3735

GEOLOGICAL REPORT

on

SOUTH GROUP MINERAL CLAIMS

TURNAGAIN RIVER, B.C.

Hard Creek Mines Limited

July 27, 1971 - September 27, 1971
June 15, 1972 - July 16, 1972

N.T.S. - 104-I

Latitude $58^{o}28'00N.$
Longitude $128^{o}50'00W.$

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 3735 MAP

Vancouver, B.C.
July 18, 1972

J. J. McDougall, P.Eng.
T. Clark

TABLE OF CONTENTS

GEOLOGICAL REPORT
ON
SOUTH GROUP MINERAL CLAIMS
TURNAGAIN RIVER, B.C.

INTRODUCTION

The Turn claims, of which the South Group is a portion, were located by Falconbridge Nickel Mines Limited to cover occurrences of copper-nickel mineralization within a highly magnetic ultramafic body on the Turnagain River in North-Central British Columbia. Following several years of detailed geophysics and diamond drilling, a subsidiary company, Hard Creek Mines Limited, was incorporated. As part of a two-year program, detailed geological mapping was begun in 1971 and is continuing throughout 1972. The initial work concerned itself essentially with the area covered by the South Group claims, while current (1972) work will centre around a more northerly group. It must be stressed that some of the conclusions reached to date may be revised after months of future laboratory work. However, final conclusions will be presented when the 1972 report on the adjoining North Group is filed.

Outcrop occurs on more than half of the mineral claims involved and since the ultramafic body is much less altered (serpentinized) than most of those in B.C., a good opportunity exists to study and correlate the mineral occurrences - such being the primary object of this continuing investigation.

Maps 145-71 (1-4 incl.) are included in this report and show claim areas as well as geology.

LIST OF CLAIMS IN SOUTH GROUP

Turn Nos. 14, 16, 18, 20, 22, 24, 25, 26, 29, 30, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 51, 52, 56, 60, 63, 64, 69, 70, 73, 74, 75, 76, 77, 78, 102, 103.

LOCATION AND ACCESS

The claims are located near the Turnagain River in north-central B.C. approximately 40 miles due east of the south end of Dease Lake. (Centre of group on Cry Lake Sheet 104 I at 58°28'N, 128°50'W.) The claims cover an area ranging in elevation from 3,500 ft. at the river to 6,000 ft.

Access was either by helicopter or by light plane to an airstrip built on the river bank a mile from the main camp. A winter Cat road passes through the property.

HISTORY OF CURRENT PROJECT

The 1971 field mapping was conducted by Ph.D. candidate Tom Clark of Queen's University Geological Department. Immediate supervision, including minor field mapping, was by J. J. McDougall, and field assistance was offered by engineering student, Hugh Reed of the University of British Columbia.

GENERAL GEOLOGY

The area including the Turn property has been mapped regionally by two agencies -- initially by the B.C. Department of Mines during a reconnaissance of the Turnagain River (Hedley and Holland 1939-40),[1] and by the G.S.C. (Map 29-1962,[2] with additions in Report of Activities, 1967, Part A, p. 27[3]).

Several serious problems besides ore control are apparent and the present study, when completed following detailed laboratory work yet to come, could throw useful light on some of these. Involved are age dates and relations of all units concerned, plus evolution of these units which include schists, intrusive breccias, Tertiary volcanics, and volcanic sills as well as the basic complex.

In general, the ultramafic body is intruded into a schist complex several miles west of the western contact of the Cassiar Batholith (see index map #145-71-1). A Tertiary volcanic centre occurs along this latter contact a few miles to the north and a number of serpentinized ultrabasics (or ultramafics) occur a few miles to the east (a portion of one of these constitutes the Letain Asbestos prospect of Cassiar Asbestos Corp.). The Turnagain ultramafic appears to dip steeply west and is felt by Gabrielse to be related and in the same "horizon" as the last described, more highly altered rocks.

Regional structures are not clear. Folding within the enclosing schist unit does not appear important. It is evident, however, that faulting has played a dominant role. A major north-easterly-trending fault is projected along the largely overburdened Turnagain River valley within the map area and several paralleling (?) ones are suspected, one of which cuts the ultramafic off to the south-east and another a couple of miles away which runs through the centre of the ultramafic. The latter may reach as far as the Cassiar Batholith contact. Unfortunately, none of these structural features are exposed on the ground, as heavy glacial drift covers most low areas or depressions. Later geological maps will depict structure more clearly after required tie-ins are made.

Metamorphism regionally appears more dynamic than thermal (green schist?), but near the map boundaries the intruded ultramafic appears to have been responsible for an increase in graphite plus iron sulphides within the schists as witnessed by an aureole of extreme geophysical response (Geophysical Assessment Report July 15, 1969).

LOCAL GEOLOGY

A.1. General

The Turnagain River ultramafic body is roughly lenticular in shape, having its long axis oriented in a NW-SE direction. The body is approximately 4.9 miles long, and is as much as about 1.5 miles wide.

The intrusion is, in the main, a complex of dunite, peridotite, pyroxene-rich peridotite, and olivine pyroxenite. Most of the ultramafic rocks are remarkably fresh, with the exception of those near the contacts with the country rocks, and those lying in fault zones.

The body is intruded into a sequence of shaley sediments and intermediate volcanic rocks and appears to be fault-bounded at the footwall and at the SE end. Country rocks adjacent to the ultramafic contacts do not show features indicating extensive contact metamorphism, but an increase in graphite and sulphides is apparent. The hangingwall is characterized by what may be a sill-like intrusive of non-schistose andeso-basalt. Fragmental dykes (hornblende porphyry) locally intrude both the ultramafic and country rocks, and at least one intrusive breccia containing course granitic fragments in a tuffaceous groundmass is recognised in some of the deeper drill holes. The time of emplacement of the ultramafic unit is thought to have followed closely on the heels of the deposition of the country rocks, namely in Devono-Mississippian times (H. Gabrielse, pers. comm., 1971).

A.2. The Ultramafic Complex

The most extensive rock type in the intrusion appears to be dunite, which occupies the core of the intrusion. This unit is surrounded on the SE, SW, and NW by peridotite and lesser amounts of olivine pyroxenite.

The dunite unit characteristically weathers a khaki colour, often with a granular texture. The fresh surface varies from jet black to dark green. Grain size is typically about 5mm, although in places the dunite becomes very coarse grained, with olivine crystals measuring about 2 inches long. In many places, pods and schlieren of chromite-rich material occur. The schlieren frequently show gradations in chromite content, and are often tightly folded. The dunite unit is cut by numerous dykes of pyroxenite, pyroxene-rich peridotite, and peridotite. These dykes are almost always unfolded, and their emplacement appears to be joint controlled. The dunite unit is primarily massive; however, there are several thick bands of peridotite within it, the longest of which strikes parallel to the long axis of the ultramafic body. The dunite is typically weakly magnetic, thus reflecting its relatively unserpentinized nature.

Peridotite, which is the second most common rock type, tends to weather a deeper reddish-brown than the dunite, and has a rougher weathering texture. Contacts between peridotite and dunite are usually gradational, although not always so. Peridotite is typically medium grained, with plates of pyroxene poikilitically enclosing olivine. Notable is the frequent occurrence of light brown mica flakes in the peridotite, sometimes in amounts equivalent to what one would expect of pyroxene.

Within the peridotite are layers of pyroxene-rich peridotite and olivine pyroxenite. A variety of contact relationships with the other ultramafic rock-types occurs. In places, contacts with normal peridotite are gradational over a few feet to a few inches. In other places, the pyroxene-rich rocks are clearly intrusive (as dykes) into the peridotite and dunite. There is good evidence supporting the contention that some of the pyroxene-rich rocks originated before the peridotite and dunite. Oval inclusions of olivine pyroxenite in peridotite were observed in two or three localities, and dunite dykelets clearly cut olivine pyroxenite in another locality.

Layering on a small scale is observed in two areas. These consist of interlayers (measured in inches to feet) or peridotite, pyroxene-rich peridotite, and olivine pyroxenite, and these layers sometimes grade into each other. In one of these two cases, the layered rock is quite certainly a large inclusion in dunite.

Faulting parallel to the Turnagain River appears to have complicated the structure in the south-eastern part of the complex.

A.3. Sulphide Mineralization

As pointed out in previous reports, there are two generations of sulphide -- one primary to the ultramafic rocks, and another (poor in nickel) either syn- or post-serpentinization.

There appears to be a relationship between the occurrence of primary sulphides and the development of pyroxene-rich peridotite and olivine pyroxenite. In the Davis claims north of the

Falconbridge property, the mineralization is, in every case examined, located in pyroxene-rich rocks. However, on the Falconbridge ground, the nickel-copper sulphides tend to be concentrated in peridotite and possibly dunite, and, in almost every case, the sulphides are closely associated spatially with interlayered pyroxene-rich rocks. The host rock of the mineralization is frequently altered to black aphanitic serpentinite. In addition, the pyroxene-rich rocks on Falconbridge ground are generally gossany, although they do not usually contain significant sulphides. (Some of this gossan may be the result of high magnetite content.) With one exception (undrilled), no notable sulphides are observed in uniform peridotite, and the massive dunite unit is almost barren of sulphides.

Relatively coarse-grained pentlandite is the only nickel sulphide of importance present and is always associated with pyrrhotite although complex intergrowths common in other B.C. deposits are rare. Chalcopyrite generally accompanies the pentlandite but is only common in a few localities. Mixtures of graphite, pyrrhotite, and magnetite occur throughout portions of the complex and are believed related to highly faulted sedimentary remnants (?) caught up in the intrusion. These veinlike deposits are thought to be non-nickeliferous injections or replacements -- possibly the second generation type referred to. Molybdenite associated with pentlandite-rich pyrrhotite has been found over a couple of feet of drill core and low grade intersections of tungsten (scheelite) have been obtained.

Mineralization, including graphite, is not too different from that found in the southern portion of the Manitoba nickel belt or at Giant Mascot in B.C.

B. Specific Geological Observations Within the Mapped Area

The ultramafic body under study is a complex composed mainly of dunite, peridotite, pyroxene-rich peridotite, olivine pyroxenite, and pyroxenite. In a previous report by T. Clark, it was suggested the complex was of the "alpine-type." This is now not thought to be the case. It seems probable that the ultramafic rocks are similar to those of the so-called "zoned complexes" found in south-eastern Alaska, and in several localities in the British Columbia cordillera. The field observations and laboratory data bearing on the nature of the rocks will now be summarized.

1. The complex is rudely zoned, having a core of dunite, which is surrounded by peridotite, and the various pyroxene-rich rocks. The footwall side of the complex is probably fault bounded, although the hangingwall side may not be.

2. The contact between the dunite core and the surrounding more pyroxene-rich rocks is evidently a highly irregular one. The excellent exposures in the north-west show the contact to be undulating. Outcrop distribution in the SE also suggests a convoluted dunite-peridotite contact.

With the exception of the contacts between the dunite core and the enclosing rocks, and between pyroxenite veins and host rocks, contacts between rock types are usually gradational. Contacts between the dunite core and the surrounding rocks in the far NW are often sharp, although intrusive relations are contradictory. The development of a sheath of green slip-fibre serpentine is conspicuous at one such contact. From examination of drill core taken from the hangingwall area in the SW, gradational contacts are apparent between dunite layers and the more pyroxene-rich rocks. However, transitions are, at the same time, quite abrupt.

3. Layering on a small scale is not obvious from outcrop examination. The dunite core zone is almost entirely massive dunite, with just a few rather thick bands of more pyroxene-rich rocks. (Chromite schlieren are prominent, although not economic, in a few localities.) Drill core shows that the peripheral zone of more pyroxene-rich rocks is characterized by an interlayering (with no predictable sequence) of all the ultramafic rock types from dunite to pyroxenite.

Layers vary in thickness from inches to feet. Contacts are apparently always gradational. Graded layering (with one or two exceptions) is not observed. Correlation of lithologies between drill holes sunk at the same site indicates that layering in the more pyroxene-rich zone (the hangingwall contact region) dips SW in two instances (conformable with the regional dip of strata) and NE in one instance. It is not clear whether the convoluted contact between the dunite core and the enclosing peridotite is due to folding, or to a peculiar mechanism of intrusion.

4. Graded layering is notable in one locality, near the contact between the dunite core and the surrounding peridotite. It seems possible, however, that the layered rock is in fact a large inclusion. The dunite is seen to cut pyroxenite of the layered sequence in this location. Gradations in the modal constitution of the ultramafic rocks are more conspicuous and more rapid in the pyroxene-rich varieties.

5. Pyroxenite veins are abundant in the dunite core, but become much less common in the more pyroxene-rich rocks. They are often coarse-grained, and are rarely deformed. It appears their emplacement was joint-controlled and most of them may be the result of the metasomatic replacement of olivine-rich rocks by the introduction along joints of fluids relatively rich in SiO_2 and CaO.

6. Tectonite fabrics are not common on hand-sample scale. Planar orientation of elongated olivine grains in the dunite core is not common, although it does occur sporadically. Schlieren of chromite-rich dunite frequently display tight folding, in which the folds are of similar style. In other places, the schlieren are broken up into segments, the spaces thus-formed between segments being filled with dunite similar to that of the enclosing dunite. Deformation shown by the schlieren probably occurred while the dunite mass was still hot. A dunite breccia consisting of dunite fragments in a serpentinite matrix was found in one locality. This deformation likely predated the serpentinization of the ultramafic rocks.

7. No orthopyroxene has been identified in thin sections of any of the ultramafic rocks. Pyroxene is invariably clinopyroxene, approximately of diopsidic composition.

8. No plagioclase has been identified in any of the ultramafic rocks, with the exception of possible highly altered feldspar in a troctolite dyke. A few fine-grained picritic dykes may also be present in the complex.

9. There appears to be a differentiation trend in the complex. Olivine compositions have been determined in several localities, using the universal stage. (Other analytical tests will follow.) Olivine compositions in the dunite vary between 95% forsterite, 5% fayalite (Fo95) and Fo90, approximately. The most magnesian olivines are found in the central parts of the core, while the more iron-rich olivines are located near the contacts with the surrounding peridotite. In peridotite, olivine compositions vary between Fo90 and Fo84. Although the data are scanty, results to date show a decrease in the Mg/Fe ratio in olivines of peridotite in a direction away from the dunite core. This variation is most apparent in the peridotites SE of the dunit core zone. There seems to be a large variation in the olivine composition of olivine pyroxenites, but one such pyroxenite contains the most iron-rich olivine yet discovered in the complex: Fo74.

10. Partial analyses (x-ray fluorescence) have been carried out on seventeen dunites, fourteen peridotites, and seven pyroxene-rich rocks. These data are still being evaluated. Following are the average compositions of the rocks of the three major groupings:

	1.	2.	3.
SiO_2	37.45	40.53	48.48
Al_2O_3	0.36	0.60	0.98
FeO*	12.11	14.15	11.06
MgO	48.09	39.57	21.90
CaO	0.35	4.62	16.63
K_2O	0.04	0.04	0.03
TiO_2	0.05	0.11	0.18
Total:	98.45	99.62	99.26

1. Average of 17 dunites.
2. Average of 14 peridotites.
3. Average of 7 pyroxene-rich rocks.
* Total iron calculated as FeO.

A superficial comparison of the average dunite composition with the compositions of some dunites in similar intrusions in B.C. and Alaska shows that the Turnagain dunites are very magnesian. A Duke Island (Alaska) dunite contains 42.30% MgO, and of six dunites of the Tulameen complex of B.C., the most magnesian contains 47.86% MgO.

11. Phlogopite occurs as interstitial flakes in the ultramafic rocks of several localities. It has been found mostly in peridotite and the more clinopyroxene-rich rocks. Mica seems most abundant where the host rock is most highly altered, although not all highly altered ultramafic rocks, by any means, contain mica. Mica is a fairly common constituent of many of the drill cores.

12. Light brown amphibole (common hornblende) has been found in several thin sections. It appears that hornblende may have formed both as a primary crystallization product, and as an alteration of pyroxene. Amphibole has been observed to enclose clinopyroxene grains poikilitically, in an olivine clinopyroxenite in the far SE part of the complex. It has also been found apparently as an alteration of clinopyroxene in a patch of pyroxene pegmatite in the far NW. Hornblende also occurs in sulphide-bearing olivine clinopyroxenite in the Davis claim-group; in peridotite (in a zone somewhat pyroxene-rich) just NE of the main Turnagain camp; and in a large layered inclusion of olivine clinopyroxenite and peridotite SE of the Turnagain River.

No generalizations are yet made as to the genesis of the hydrous minerals. They do attest to the fact that water was available, probably during the late stages of the crystallization of the ultramafic part of the complex. It may be, however, that some occurrences of these minerals originated long(?) after the cooling of the ultramafic mass, with water having been provided by an independent source, or even by the primary hydrous minerals of the ultramafic rocks themselves.

13. From drill hole logs and assay results, it seems that average barren or very weakly mineralized dunite contains less than 0.20% nickel. On the other hand, unmineralized pyroxene-rich rocks tend to have lower nickel concentrations, say 0.05% Ni, or less. However, correlation of drill logs and assay results also seem to indicate that relatively high nickel values may be found in any rock type. The most economically interesting sulphide occurrences are those characterized by a relatively high nickel content and a sizeable thickness. These sulphides tend to have blebby or net textures, indicating intercumulus origin. Such occurrences almost always occur in dunite and, especially, in peridotite. Massive sulphides of very high nickel content (around 1.0% occur in very narrow bands (measured in inches)). Although these massive sulphides usually occur in rocks of high background nickel content, they are also found in pyroxenites, showing a very low overall nickel concentration. It would appear that the nickel sulphide concentrations having sizeable thicknesses are primary to the ultramafic sequence, having crystallized during the cooling of the mass. Since massive nickeliferous sulphides are sometimes found in rocks of low background nickel content, it is thought these occurrences have no direct relationship to the rocks in which they occur. From descriptions of these sulphides in the drill logs, it is possible they are in fact injections (more analytical work is required here!). Perhaps the primary sulphides have, in some way, been mobilized and reconcentrated as veins. In most cases, the narrow massive sulphide bands are associated with rocks of high background nickel, and with intercumulus-type sulphides. Therefore, if remobilization has occurred, the sulphides have not generally travelled far from their point of origin. The occasional close spatial relationship between heavy net sulphides and a black aphanitic serpentinite has not yet been interpreted.

14. The band of volcanic rock outcropping SW of the ultramafic mass is interpreted as a sill within shaley sediments. One outcrop quite clearly contains blocks and rafts of sedimentary rock. The composition of the volcanic corresponds approximately to basaltic-andesite (see table on page 12).

15. The hornblende porphyry (often fragmental) dykes intruding both the ultramafic complex and the surrounding country rocks have not yet been investigated in detail. However, the composition of one such dyke (no ultramafic fragments present) is reported below. The partial analysis suggests its overall composition is basaltic.

	1.	2.
SiO_2	54.54	49.59
$Al2\ O_3$	17.3	13.2
FeO*	10.22	14.20
MgO	3.5	7.6
CaO	6.59	8.58
K_2O	0.36	1.90
TiO_2	1.50	1.25
Total:	94.00	96.3

1. Volcanic rock outcropping SW of the ultramafic complex.
2. Hornblende porphyry dyke.

* Total iron calculated as FeO.

SUMMARY AND CONCLUSIONS

The Turnagain ultramafic is a rudely-zoned complex having a core of high magnesian dunite surrounded by peridotite and pyroxenite.

The contacts between pyroxenite and either dunite or peridotite appear most favourable for nickel sulphides, although there are occurrences of "sieve" or "net" textured sulphides in highly altered dunites, seldom far removed from a pyroxenite contact.

The pyroxenite contact areas are the most favourable zones in which to prospect for nickel.

James J McDougall P.Eng.
J. J. McDougall, P.Eng.
Tom Clark
T. Clark

Vancouver, B.C.
July 18, 1972

REFERENCES

1. Reconnaissance in the Area of Turnagain and Upper Kechika Rivers, by M. S. Hedley and S. S. Holland. B.C.D.M. Bulletin 12, 1941.

2. G.S.C. Map 29-1962, Cry Lake, Sheet 104I.

3. Report of Activities, 1967, Part A, p.27.

Appendix B

FALCONBRIDGE NICKEL MINES LIMITED
1112 West Pender Street, Vancouver 1, B.C., Canada
Telex 04-53245
Telephone (604) 682-6242

July 18, 1972

The Mining Recorder
Liard Mining Division
Victoria, B.C.

Dear Sir:

Re: Statement of Qualifications

This is to certify that the geological work on the Turn Mineral Claims (South Group) and presented in this report was done under the direction of Ph.D. candidate Mr. Tom Clark, B.A., M.S. (Queen's), and under my supervision.

Surveying and field assistance was provided by University of British Columbia engineering student Mr. Hugh Reed.

I am a U.B.C. geology graduate and a member of the Association of Professional Engineers of the Province of British Columbia.

Yours very truly,

FALCONBRIDGE NICKEL MINES LIMITED

James J. McDougall P. Eng.

J. J. McDougall, P.Eng.

JJM:jr

Appendix A

DOMINION OF CANADA:
PROVINCE OF BRITISH COLUMBIA.
TO WIT:

In the Matter of Geological Survey on Turn #24-26, 29-30, 35-48, 51, 52, 73, 75, and 77 mineral claims of the South Group.

I, J. J. McDougall

of #500 - 1112 West Pender Street, Vancouver 1, B.C.

in the Province of British Columbia, do solemnly declare that the following work was done on the South Group Mineral Claims:

Personnel	Position	Dates	Days	Rate/Day	Charges
T. Clark	Geologist	July 27 - Sept 27, 1971;	63	$60.00	$3,780.00
		June 20 - July 16, 1972.	26	60.00	1,560.00
Hugh Reed	Geological Assistant	July 27 - Sept 5, 1971.	41	45.00	1,845.00
J.J. McDougall	Geologist	July 27 - Aug. 1, 1971;	6	80.00	480.00
		July 4 - July 6, 1972.	3	80.00	240.00
G. Templeman	Draughtsman	June 15 - June 27, 1972.	13	40.00	520.00

Transportation:

1971 - Fixed wing - (Watson Lake Flying Service)	1,500.00
1972 - Fixed wing - July 1-4 (Watson Lake Flying Service)	825.00
1971 - Helicopter - 5 hrs @ $250.00/hr.	1,250.00
	$12,000.00

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

Declared before me at the City of Vancouver, in the Province of British Columbia, this 18th day of July, 1972, A.D.

James J McDougall P.Eng

G. Phillips

A Commissioner for taking Affidavits within British Columbia or A Notary Public in and for the Province of British Columbia.

Sub-Mining Recorder

FALCONBRIDGE NICKEL MINES LIMITED

PROPERTY: SOUTH GROUP M.C., HARD CREEK MINES LTD.

LOCATION: Turnagain River, Liard M.D., B.C.

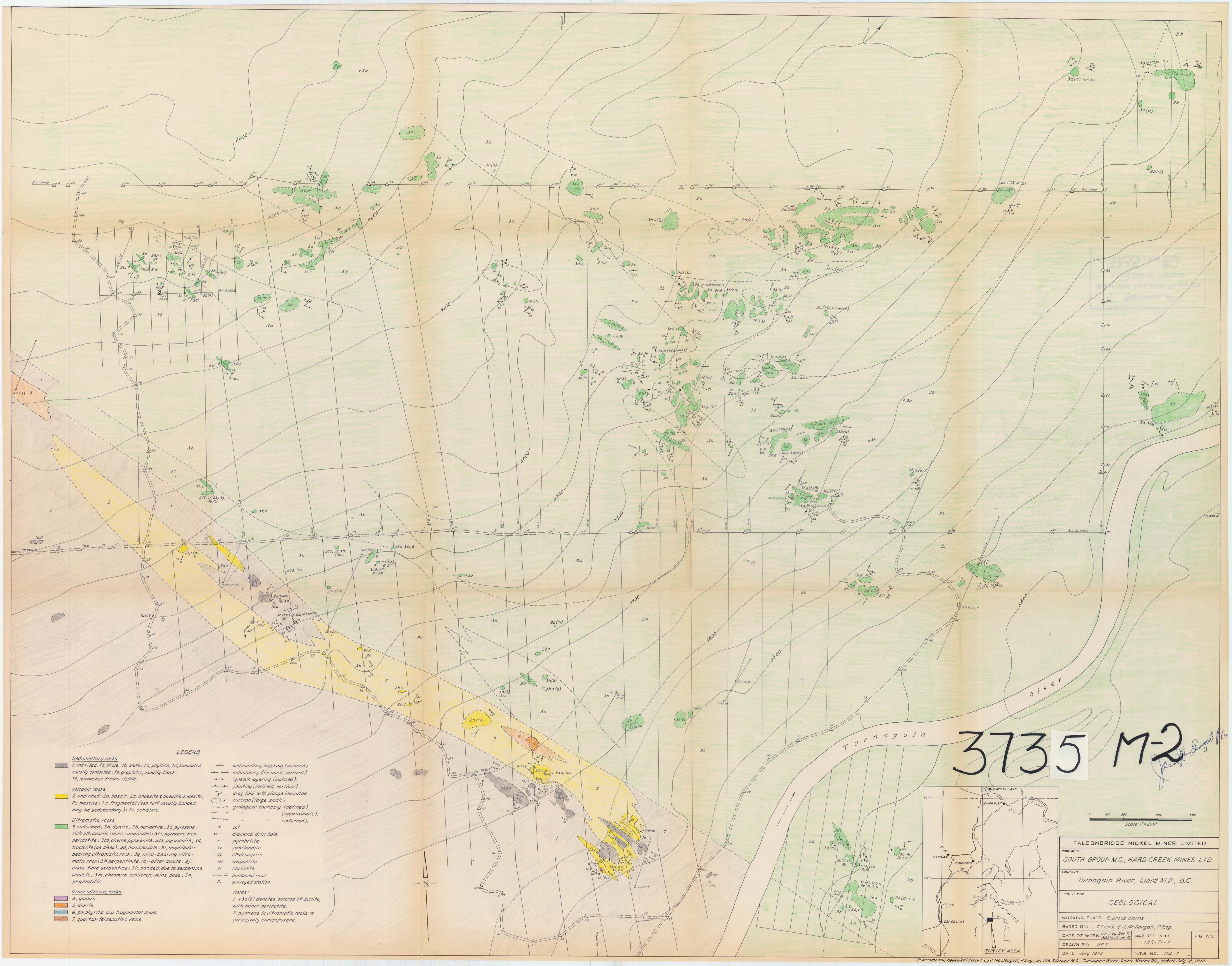
TYPE OF MAP: CLAIMS AND GRID LOCATION

WORKING PLACE: S. Group claims

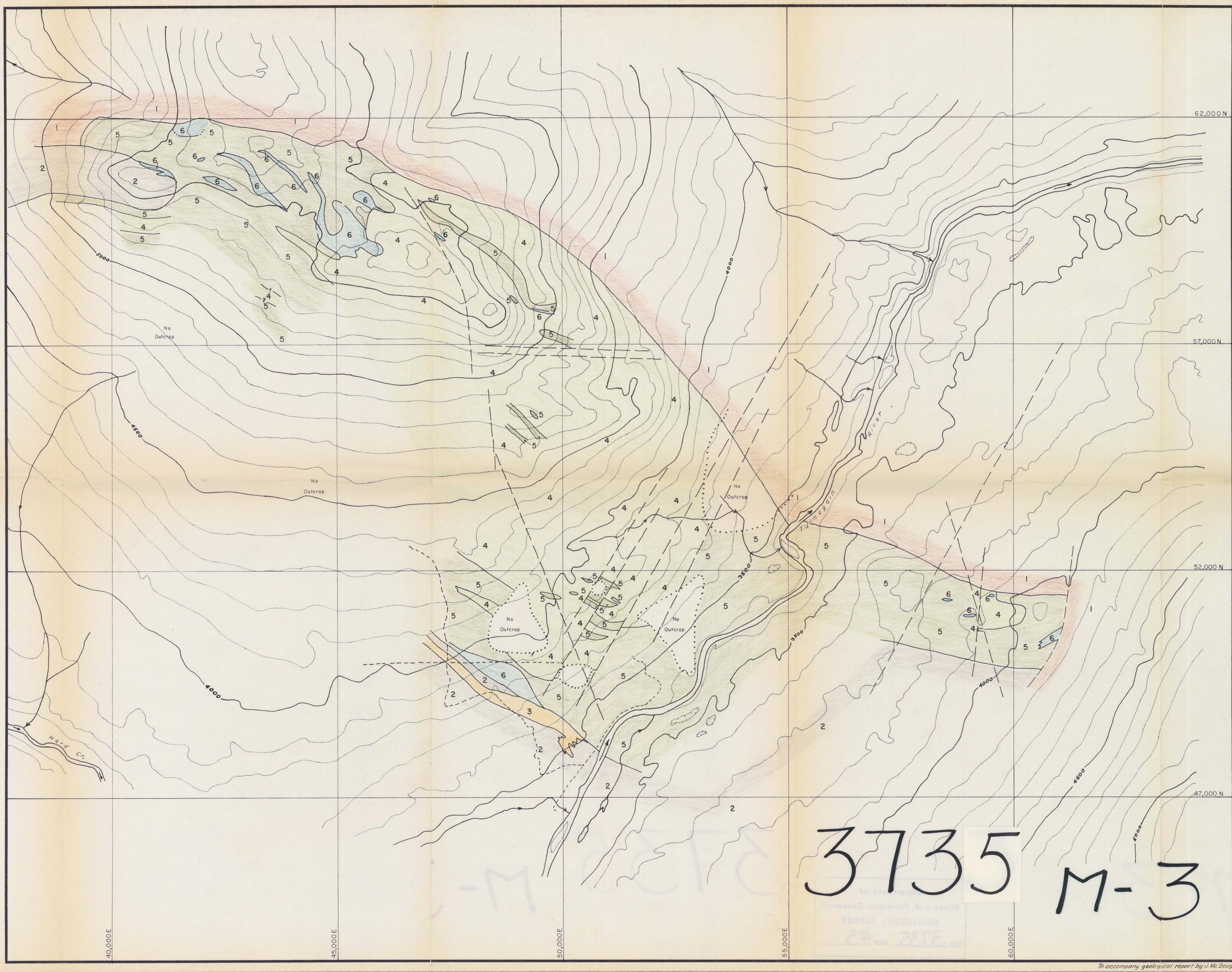
BASED ON: T. Clark & J. Mc Dougall, P.Eng.

DATE OF WORK: Jul, Aug, Sep. '71 July, 1972	MAP REF. NO.: 145-71-1	FIG. NO.:
DRAWN BY: H.G.T.		
DATE: July 17, 1972	N.T.S. NO.: 104-I	

To accompany geological report by J. McDougall, P.Eng. on the S.Group M.C., Turnagain River, Liard Mining Div. dated July 18, 1972


3735 M-2
Turnagain River
LEGEND
Sedimentary rocks.
1, undivided; 1a, shale; 1b, slate; 1c, phyllite; 1d, laminated, usually contorted; 1e, graphitic, usually black; 1f, micaceous flakes visible.
Volcanic rocks.
2, undivided; 2a, basalt; 2b, andesite & basaltic andesite; 2c, massive; 2d, fragmental (esp. tuff, usually banded, may be sedimentary); 2e, schistose.
Ultramafic rocks.
3, undivided; 3a, dunite; 3b, peridotite; 3c, pyroxene-rich ultramafic rocks - undivided; 3c1, pyroxene rich peridotite; 3c2, olivine pyroxenite; 3c3, pyroxenite; 3d, troctolite (as dikes); 3e, hornblendite; 3f, amphibole-bearing ultramafic rock; 3g, mica-bearing ultramafic rock; 3h, serpentinite, (a): after dunite; 3j, cross-fibre serpentine; 3k, banded, due to serpentine veinlets; 3m, chromite schlieren, veins, pods; 3n, pegmatitic.
Other intrusive rocks.
4, gabbro.
5, diorite.
6, porphyritic and fragmental dikes.
7, quartzo-feldspathic veins.
sedimentary layering (inclined).
schistosity (inclined, vertical).
igneous layering (inclined).
jointing (inclined, vertical).
drag fold, with plunge indicated.
outcrop (large, small).
geological boundary (defined).
" " (approximate).
" " (inferred).
pit
diamond drill hole.
Po pyrrhotite.
Pn pentlandite.
Cp chalcopyrite.
Mt magnetite.
cr chromite.
bulldozed road.
surveyed station.
Notes:
1. x 3a(b) denotes outcrop of dunite, with minor peridotite.
2. pyroxene in ultramafic rocks is exclusively clinopyroxene.
WATSON LAKE
LOWER POST
CASSIAR
DEASE LAKE
SURVEY AREA
0 100 200 400 600
Scale: 1" = 200'
FALCONBRIDGE NICKEL MINES LIMITED
PROPERTY: SOUTH GROUP M.C., HARD CREEK MINES LTD.
LOCATION: Turnagain River, Liard M.D., B.C.
TYPE OF MAP: GEOLOGICAL
WORKING PLACE: S. Group claims.
BASED ON: T. Clark & J. McDougall, P.Eng.
DATE OF WORK: Jul., Aug., Sep. '71 Additions Jul., 72
MAP REF. NO.: 145-71-2
FIG. NO.:
DRAWN BY: H.G.T.
DATE: July 1972
N.T.S. NO.: 104-I
To accompany geological report by J. McDougall, P.Eng., on the S.Group M.C., Turnagain River, Liard Mining Div., dated July 18, 1972.

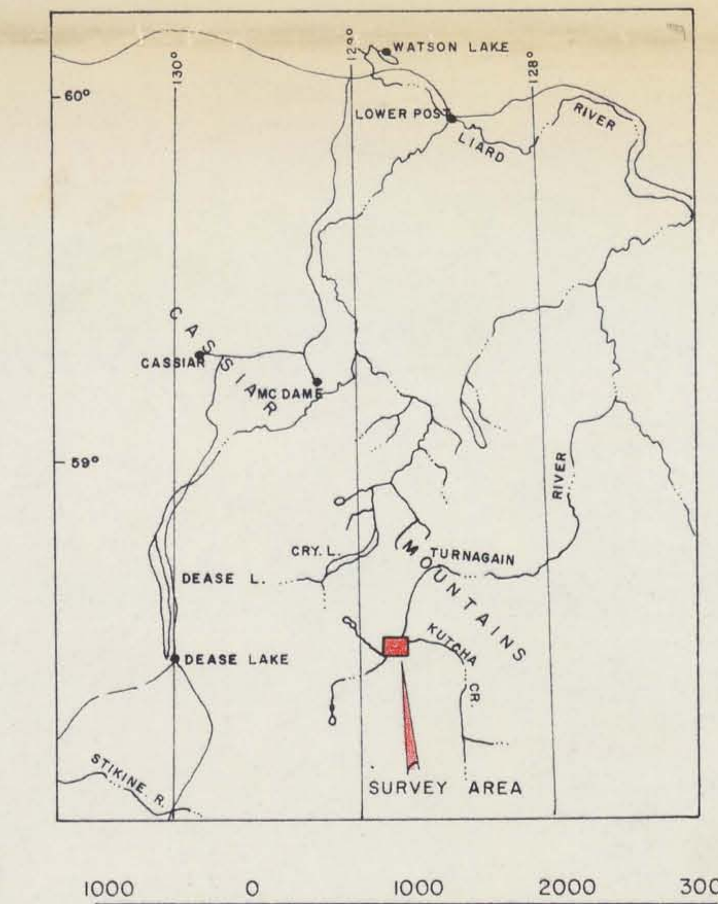
MAP REF. NO.:
N.T.S.:



3735 M-3

LEGEND

- 6 PYROXENE-RICH PERIDOTITE OLIVINE PYROXENE PEGMATITE
- 5 PERIDOTITE
- 4 DUNITE
- 3 INTERMEDIATE VOLCANICS PROBABLY A SILL
- 2 SHALE WITH SILTY LAMINATIONS HIGHLY CONTORTED POSSIBLY SLUMPED
- 1 SHALE BLACK SILTY LAMINATIONS NOT CONSPICUOUS
- LITHOLOGIC CONTACT
- LINEAMENT OR FAULT



1000 0 1000 2000 3000

SCALE: 1 INCH TO 1000 FEET

FALCONBRIDGE NICKEL MINES LIMITED

PROPERTY: TURNAGAIN NICKEL

LOCATION: TURNAGAIN RIVER B.C.

TYPE OF MAP: GEOLOGICAL

WORKING PLACE:

BASED ON: GEOLOGY BY T. CLARK

DATE OF WORK: JULY, AUG. 1971	MAP REF. NO.:	FIG. NO.:
DRAWN BY: G.T.	145-71-3	
DATE: OCTOBER 1971	N.T.S. NO.: 104-I-7	

To accompany geological report by J. Mc Dougall, P. Eng., on the S. Group M.C., Turnagain River, Liard Mining Div., dated July 18, 1972.

To accompany geological report by J. McDougall, P. Eng., on the S. Group M.C., Turnagain River, Liard Mining Div., dated July 18, 1972