

**NOVA SCOTIA DEPARTMENT OF NATURAL
RESOURCES, MINES AND ENERGY BRANCHES
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**Report on Geological Mapping, Mineral Inventory Studies
and Diamond Drilling Surveys at the Rifle Range and
Krumrine Quarries, Upper Leitches Creek, Cape Breton
County, Nova Scotia**

by
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**Honourable Donald R. Downe
Minister**

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ABSTRACT

A drilling and geological mapping program was undertaken by the Nova Scotia Department of Natural Resources in 1993 to evaluate two new mineral occurrences discovered by departmental staff during a regional mineral inventory survey conducted in 1992. The Rifle Range and Krumrine Quarries expose a complex mixture of skarn, marble and metasedimentary rocks of Precambrian age, Bras d'Or Gneiss (George River Group), and several intrusive phases of the Boisdale Hills Pluton.

Drillholes ULC 93-1 and ULC 93-2 were drilled in the Rifle Range aggregate Quarry, Upper Leitches Creek, Cape Breton County, to test an Fe-Cu-Bi-W-Co-Au occurrence, and drillholes ULC 93-3 and ULC 93-4 were drilled in the Krumrine aggregate Quarry, Upper Leitches Creek, Cape Breton County, to test a Cu-Ni occurrence.

The Fe-Cu-Bi-W-Co-Au mineralization exposed in the Rifle Range Quarry is restricted to the skarn and marble of the Bras d'Or Gneiss. The following three distinct styles of mineralization were observed in both outcrop exposures in the Quarry and in the drill core: (1) disseminated bismuthinite(?) and gold with associated pyrite, pyrrhotite and graphite in a white quartz vein in a sheared and brecciated tremolite skarn; (2) sporadic, disseminated bismuthinite(?), chalcopyrite, gold and scheelite associated with submassive patches of pyrrhotite in both tremolite and diopside/forsterite skarns; and (3) bismuthinite(?) and native gold associated with disseminated clots of forsterite or diopside in a light green to pink mixture of serpentine marble, hybrid granitic intrusive and

quartz vein in drillhole ULC 93-2. The best intersection was found in drillhole ULC 93-2 at a depth of 15.28-15.75 m. This zone returned values of 9.72 ppm Au and 2000 ppm Bi. The quartz vein returned values as high as 2.5 ppm Au and 1310 ppm Bi. Anomalous cobalt values were detected in the analysis of samples of the submassive pyrrhotite, but a cobalt mineral could not be identified in the samples examined.

Significant amounts of chalcopyrite and pyrrhotite were noted in samples of skarn and gabbro collected from the Krumrine Quarry in the 1992 mineral inventory survey. Anomalous nickel values were detected in the analysis of these samples. The drilling and geological mapping program undertaken by Nova Scotia Department of Natural Resources in 1993 determined that the mineralized zone in the Quarry is of limited areal extent. The mineralized gabbro-skarn zone exposed along the western wall of the Quarry averaged 4243 ppm Cu and 2153 ppm Ni (6 samples) across a width of 35 m. Drillhole ULC 93-3 did not intersect the mineralized skarn-gabbro units. The mineralized gabbro intersected between 4.53 and 9.97 m in drillhole ULC 93-4 averaged 4506 ppm Cu and 3880 ppm Ni.

There is a strong possibility that the two new types of mineralization identified in this study may be found in other areas within the Bras d'Or Gneiss (George River Group) of the Boisdale Hills, or in other belts of the George River Group which occur throughout Cape Breton Island.

ACKNOWLEDGMENTS

I thank E. Standing and H. Avery of the Nova Scotia Department of Natural Resources Drilling Division for drilling the four holes at Upper Leitches Creek, under adverse winter weather conditions. I also thank G. Podetz and W. Harding of the Coxheath Survey Division of the Nova Scotia Department of Natural

Resources, for an excellent job surveying in the drillholes. Finally, a sincere thank you to my assistants, J. MacIntosh and N. Purcell for their hard work and valuable assistance in mapping the Quarries and logging the drill core.

METALLIC MINERALS DATABASE

OCCURRENCE NUMBER: K01-32

Occurrence Name: Rifle Range Quarry
(Upper Leitches Creek)

Location

County: Cape Breton

Claim Map: 11K/01B **Tract:** 104 **Claim:** B

Easting: 700250 **Northing:** 5110344

Zone: 20

Longitude: 60°24'29" **Latitude:** 46°07'09"

Mineralization: Pyrrhotite, pyrite, chalcopyrite, bismuthinite, gold, scheelite

Commodity: Fe, Cu, Au, Bi, W, Co, Sn

Stratigraphic Unit: George River Group, Bras d'Or Gneiss and Boisdale Hills Pluton

Age: Hadrynian and Precambrian

Host Rock: Skarn, serpentine marble, hybrid granitic rocks

Status: The mineralization is exposed in outcrop in the Quarry and was intersected in both holes drilled by the Nova Scotia Department of Natural Resources in 1993 (ULC 93-1 and ULC 93-2).

Verification: The occurrence was located in the field by Nova Scotia Department of Natural Resources staff in 1992.

Surveys Performed: Geological, lithogeochemical

Descriptive Location: The occurrence is located in the aggregate Quarry located at the southern end of the Nova Scotia Department of Natural Resources Rifle Range at Upper Leitches Creek. The Quarry is located on the northern side of the Upper Leitches Creek Road, 4 km southwest of the junction of the Upper Leitches Creek Road and Route 223.

Geological Environment: The occurrence is located in a narrow band of rock composed primarily of marble, impure marble and calc-silicates with lesser amounts of pelitic, semipelitic and psammitic sedimentary rocks (Raeside, 1989). This band of rocks was formerly included in the George River Group (Milligan, 1970), but has recently been regrouped as part of the Bras d'Or Gneiss (Raeside,

1989). The rocks have been metamorphosed to upper amphibolite grade (Raeside, 1989).

The Bras d'Or Gneiss was intruded on the northern side by the Boisdale Hills Pluton (Barr and Setter, 1986). Barr and Setter (1986) divided the Pluton into seven units which grade from diorite to leucogranite. The Bras d'Or Gneiss, of the showing area, is mapped as occurring in contact with a biotite granodiorite phase of the Pluton (Barr and Setter, 1986).

Reference Description: Butt (1976): "Locality 1: This locality represents the best developed part of the pyrite halo in the rocks of the George River Series along the granite contact. The pyrite halo appears only in argillaceous and siliceous rocks. Other than pyrite, additional sulphides are sparse."

Field Description: Bismuth and gold were first detected in a lithogeochemical analysis of a mineralized quartz vein sample collected by G. DeMont in 1992. Two holes were drilled by the Nova Scotia Department of Natural Resources during the winter of 1993 (ULC 93-1 and ULC 93-2), to evaluate the extent and stratigraphic control of the mineralized quartz vein. The quarry was mapped and sampled in more detail by Department of Natural Resources staff during the 1993 field season.

Quarry Geology: The Quarry exposes a complex mixture of serpentine and dolomitic marble, tremolite and diopside-forsterite skarns, metasedimentary rocks, and multiple phases of intrusive rocks.

The intrusives have been grouped by this study under the Boisdale Hills Pluton, as defined by Barr and Setter (1986). There are four phases of intrusive rocks visible in the Quarry: (1) grey, medium grained diorite, (2) pink to white, medium grained, hybrid granitic rocks which contain numerous, dark green mafic inclusions, (3) dark green, fine grained, porphyritic diabase dyke, and (4) pink felsic dykes. The timing of these phases has not been clearly defined in this study, but field relationships tend to indicate that the ages run in the numerical order listed above, with the diorite being the oldest and the felsic dykes the youngest. Brittle faulting is developed at

the contacts between the diorite and the hybrid granitic rocks, and the contacts between the hybrid granitic rocks and the diabase dyke. The initial results of lithogeochemical analyses of samples of the various intrusive rocks indicate that the hybrid granitic rocks may be anomalous in Au (up to 436 ppb in sample K01-RR(09)). Subsequent to these initial results, more samples of the granitic rocks were collected for analyses. Results of the analyses of these samples (93K01-RR(29)-(36)) indicate that the hybrid granitic rocks are weakly anomalous in Au (up to 40 ppb).

The marble, skarn and metasedimentary rocks form part of the George River Group defined by Milligan (1970) (Bras d'Or Gneiss, Raeside, 1989). The following two types of skarn were recognized in hand specimens collected in the Quarry: (1) a skarn composed of prismatic crystals of tremolite or actinolite, and (2) dark green, cloudy, massive skarn composed primarily of rounded crystals of diopside and forsterite, with minor tremolite and antigorite. Both types of skarn contain disseminated to submassive pyrrhotite mineralization. The hybrid granitic rocks in the drill core contain patches of submassive pyrrhotite, but petrographic examination showed that these patches have been assimilated from the skarn because the pyrrhotite is always associated with remnant tremolite or diopside. The percentage of pyrrhotite in the skarn appears to be related to the intensity of shearing of the skarn.

Mineralization: The following three styles of Bi-Au mineralization were noted in the drill core and outcrop in the Quarry:

(1) The initial discovery was made in a white quartz vein located in outcrop, immediately north of the Upper Leitches Creek Road. The vein contains disseminated bismuthinite(?), pyrite, pyrrhotite and graphite. No visible gold could be identified in the hand specimens even though lithogeochemical analyses of the vein samples gave anomalous values for gold. The vein also contains an unidentified, powdery mineral which on fresh surface is grey, but on exposure to air, turns white and increases in volume, and on prolonged exposure turns sulphur yellow. This mineral is also found in shear zone-hosted veins located along the northwestern side of the main Quarry face (samples 93K01-RR(11) and (12)). The quartz vein was the target for drillhole ULC 93-2.

(2) Bismuthinite and native gold are associated with sporadic, disseminated, dark green clots of diopside or forsterite in a light green to pink mixture of serpentine marble, hybrid granitic intrusive, and quartz vein over an interval of 7.37-16.76 m, in drillhole ULC 93-2.

(3) Sporadic, disseminated bismuthinite, gold, chalcopyrite and scheelite(?) are associated with patches of disseminated to submassive pyrrhotite which has developed in the skarns. This mineralization is found both in outcrop and drill core. The zones of pyrrhotite are also geochemically anomalous in Sn and Co. The highest geochemical values for Au, Bi, W, Sn and Co are found in the zones of submassive pyrrhotite which occur in shear zones in the skarn (samples 93K01-RR(17), (20) and (29)).

Drilling: Drillhole ULC 93-1 was drilled in the bottom of the Quarry to test the stratigraphic extent of the skarns. The top 8.8 m were in skarn and marble which contained from 3-40% pyrrhotite, with minor disseminated chalcopyrite. The balance of the drillhole intersected a mixture of hybrid granitic rocks and diorite, with minor inclusions of marble and skarn. The hole was stopped at a depth of 37.8 m, because it was assumed that the target unit (skarn) had been assimilated by the intrusives.

Drillhole ULC 93-2 was drilled to obtain stratigraphic and mineral potential information on the mineralized quartz vein. The dip of the vein could not be determined in the initial sampling due to poor exposure. An assumption was made that the vein was vertically dipping, and thus, the drillhole should have intersected the vein. A portion of the outcrop slumped off over the winter, and an examination of the vein in 1993 determined that the dip of the vein is actually 65° SE. As a result the drillhole was stopped approximately 12 m short of the projected intersection with the vein. A mineralized vein was, however, intersected in this drillhole. Bismuthinite-gold mineralization, described under Mineralization, was intersected at a depth of 7.37-16.76 m. The mineralization is sporadic over this section, with the richest zone occurring at a depth of 15.28-15.75 m. This rich zone returned values of 9.72 ppm Au and 2000 ppm Bi.

The majority of the Bi-Au mineralization in the Quarry is associated with the skarn zones enriched in

pyrrhotite. It is interesting to note that the zone described above, which was intersected in drillhole ULC 93-2, was not associated with any pyrrhotite mineralization.

Samples:

- 92K01-RR(01): Mineralized quartz vein, disseminated bismuthinite, pyrite, pyrrhotite and graphite
 92K01-RR(02): Sample of skarn from a mineralized shear zone taken from the northwestern wall of the Quarry
 92K01-RR(03): Skarn sample taken below sample (02)
 92K01-RR(04): Dolomitic marble; minor disseminated pyrite and pyrrhotite
 93K01-RR(04): Sheared diorite and granitic dyke; minor disseminated pyrite
 93K01-RR(05): Brecciated, felsic (rhyolite) dyke; minor hematite and limonite along fracture planes
 93K01-RR(06): Hybrid granitic rock
 93K01-RR(07): Diopside-forsterite skarn
 93K01-RR(08): Diopside-forsterite; 3-5% disseminated pyrite and pyrrhotite
 93K01-RR(09): Hybrid granitic rocks with numerous mafic inclusions; minor disseminated pyrite, and rare chalcopyrite, primarily in the mafic inclusions
 93K01-RR(10): Forsterite-diopside skarn and diorite; 3-5% disseminated pyrrhotite
 93K01-RR(11): Mineralized shear zone in skarn; contains the unidentified powdery grey mineral described above
 93K01-RR(12): Tremolite skarn
 93K01-RR(13): Tremolite skarn
 93K01-RR(14): Skarn
 93K01-RR(15): Dolomitic marble; light brown, sandy textured weathered surface; minor patches of light green diopside(?); 1-3% disseminated pyrite, pyrrhotite and magnetite
 93K01-RR(16): Grey diorite
 93K01-RR(17): Massive pyrrhotite with minor chalcopyrite and bornite(?) in a shear zone in a tremolite skarn; the shear zone is developed along the contact between the skarn and grey diorite
 93K01-RR(18): Contact between grey diorite and pink hybrid granitic rocks; minor disseminated pyrite and magnetite
 93K01-RR(19): Brecciated mixture of grey diorite and tremolite skarn; 1-3% disseminated pyrite, pyrrhotite and magnetite
 93K01-RR(20): Massive pyrrhotite with minor chalcopyrite and bornite(?) in tremolite skarn, from an extension of the shear zone of sample (17)
 93K01-RR(21): Dark green, porphyritic diabase
 93K01-RR(22): Hybrid granitic rock
 93K01-RR(23): White dolomitic marble; minor disseminated pyrrhotite
 93K01-RR(24): Hybrid granitic rock with numerous mafic inclusions
 93K01-RR(25): Brecciated skarn; gossan developed on the weathered surface; minor disseminated graphite
 93K01-RR(26): Mineralized, white quartz vein; disseminated graphite(?), bismuthinite(?), pyrite and pyrrhotite
 93K01-RR(27): Serpentine-rich, dolomitic marble; 1-2% disseminated pyrrhotite
 93K01-RR(28): Skarn
 93K01-RR(29): Tremolite skarn with submassive pyrrhotite
 93K01-RR(30)-(36): Hybrid granitic rocks with numerous mafic inclusions

ASSAY DATA:**Nova Scotia Department of Natural Resources, 1992****Bondar Clegg Au + 29**

Samples K01-RR		(01)	(02)	(03)	(04)
Elements	Units				
Au	ppb	1683	11	10	<5
Al	pct	1.03	0.08	1.26	1.20
Fe	pct	2.78	2.03	8.82	2.85
Mn	ppm	128	38	197	631
Mg	pct	0.46	0.44	1.48	8.79
Ca	pct	1.00	0.33	0.69	>10.00
Na	pct	0.07	0.05	0.09	0.06
K	pct	0.05	0.03	0.09	0.02
Sc	ppm	<5	<5	<5	<5
V	ppm	17	8	19	5
Cr	ppm	70	10	16	22
Co	ppm	16	7	85	18
Ni	ppm	23	11	96	17
Cu	ppm	143	212	344	35
As	ppm	<5	<5	11	7
Sr	ppm	3	<1	5	60
Y	ppm	1	<1	3	5
Mo	ppm	2	<1	3	<1
Ag	ppm	0.6	0.5	1.4	<0.2
Cd	ppm	1.0	0.7	1.4	<0.2
Sn	ppm	<20	<20	<20	<20
Sb	ppm	<5	<5	<5	<5
Te	ppm	<10	<10	<10	<10
Ba	ppm	4	2	5	4
La	ppm	2	<1	5	6
W	ppm	<20	<20	<20	<20
Pb	ppm	15	12	11	2
Bi	ppm	312	<5	<5	<5
Zn	ppm	15	20	39	21
Hg	ppb	<5	<5	6	<5

**Nova Scotia Department of Natural Resources, 1993
 Technical University of Nova Scotia Atomic Absorption**

Elements Samples	Cu (ppm)	Ni (ppm)	Bi (ppm)	Au (ppm)
K01-RR				
(04)	31	12	<10	<0.004
(05)	7	4	<10	<0.004
(06)	8	6	<10	<0.004
(07)	100	70	<10	<0.004
(08)	50	29	<10	0.004
(09)	25	8	<10	0.436
(10)	131	51	<10	0.011
(11)	362	106	<10	0.057
(12)	89	8	<10	0.007
(13)	57	44	<10	<0.004
(14)	15	5	<10	0.015
(15)	18	4	<10	<0.004
(16)	33	10	<10	<0.004
(17)	693	49	98	1.200
(19)	81	44	<10	0.007
(20)	649	70	<10	0.095
(21)	77	24	<10	<0.004
(23)	10	6	<10	<0.004
(24)	10	3	<10	0.160
(25)	250	10	17	0.036
(26)	135	16	1310	2.510
(27)	24	9	<10	0.011
(29)				<0.004
(31)				0.015
(32)				0.029
(33)				0.011
(34)				0.040
(35)				0.040
(36)				0.011

REFERENCE INFORMATION:

Map References:

NTS 11K/01 Sydney, 1:50 000.

Hill, J. R., 1987: Geological map; *in* Geological Survey of Canada, Open File Report 1597, Map 1-2, Scale 1:10 000.

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Updated by:

Field checked by: G. J. DeMont and T. Allen, 1992;
G. J. DeMont and J. MacIntosh, 1993

METALLIC MINERALS DATABASE OCCURRENCE NUMBER: K01-33

Occurrence Name: Krumrine Quarry
(Upper Leitches Creek)

Location

County: Cape Breton

Claim Map: 11K/01B **Tract:** 104 **Claim:** D and E

Easting: 699860 **Northing:** 5109790

Zone: 20

Longitude: 60°24'51" **Latitude:** 46°06'49"

Mineralization: Pyrrhotite, chalcopyrite, pentlandite

Commodity: Cu, Ni, Fe

Stratigraphic Unit: George River Group, Bras d'Or Gneiss and Boisdale Hills Pluton

Age: Hadrynian and Precambrian

Host Rock: Gabbro, skarn, hybrid granitic rocks

Status: The mineralization is exposed in outcrop in the Quarry and was intersected in drillhole ULC 93-4, drilled by the Nova Scotia Department of Natural Resources in 1993.

Verification: The copper mineralization was first noted by Butt (1976). This mineralization was confirmed by Department of Natural Resources staff in 1992, and nickel mineralization was discovered at that time.

Surveys Performed: Geological, stream sediment geochemical, lithochemical

Descriptive Location: The occurrence is exposed in an aggregate quarry which is located immediately northwest of the junction of the Upper Leitches Creek Road and the Gouthro Road.

Geological Environment: The occurrence is located in a narrow band of rock composed primarily of marble, impure marble and calc-silicates with lesser amounts of pelitic, semipelitic and psammitic sedimentary rocks (Raeside, 1989). This band of rocks was formerly included in the George River Group (Milligan, 1970), but has recently been regrouped as part of the Bras d'Or Gneiss (Raeside, 1989). The rocks have been metamorphosed to upper amphibolite grade (Raeside, 1989).

The Bras d'Or Gneiss was intruded on the northern side by the Boisdale Hills Pluton (Barr and Setter, 1986). Barr and Setter (1986) divided the Pluton into seven units which grade from diorite to leucogranite. The Bras d'Or Gneiss, of the showing area, is mapped as occurring in contact with a biotite granodiorite phase of the Pluton (Barr and Setter, 1986).

Reference Description: Butt (1976): "Locality 2: The area outlined contains amphibolites, dioritic rocks, coarsely crystalline marbles and metasilstones. Both amphibolite and dioritic rocks have disseminated pyrite, pyrrhotite and chalcopyrite.

Field Description: Samples of gabbro and skarn collected in the Quarry by Department of Natural Resources staff in 1992 contained significant amounts of chalcopyrite and pyrrhotite. Analyses of these gave anomalous values for Cu and Ni. Two holes were drilled on the occurrence during the winter of 1993 (ULC 93-3 and ULC 93-4) to evaluate the extent of the mineralized gabbro. The Quarry was mapped and sampled in more detail during the 1993 field season.

Quarry Geology: The Quarry exposes a complex mixture of skarn, marble, metasedimentary rocks, and multiple phases of intrusive rocks.

The intrusives have been grouped by this study, under the Boisdale Hills Pluton, as defined by Barr and Setter (1986). There are four phases of intrusive rocks visible in the Quarry: (1) dark green, medium grained gabbro, (2) pink to greenish-white, medium grained, granitic rocks, (3) grey, medium grained diorite, and (4) pink, felsic dykes and quartz veins.

The granitic rocks intruded the gabbro both as dykes, and a diapiric intrusive body which is exposed at the northwestern corner of the Quarry. The gabbro has a distinct orangish-black, iron stained, weathered surface in the area above the diapiric intrusive contact. The gabbro, located southwest of the skarn and diapiric contact, does not exhibit this iron stained weathered surface, even though the sulphide concentrations of the gabbro are similar in both locations.

The relationship between the diorite and the gabbro could not be determined in the outcrop exposures, because the diorite and the gabbro exposed in the Quarry wall are cut by numerous vertical shear zones which complicate the contact between the two units. The diorite in the drill core is intermixed with the gabbro, which tends to suggest that it may be either an alteration of the gabbro, or a younger intrusive. The sulphide concentrations drop dramatically when passing from the gabbro into the diorite. The diorite in the drill core contains inclusions of the skarn, indicating that the diorite intruded this unit. The only contact observed between the gabbro and skarn is a faulted contact exposed in the quarry wall.

The diorite and gabbro are both cut by granitic dykes. Minor felsic dykes and quartz veins are developed in shear zones in all of the intrusive rocks described above.

The marble, skarn, amphibolites and metasedimentary rocks form part of the George River Group defined by Milligan (1970) (Bras d'Or Gneiss, Raeside, 1989). A block of mineralized skarn is exposed in the southeastern wall of the Quarry. The skarn is bounded on its eastern and western sides by the gabbro unit described above. A 1-2 m wide, vertical shear zone defines the eastern contact of the skarn and the gabbro, and a less distinct 20-30 cm wide shear zone defines the western contact.

The following two distinct zones are developed in the skarn unit: (1) a 1-2 m wide, green, malachite-rich zone (zone 1) is developed along the western contact with the gabbro, and (2) a 3-4 m wide, reddish-orange, gossaniferous zone is developed on the eastern side of zone 1. The reddish-orange zone is truncated on the eastern side by the vertical shear zone and gabbro described above.

A mixture of grey and greenish-grey metasedimentary rocks, amphibolites, grey diorite, and pinkish-white granitic rocks are exposed along both the eastern half of the southern wall and the eastern wall of the Quarry. The western contact of the amphibolite/metasedimentary rocks and the main diorite body is defined by a vertical shear zone. Several zones composed primarily of white to translucent quartz, with lesser amounts of sericite/muscovite and saussuritized feldspar are also exposed in these Quarry walls. The light green,

disseminated sericite-muscovite and altered feldspars give a banded or bedded appearance to the quartz. Some of the quartz-rich zones show obvious brecciation, and the quartz in both of the samples examined in thin section (93K01-NI(20) and (21)) show undulose extinction, with some crystals exhibiting a grain size reduction attributable to shearing. The genesis of these quartz-rich zones was not determined in this study. The quartz zones contain <0.5% disseminated chalcopyrite.

Mineralization: The Cu-Ni mineralization is found primarily in the gabbro and skarn, with lesser amounts in sheared granitic rocks and grey diorite. The gabbro and skarn contain 1-5% disseminated chalcopyrite and pyrrhotite. The nickel sulphide was not positively identified in this study, but it appears to be pentlandite. The pyrrhotite, pentlandite and chalcopyrite are blended together in complex, disseminated aggregates in both the gabbro and skarn. The larger patches of malachite appear to be restricted to the skarn. Minor amounts of chalcopyrite, pyrrhotite and malachite mineralization are found along fracture planes in the sheared granitic intrusives, in close proximity to the gabbro contact.

The mineralized gabbro and skarn exposed in the western half of the southern wall of the Quarry, contain an average of 4243 ppm Cu and 2153 ppm Ni (6 samples) over a width of 35 m. The limits of the mineralized gabbro and skarn are open in western, eastern and vertical directions. Drillhole ULC 93-3 did not intersect the mineralized gabbro and skarn, so the southern limits appear to be defined by the contacts exposed in the southern wall of the Quarry. A small block of mineralized gabbro is exposed along the northern wall of the Quarry, so there is some potential for an eastern extension, but there is not much gabbro exposed in the Quarry floor in this direction. The main granodiorite body of the Boisdale Hills Pluton is exposed in sporadic outcrops along the brook which runs along the northern side of the Quarry. It would appear that this granodiorite body would define the northern limits of the mineralized skarn and gabbro. The showing is open in a westward direction, but the rubbly subcrops exposed in the bulldozed area to the west of drillhole ULC 93-4 indicate that pink granitic rocks are becoming the dominant rock type in this direction.

Drilling: Drillholes ULC 93-3 and ULC 93-4 were drilled to determine the extent of the mineralized gabbro and skarn.

Drillhole ULC 93-3 intersected a mixture of grey diorite, skarn and metasedimentary rocks, with minor granitic dyking. A 2.3 m wide granite dyke(?) intersected at a depth of 34.3-36.69 m may be an extension of the diapiric intrusive body described above (see Quarry Geology). Only minor disseminated pyrite and pyrrhotite were noted in this drillhole.

Drillhole ULC 93-4 intersected a mixture of gabbro, diorite, skarn and pink to pinkish-green

granitic dykes. A 2.5 m wide granitic dyke(?), intersected from 41.27-43.78 m, may be an extension of the diapiric intrusive body described above. This dyke(?) is also presumed to be the same granitic dyke(?) intersected in drillhole ULC 93-3. The Cu-Ni mineralization is concentrated in the top 10 m of the drillhole. Analyses of the gabbro intersected between 4.53 m and 9.97 m averaged 4506 ppm Cu and 3880 ppm Ni. The Cu-Ni values dropped significantly below a depth of 10 m, as the gabbro either phased into an unmineralized diorite, or was intruded by the diorite. The skarn or marble inclusions in the diorite contain only minor disseminated pyrite and pyrrhotite.

Samples for 1992:

- K01-TA(01): Dark green gabbro; 3-5% disseminated pyrrhotite and chalcopyrite
 K01-TA(02): Green skarn; 3-5% disseminated pyrrhotite and chalcopyrite; malachite is developed on the weathered surface
 K01-TA(03): Pink granitic rock; 1-3% pyrrhotite with minor chalcopyrite occur as fracture fillings and disseminations in close proximity to the gabbro contact

Samples for 1993:

- K01-NI(01): Generally light green to greenish white, with the odd dark green patch; tremolite-diopside skarn and/or serpentine alteration of a diopside-forsterite skarn; <1% disseminated chalcopyrite
 K01-NI(02): Pinkish-white, medium grained, granitic intrusive; minor disseminated pyrite and chalcopyrite along fracture planes.
 K01-NI(03): Pinkish-white, medium grained, granitic rock; numerous zoned plagioclase with sericitized or saussuritized cores
 K01-NI(04): Gossaniferous, brecciated gabbro; 1-2% disseminated pyrrhotite in the breccia clasts and minor chalcopyrite along fractures
 K01-NI(05): Pink, sheared, granitic intrusive; light green patches of epidote(?) alteration in sheared areas of the outcrop; minor malachite and chalcopyrite developed along fracture surfaces
 K01-NI(06): Dark green gabbro; 1-2% disseminated mixture of chalcopyrite and pyrrhotite
 K01-NI(07): Dark green gabbro; 3-5% disseminated chalcopyrite and pyrrhotite
 K01-NI(08): Pink granitic dyke with patches of dark green chlorite alteration; strong sericite or saussurite alteration of the plagioclase feldspars
 K01-NI(09): Dark green gabbro; 2-3% disseminated chalcopyrite and pyrrhotite
 K01-NI(10): Greenish-grey, tremolite skarn; carbonate alteration; dark green patches of chlorite; sporadic patches of 2-3% disseminated malachite and chalcopyrite
 K01-NI(11): Reddish-orange gossan developed in a skarn
 K01-NI(12): Greenish-grey, brecciated amphibolite and quartz vein taken from a 10-15 cm wide shear zone; 5-10% pyrite and pyrrhotite as disseminations and fracture filling veinlets
 K01-NI(13): Dark green gabbro; 3-5% disseminated chalcopyrite and pyrrhotite
 K01-NI(14): Pinkish-white, granitic rock; no visible sulphides
 K01-NI(15): Dark green, medium grained gabbro; 1-2% disseminated aggregates of pyrrhotite and chalcopyrite
 K01-NI(16): Dark green, medium grained gabbro; 2-3% disseminated chalcopyrite and pyrrhotite
 K01-NI(17): Biotite-rich, medium grained diorite; no visible sulphides

K01-NI(18):	Dark green amphibolite
K01-NI(19):	Dark green amphibolite and pinkish-green, granitic dyke
K01-NI(20):	White quartz vein or altered dyke; light green patches give a banded appearance to the rock; the light green patches are saussuritized feldspar; <1% disseminated chalcopyrite
K01-NI(21):	Same as (20), but the rock is brecciated; <1% disseminated chalcopyrite
K01-NI(22):	Grey, brecciated metasedimentary rock(?)

ASSAY DATA:

Nova Scotia Department of Natural Resources, 1992

Bondar Clegg Au + 29

Samples	K01-TA	(01)	(02)	(03)
Elements	Units			
Au	ppb	35	25	8
Al	pct	3.57	4.93	0.83
Fe	pct	5.91	6.96	1.36
Mn	ppm	347	1390	184
Mg	pct	1.95	6.70	0.49
Ca	pct	1.84	2.56	0.15
Na	pct	0.34	0.10	0.10
K	pct	0.09	0.19	0.17
Sc	ppm	<5	7	<5
V	ppm	26	72	10
Cr	ppm	115	487	19
Co	ppm	168	109	41
Ni	ppm	3067	1692	2328
Cu	ppm	2910	3982	937
As	ppm	7	17	<5
Sr	ppm	104	21	3
Y	ppm	2	6	8
Mo	ppm	<1	<1	<1
Ag	ppm	1.2	1.0	0.4
Cd	ppm	1.9	<0.2	<0.2
Sn	ppm	<20	<20	<20
Sb	ppm	<5	<5	5
Te	ppm	<10	<10	<10
Ba	ppm	17	20	18
La	ppm	4	7	6
W	ppm	<20	<20	<20
Pb	ppm	18	9	9
Bi	ppm	<5	<5	<5
Zn	ppm	132	150	20
Hg	ppb	<5	<5	<5

Nova Scotia Department of Natural Resources, 1993

Bondar Clegg Au + 29

Samples K01-NI		(17)	(20)
Elements	Units		
Au	ppb	<5	<5
Ag	ppm	<0.2	<0.2
Pb	ppm	21	16
Zn	ppm	90	32
Fe	pct	3.36	0.76
Ba	ppm	128	15
Sn	ppm	<20	<20
Al	pct	2.01	0.45
Na	pct	0.14	0.07
Mn	ppm	505	87
Mg	pct	1.07	0.14
K	pct	0.15	0.08
Sc	ppm	9	<5
V	ppm	52	2
Cr	ppm	26	27
Ni	ppm	13	7
Mo	ppm	2	4
Cd	ppm	<0.2	<0.2
Sb	ppm	<5	7
W	ppm	<20	<20
Ca	pct	0.95	0.70
Cu	ppm	11	20
Co	ppm	11	2
As	ppm	<5	<5
Bi	ppm	<5	<5
Te	ppm	<10	<10
La	ppm	17	3
Sr	ppm	19	2
Y	ppm	16	2
Hg	ppb	<5	<5

**Nova Scotia Department of Natural Resources, 1993
 Technical University of Nova Scotia Atomic Absorption**

Elements Samples	Cu (ppm)	Ni (ppm)	Bi (ppm)	Au (ppm)
K01-NI				
(01)	57	36	<10	0.016
(03)	135	89	<10	0.050
(04)	2440	1180	<10	0.043
(05)	607	958	<10	0.018
(06)	1980	1200	<10	0.048
(07)	2050	1230	<10	0.011
(08)	63	50	<10	<0.004
(10)	1600	800	<10	0.007
(11)	8560	2200	<10	0.174
(12)	556	137	<10	0.007
(13)	4660	3320	<10	0.025
(15)	3810	1570	<10	0.080
(16)	2800	3400	<10	0.044

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Compiled by: G. J. DeMont, January 1994

Updated by:

Field checked by: G. J. DeMont and T. Allen, 1992;
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APPENDIX 1.
NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES
DIAMOND DRILL RECORDS ULC 93-1 TO ULC 93-4,
UPPER LEITCHES CREEK, CAPE BRETON COUNTY

**NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES
DIAMOND DRILL RECORD 1993
UPPER LEITCHES CREEK, CAPE BRETON COUNTY**

Hole number:	ULC 93-1	Elevation:	150.473 m
Location:	Rifle Range Quarry, Upper Leitches Creek, Cape Breton County	Azimuth:	100°
		Dip:	-45°
Longitude:	60° 24' 30"	Proposed depth:	37.8 m
6° UTM:	E 700250.79	Ultimate depth:	37.8 m
Latitude:	46° 07' 09.29"	Drilled by:	Nova Scotia Department of Natural Resources
6° UTM:	N 5110344.11	Geologist:	G. J. DeMont
Datum:	Mean sea level		

Depth m (ft)	Description
0-8.8 (0-28.86)	<p>Grey to greenish-grey marble and calc-silicate skarn; minor, thin, shear zones are enriched in dark green to black chlorite; minor dyking of pinkish-white, hybrid granitic intrusive; the marble and calc-silicate skarn contain 3-40% pyrrhotite as disseminations, irregular patches and submassive layers; the pyrrhotite-rich layers cut the core at approximately 70° to the core axis; minor, thin, 1-2 mm, pyrite veinlets cut the pyrrhotite; rare blebs of chalcopyrite are found as disseminations in the pyrrhotite.</p> <p>4.46-4.95 m (14.64-16.25 ft): dark green, chloritic, sheared marble; ground and broken core; probable fault</p> <p>5.49-6.00 m (18.01-19.67 ft): 50-50 mixture of greenish-grey marble or skarn and pink to white, hybrid granitic dyking; the dyke material varies in composition from a mix of pink K-feldspar and quartz to a white mixture of plagioclase and quartz</p> <p>5.49-8.8 m (19.67-28.86 ft): massive, greenish-grey, calc-silicate skarn and marble; small broken zones</p> <p style="padding-left: 2em;">7.25-8.8 m: pyrrhotite rich, 3-40%, with highest concentrations in the last 0.46 m of the zone.</p>
8.8-37.8 (28.86-124)	<p>A mixture of pink to white, hybrid granitic intrusive and grey, medium grained diorite with inclusions of greenish-grey to grey marble and calc-silicate skarn.</p> <p>8.8-9.75 m (28.86-32 ft): a mixture of greenish-grey skarn or marble and pink, hybrid granitic dyke material; the integral mixture of the K-feldspar-rich dyke and the marble gives a pink, mottled appearance to the marble; the marble or skarn contains minor patches of pyrrhotite</p> <p>9.75-12.51 m (32-41.05 ft): pink, hybrid granitic dyke; contains a zone of light green sericite or saussurite alteration</p> <p style="padding-left: 2em;">9.75-9.85 m: pink quartz(?)</p> <p style="padding-left: 2em;">10.11-10.31 m: brecciated zone cemented with white calcite</p> <p style="padding-left: 2em;">10.31-11.34 m: shear zone</p> <p style="padding-left: 2em;">11.34-12.32 m: light green zone of sericite or saussurite alteration</p> <p style="padding-left: 2em;">12.34-12.51 m: mixture of pink K-feldspar and white quartz</p> <p>12.51-17.9 m (41.05-58.74 ft): pink to grey mixture of granitic or dioritic intrusive with minor, dark green, mafic inclusions</p> <p style="padding-left: 2em;">16.7-17.9 m: fractured zone</p> <p>17.9-20.09 m (58.74-65.92 ft): grey, medium grained diorite with pink to white, hybrid granitic dykes and associated patches of white quartz</p>

Depth m (ft)	Description
20.09-21.03 m (65.92-69 ft):	grey, medium grained diorite (older?); minor, disseminated pyrite is found in white, 1-3 mm, quartz veinlets which have developed along fracture planes in the diorite
21.03-24.31 m (69-79.75 ft):	pink to grey, hybrid granitic intrusive with grey, mafic inclusions; the grey areas appear to be assimilated diorite in a primarily pink granitic intrusive
24.31-35.73 m (79.75-117.23 ft):	mainly grey, medium grained diorite with numerous inclusions of marble and minor pink to white, hybrid granitic dykes; the granitic dykes intruded both the marble and the diorite at an angle of approximately 45° to the core axis (clearly defined intrusive contacts)
25.13-25.39 m:	granitic dyke with a distinct intrusive contact with the diorite
26.10-26.75 m:	dark green skarn(?) inclusion in the diorite
26.75-31.38 m:	mixture of grey diorite and marble with minor granitic dykes (difficult to distinguish between the marble and the diorite); minor patches of pyrite or pyrrhotite (<1%)
30.6-30.88 m:	white to pink, hybrid granitic dyke intruded a grey marble inclusion in the diorite
31.38-33.28 m:	massive, medium grained diorite
33.28-35.73 m:	mainly greenish-grey marble or skarn with minor diorite
35.73-37.8 m (117.23-124 ft):	mainly pink to greyish-white, hybrid granitic intrusive with quartz veins and inclusions of grey diorite
36.41-36.98 m:	grey diorite inclusion
37.8 (124)	End of Hole

ULC 93-1

Footage Drilled	Footage in Core Box
0 - 12 ft	6 ft 3 in
12 - 22 ft	11 ft 5 in
22 - 32 ft	9 ft 9 in
32 - 42 ft	10 ft 11 in
42 - 52 ft	12 ft 3 in
52 - 62 ft	10 ft 9 in
62 - 72 ft	11 ft 11 in
72 - 82 ft	10 ft 1 in
82 - 92 ft	11 ft
92 - 102 ft	10 ft 9 in
102 - 112 ft	10 ft 5 in
112 - 122 ft	10 ft 7 in
122 - 124 ft	2 ft

ULC 93-1 Samples

Sample	Interval m (ft)	Elements (ppm)				
		Au	Cu	Bi	Co	W
(01)	3.36-3.86 (11.04-12.66)	Petrographic analyses				
(02)	1.41-1.56 (4.64-5.12)	Petrographic analyses				
(03)	2.63-2.93 (8.64-9.6)	Petrographic analyses				
(04)	4.28-4.42 (14.05-14.49)	Petrographic analyses				
(05)	4.69-4.75 (15.37-15.59)	Petrographic analyses				
(06)	4.98-5.04 (16.33-16.55)	Petrographic analyses				
(07)	25.11-25.27 (82.38-82.91)	Petrographic analyses				
(08)	7.36-7.39 (24.15-24.23)	Petrographic analyses				
(09)	6.34-6.47 (20.8-21.24)	Petrographic analyses				
(10)	5.42-5.51 (17.79-18.09)	Petrographic analyses				
(11)	8.33-8.41 (27.32-27.58)	<0.004	365	3	70	6
(12)	8.41-8.69 (27.58-28.52)	Petrographic analyses				
(13)	26.61-26.73 (87.31-87.69)	Petrographic analyses				
(14)	35.08-35.22 (115.1-115.57)	Petrographic analyses				

Hole number:	ULC 93-2	Elevation:	153.310 m
Location:	Rifle Range Quarry, Upper Leitches Creek, Cape Breton County	Azimuth:	113°
Longitude:	60° 24' 28"	Dip:	-45°
6° UTM:	E 700288.65	Proposed depth:	40.54 m
Latitude:	46° 07' 09.43"	Ultimate depth:	40.54 m
6° UTM:	N 5110349.92	Drilled by:	Nova Scotia Department of Natural Resources
Datum:	Mean sea level	Geologist:	G. J. DeMont

Depth m (ft)	Description
0-7.37 (0-24.2)	Grey, coarse- to fine-grained marble and skarn with minor pink, hybrid, granite dykes. Small zones of ground and broken core may be indicative of brittle shearing. 0-1.68 m (0-5.52 ft): coarse grained, grey marble 1.68-1.88 m (5.52-6.16 ft): pink granitic dyke 3.25-3.44 m (10.65-11.29 ft): pink granitic dyke 3.79-4.16 m (12.45-13.64 ft): pink granitic dyke and quartz vein 4.58-4.74 m (15.02-15.56 ft): ground and broken core 5.37-5.69 m (17.68-18.65 ft): ground core
7.37-16.76 (24.2-55.0)	Mixture of pink to white, hybrid granitic intrusive, light green serpentine marble, and quartz vein; the unit becomes increasingly quartz rich in a downhole direction, with the lower 1 m being composed of white quartz with minor green chlorite. The intrusive contains minor clasts of pyrrhotite-rich skarn. 11.68-12.42 m (38.3-40.76 ft): mixture of granitic intrusive, light green serpentine marble and pink quartz; contains a disseminated, grey, Bi-sulphide (<0.5%) set in dark clots of diopside-forsterite skarn 12.42-12.75 m (40.76-41.82 ft): submassive pyrrhotite and marble inclusion

Depth m (ft)	Description
	12.75-13.12 m (41.82-43.04 ft): submassive pyrrhotite and skarn inclusion with minor disseminated grey Bi-sulphide (<0.5%)
	13.12-14.76 m (43.04-48.44 ft): pink intrusive; more felsic than upper portion; <0.5% disseminated, grey Bi-sulphide
	14.76-14.92 m (48.44-48.95 ft): white quartz vein
	14.92-15.75 m (48.95-51.67 ft): pink to light green granitic intrusive (<1% mafic minerals) intermixed with serpentine marble; contains 1-2% disseminated, grey Bi-sulphide set in dark green clots of diopside-forsterite skarn
	15.75-16.76 m (51.67-55.0 ft): white quartz vein with disseminated green chlorite(?); <0.5% disseminated, grey Bi-sulphide in upper 15 cm; bottom 15 cm is a mixture of quartz, pink granitic intrusive and grey marble.
16.76-24.4 (55.0-80.28)	Grey marble; limited banding; contains light green calc-silicate-rich zones; minor pink granitic dykes near the base of the unit; occasional green serpentine(?) veinlets. 17.25-17.73 m (56.6-58.2 ft): broken core; limonite gossan stain on fracture surfaces 24.0-24.16 m (78.78-79.25 ft): pink granitic dyke
24.4-27.3 (80.28-89.55)	Pink to grey, hybrid granitic intrusive with minor grey, mafic inclusions and greenish-grey marble (similar to the unit seen in outcrop 93-K01-RR(09)). Greenish-grey marble inclusions are more abundant in the last metre of this unit. 26.48-26.7 m (86.88-87.6 ft): light green skarn or marble inclusion 27.02-27.24 m (88.66-89.39 ft): light green skarn or marble inclusion
27.3-30.14 (89.55-98.9)	A mixture of grey banded marble and light greenish-grey skarn, with minor pinkish-white, hybrid granitic dyking 27.66-28.09 m (90.76-92.16 ft): pinkish-white, hybrid granitic intrusive; the upper contact with the green calc-silicate marble is sharp, but the lower contact is marked by an irregular gossaniferous zone
30.14-32.26 (98.9-105.84)	Grey, medium grained, hybrid intrusive; this zone appears to be a grey diorite which contains small patches which are enriched in pink K-feldspar; contains minor dark grey, mafic inclusions
32.26-33.89 (105.84-111.13)	Greenish-grey, calc-silicate marble or skarn; the upper 38 cm is broken, and contains patches of limonite gossan; this zone contains minor disseminated pyrrhotite. Note: core was probably lost in this section.
33.89-35.9 (111.13-117.78)	Grey to greyish-white, hybrid granitic(?) dyke with light green calc-silicate-rich marble and dark-grey, mafic inclusions. 34.59-34.81 m (113.49-114.21 ft): dark grey, mafic inclusion 35.13-35.6 m (115.26-116.8 ft): light green calc-silicate-rich marble or skarn; the inclusion is enclosed in a 2.5-3 cm white halo.
35.9-40.54 (117.78-133)	Dark grey metagabbro or metasedimentary rocks with white, hybrid granitic intrusive dyking, and pink granitic veinlets. The metagabbro or metasedimentary rocks contain 1-3% disseminated pyrrhotite, and one of the white hybrid dykes contains a 10-12 cm patch of 3-5% pyrrhotite enclosed in minor, dark green diopside-forsterite skarn. The pyrrhotite in this dyke contains rare specks of the bismuth sulphide and chalcopyrite. The white, hybrid granitic(?) dyking is more prominent in the top 0.75-0.9 m of this zone.
40.54 (133)	End of Hole

ULC 93-2**Footage Drilled Footage in Core Box**

0 - 13 ft	8 ft 5 in
13 - 23 ft	10 ft 4 in
23 - 33 ft	8 ft 10 in
33 - 43 ft	10 ft 3 in
43 - 53 ft	9 ft 9 in
53 - 63 ft	9 ft
63 - 73 ft	9 ft 1 in
73 - 83 ft	10 ft 7 in
83 - 93 ft	10 ft 4 in
93 - 103 ft	8 ft 9 in
103 - 113 ft	8 ft 2 in
113 - 123 ft	10 ft 4 in
123 - 133 ft	6 ft 4 in

ULC 93-2 Samples and Results

Sample	Interval m (ft)	Elements (ppm)							
		Cu	Pb	Zn	Bi	Ni	As	Ag	Au
(01)	37.49-38.1 (123-125)	68	13	200	-	46	3	-	0.004
(02)	38.1-39.2 (125-128.75)	26	13	260	-	56	2	-	0.004
(03)	36.48-37.49 (123-125)	41	16	141	-	44	1	-	0.021
(04)	15.28-15.75 (50.14-51.67)	11	190	28	2000	4	9	4	9.720
(05)	14.04-14.51 (46.06-47.59)	29	10	73	57	3	143	-	0.120
(06)	11.68-12.42 (38.3-40.76)	69	-	-	< 10	-	-	-	0.015
(07)	12.42-13.32 (40.76-43.69)	635	-	-	79	-	-	-	0.132
(08)	12.62-12.80 (41.41-41.98)	Petrographic analyses							
(09)	13.39-14.04 (43.94-46.06)	11	-	-	<10	-	-	-	0.004
(10)	19.2-19.43 (63-63.73)	Petrographic analyses							
(11)	24.55-26.36 (80.55-86.48)	19	-	-	<10	-	-	-	0.007
(12)	32.26-32.42 (105.85-106.36)	Petrographic analyses							
(13)	34.6-34.74 (113.49-113.07)	Petrographic analyses							

Hole number:	ULC 93-3	Elevation:	157.482 m
Location:	Krumrine Quarry, Upper Leitches Creek, Cape Breton County	Azimuth:	346°
Longitude:	60°24'51.63"	Dip:	-60°
6° UTM:	E 699806.44	Proposed depth:	53.95 m
Latitude:	46°06'49.37"	Ultimate depth:	53.95 m
6° UTM:	N 5109714.39	Drilled by:	Nova Scotia Department of Natural Resources
Datum:	Mean sea level	Geologist:	G. J. DeMont

Depth m (ft)	Description
0-5.97 (0-19.59)	Ground core; light creamy brown to white with minor patches of pink K-feldspar; granitic intrusive and quartz

Depth m (ft)	Description
5.97-34.3 (19.59-112.53)	Grey mixture of fine grained diorite, metasedimentary rocks and marble or skarn, with minor white quartz veining and white to pink granitic dykes (it is difficult to define the boundaries between the various lithologies in this section) 16.71-17.45 m (54.82-57.26 ft): white quartz vein 17.68-17.88 m (58.01-58.67 ft): white quartz vein 19.91-20.12 m (65.32-66.01 ft): pink to green granitic dyke 24.82-25.32 m (81.44-83.07 ft): light green gouge and white quartz vein 33.76-33.96 m (110.75-111.41 ft): junction of two white, granitic(?) dykes; composed primarily of white feldspar and quartz (little mafic content)
34.3-36.69 (112.53-120.38)	Light green granitic(?) dyke with a 10 cm pink band at the lower end; primarily feldspar and quartz
36.69-53.95 (120.38-177)	Dark grey mixture of diorite and metasedimentary rock with minor patches of marble or skarn and pink to pinkish-green granitic(?) dykes; the lower 2.45 m is composed primarily of a white granitic rock with numerous inclusions of the diorite and metasedimentary rock; minor quartz veining occurs in the upper 6.1 m of this section 39.70-39.94 m (130.24-131.02 ft): white quartz vein 43.62-43.75 m (143.10-143.55 ft): pink granitic(?) dyke
53.95 (177)	End of Hole

ULC 93-3

Footage Drilled	Footage in Core Box	Footage Drilled	Footage in Core Box
0 - 14 ft	5 ft	94 - 104 ft	12 ft
14 - 24 ft	2 ft 10 in	104 - 114 ft	11 ft 4 in
24 - 34 ft	2 ft 1 in	114 - 124 ft	11 ft 8 in
24 - 44 ft	6 ft 2 in	124 - 134 ft	11 ft 8 in
44 - 54 ft	11 ft 1 in	134 - 144 ft	11 ft 2 in
54 - 64 ft	11 ft 3 in	144 - 154 ft	12 ft 7 in
64 - 74 ft	12 ft	154 - 164 ft	11 ft 7 in
74 - 84 ft	10 ft 9 in	164 - 174 ft	10 ft 8 in
84 - 94 ft	12 ft	174 - 177 ft	3 ft 6 in

ULC 93-3 Samples

Sample	Interval m (ft)	Elements
(01)	28.65-28.82 (94-94.55)	Petrographic analyses
(02)	23.41-23.59 (76.79-77.41)	Petrographic analyses
(03)	36.23-36.43 (118.47-119.52)	Petrographic analyses
(04)	32.53-32.73 (106.71-107.37)	Petrographic analyses
(05)	41.28-41.53 (135.43-136.25)	Petrographic analyses
(06)	48.73-48.88 (159.88-160.38)	Petrographic analyses
(07)	50.49-50.63 (165.65-166.12)	Petrographic analyses
(08)	51.32-51.49 (168.39-168.94)	Petrographic analyses

Hole number:	ULC 93-4	Elevation:	149.830 m
Location:	Krumrine Quarry, Upper Leitches Creek, Cape Breton County	Azimuth:	138°
Longitude:	60° 24'52"	Dip:	-45°
6° UTM:	E 699787.17	Proposed depth:	58.22 m
Latitude:	46° 06'50.72"	Ultimate depth:	58.22 m
6° UTM:	N 5109755.51	Drilled by:	Nova Scotia Department of Natural Resources
Datum:	Mean sea level	Geologist:	G. J. DeMont

Depth m (ft)	Description
0-3.02 (0-9.89)	Ground and broken core; mixture of dark green gabbro and pink granitic dykes.
3.02-29.79 (9.89-97.72)	Primarily dark green gabbro with lesser amounts of green diorite and pink granitic dykes, with minor inclusions of green skarn or marble. 3.02-8.41 m (9.89-27.59 ft): broken core; dark green, iron stained gabbro 8.41-9.65 m (28.59-31.66 ft): dark green gabbro with 2-3% disseminated pyrrhotite and chalcopyrite 9.92-10.80 m (32.54-35.43 ft): mixture of diorite and gabbro with pink granitic dyking and green skarn or marble inclusions; little visible sulphide 10.80-11.65 m (35.43-38.23 ft): dark green gabbro; 1-2% disseminated chalcopyrite and pyrrhotite 11.65-12.37 m (38.23-40.58 ft): greenish-grey diorite with intermixed pink to white granitic or syenitic intrusive 12.37-12.99 m (40.58-42.63 ft): mixture of pink granitic dyking, white quartz vein and diorite 12.99-16.26 m (42.63-53.37 ft): green diorite with minor granitic dyking; the lower 45 cm contain <1% disseminated pyrrhotite or pyrite 15.46-15.6 m: shear zone 16.26-19.47 m (53.37-63.89 ft): intermixed green diorite and pink granitic dyking (70% diorite and 30% granitic dyking) 19.47-20.20 m (63.89-66.29 ft): pink granitic dyke; intrusive contacts with the diorite 20.20-21.21 m (66.29-69.59 ft): green diorite 21.21-21.75 m (69.59-71.36 ft): pink granitic dyke 21.75-29.79 m (71.36-97.72 ft): green diorite with numerous thin, 1-4 mm, pink granitic veinlets
29.79-32.28 (97.72-105.90)	Greenish-grey marble and skarn with minor pink to white granitic dykes (dykes are not well defined); the marble appears to be in fault contact with the diorite because the upper and lower 45 cm of the marble are brecciated.
32.28-41.27 (105.90-135.41)	Greenish-grey diorite with thin, 1-2 mm, pink granitic veinlets 32.28-34.86 m (105.9-114.38 ft): brecciated with a narrow gouge zone at 34.4 m 39.53-40.16 m (129.7-131.76 ft): broken core; last 22 cm are brecciated and cemented with pink granitic or syenitic intrusive(?)
41.27-43.78 (135.41-143.63)	Pink granitic or syenitic dyke; very low mafic content; mixture of K-feldspar and quartz; patches of light green epidote alteration.
43.78-49.39 (143.63-162.05)	Greenish-grey diorite with occasional thin, 1-10 mm, pink granitic veinlets; bottom 55 cm are brecciated with minor fault gouge; upper 81 cm brecciated with minor fault gouge

Depth m (ft)	Description
49.39-52.94 (162.05-173.69)	Greenish-grey skarn; brecciated and recemented with irregular white quartz veins; <1% disseminated patches of pyrite or pyrrhotite
52.94-58.22 (173.69-191)	Greenish-grey diorite with inclusions of marble; the lower and upper ends of the diorite contain small amounts of pink K-feldspar which gives the diorite a monzonitic appearance
58.22 (191)	End of Hole

ULC 93-4

Footage Drilled	Footage in Core Box	Footage Drilled	Footage in Core Box
0 - 13 ft	3 ft 6 in	103 - 113 ft	12 ft 8 in
13 - 23 ft	8 ft 6 in	113 - 124 ft	10 ft 11 in
23 - 33 ft	9 ft 5 in	124 - 134 ft	10 ft 6 in
33 - 43 ft	11 ft	134 - 140 ft	7 ft 9 in
43 - 53 ft	11 ft 2 in	140 - 143 ft	2 ft 11 in
53 - 63 ft	9 ft 11 in	143 - 153 ft	11 ft 10 in
63 - 73 ft	13 ft 2 in	153 - 163 ft	10 ft 4 in
73 - 83 ft	9 ft 7 in	163 - 173 ft	9 ft 7 in
83 - 93 ft	11 ft 8 in	173 - 183 ft	10 ft 10 in
93 - 103 ft	9 ft 8 in	183 - 191 ft	7 ft 10 in

ULC 93-4 Samples and Results

Sample	Interval m (ft)	Elements (ppm)	
		Cu	Ni
(01)	4.53-7.01 (14.87-23)	6970	2300
(01A)	4.86-4.95 (15.95-16.25)	Petrographic analyses	
(02)	6.51-6.60 (21.35-21.65)	Petrographic analyses	
(03)	7.01-8.41 (23-27.59)	3580	4540
(04)	8.41-9.97 (27.59-32.72)	2970	4800
(05)	8.71-8.84 (28.57-29.01)	Petrographic analyses	
(06)	9.97-10.06 (32.72-33)	Petrographic analyses	
(07)	10.06-11.03 (33-36.19)	757	213
(08)	10.27-10.45 (33.68-34.29)	Petrographic analyses	
(09)	11.03-12.42 (36.18-40.74)	1440	500
(10)	11.47-11.70 (37.63-38.38)	Petrographic analyses	
(11)	12.42-12.99 (40.74-42.63)	88	46
(12)	12.99-13.45 (42.63-44.13)	111	38
(13)	13.45-14.75 (44.13-48.40)	300	108
(14)	14.75-16.15 (48.40-53)	168	70
(15)	16.12-16.19 (52.9-53.13)	Petrographic analyses	
(16)	15.65-15.74 (51.35-51.65)	Petrographic analyses	
(17)	41.27-43.79 (135.41-143.66)	17	-
(18)	43.39-43.41 (142.36-142.43)	Petrographic analyses	

APPENDIX 2. FIGURES

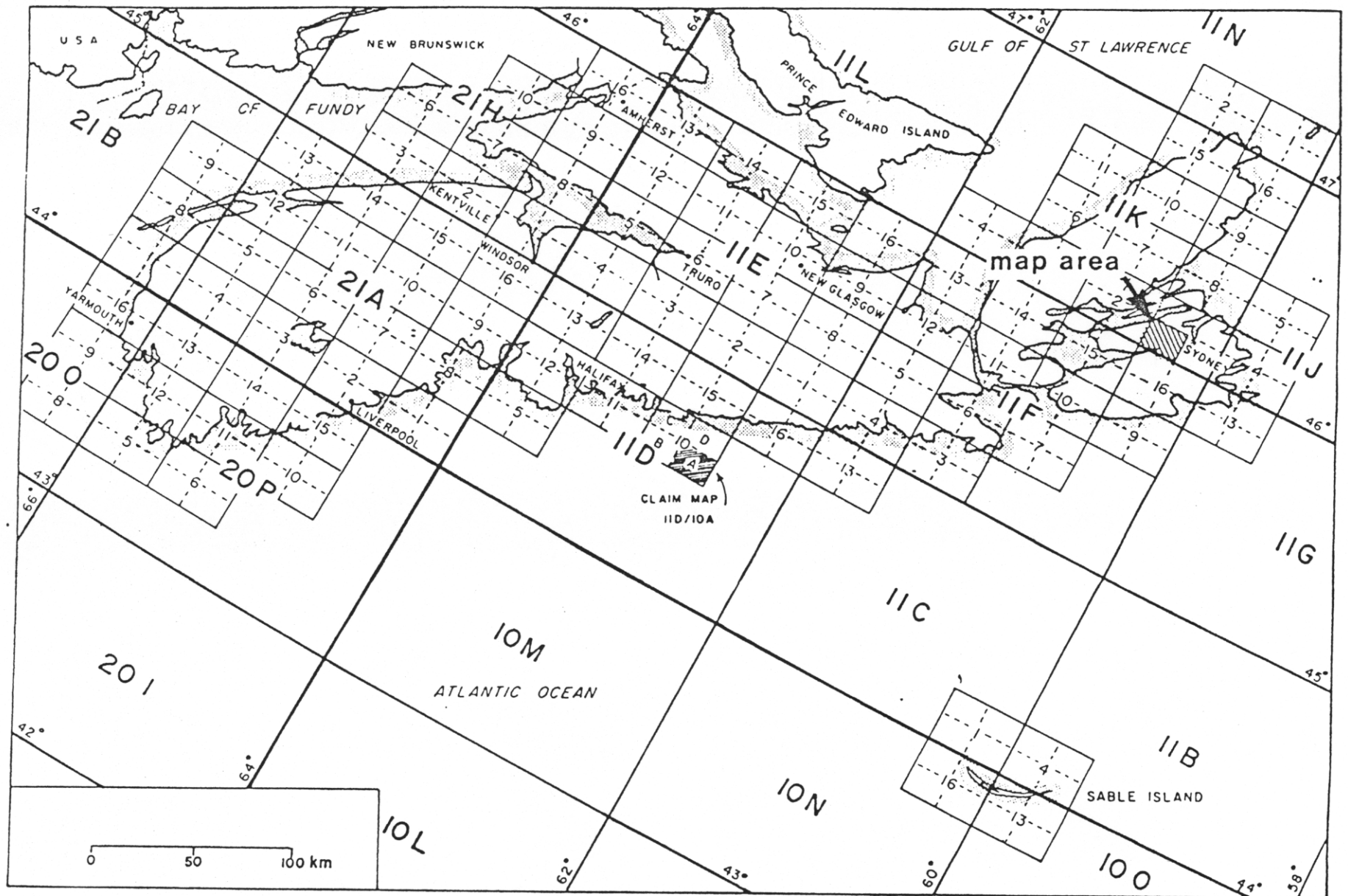


Figure 1. Claim reference location map for the Upper Leitches Creek area, Cape Breton County.

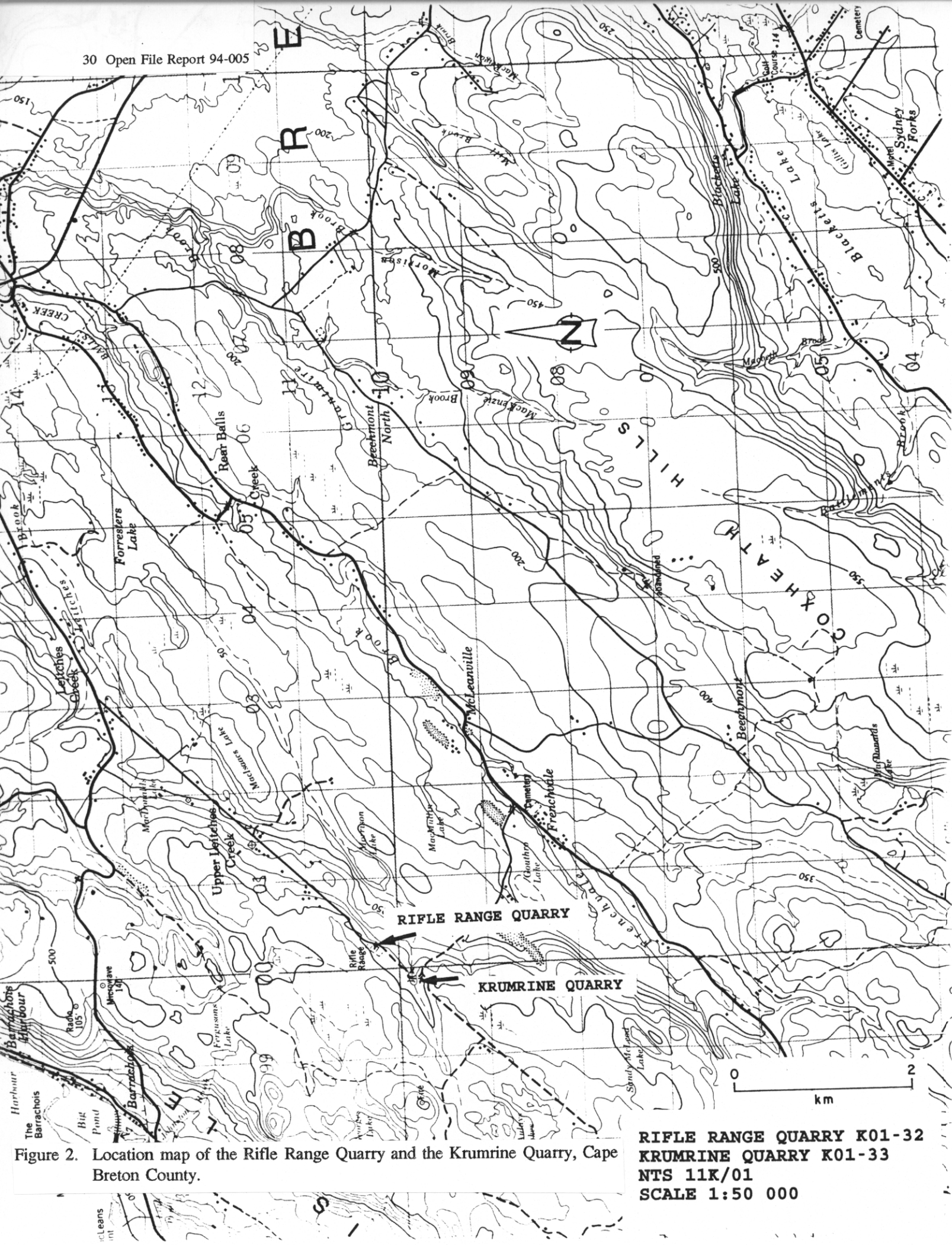


Figure 2. Location map of the Rifle Range Quarry and the Krumrine Quarry, Cape Breton County.

RIFLE RANGE QUARRY K01-32
KRUMRINE QUARRY K01-33
NTS 11K/01
SCALE 1:50 000

RIFLE RANGE QUARRY

GEOLOGICAL MAP

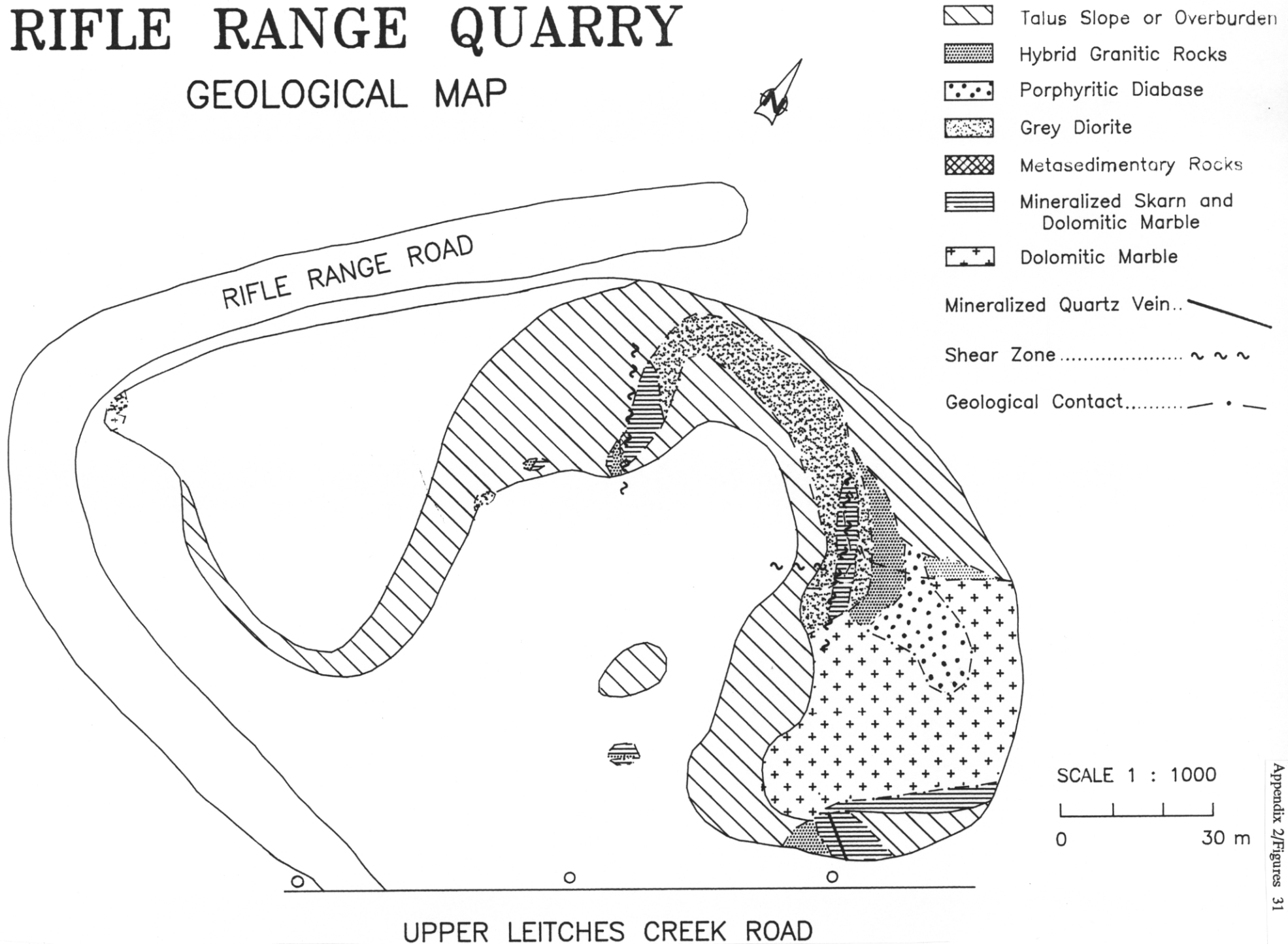





Figure 3. Geological map of the Rifle Range Quarry, Upper Leitches Creek, Scale 1:1000.

RIFLE RANGE QUARRY

SAMPLE LOCATIONS

- Drillhole ●
- Sample Location and Number..... ● 07
- Talus Slope or Overburden..... 
- Area of Rubbly Outcrop..... 
- Area of Outcrop..... 

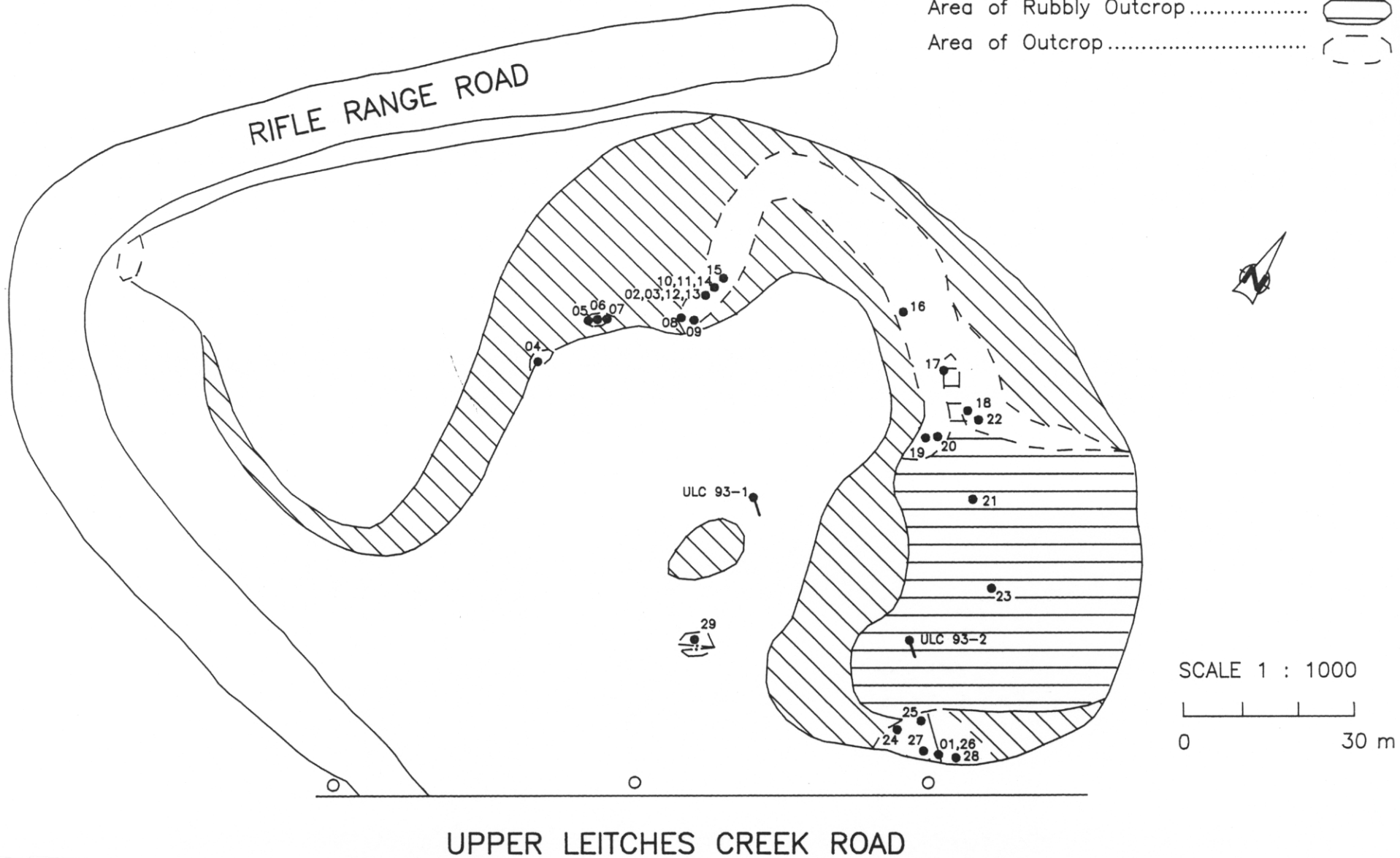
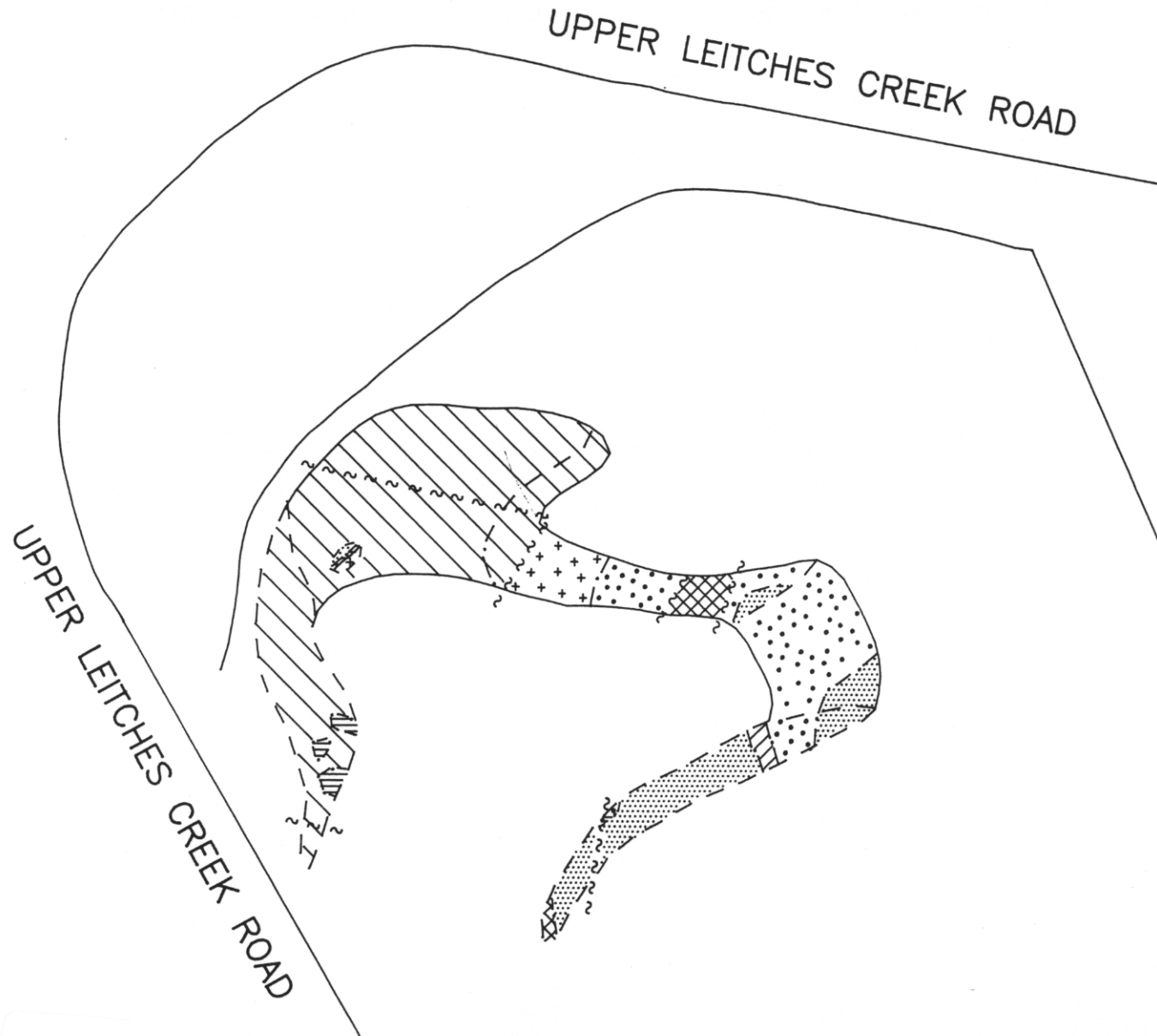









Figure 4. Sample locations of the Rifle Range Quarry, Upper Leitches Creek, Scale 1:1000.

KRUMRINE QUARRY

GEOLOGICAL MAP



-  Skarn and Marble
-  Quartz-rich Zones
-  Area of Chlorite Alteration of Granitic Rocks
-  Granitic Rocks
-  Grey Diorite
-  Gabbro with Intrusive Granitic Dykes
-  Metasedimentary Rocks, Amphibolites, Diorite, and Granitic Rocks
- Shear Zone ~ ~ ~
- Geological Contact - - -

SCALE 1 : 1000

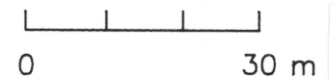
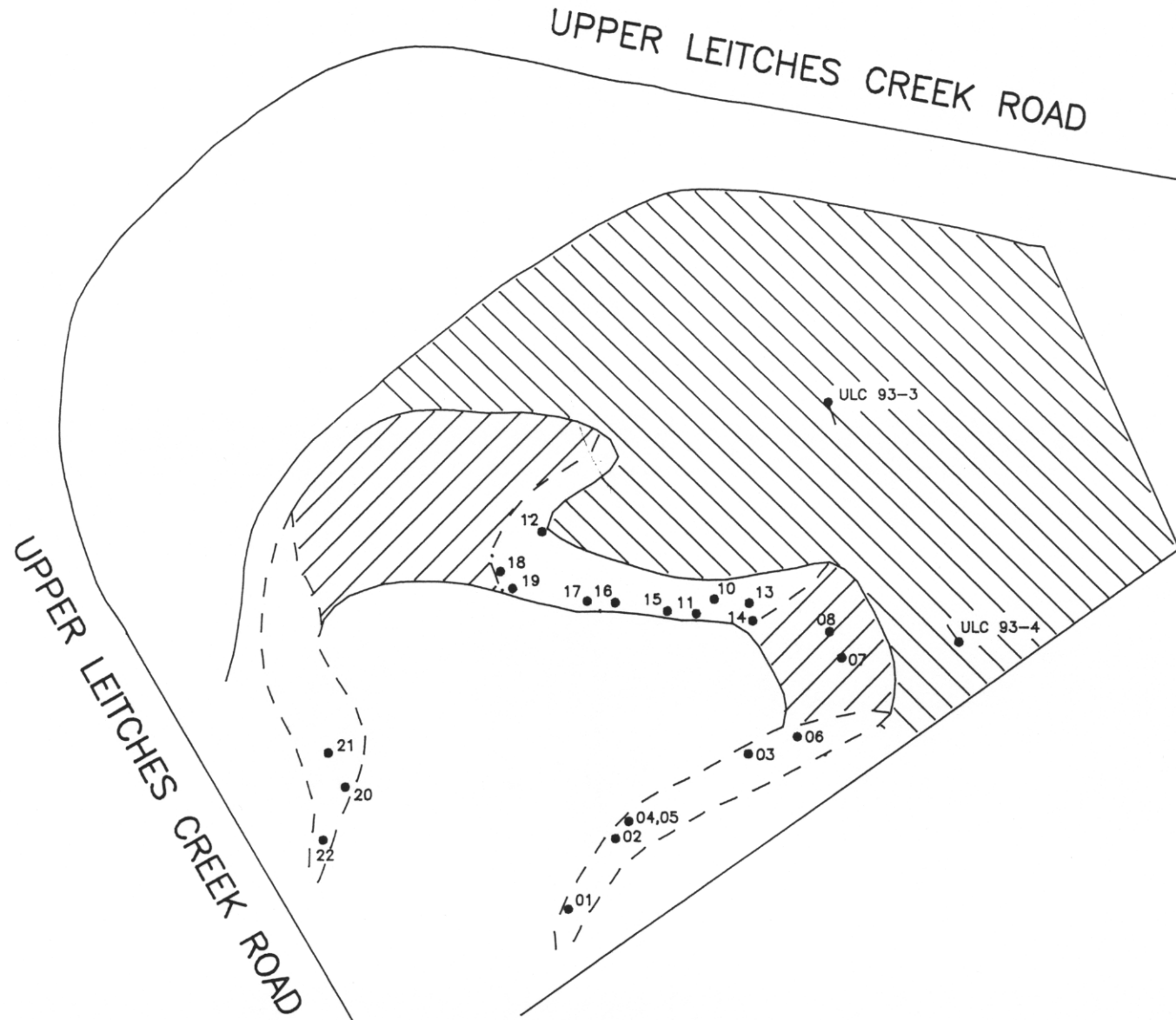


Figure 5. Geological map of the Krumrine Quarry, Upper Leitches Creek, Scale 1:1000.

KRUMRINE QUARRY

SAMPLE LOCATIONS








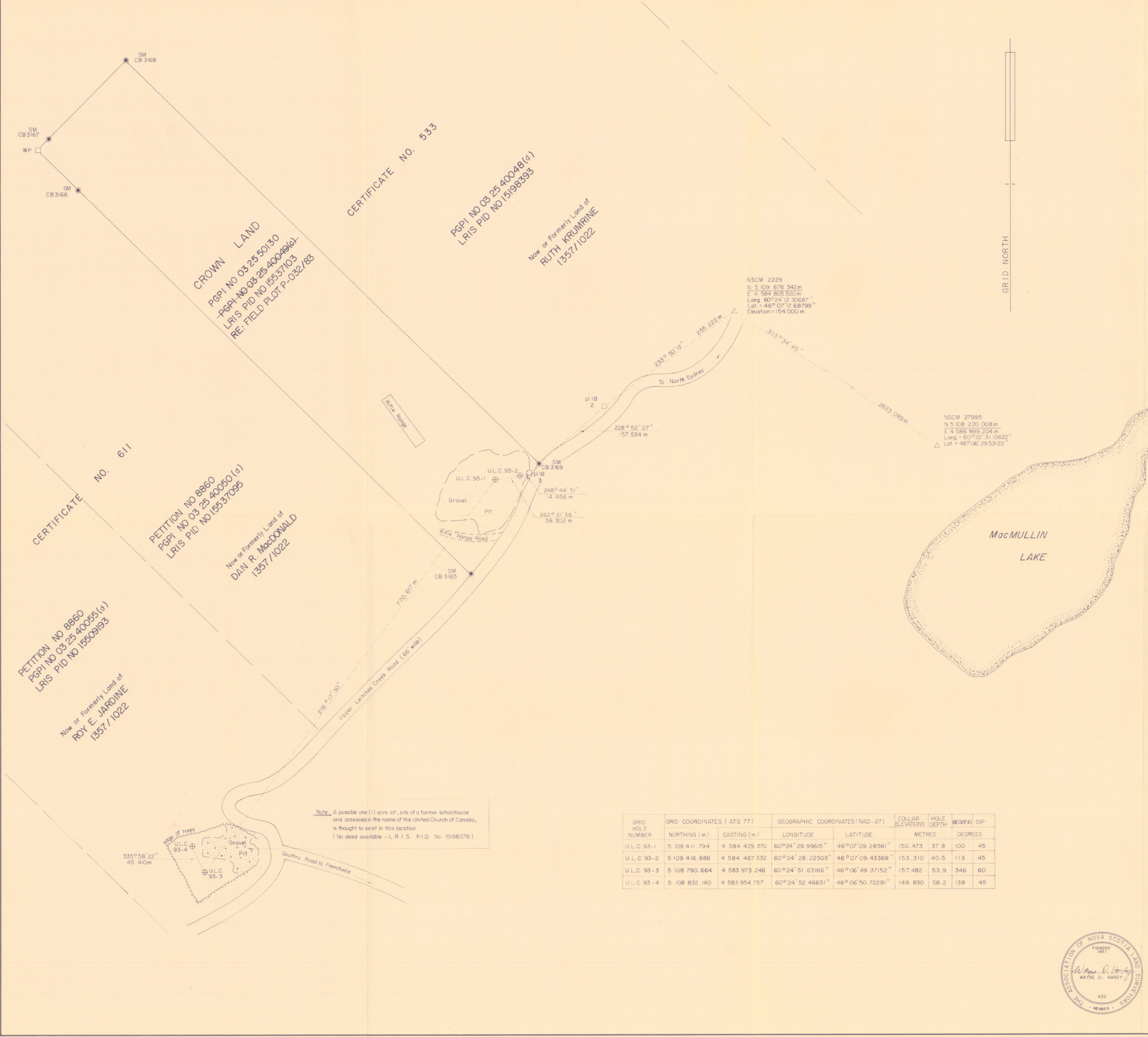
- Drillhole 
- Sample Location and Number 
- Steep Slope with Rubbly Outcrop..... 
- Dozed Area with Rubbly Subcrop..... 
- Area of Outcrop..... 

Figure 6. Sample locations of the Krumrine Quarry, Upper Leitches Creek, Scale 1:1000.



NOTES

ALL AZIMUTHS ARE GRID AND WERE DERIVED FROM NOVA SCOTIA COORDINATE MONUMENTS 2229 AND 27995, BASED ON THE NOVA SCOTIA 3rd MODIFIED TRANSVERSE MERCATOR PROJECTION, ZONE 4, CENTRAL MERIDIAN AT 61°30' WEST LONGITUDE. ALL DISTANCES ARE HORIZONTAL COORDINATE VALUES ARE AT S 77 WITH GEOGRAPHIC COORDINATES BASED ON THE NAD 27 DATUM.

ELEVATIONS AS SHOWN HEREON ARE BASED ON GEODETIC DATUM AND ARE REFERENCED TO N.S. COORDINATE MONUMENT 2229, ELEVATION 154,000m.

TOPOGRAPHIC FEATURES WERE PLOTTED FROM FIELD DATA AND RESOURCE MAP 11K/01-U2.

CLOSURE OF SURVEY: N/A
 LOOSELEAF FIELD NOTE PAGES 1 TO 24
 DRAFTED BY DEBORAH R. WENTZELL.

- LEGEND**
- SURVEY MARKER ----- SM ●
 - NOVA SCOTIA COORDINATE MONUMENT ----- NSCMA △
 - IRON BAR ----- IB □
 - WOODEN POST ----- WP □
 - DIAMOND DRILL HOLE ----- U.L.C. 93-1 ⊕
 - PLACED ----- p-l
 - FOUND ----- f-d
 - CALCULATED ----- (c)
 - PROVINCIAL GOVERNMENT PARCEL IDENTIFIER NUMBER ----- PGP I NO
 - REGISTRY BOOK AND PAGE REFERENCE ----- 000/000
 - TIE LINE -----
 - OTHER LAND -----
 - PREVIOUSLY SURVEYED CROWN BOUNDARY -----

Figure 7. Plan of survey showing diamond-drill hole locations and elevations, Upper Leitches Creek, Scale 1:3000.

PLAN OF SURVEY SHOWING
DIAMOND DRILL HOLE LOCATIONS AND ELEVATIONS
 UPPER LEITCHES CREEK

CAPE BRETON COUNTY, NOVA SCOTIA

* FOR MINES & MINERALS BRANCH, DEPT. OF NATURAL RESOURCES. *

SCALE : 1:3000

FIELD SURVEYS WERE CARRIED OUT DURING THE PERIOD OF FEB. 15 TO MARCH 11, 1993.

This survey was executed under the direction of WAYNE D. HARDY, N.S.L.S.

Dated this 9th day of June, 1993.

INDEX SHEET: 131 RESOURCE MAP 11K/01-U2
 CLFS: CB 57

NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES
 Surveys Division

ORDER OF SURVEY: S-61/93
FIELD PLOT: P-062/93

KEY PLAN SCALE 1:125,000

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
 FOUNDED 1951
 WAYNE D. HARDY
 MEMBER 432

GRID HOLE NUMBER	GRID COORDINATES (ATS 77)		GEOGRAPHIC COORDINATES (NAD-27)		COLLAR ELEVATIONS METRES	HOLE DEPTH METRES	BEARING DEGREES	DIP DEGREES
	NORTHING (m)	EASTING (m)	LONGITUDE	LATITUDE				
U.L.C. 93-1	5 109 411.794	4 584 429.370	60°24'29.99615"	46°07'09.28561"	150.473	37.8	100	45
U.L.C. 93-2	5 109 416.886	4 584 467.332	60°24'28.22503"	46°07'09.43368"	153.310	40.5	113	45
U.L.C. 93-3	5 108 790.664	4 583 973.246	60°24'51.63166"	46°06'49.37152"	157.482	53.9	346	60
U.L.C. 93-4	5 108 832.140	4 583 954.757	60°24'52.46631"	46°06'50.72291"	149.830	58.2	138	45

Note: A possible one (1) acre lot, site of a former schoolhouse and assessed in the name of the United Church of Canada, is thought to exist in this location.
 (No deed available - L.R.I.S. P.I.D. No. 15198278)