge just south of the Vista Claims and described by Cosburn (1962). This deposit is the one exception as it contains pink fluorite in fairly large amounts in one area. It is a triangular shaped deposit with the wide side approximately 60 m (200') wide to the south and cross-cutting strata to the north for a total of 400 m (1310') tapering very gradually at the north end. Galena is described in the barite in one report but none was seen on this project. The structure is complex in this area, folded and faulted with some overturned beds. Shale, possibly Besa River, as described previously, is present in a draw below the bluff which marks the south end of the barite. Another smaller deposit of barite is present on the west side of Cosburn Ridge near the south end. This deposit follows one bed for about 30 m (100') and then jumps up to another patch, so it is not stratabound. Breccia blocks of limestone are present within the barite patch which lies in flat lying beds.

A large barite patch is present on the top of the bluff on the east side at the head of Straight Creek and shows up well on aerial photos as do most of the others. There is a fault or fracture (it was not possible to determine which) trending N 25° E which shows up as an erosional low. Barite is present only on the east side of this fault, parallel to the fault in an area 200 m (655') long by 30 m (100') wide over a stratigraphic interval of about 10 m (33'). Calcite is rare here and barite makes up a high percentage of the rock.

Another prominent barite patch is located on the steep bluff

Plate 15

Calcite mass in upper limestone on southeast corner of plateau.

Plate 16

"Z" folds and fractures at east end of Vista Ridge. Barite/calcite patch on right side.

Plate 17

Close-up of barite/calcite breccia in plate 16. Note sharp margin at left (south) end along fracture.

Plate 18

Close-up of northeastern part of breccia. Note tumbled limestone blocks. Long side of picture covers approximately 100'.

at the east end of Vista Ridge (see photo). This patch is in highly folded and faulted limestone beds below several "Z" folds. The barite which is intermixed with calcite locally is probably fracture controlled. Very prominent tumbled angular blocks of limestone are present within the mass. The barite tends to taper off gradually on the edges with another prominent feature being the large barite "roses" leading into the country rock. This barite mass is probably the source of the abundant barite boulders in "Barite Creek".

Two more small barite patches are present on both sides of Barite Creek to the west.

Other barite patches are common on the west side of the claims area, both inside and outside, in the bottom of Straight Creek, on Vista Ridge and extensive but discontinual patches on the west side of the divide between Straight and Barite Creeks. The barite patches tend to be rarer eastward. Small ones were noted on "Kink Creek" and other areas on the west side of the plateau.

Barite patches up to 12 m (40') in diameter were present right on the east margin fault at the north face cliff. Solid barite patches are present at random in the limestone, on the actual fault plane and leading into the Besa River shale under the thrust. This indicates that the barite mineralization there, or at least the final mobilization, is Laramide or post Laramide in age.

A vein of barite is present in Besa River shales in a steep creek canyon ("Shale Creek") about 500 m (1640') east of the east margin fault. The vein, solid barite, is about 5.5 m (18') wide, nearly vertical and parallel to the thrust. Because the shales have been phylliticized, it is not possible to see original bedding but the barite appears to be concordant.

A small amount of barite in patches is present in Dunedin platform rocks at South Mountain, a few hundred meters or so west of a thrust fault which brings that formation over Besa River beds.

In almost all of the large barite mineralizations a strong fetid sulfurous odor was noted when the rock was broken.

(f) <u>Vein mineralization</u>

As mentioned under category "a", stratabound mineralization, at the west end of the basal reef on the south face a vertical fracture zone is mineralized. This fracture zone is at a sharp bend in the west arch. Mineralization is fairly good over a zone about 4-5 m (13-16.5') wide with indications of vertical shearing, etc. Above the reef there are no more outcrops until near the top of the hill where mineralization appears to line up with the mineralization below both on the ground and aerial photos.

At the top of the hill the mineralization is in a very highly silicified brecciated dolomite with coarse dolomite patches. Very coarse galena is common along the margins of the coarse crystals. Secondary zinc is present along the margins of the galena and dolomite patches and very fine yellow and brown sphalerite is present intermixed in the coarse material.

Barite is not common. Quartz is very abundant and some thin quartz veins are present.

In some samples euhedral quartz is seen in vugs mixed with secondary zinc and leached boxworks. The minerals appear to have been deposited at the same time or later than quartz.

Because the mineralization at the top of the mountain resembles many of the other mineralized areas on the top of the plateau and appears to have been fracture controlled, it is possible that most of the mineralized areas on top of the plateau are fracture or fault controlled also.

(g) Mineralization in float and outcrop(?) on Tyr flat

Mineralized Pine Point dolomites were found along the seismic road on Tyr flat. A short distance northeast of camp mineralization was found in dark grey Pine Point dolomites on what appears to be in-place rock. The attitude of the dolomites could not be determined. Trenching would be necessary to determine the extent of mineralization and the attitudes of the beds.

Further east in what is almost certainly float, other mineralized rocks were noted. Mineralization is mostly secondary zinc with some sphalerite. At another hump further east, again apparently in-place mineralization was found.

Some mineralized float was also found on Besa River below Little Redfern Lake and at the lower end of Hammer Creek.

Parameters associated with mineralization

In review, several parameters, or at least most of them are present in most mineral occurrences in the Redfern area. They are: (1) porosity; (2) silica; (3) pyrobitumen; (4) ferruginous material; (5) dolomite. These parameters are also present in all of the other mineralized areas in Middle Devonian rocks in the B.C. Rockies and at Pine Point, N.W.T.

(1) Porosity

Porosity is almost universally present in Redfern mineralized areas, although often low grade. Even in the basically dense upper limestones, porosity, although generally poor, is present, for example, in the silicified stromatoporoid-rich beds. One exception to this is in the large barite patches which are in dense limestone. However, those deposits are probably in fractured and faulted beds and fracture porosity may have been present. The basal reef has poor to fair intergranular and vuggy porosity. Much of the original porosity is filled with coarse calcite and dolomite.

(2) Silica

Abundant quartz is one of the most prevalent features of mineralized areas at Redfern. This is particularly so in the upper limestone occurrences and some but not all of the basal reef deposits. Both single and double ended euhedral quartz crystals are present along with rounded grains which replace carbonate grains. Euhedral and rounded quartz are in about equal amounts. The quartz grains are generally small, mainly less than 1 mm. Larger euhedral quartz crystals are present in vugs. As stated previously, there is frequently a silica halo around mineralized areas.

(3) Pyrobitumen

Pyrobitumen is present in varying amounts in most of the basal reef mineralization, usually as very fine disseminations but there are also a few large patches, many of which are hard and porcellaneous. The unmineralized portions of the reef also have pyrobitumen, in about the same amount as the mineralized portions. Some pyrobitumen is also present in the upper limestone porosity.

(4) Ferruginous material

Varying amounts of pyrite and limonite are present in the mineralization shows. The highest amounts were seen on the north face in basal reef mineralization. These fine grained pyrite cubes, the same size as the sphalerite crystals, are abundant. They also show in concentrated banding affect in the sheared appearing limestones. At the top of the basal reef at the south face small amounts of ferruginous material are present. Minor amounts of pyrite are present in most of the mineralized patches in the upper limestone. Pyrite is relatively rare in the calcite and barite patches. Pyrite and limonite were also seen where no base metal mineralization is present.

(5) Dolomites

Except for some of the north face reef mineralization and mineralization in the upper limestones all of the mineralization was found in dolomites. At the north face some mineralization was found in limestone as well as dolomite, but in all other mineralized areas in the basal reef mineralization was always in dolomite. This is particularly noticeable where dolomites and limestone are intermixed, changing laterally or vertically. At the south face mineralization is located near to or at the top of the dolomite whereas the main mass of the reef is barren.

Some of the mineralized patches in the upper limestones are dolomitized, partly grading to dolomite. Because of the large amount of silica it is difficult to tell whether some rocks are dolomites or limestones.

Paleoenvironment and Genesis of Mineralization

In review, the mineralization at Redfern is situated in porous reefal and backreef rocks in a lobe of carbonates surrounded on three sides by shale. There are indications that all of the formations from the Ordovician to Middle Devonian begin to shale out not far to the west according to GSC personnel and in the writer's view. One problem is that to the west older rocks overlie all of the younger rocks and the next appearance of Devonian and Silurian rocks to the west is on the Ospika and Akie Rivers where they have shaled out completely.

In addition to the lateral shaling out of Pine Point beds at Redfern they are overlain by ferruginous shales deposited in a reducing environment. A thin shaly unit is also present below in the platform. As such possible source beds for mineralization are closely available.

Because of the extensive lead-zinc deposits at Pine Point, N.W.T. in the same aged rocks it is interesting to compare the two areas. There are basic similarities to conditions at Pine Point: (a) porous reef rock with an abrupt reef front;

(b) underlying basal carbonate blanket or platform which extends in all directions; (c) the platform is underlain by Stone formation equivalents.

There are major dissimilarities however:

(a) Close-by lateral facies change to evaporites (Muskeg formation) at Pine Point whereas at Redfern the equivalent Stone formation is dolomite in all directions and the nearest evaporites would be some distance to the east (unless the Stone breccias represent leached evaporites) which is a controversial topic.

(b) No intertonguing shales in the reef rock at Redfern.

(c) Dissimilarities in the shape of the reef, its fossil content and diagenesis, etc.

(d) No definite periods of emergence with development of karsts in Pine Point and younger beds at Redfern.

(e) No evidence of underlying geofractures at Redfern.

(f) No very coarse crystalline development with good cavernous porosity ("Presquilization") as at Pine Point.

To compare Redfern with Pine Point may not be appropriate. Pine Point is actually a unique deposit, formed under a unique sequence of circumstances not repeated elsewhere. For example, while scattered mineralization is actually rather common in Pine Point rock on the reef front in the subsurface from Pine Point to southwest of Fort Nelson, no significant mineral concentrations have been found in the hundreds of wells drilled to date. Similarly, all of the other showings of mineralization in the B.C. Rockies are unique, i.e. Robb Lake and Richards Creek, although both in Stone formation breccias, are different types of deposits.

The showings at Mt. Burden far to the south are in uppermost Stone reef front rocks with some mineralization at the base of the Pine Point.

Because of the probable lack of associated evaporites as a source of sulfur for sulfide precipitation, we must look to sulfurous hydrocarbons as a source. Evidence of hydrocarbons is given by the presence of pyrobitumen in both the basal reef and upper limestones.

Work done by GSC personnel suggests that the hydrocarbons are possibly Laramide in age, working with depth of burial, etc. They are doing further work in attempting to determine the genesis and mobilization history of mineralization using such tools as analyzing the liquid inclusions in country rock, ore and hydrocarbons.

Mineralization is widespread (albeit not in large concentrations) over the entire Redfern plateau area in the Pine Point while mineralization is practically absent in that formation in other areas, except for local small concentrations to the south. To the writer's knowledge there are no areas of mineralization in similar Pine Point rocks between Petrie and Keilly Creeks. North of Petrie the structures are complex and closely spaced, and the topography is rugged. No plateau areas develop as at Redfern. Perhaps it is this ruggedness with most of the Pine Point rocks being inaccessible that has precluded the finding of mineralization.

However, perhaps it is this development of an extensive plateau area at Redfern that is related to the mineralization. Such large plateau areas are rare in the Rockies. There is a possibility that the lack of cross-cutting streams is responsible for the plateau development but when considering the structures in this and all other areas and if the cross-cutting streams were removed still no other extensive plateau areas would develop. Interestingly enough, Robb Lake is also on an arching anticline.

There is no evidence of geofractures at Redfern although there is always the possibility that the reefal lobe and plateau are caused by underlying geofractures or other deep seated features such as granitics. The closest granitic rocks on the surface are at least 80 km (50 miles) to the west. The regional aeromagnetic map shows a slight anomaly over the plateau with a sharp jog at the south end roughly corresponding with the south margin of the reef front.

The history of mineralization at Redfern is uncertain. The mineralization probably had a complex history. Refluxing by dolomitic and siliceous solutions may be the cause of the mineralization in the basal reef, as mineralization is usually situated at or near the limestone-dolomite contacts, frequently with a siliceous halo. There are suggestions that much of the mineralization, such as at the north face, is associated with fractures. These fractures appear to be Laramide or post-Laramide in age. Some of the dolomitization may also be Laramide or post-Laramide. Calcite and dolomite cementation has filled in many of the voids in the basal reef. In some of the coarse crystalline developments ore minerals appear to be later than carbonate infilling, in others, earlier. Similarly silica is both pre and post-carbonate.

The deposits of barite on the north face on the east margin fault are Laramide or post-Laramide in age. Similarly the extensive barite and calcite breccias and spotty mineralization patches in the upper limestone are probably Laramide or post-Laramide, likely associated with fractures.

The most significant occurrences of mineralization are those in the basal reef at both the north and south faces of the plateau. At the south end stratabound mineralization is present for approximately 2000 m (6560') laterally. In the same beds to the north 7315 m (24,000') mineralization is present. In addition to this basal Pine Point reef rocks are lightly mineralized in other areas just outside the plateau. The entire plateau may be underlain at depths of approximately 90 m (300') to 245 m (800') with mineralization in the basal reef. In some of the coulees and low spots on the plateau the reef depths may be less.

All of the diamond core holes bottomed in the upper limestone. The mineralization found was probably in the isolated brecciated masses or in the semi-stratabound stromatoporoidal beds. As seen around drillholes 3 and 9 which have fair mineral intersections the surrounding nearby holes found only traces or little mineralization. Mineralization is probably in linear patches, possibly fracture controlled. The soil sample anomalies are generally in topographic lows below surface mineralization patches.

While mineralization is widespread in a favourable environment, i.e. porous reef rocks, surrounded by shale with probable sulfurous hydrocarbons as a source of sulfur, because of its history, the "big concentrator" may be missing at Redfern.

There is always the possibility that such an area of high grade ore is present at Redfern but has not been found yet. The most likely areas where such a concentration could occur is under the main plateau, under the Tyr flat to the south or outside the claims area.

SUGGESTIONS FOR POSSIBLE FOLLOW-UP WORK

If any follow-up work is done the following suggestions are made:

1. Diamond drill holes would find the basal reef at shallow depths (15-90 m) (50-300') at the south end of the plateau. The basal reef would also occur at shallow depths, less than 30 m (100'), at the north end of the plateau but depths would increase rapidly further south. Shallow drilling may also intersect the basal reef at the northeast corner of the claims in a structurally complex area.

At the center of the plateau drill holes would have to be much deeper to intersect the reef.

Diamond drilling could also intersect the basal reef on Tyr flat but because of extensive cover and uncertain geology, Induced Polorization surveys may have to be done first to select drillsites.

2. Deep-focused IP surveys could be considered on the plateau itself. There may be enough ferruginous material for success with that method. Shallow focusing surveys would not get to the

basal reef. Induced polarization could also be considered on certain areas of Tyr flat that are probably underlain by Pine Point beds. Shallow focused surveys would probably suffice there.

3. Additional geological work, especially more detailed stratigraphic work and closer examination of mineral occurrences could be considered. Detailed stratigraphic sections may be correlatable with the 1974 diamond coring. Thin section work could be considered in attempting to determine ore genesis to aid in finding higher concentrations.

4. Surrounding areas which appear favorable could be examined in more detail and if any encouragement found, more staking be done.

ACKNOWLEDGEMENTS

The ability and enthusiasm of all members of the party were greatly appreciated. Morale was held at a high level by the exceptionally good nature of the assistants and the cooking, especially the pastries, of Mrs. Gow kept spirits and particularly energy, at a high level.

The help of Ted Johnson in organizing and running the party is greatly appreciated. His familiarization program and observations in the field were of great help, as were the field opinions of Colin Spence and Larry Haynes. The advice of R. Thompson and R. MacQueen of the GSC was very helpful.

D T Cosgrove

Donald T. Cosgrove, P.Geol.
Consulting Geologist

Calgary, Alberta.
20 August, 1975.

STATEMENT OF QUALIFICATIONS

I, Donald T. Cosgrove, am a registered professional geologist with the Association of Professional Engineers, Geologists and Geophysicists of Alberta, having been first registered in 1967.

I graduated from the University of Washington in Seattle, Washington, in March 1959, with a Bachelor of Science in Geology degree.

I have been steadily employed as a geologist since graduation, having worked for a major oil company until 1966.

In January 1967, I became a self employed consulting geologist. Much of my experience has been in carbonate rocks, including the project area.

D T Cosgrove

Donald T. Cosgrove, P.Geol. (Alberta)
APEGGA

Calgary, Alberta
29 August, 1975

CERTIFICATE OF ANALYSIS

CHEMEX LABS (ALBERTA) LTD.
ANALYTICAL CHEMISTS

4638 - 11th ST. N.E.
Calgary, Alberta T2E 2W7
TELEPHONE: 403-276-9627
TELEX: 038-25541
TWX: 610-821-7390

• MINERAL • GAS • WATER • OIL • SOILS • VEGETATION • ENVIRONMENTAL ANALYSIS

Don Cosgrove
3618 - 10 St. S.W.
Calgary Alberta

Rock Assays Analyses

Certificate No. 158-03-01
Date Received
Date Analysed
Invoice C1997

Sample #	Zn %	Pb %
75-P-1	0.50	0.10
75-C-6	0.50	0.18
75-C-13	3.00	0.07
75-C-20	0.44	0.01
75-C-21	5.00	0.09
75-C-24	0.70	0.01
75-C-27	7.8	0.14
75-C-28	44.0	14.6
75-C-29	1.80	0.04
75-C-30	2.10	0.01

Certified by Gary Swaby

VESTOR OPTION - REDFERN LAKE
GEOLOGICAL MAPPING, GEOCHEMICAL SURVEY
1 June - 13 July 1975

COST STATEMENT:

(a) WAGES AND SALARIES:

Name	Dates	Days	Rate	Total	
EW Johnson supervision	1 Jun - 13 Jul	25	66.00	1,650.00	
L. Palmer GEOL	1 Jun - 4 Jul	32	38.00	1,216.00	
H. Gow cook	1 Jun - 4 Jul	34	33.00	1,122.00	
S. Shaw GEOL. STUDENT	1 Jun - 26 Jun	26	29.00	754.00	
R. MacGregor	1 Jun - 25 Jun	25	29.00	725.00	
G. Schwarz	1 Jun - 11 Jun	10	33.00	330.00	
D. Cosgrove GEOL	1 Jun - 13 Jul	33	160.00	5,280.00	
C. Spence	16 Jun - 22 Jun	3	100.00	300.00	
	8 Jul - 10 Jul	3	100.00	300.00	
L. Haynes	16 Jun - 22 Jun	3	44.00	132.00	11,809.00

(b) EMPLOYEE BENEFITS: 2,361.80

(c) TRANSPORTATION:

Fixed-Wing (Quadra Travel Service)	689.15	
Fixed-Wing (Northern Thunderbird Air)	3,234.00	
Helicopter (Okanagan)	6,872.81	
Truck (Rio Tinto)	100.00	
Helicopter (Northern Mountain)	5,429.00	16,324.96

(d) EQUIPMENT RENTAL:

Ryder Truck	443.73	
Chain Saw	120.00	563.73

(e) REPORT PREPARATION: 773.11

(f) GEOCHEMICAL ANALYSIS:

388 samples @ 3.45 each 1,338.60

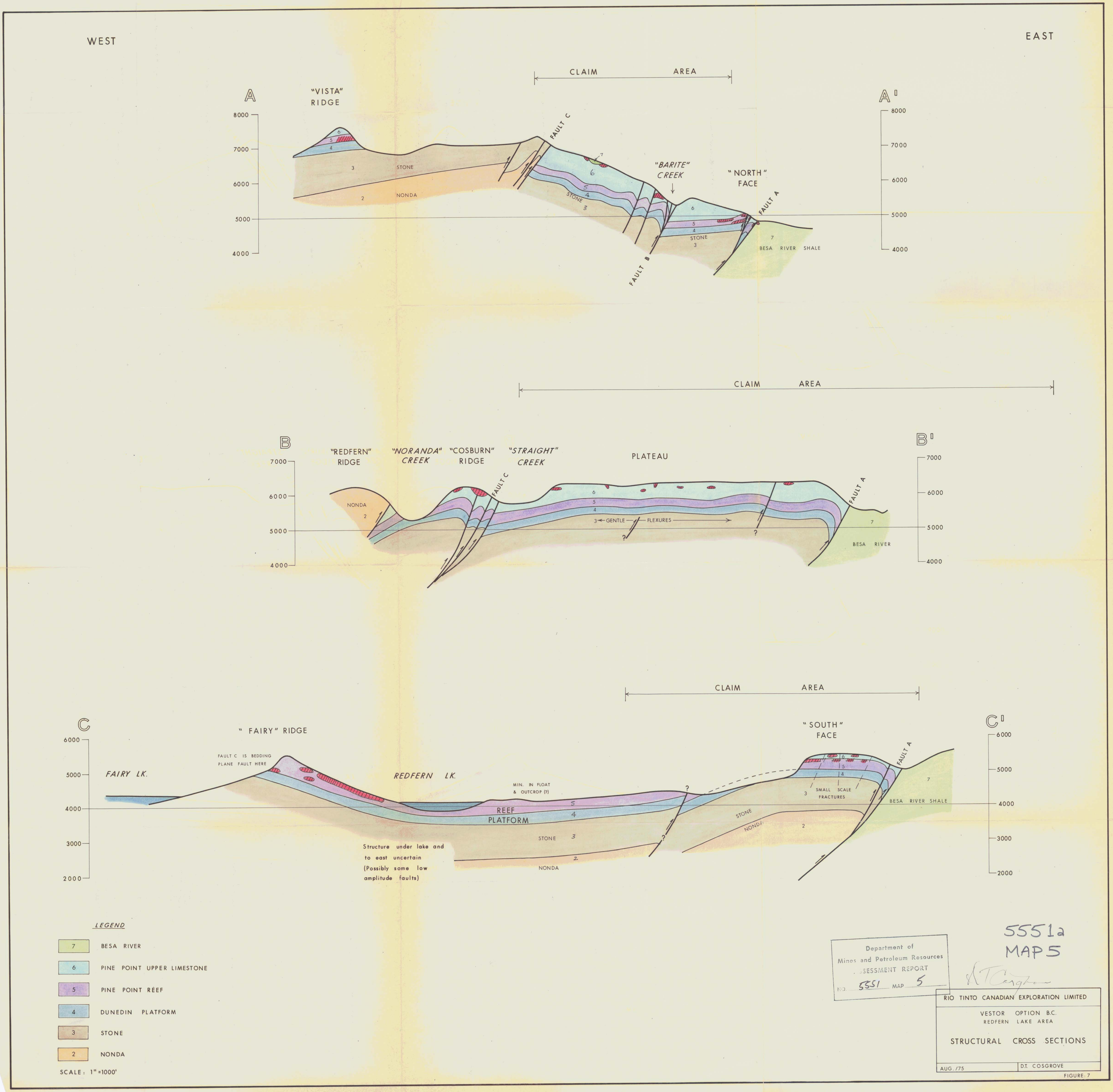
(g) OTHER COSTS:

Fuel	194.13	
Supplies	1,542.58	
Miscellaneous	333.71	2,070.42

(h) FOOD & ACCOMMODATION: 1,127.39

36,369.01

SE:rl


WEST
EAST
CLAIM AREA
A
"VISTA" RIDGE
8000
7000
6000
5000
4000
FAULT C
STONE
NONDA
"BARITE" CREEK
"NORTH" FACE
FAULT A
FAULT B
STONE
BESA RIVER SHALE
A'
CLAIM AREA
B
"REDFERN" RIDGE
"NORANDA" CREEK
"COSBURN" RIDGE
"STRAIGHT" CREEK
PLATEAU
NONDA
FAULT C
GENTLE FLEXURES
FAULT A
BESA RIVER
B'
CLAIM AREA
C
"FAIRY" RIDGE
FAULT C IS BEDDING PLANE FAULT HERE
FAIRY LK.
REDFERN LK.
MIN. IN FLOAT & OUTCROP (?)
REEF PLATFORM
STONE
NONDA
Structure under lake and to east uncertain (Possibly some low amplitude faults)
"SOUTH" FACE
SMALL SCALE FRACTURES
FAULT A
BESA RIVER SHALE
C'
6000
5000
4000
3000
2000
LEGEND
7 BESA RIVER
6 PINE POINT UPPER LIMESTONE
5 PINE POINT REEF
4 DUNEDIN PLATFORM
3 STONE
2 NONDA
SCALE: 1" = 1000'
5551a
MAP 5
Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 5551 MAP 5
RIO TINTO CANADIAN EXPLORATION LIMITED
VESTOR OPTION B.C.
REDFERN LAKE AREA
STRUCTURAL CROSS SECTIONS
AUG./75
D.T. COSGROVE
FIGURE: 7


(PARTIAL) GLACIAL COVERED
"C" FAULT
"B" FAULT
COMPLEX OVERTURNED FOLDS IN DUNEDIN BEDS
VERY COMPLEX FAULTS & FOLDS
A'
"ZED" FOLDS
SCATTERED MINERALIZED PATCHES Ba Zn & Pb
SCATTERED MIN.
HIGHLY DISTURBED
EAST MARGIN THRUST
STRUCTURES UNCERTAIN
"D" FAULT
COMPLEX FOLDS & FAULTS
DRILL CAMP
A
"K" FAULT
B'
COMPLEX STRUCTURES
B
REDFERN RIDGE
Noranda Creek
REPORTED NONDA OTC.
SCATTERED OTC. OF OLDER BEDS
COMPLEX FOLDS & FAULTS
LAKE
POSSIBLE FAULT
Straight Creek
NORANDA CAMP
SCATTERED STONE OTC.
C'
COMPLEX FOLDS & FAULTS
REDFERN LAKE
Kirk Creek
OUTCROP (?) OF BASAL REEF
RIO CAMP
SCATTERED MIN IN PINE POINT FLOAT ALONG ROAD
STONE OTC.
BEDDING PLANE FAULT
VISTA RIDGE
REDFERN LAKE AND BESA RIVER VALLEYS COVERED WITH GLACIAL AND RECENT MATERIAL, STRUCTURES AND BEDROCK UNCERTAIN.
TYR FLAT HAS COVER OF VEGETATION, TALUS AND GLACIAL MAT. STRUCTURE UNCERTAIN PROBABLY UNDERLAIN BY STONE BEDS
C
LITTLE REDFERN LAKE
FAIRY LAKE
OTC. PINE POINT (?)
PINE POINT OTC.
STONE OTC.
EDGE OF PINE POINT REEF
BESA RIVER
OTC. UNKNOWN BEDS
OLDER ROCK
POSSIBLE FAULT
MIN FLOAT
CARBONATE (PINE POINT ?) OUTCROP (NOT EXAMINED)
5551a MAP 4
PINE POINT OUTCROPS
PINE POINT OTC. BASAL REEF AND UPPER LIMEST. (?) UNDIFFERENTIATED
POSSIBLE BEDDING PLANE THRUST AT BASE OF SHALE
Department of Mines and Petroleum Resources ASSESSMENT REPORT
NO. 5551 MAP 4
FORMATIONS
PLEIST. - RECENT 8 Glacial & Recent Deposits
M. & U. DEV. 7 Besa River
M. DEV. 6 Pine Point Upper Limestone
M. DEV. 5 Pine Point Basal Reef
M. DEV. 4 Dunedin Platform
L. (?) & M. DEV. 3 Stone (U/L Diff. Upper & Lower)
SIL. 2 Monda
ORD. - SIL. 1 Older Beds
Probable Bedrock (May Have Cap of Glacial or Recent Deposits)
FAULTS, FRACTURES
Thrust Fault Defined
Thrust Fault Inferred
Fracture
Fault of Unknown Type
DA Distinct Alignment (May Indicate Fault or Fracture)
FOLD AXES
Anticline (With Direction of Plunge)
Syncline
Fold Axes Inferred
Overturned Anticline
BEDDING
Formation Contact
Contact Inferred
STRIKE & DIP OF BEDDING
1. 60° Dips Measured on Ground
2. Photo. Dips or Approximate Dips
Flat or Nearly Flat
2 - 20°
20 - 45°
45 - 70°
70 - 85°
Vertical or Near Vertical
Overturned
MISCELLANEOUS
Pb Zn Ca PbZn Ba Mineralization
C-2 Sample Station (75) C-2
N.T.S 94-G-5W
SCALE : 1:12,000
METRES
FEET
RIO TINTO CANADIAN EXPLORATION LIMITED
VESTOR OPTION - REDFERN
GEOLOGICAL MAP
D.T. COSGROVE
AUGUST, 1975
DWG. FIG. 6

5551 (PT. 2 OF 2)

94G/5W

VESTOR OPTION

REDFERN LAKE AREA, B. C.

GEOCHEMICAL REPORT

N.T.S. 94-G-5W

A. Troup August, '75

TABLE OF CONTENTS

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VESTOR OPTION
REDFERN LAKE AREA, B.C.
GEOCHEMICAL REPORT

INTRODUCTION

From June 4 to June 26, 1975 a small soil sampling programme was carried out over the Vestor Option in the Redfern Lake area of B.C. The purpose of the survey was to investigate the potential for Zn and Pb mineralization over two areas of known mineralization that had not been adequately tested previously.

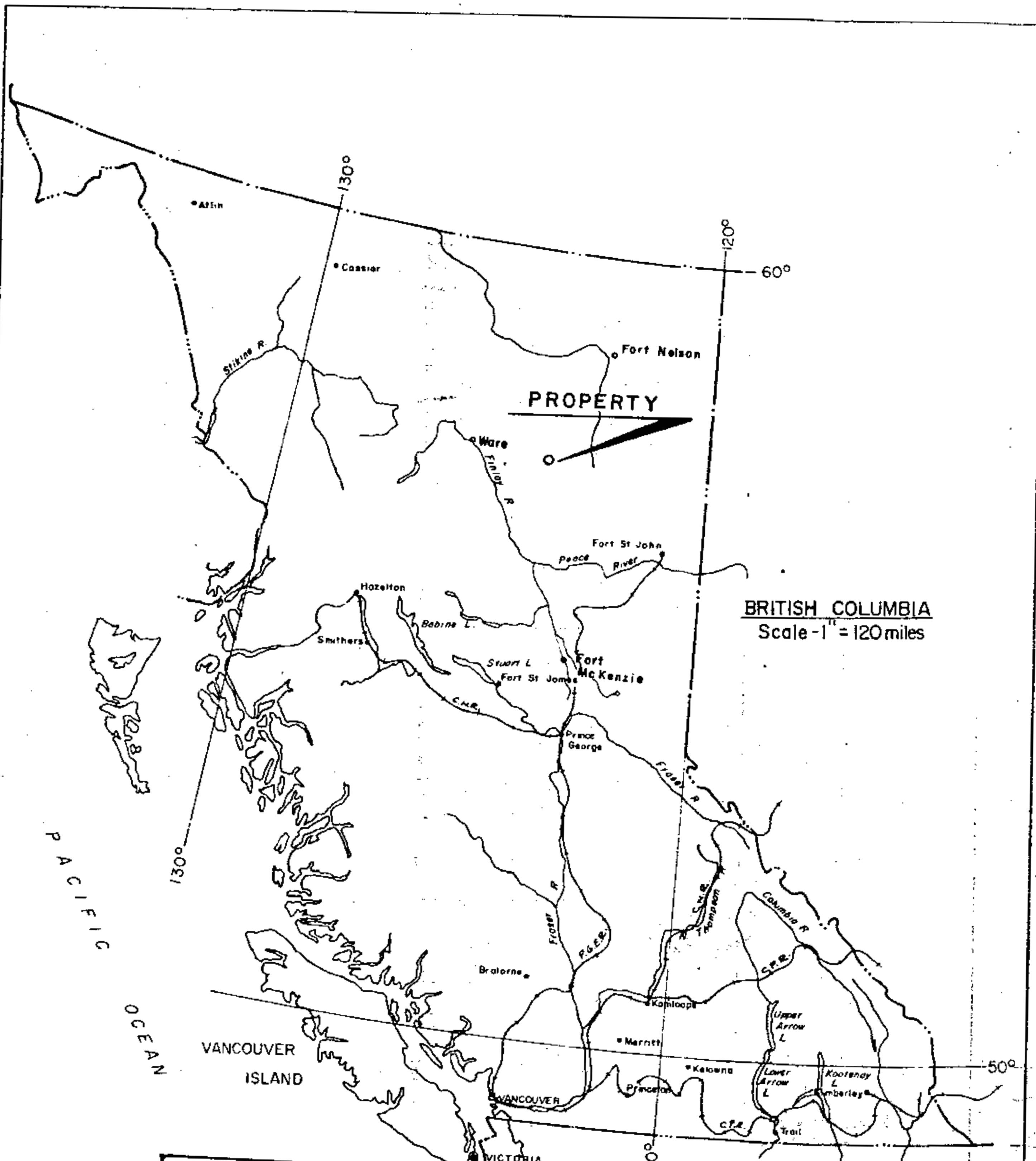
The programme was supervised by Mr. E.W. Johnson a permanent member of the Rio Tinto staff and Manager of the Prince George office. Field operations were coordinated by Mr. D. Cosgrove a geological consultant retained by Rio Tinto specifically for geological work in the Redfern Lake area.

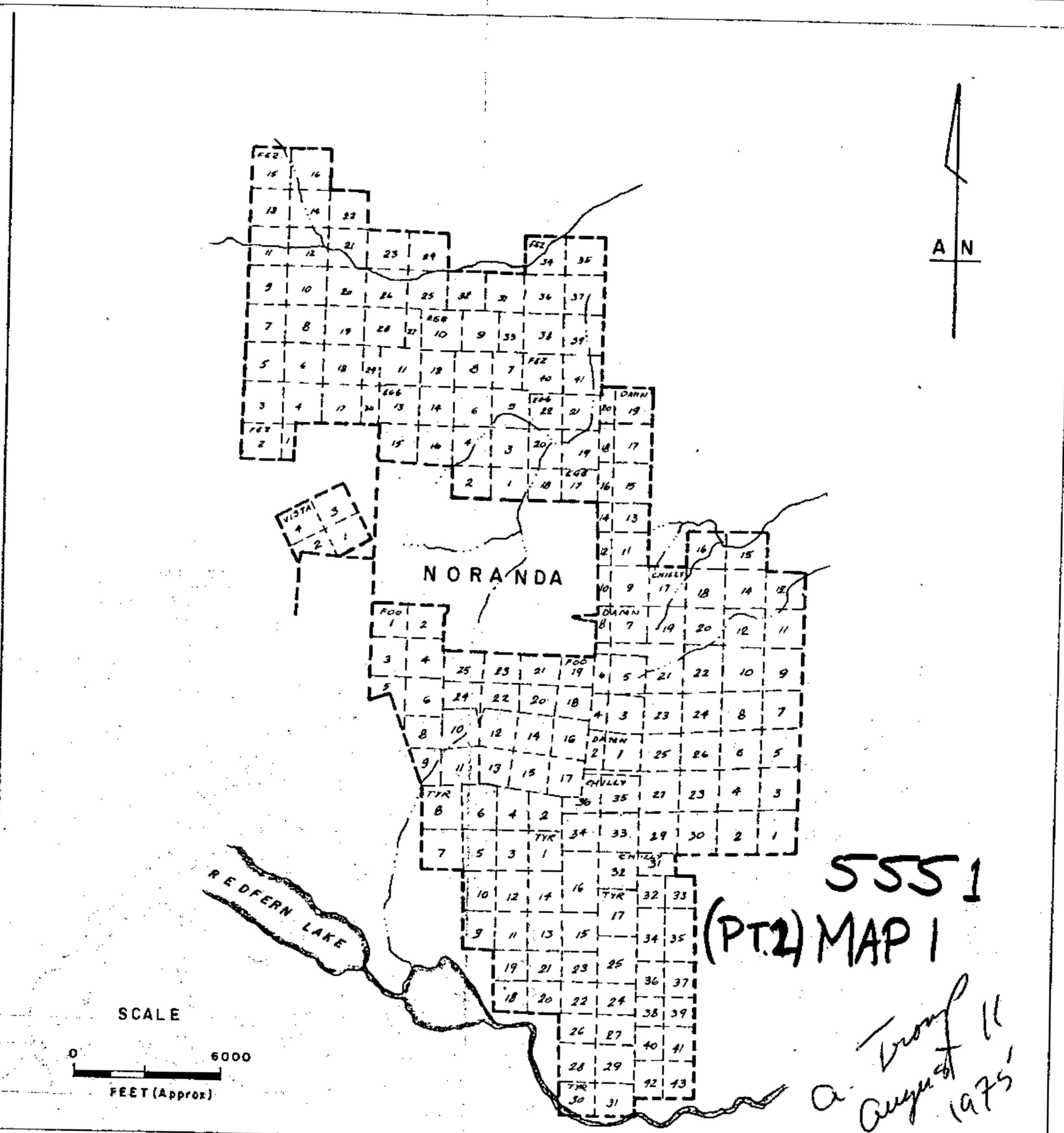
Results of the geochemical survey are discussed in the following report.

ACCESS and LOCATION

The property currently consists of 129 mineral claims under option to Rio Tinto Canadian Exploration Ltd., from Vestor Exploration Ltd. The claims are situated approximately 180 km. (110 air miles) south west of Fort Nelson and 215 km. (135 air miles) north west of Fort St. John. The south west edge of the property lies approximately 1.6 km. (one mile) north east of the east end of Redfern Lake. The centre of the property lies at Latitude 57°30' and Longitude 123°49'.

During the current programme access was by air from Fort St. John. Due to a late break-up of the ice on Redfern Lake, helicopter access was employed for the initial stages of the programme. Fixed wing aircraft was used for the latter part of the programme.





Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 5551 MAP 1

N.T.S.
94-G-5

RIO TINTO CANADIAN EXPLORATION LTD.

VESTOR OPTION – B.C.

REDFERN LAKE AREA

LOCATION MAP

July - 1973 R.A.B. /e.k DWG [illegible]

GENERAL GEOLOGY

The property is situated near the head of the Besa River in north eastern British Columbia. In this area thrusting and folding associated with the Laramide orogeny have exposed a sequence of Paleozoic rocks.

During the 1975 field season the property was mapped in considerable detail by Rio Tinto geologists under the supervision of Don Cosgrove. This work showed the two areas tested by soil sampling to be underlain by a sequence of limestones belonging to the Upper Pine Point formation.

SAMPLING, SAMPLE PREPARATION and ANALYTICAL PROCEDURE

The soil sampling programme was carried out by a four man crew working from a base camp at the extreme east end of Redfern Lake. The work was carried out over a three week period from June 4 to June 26. A total of 390 samples were collected during the course of the programme.

The programme involved the collecting of samples from two widely separated grids; the 'TYR Grid' located near the south end of the claim block, and the 'EGG Grid' located near the north end of the property.

The 'TYR Grid' is by far the smaller of the two areas sampled. This grid centres on claim TYR 19 but extends over portions of claims TYR 9, 11, 13, 18 and 21. In this area 144 soil samples were collected at 30 metre (100 ft) intervals along 120 meter (400 ft) spaced, north west trending lines.

The 'EGG Grid' is centred on claims EGG 5, 6, 7 and 8. It encompasses an area of approximately 1½ sq. miles in extent. Here 246 soil samples were collected at 60 metre (200 ft) intervals along 120 metre (400 ft) spaced east-west trending lines.

In most instances samples were taken from the 'B' soil horizon with the aid of a mattock. Where 'B' horizon material could not be obtained the 'AH' soil horizon was sampled and the samples recorded as such.

All samples were placed in Kraft paper envelopes and shipped to the Rio Tinto Laboratory in North Vancouver. Here the samples were oven-dried at approximately 60°C. The dried samples were sieved through 80 mesh bolting cloth and the oversized material discarded. Analysis was carried out on the minus 80 mesh fraction by atomic absorption spectrometer after digestion with hot concentrated nitric and perchloric acid. The Ag, Pb and Zn concentrations in parts per million (ppm) were obtained by the company analyst, Mr. E. Paski, Jr.

PRESENTATION and DISCUSSION of RESULTS

Results of the soil sampling programme are shown on two accompanying drawings GC-8346 and GC-7287. Both drawings are at a scale of 1:4800 (400 feet to the inch).

Threshold and anomalous levels for the elements Pb and Zn have been derived for the 'B' horizon soils. These statistics were carried out on approximately

220 samples. All samples known to come from mineralized areas were omitted from the statistical calculations. Previous work in this environment has shown both Pb and Zn to display a log normal distribution in the 'B' soil horizon. Therefore, statistical manipulations were carried out on the logs of the values. Threshold and anomalous levels were taken at the mean plus two standard deviations and the mean plus three standard deviations respectively. The mean, threshold and anomalous levels for both metals have been converted back into parts per million and are given in Table I.

An insufficient number of 'AH' horizon samples were taken for meaningful statistical treatment. These samples were therefore disregarded in interpretation of the results.

Inspection of the results reveals there to be no significant anomaly for any of the elements of interest on the 'TYR Grid'. Therefore this grid will not be discussed further.

TABLE I

Threshold and Anomalous Metal Values in 'B' horizon soils - Redfern Lake area, B. C.

Metal	Mean	Threshold Value	Anomalous Value
Pb	23 ppm	125 ppm	300 ppm
Zn	165 ppm	565 ppm	1050 ppm

(Data on the minus 80 mesh fraction : analysis on the Atomic Absorption spectrometer after digestion with hot concentrated nitric and perchloric acid. Log normal metal distribution assumed.)

An extensive soil anomaly for both lead an zinc was found on the 'EGG Grid'. The central portion of this anomaly extends in a north north-easterly direction from line 20 N to line 56 N at the extreme north end of the grid. This anomaly is somewhat discontinuous and is slightly offset in the vicinity of line 32 N. This offset appears to parallel an offset in a nearby stream channel and is therefore possibly reflecting local folding of the underlying strata. The highest zinc values are shifted slightly to the east of the highest lead values. This is possibly due to a slight down slope transport of this metal in solution. Lead being unsoluble should not move an appreciable distance from the source.

During the course of the sampling programme a considerable quantity of mineralization was found both in float and in outcrop over the soil anomaly. Mineralization consisted of sphalerite and minor galena occurring in silicified and dolomitized limestone. Although samples containing up to 3% zinc and 1% lead were found, most samples contained only trace amounts of these metals. These minor concentrations of metal are possibly the cause of the above described soil anomaly.

CONCLUSIONS and RECOMMENDATIONS

The current programme successfully outlined a broad soil anomaly for the elements Pb and Zn near the north end of the 'EGG' soil grid. Prospecting, however, appears to have shown this anomaly to be caused by sub-economic concentrations of mineralization.

No additional work is recommended for the two areas tested by this programme.

A. Troup

AT:rl

Vancouver Office
August, 1975

STATEMENT OF QUALIFICATIONS

A. TROUP

ACADEMIC

1967	B.Sc. Geology	McMaster University, Ontario
1969	M.Sc. Geochemistry	McMaster University, Ontario

PRACTICAL

1969-1975	Rio Tinto Canadian Exploration Limited. Vancouver, B. C.	Geologist involved in all aspects of mineral exploration in B. C.
1968(Summer)	McMaster University Dept. of Geology Hamilton, Ontario	M.Sc. thesis work. Reconnaissance mapping and geochemical study, Lake Shubenicadia area, Nova Scotia
1967(Summer)	Canex Aerial Exploration Ltd., Toronto, Ontario	Geologist in charge of detailed mapping and reconnaissance geochemical programme in Gaspe, Quebec.
1966(Summer)	McMaster University Dept. of Geology Hamilton, Ontario	Summer vacation work. Detailed and reconnaissance mapping in northern Ontario.
1965(Summer)	International Nickel Co. of Canada Thompson, Manitoba	Summer vacation work. Detailed mapping in the Thompson Area, Manitoba.
1964(Summer)	Geological Survey of Canada. Ottawa, Ontario	Summer vacation work. Regional geochemical survey in the Keno Hill area, Yukon.

VESTOR OPTION - REDFERN LAKE
GEOLOGICAL MAPPING, GEOCHEMICAL SURVEY
1 June - 13 July 1975

COST STATEMENT:

(a) WAGES AND SALARIES:

Name	Dates	Days	Rate	Total	
EW Johnson	1 Jun - 13 Jul	25	66.00	1,650.00	
L. Palmer	1 Jun - 4 Jul	32	38.00	1,216.00	
H. Gow	1 Jun - 4 Jul	34	33.00	1,122.00	
S. Shaw	1 Jun - 26 Jun	26	29.00	754.00	
R. MacGregor	1 Jun - 25 Jun	25	29.00	725.00	
G. Schwarz	1 Jun - 11 Jun	10	33.00	330.00	
D. Cosgrove	1 Jun - 13 Jul	33	180.00	6,240.00	
C. Spence	16 Jun - 22 Jun	3	100.00	300.00	
	8 Jul - 10 Jul	3	100.00	300.00	
L. Haynes	16 Jun - 22 Jun	3	44.00	132.00	12,769.00

(b) EMPLOYEE BENEFITS: 2,361.80

(c) TRANSPORTATION:

Fixed-Wing	(Quadra Travel Service)	742.65	
Fixed-Wing	(Northern Thunderbird Air)	3,234.00	
Helicopter	(Okanagan)	6,872.81	
Truck	(Rio Tinto)	100.00	
Helicopter	(Northern Mountain)	5,429.00	
Other		678.60	17,057.06

(d) EQUIPMENT RENTAL:

Ryder Truck	443.73	
Chain Saw	120.00	563.73

(e) REPORT PREPARATION: 1,247.32

(f) GEOCHEMICAL ANALYSIS:

388 samples @ 3.45 each (Rio Tinto)	1,338.60	
Bondar - Clegg Assays	134.00	
Other Assays	120.00	1,592.60

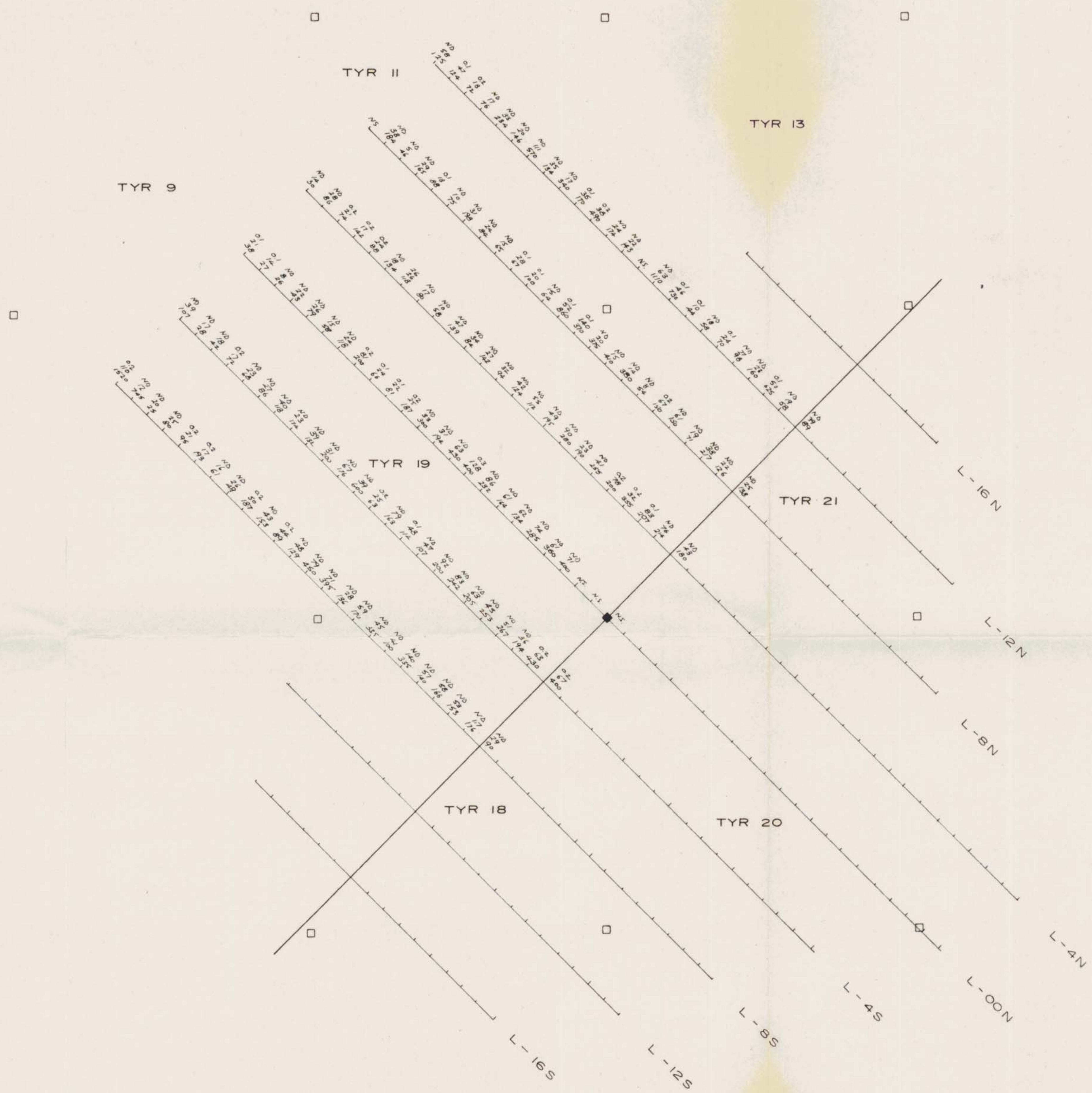
(g) OTHER COSTS:

Fuel	276.79	
Supplies	2,223.02	
Miscellaneous	340.21	
Freight	42.75	2,882.77

(h) FOOD & ACCOMMODATION: 2,221.22

40,695.50

SE:rl



LEGEND

Grid line with sample location

0.1 Ag
36 Pb
170 Zn
} Results in p.p.m., N.D. not detected

N.S. No sample

□ Claim corner

◆ Claim post located

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 5551b MAP 2

a. Troup
August 11 1975

5551b
MAP 2

N

N.T.S

SCALE

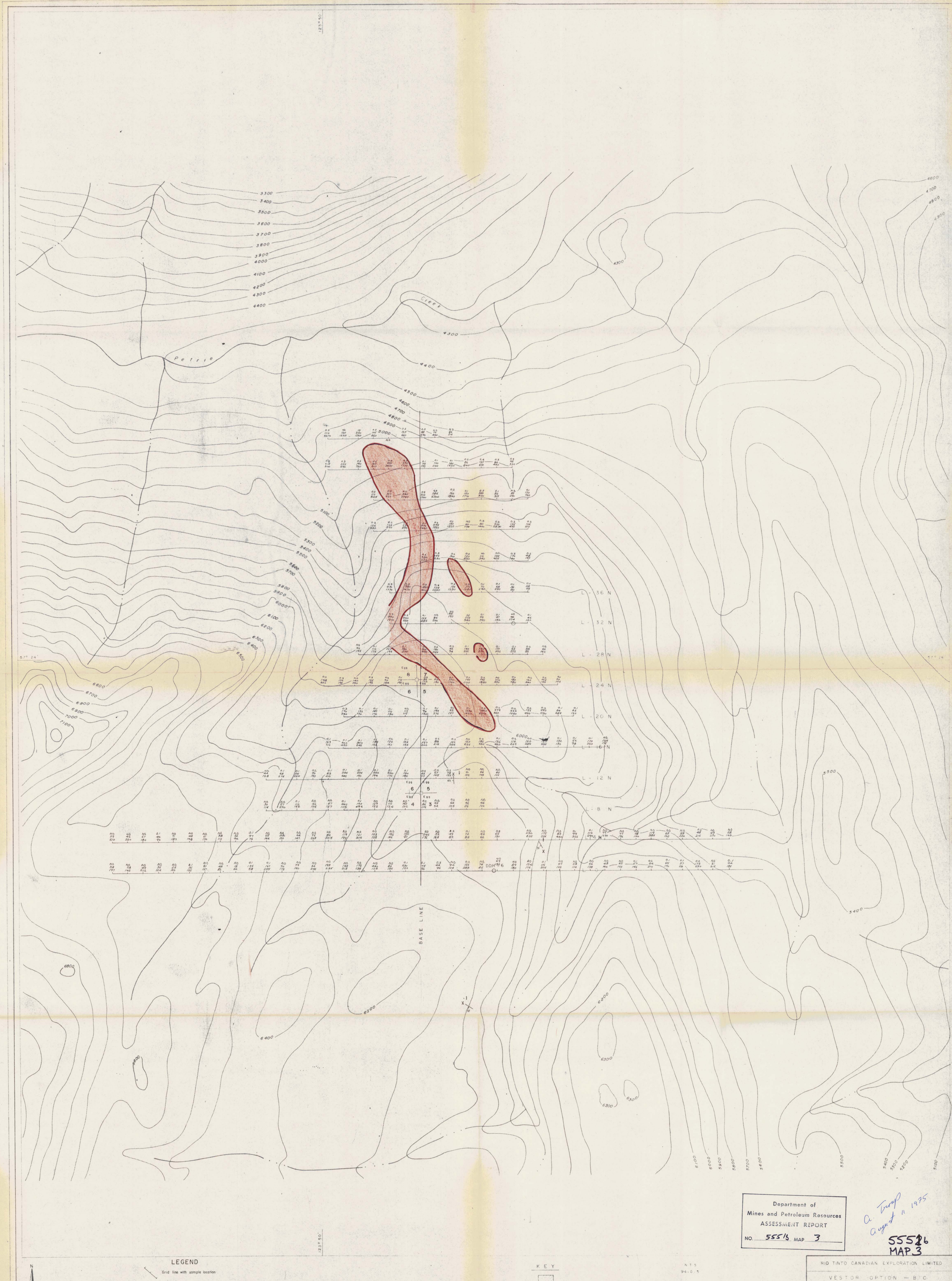
400 0 400 800 1200 1600

RIO TINTO CANADIAN EXPLORATION LIMITED

VESTOR OPTION - B.C.

REDFERN LAKE AREA
SOIL SAMPLING (TYR GRID)
Ag. Pb. Zn. RESULTS

July - 1975 | E.W.J. / ym | DWG. G.C. - 7287


Petrie
Creek
BASE LINE
L - 36 N
L - 32 N
L - 28 N
L - 24 N
L - 20 N
L - 16 N
L - 12 N
L - 8 N
LEGEND
Grid line with sample location
0.1 Ag
36 Pb
170 Zn
Results in p.p.m., N.D. not detected
N.S. No sample
Pb ≥ 300 ppm.
Note: For Legend See map G-4
KEY
SCALE
FEET
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 5551b MAP 3
A. Troup
August 11 1975
5551b
MAP 3
RIO TINTO CANADIAN EXPLORATION LIMITED
VESTOR OPTION — B.C.
REDFERN LAKE AREA
SOIL SAMPLING (EGG GRID)
Ag. Pb. Zn. RESULTS
JULY 1975 E.W.J./y.m DWG G.C.-8346


Petrie
L - 36 N
L - 32 N
L - 28 N
L - 24 N
L - 20 N
L - 16 N
L - 12 N
L - 8 N
BASE LINE
DDH
123° 50'
LEGEND
Grid line with sample location
0.1 Ag
36 Pb
170 Zn
Results in p.p.m., N.D. not detected
N.S. No sample
Zn ≥ 1050 ppm.
Note: For Legend See map G-4
KEY
SCALE
FEET
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 5551b MAP 4
a. Troup
August 11, 1975
5551b
MAP 4
RIO TINTO CANADIAN EXPLORATION LIMITED
VESTOR OPTION — B.C.
REDFERN LAKE AREA
SOIL SAMPLING (EGG GRID)
Ag. Pb. Zn. RESULTS
JULY 1975 E.W.J./y.m DWG G.C.-8346