80-691-#8503

LONG LAC MINERAL EXPLORATION

DIAMOND DRILLING REPORT

GRANSIL CLAIMS I & II ,GRANITE-SCHEELITE #1

GRANITE MTN. AREA

SIMILKAMEEN MINING DISTRICT
92H/7W

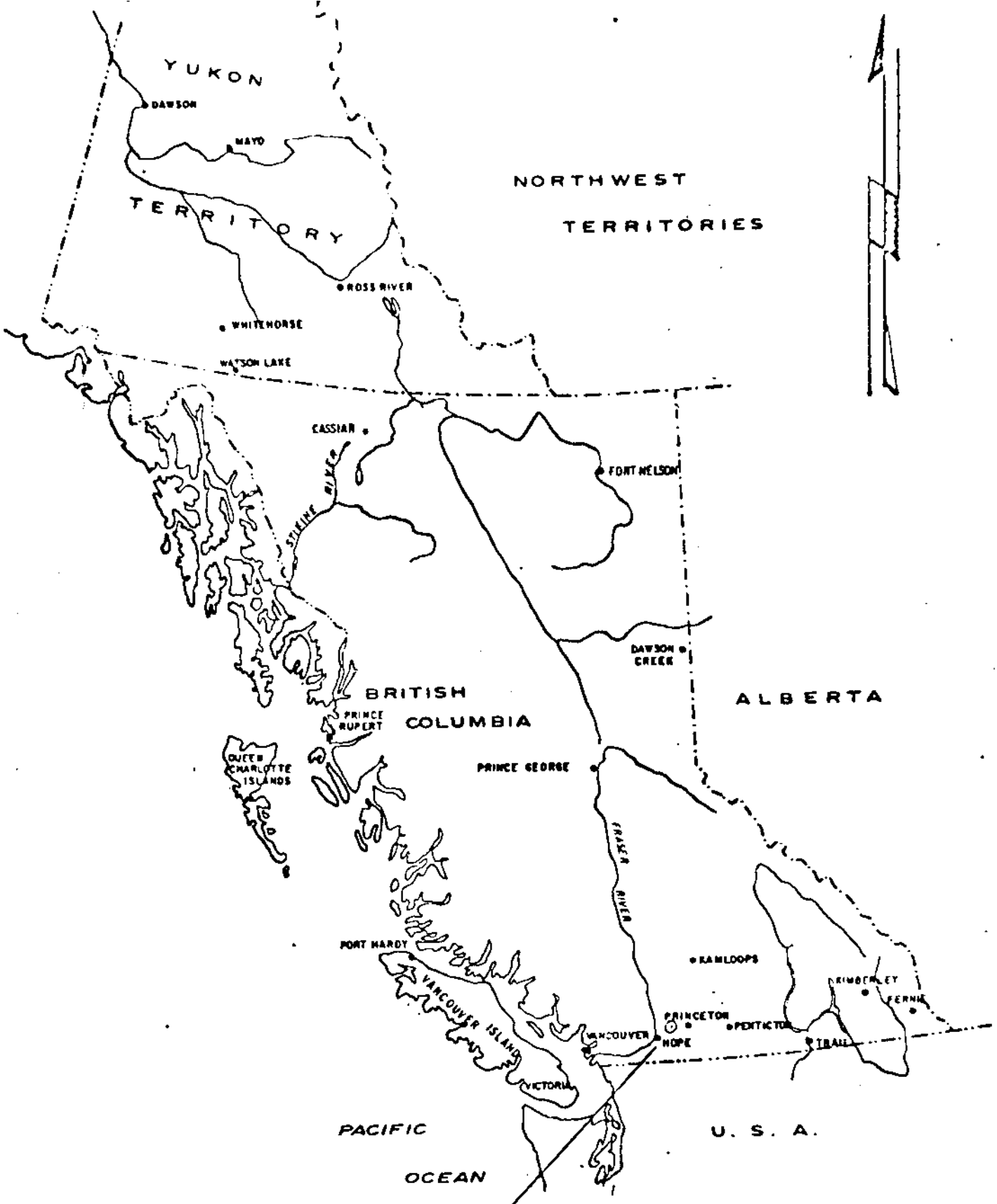
Longitude 120°58'
Latitude 49°20'

OPTIONED FROM: NORTHERN LIGHTS RESOURCES

R.F. Brown
B.Sc. Geology, P. Eng.
Long Lac Mineral Expl.

September 18, 1980

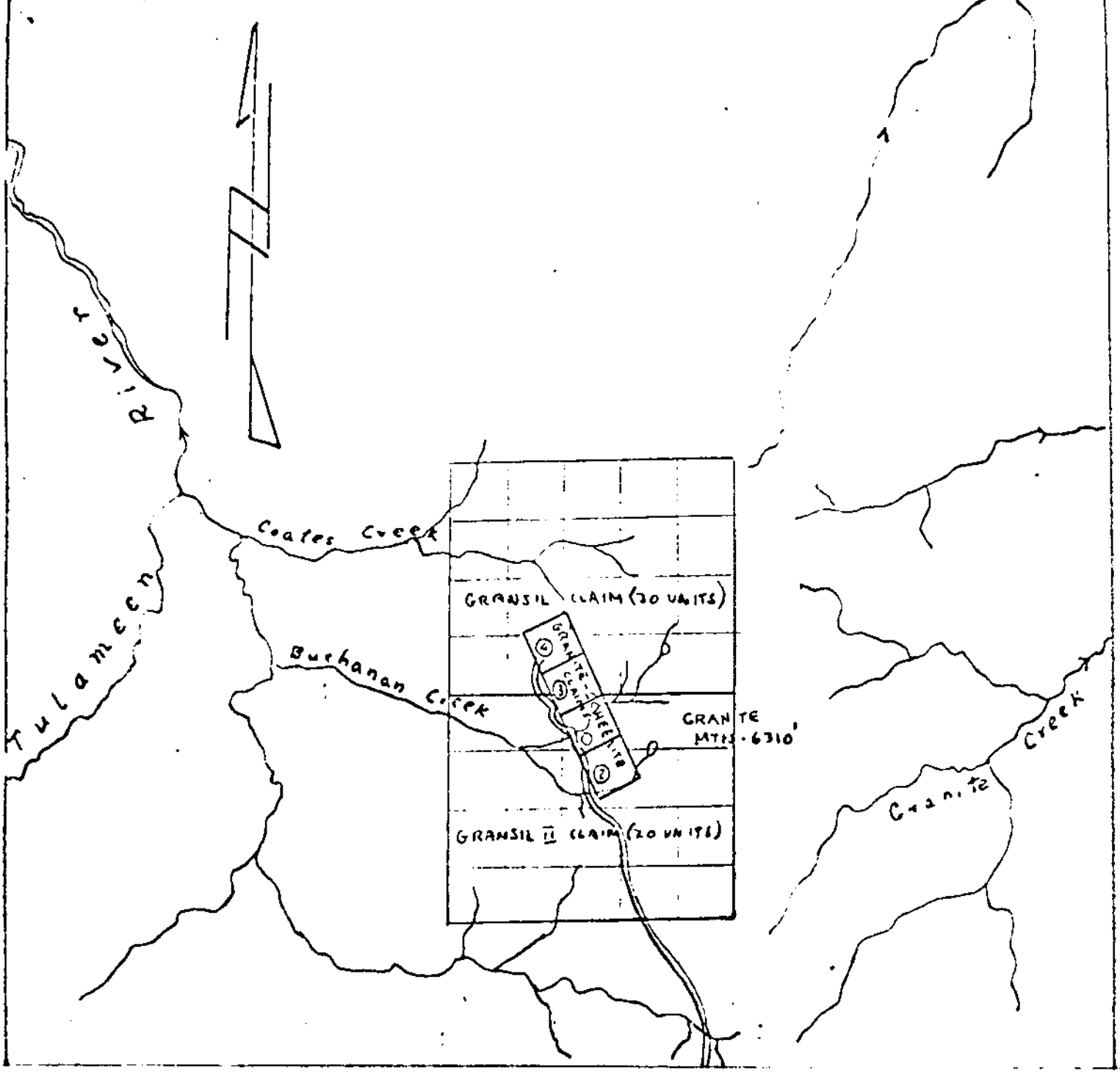
CONTENTS



NORTHERN LIGHTS RESOURCES
GRANITE MTN. PROPERTY.

LONG LAC MINERAL EXPL.
SEPT 1980. by RFB.

1 : 12,672,000.



LONG LAC MINERAL EXPL.

NORTHERN LIGHTS RESOURCES LTD. OPTION
GRANITE MOUNTAIN,
SIMILKAMEEN MINING DISTRICT, B.C.

1:50,000.

0 1 km 2 km.

INTRODUCTION:

Long Lac Mineral Expl. optioned Northern Lights Resources' Quartz Mtn. property in February of 1980. At that time N.L.R. was snow plowing a road to commence diamond drilling. The Quartz Mtn. property consists of 40 claims owned by N.T.L. and four (4) optioned from Joe Curuso and Ivan McKay. The main showing (Au, Ag) of interest is on one of I. McKay's claims.

LOCATION:

The claim group is situated approximately 27 km. W.S.W. of Princeton, B.C. at longitude 120°50', latitude 120°48'. They are in the Similkameen Mining District MAP 92H/7W.

ACCESS & TOPOGRAPHY:

The claims are at the upper end of the Whipsaw Creek road which intersects highway #3, 17 km. south of Princeton. The Whipsaw Creek road has summer accessibility only, with winter access by snowmachine. The claims are in a high (+5,000') plateau area of rolling hills. The plateaus are dissected by steep ravines such as the Whipsaw Creek.

CLAIM STATUS:

Forty-four (44) units (6 claims) were optioned by Long Lac Mineral Expl. from Northern Lights Resources in February 1980. Of those 44 units four claims comprising four units were optioned by N.L.R. from Joe Curuso (Granite Sheelite #3, #4) and Ivan McKay (Granite Sheelite #1, #2). Northern Lights owns 40 units in two claims (Gransil I and II).

PREVIOUS WORK:

September of 1979 saw R.W. Phendler, Consultant, P.Eng., do sampling on the Granite Sheelite I claim for N.L.R. Mr. Phendler resampled old trenches over 275 meters and an adit into the same quartz vein system. Gold and silver assay from the above sampling were impressive although over narrow widths (see R.W. Phendler, October 17, 1979 report) and further work was recommended. Diamond drilling was commenced in February 1980 by N.L.R. who coincidentally optioned the Quartz Mtn. property to Long Lac. All work done to date has been on the Granite Sheelite I claim.

WORK COMPLETED BY LONG LAC MINERAL:

The five holes drilled by N.L.R. were shipped to Vancouver, logged and split by R.F. Brown (Long Lac) and sent for assay at Bondar Clegg. The logs and sections for the holes are in the pocket, a location map is in the report. Resampling of the trenches by J.W. Hogan (Long Lac, P.Eng.) was done in August of 1980. J.W. Hogan's sample locations and assays as well as R.W. Phendler's are on LIST #1 and MAP #3.

GEOLOGY:

Regionally the area lies in the coastal intrusions, specifically as part of the Cascade Mtns. The Dept. of Mines and Resources (1"= 4 miles; MAP 888A,

Princeton, 1947) notes the surrounding geology to be largely grey, slightly gneissic graniodiorite. Diamond drilling shows the immediate area of the showings to be hornblende-quartz-feldspar gneiss, most likely on amphibolitized metavolcanic (see Petrology APPENDIX #2).

Within the mafic amphibolitized metavolcanics is a narrow sericitized pyritic siliceous unit (rhyolite?) which is believed to be correlatable between holes #1, 2 and 4. Holes #1 and 4 have a zone of barren pyritic gneiss to the south of the siliceous section, hole #2 has a similar unit to the north of the siliceous unit, as well barren of Au, Ag values. The most northerly hole #3 believed to be on the north side of a small E-W displacing fault between #3 and #2 has a pyritic zone with q.v.'s in the mafic gneiss. The q.v.'s are narrow, pyritic and have reported low Au, Ag values. Hole #5, the most southerly hole, intersected a very narrow barren pyritic siliceous unit.

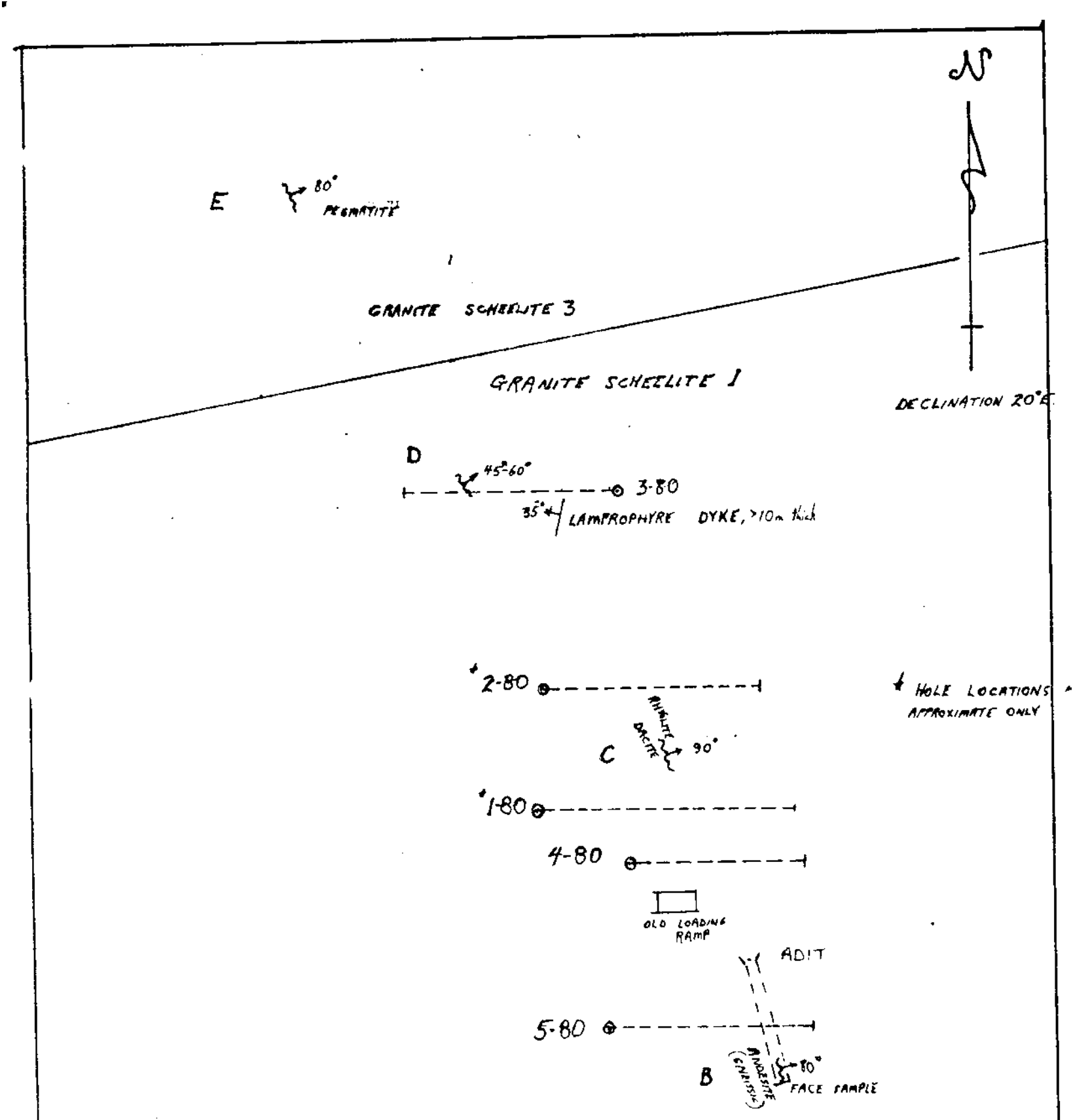
Holes #1 and #2 extended the furthest to the east intersected a pyritic feldspar porphyry unit. Although the porphyry was barren a narrow quartz vein with pyrite was persistent on the west side of the porphyry and carried Au, Ag values over narrow widths.

CONCLUSIONS:

All five (5) holes are believed to have intersected the downdip extensions of the trench sampled quartz veins. The narrow widths and poor grades obtained from the drilling (see sections) severely limits if not negates all possibilities of further exploitation.

LONG LAC MINERAL EXPL.

R.F. BROWN, B.Sc., P.Eng.



LONG LAC MINERAL EXPL.

NORTHERN LIGHTS RESOURCES OPTION

QUARTZ MOUNTAIN, SIMILKAMEEN M.D., B.C.

SEPT. 23, 1980 R.F. BROWN, J.W. HOGAN

1:1000

JORGENSEN BEAUCHAMP
Chartered Accountants

101-1687 West Broadway, Vancouver, B.C., V6J 1X2
Telephone: (604) 734-7711

April 1, 1980

Long Lac Minerals Exploration Limited,
1050 West Pender Street,
Vancouver, B.C.

Attention: Mr. T. Hogan

Dear Sirs:

Re: Northern Lights Resources Ltd.
Drilling Program
Granite Mountain

Enclosed is a Statement of Cost relating to the drilling program on Granite Mountain. Please contact the writer if you require any other information and/or explanations.

Yours very truly,

JORGENSEN BEAUCHAMP

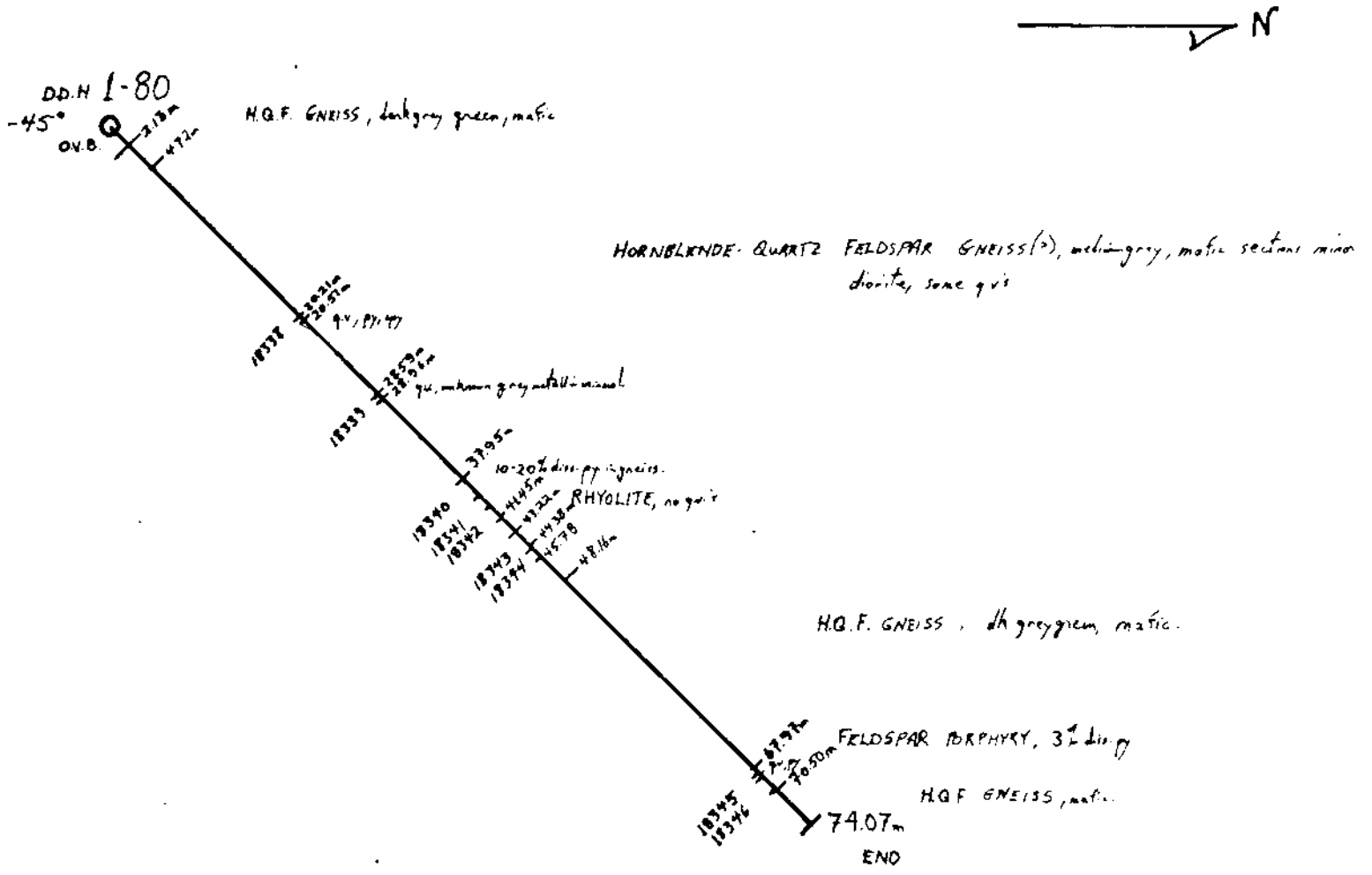
MJ:it
Encl.

NORTHERN LIGHTS RESOURCES LTD.

DRILLING COSTS - GRANITE MOUNTAIN

MARCH 31, 1980

R.STEWART DRILLING, PRINCETON, B.C.			
Contract Labour			
Vince Finch	$2,562.00		
Sam Stewart	3,864.00		
Ron Stewart	5,920.00		
Malcolm McLean	2,490.00	$14,836.00	
Meals and groceries		1,676.08	
Supplies and materials		638.61	
Freight		116.80	
Fuel		509.08	
Miscellaneous		6.50	$17,783.07
TRI-VALLEY CONTRACTORS, PRINCETON, B.C.			
Snow clearning and road rehabilitaion -08CAT			13,914.50
ALPINE DISTRIBUTORS LTD, VERNON, B.C.			
Snowmobile rental			3,968.00
J.K.SMIT & SONS, VANCOUVER, B.C.			
Coring bits, reaming shells, casing shoes, corelifters, corelifter case (5713.83 less estimated credits of $2,000.00)			3,713.83
E.C.WHALLEY & SON, BURNABY, B.C.			
Bean 420 Pump rental		520.00	
Fabrication of drill shock		843.83	
Core boxes		289.73	1,653.56
CANA RENTALS, VANCOUVER, B.C.			
Tuck rental			1,166.66
MODEL TRANSFER LTD., PRINCETON, B.C.			
Hauling snow machine, drill			746.00
R.W.PHENDLER, P.ENG.,RICHMOND, B.C.			
Engineering re drilling program			1,436.18
VANCOUVER ISLAND HELICOPTERS LTD., SYDNEY, B.C.			
Transportation -driller to inspect location			1,006.75
PAT WRIGHT, PRINCETON, B.C.			
Cabin rent		500.00	
Flagging road		200.00	700.00
			$46,088.55



LONG LAC MINERAL EXPL.

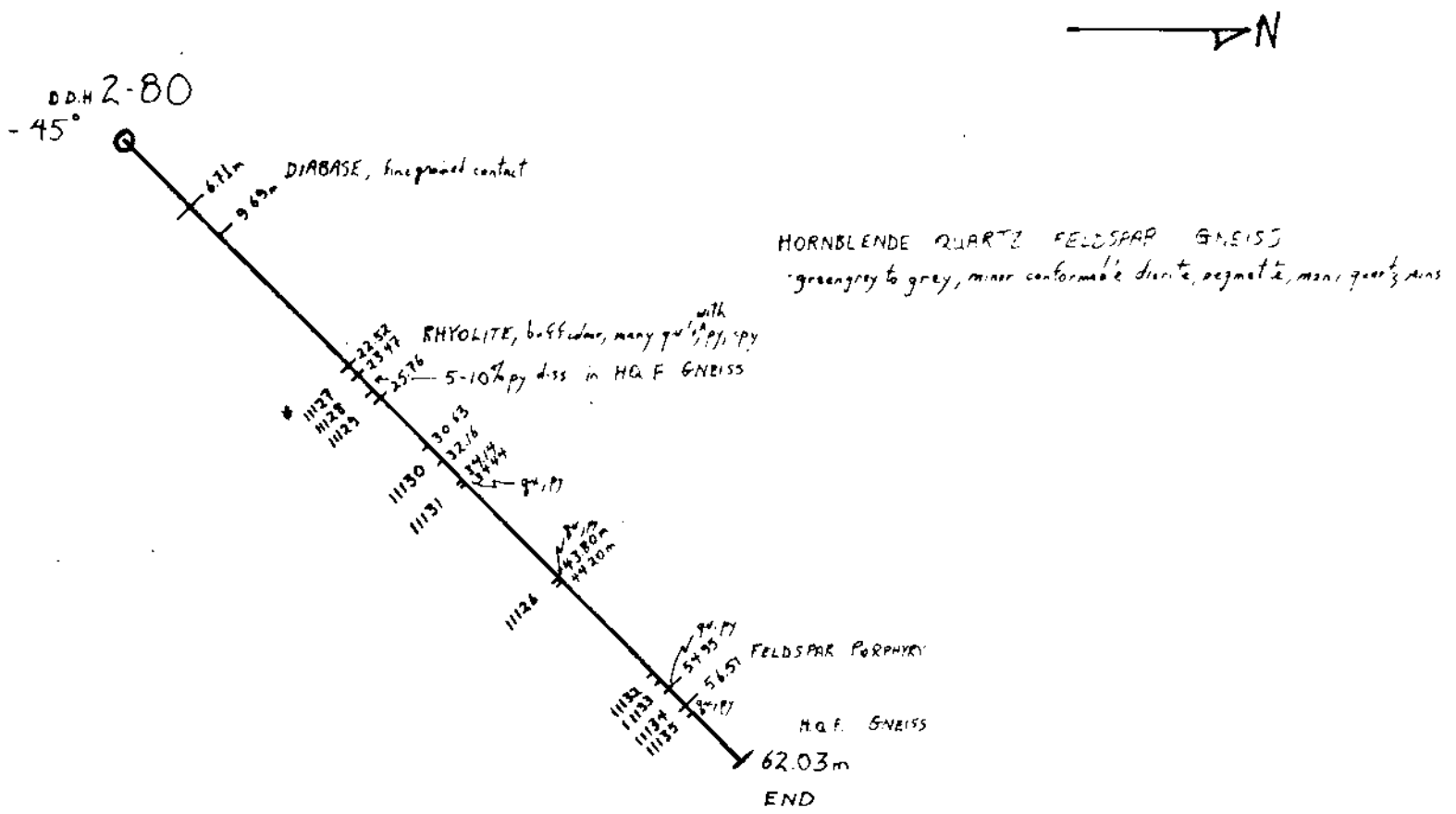
NORTHERN LIGHTS RESOURCES OPTION

QUARTZ MOUNTAIN, SIMILKAMEEN M.D., B.C.

SEPT. 23, 1980

R.F. BROWN.

1:500



LONG LAC MINERAL EXP.

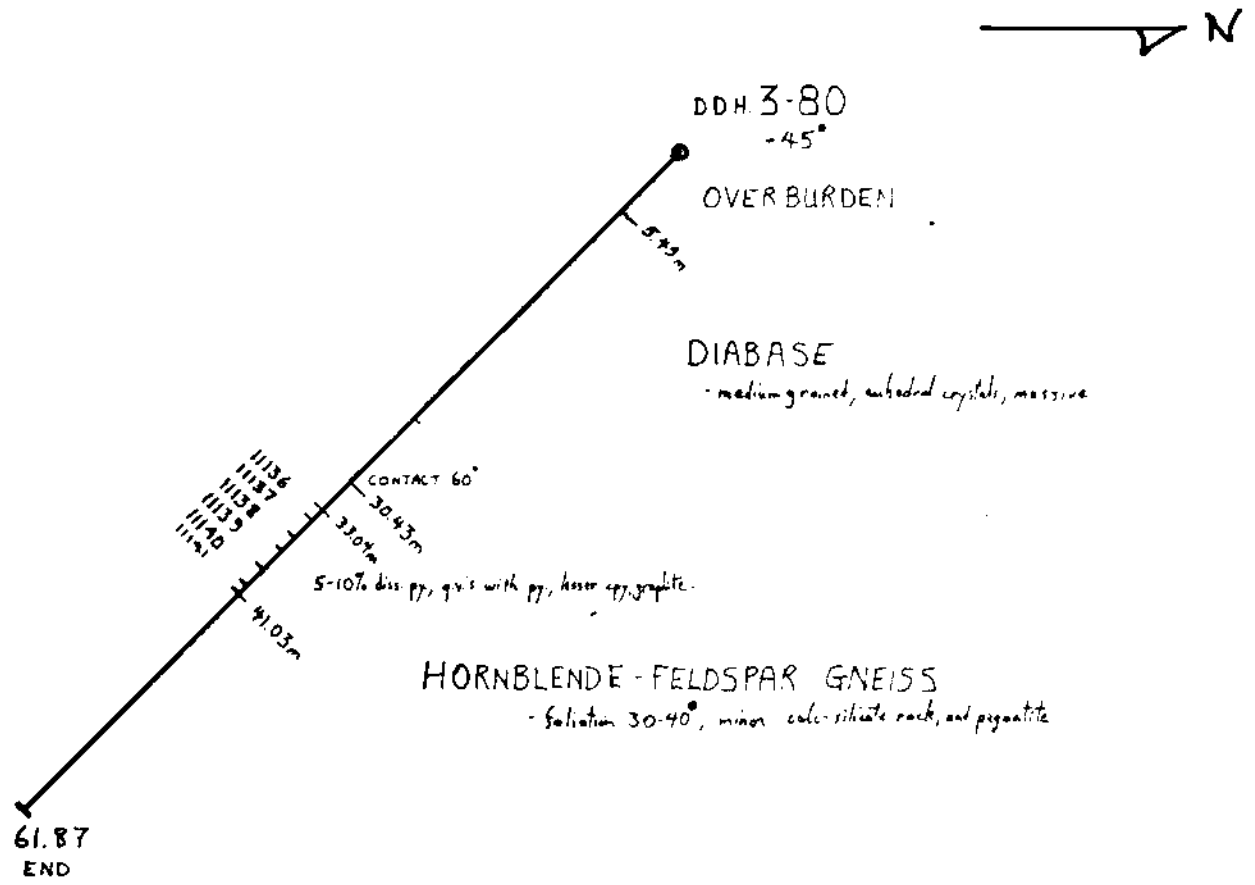
NORTHERN LIGHTS RESOURCES OPTION

QUARTZ MOUNTAIN, SIMILKAMEEN M.D., B.C.

SEPT 23, 1980

R F BROWN

1:500



LONG LAC MINERAL EXPL.

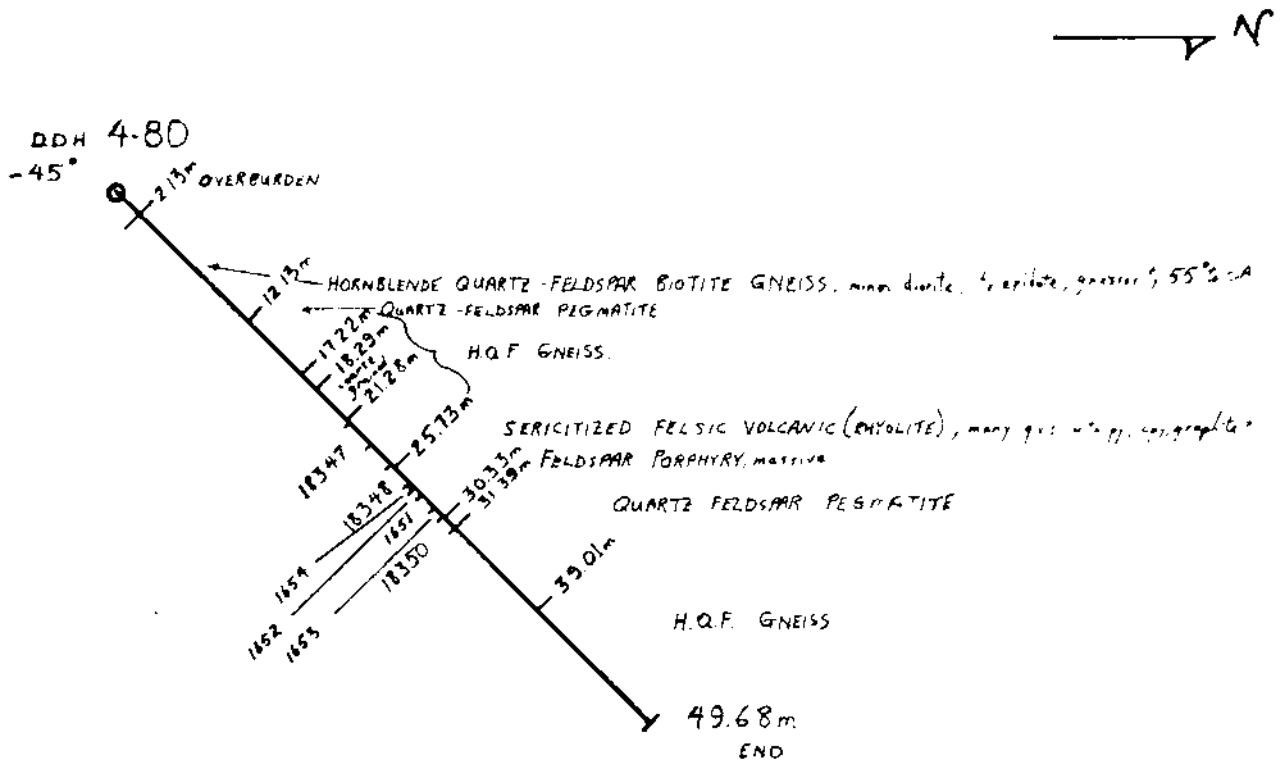
NORTHERN LIGHS RESOURCES OPTION

QUARTZ MOUNTAIN, SIMILKAMEEN M.D., B.C.

SEPT 23, 1980

R.F. BROWN

1:500



LONG LAC MINERAL EXP.

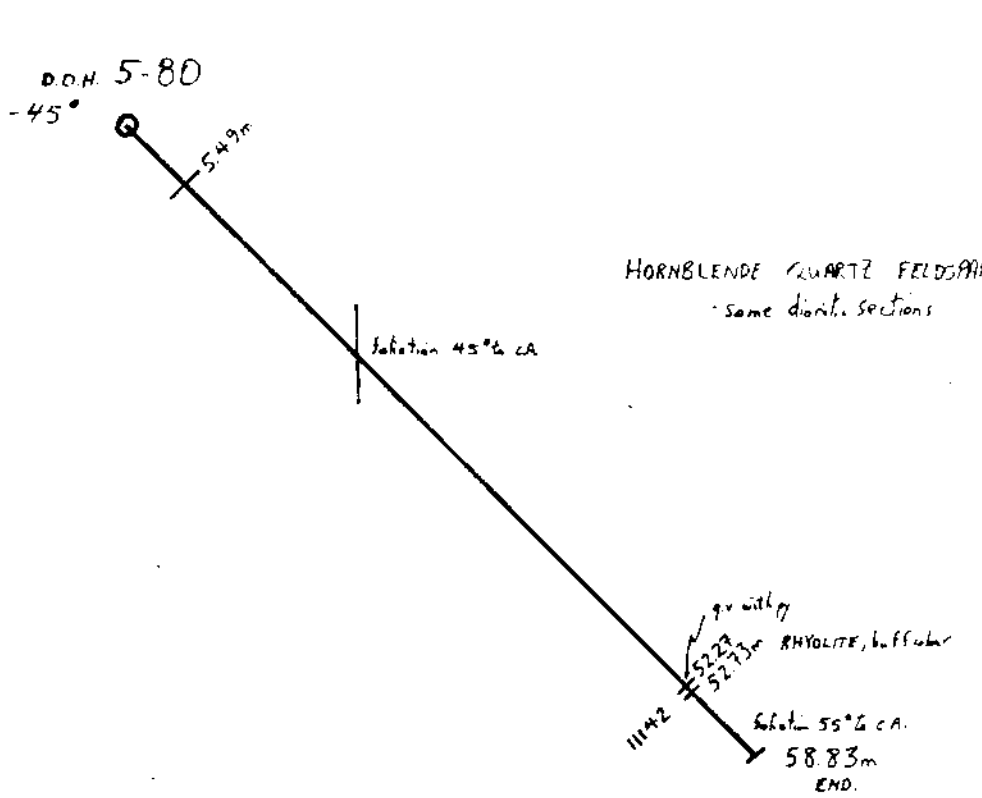
NORTHERN LIGHTS RESOURCES DIST.

QUARTZ MOUNTAIN, SIMILKAMEEN M.D., B.C.

SEPT 23, 1980

R.F. BROWN

1:500



HORNBLENDE QUARTZ FELDSPAR GNEISS, biotite sections, minor garnets
- some diorite sections

LONG LAC MINERAL EXPL.

NORTHERN LIGHTS RESOURCES OPTION
QUARTZ MOUNTAIN, SIMILKAMEEN M.D. B.C.
SEPT. 23, 1980
R.F. BROWN

1:500

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C.
V6E 3S7

DRILL HOLE GEOLOGIC LOG DDH 5-80

HOLE NUMBER
PAGE No 1 OF 1
LOGGED BY R.F. BROWN
DATE MARCH 25, 1980

PROJECT NORTHERN LIGHTS RESOURCES TYPE OF HOLE D.D.H. ☒ R.D.H. ☐ P.D.H. ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRXX	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPBT	biotite porphyry	OVB	overburden	CB	carbonate	KA	kaolin	SA	sausserite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	kspar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	SI	siliceous
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SH	shear
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION ____ AZIM 090° DIP -45°
COLLAR LATITUDE ____ DEPARTURE ____
ELEVATION COLLAR ~~1955~~ BOTTOM ____
LENGTH 58.83m (193') RECOVERY ____ CORE SIZE BQ.
PURPOSE QUARTZ MTN., SLIMKAMEEN MINING DIVISION
DATE STARTED ____ END ____

CORE METRES	LITHOLOGY	STRUCTURE ALTERATION	MINERALIZATION	TO	FROM	TO	DESCRIPTION	VISUAL ESTIMATE %CP %BO %M %PY	SAMPLE NUMBER	FROM	TO	METRES	ASSAY Cu	Ag gms/T	Au gms/T
					0m	5.49m	OVERBURDEN								
					5.49	58.83m	HORNBLENDE - QUARTZ - FELDSPAR GNEISS								
							- lesser biotite, tr. epidote, very few garnets.								
							- medium grained with minor coarser dioritic sections								
							5.49-19.20m more felsic, no diorite, coarse grained sect'n 15.24-15.85m								
							with tapioca texture (aplite?, pegmatite?)								
							5.49-9.14m limonite stain, core competent, usually breaks								
							at 45°-60°								
							13.72m foliation 40° to C.A.								
							9.60m 7cm qtz. vein with hornblende, pyrite								
							9.91m 4cm " " "								
							20.57m 4cm, vuggy with pyrite and rust stain.								
							20.42m foliation at 50° to C.A.								
							22.56m " " 45° to C.A.								
							24.38m 7cm. barren quartz vein.								
							28.65 - 33.83m folded foliation from 0° to 40° to C.A.								
							predominately 10° to C.A.								
							34.47 - 35.05m dioritic, conformable contacts.								
							40.84m quartz vein 1cm, 20° to C.A., foliation 50° to C.A.								
							43.13 - 43.28m 1cm, qtz vein 0° to C.A., tr. pyrite.								
							45.42 foliation 40° to C.A.								
							45.42 - 46.33m calc-silicate rock, green and red mottled colours								
							contacts both 40° to C.A. (chlorite, garnet rich)		11142	52.27	52.73m	0.46m		0.17	1.70
							49.23 - 49.68m foliation 0° to C.A.								
							51.97m a few garnets								
							52.27 - 52.73m tuffs rhyolite (mylonite?), 52.27m qtz vein								
							with pyrite (10° to C.A.); 57.61m foliation 55° to C.A.								
							58.83m end of Hole								

CP

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C.
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER L-80
PAGE No 1 OF 2
LOGGED BY R.E. BROWN
DATE MARCH 09, 1980

PROJECT NORTHERN LIGHTS RESOURCES. TYPE OF HOLE DDH ☒ BDH ☐ PDH ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	mo ybdenite
BRXY	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPBI	biotite porphyry	OVB	overburden	CB	carbonate	KA	kaolin	SA	sausserite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	kspar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	SH	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SI	siliceous
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION ____ AZIM 090° DIP -45°
COLLAR LATITUDE ____ DEPARTURE ____
ELEVATION COLLAR ____ BOTTOM ____
LENGTH 740.7m RECOVERY ____ CORE SIZE B.Q.
PURPOSE Au, Ag prospect, QUARTZ MTN., SILVERCAMP MINING DIV.
DATE STARTED ____ END ____

CORE: METRES | LITHOLOGY | STRUCTURE | ALTERATION | MINERALIZATION

TO	FROM	TO	DESCRIPTION	VISUAL ESTIMATE %CP %BORN %PY	SAMPLE NUMBER	FROM	TO	METRES	ASSAY Cu %	Mo %	Au gms/mt	Ag gms/mt
	0	2.13m	OVERBURDEN									
	2.13	4.72m	HORNBLENDE - QTZ. - FELD. SCHIST, sections weakly magnetic, dk. grey, black, predominately banded with chl. alteration, minor biotite, tr. pyrite, very weak gneissosity, medium grained.									
			4.27 - 4.58m qtz. vein with carbonate, 45° to C.A.									
			3.4m schistosity 60°									
			5.18 - 5.49m, 0.30m lost core, vuggy.									
	4.72	48.16	MIXED DK. GREY TO GREENISH GREY GNEISS(?), weakly developed gneissosity, mafic sections with good schistosity, minor chl, biotite - a few diorite sections, to granodiorite.									
			20.42 - 20.45m white qtz vein with cpy, py at 50° to C.A.									
			20.45 - 20.51m silicified, tr. py.									
			20.51m rusty, ipy & boxy.									
			17.83 - 18.35m mostly quartz.									
			24.54 - 24.69m green chl. rich schist gneiss, garnet (rusty celebles)									
			26.09, 26.15m qtz veins.									
			28.32m qtz vein conformable to gneissosity at 55° to C.A., with									
		→	metallic steel grey, diss. mineral, soft (H4), grey streak, non magnetic.									
			28.63 - 28.66m qtz. vein w. py.									
			28.66 - 28.91m 3-5% disseminated py.									
			33.07m coarse grained diorite, conformable contacts at 60°									
			34.81 - 35.41m coarse diorite 50-50° to C.A. contacts									
			36.27 - 37.80m " " , broken for 10cm at 37.80m									
			37.34 - 37.95m 50%? lost core.									
			37.95 - 41.45m weakly gneissic, chl. rich, dark, minor q.v.'s 10% - 20% pyrite, disseminated to bleby, some net work and stringer pyrite, minor q.v., medium - fine grained, tr. biotite,									
			41.45 - 41.72m coarse diorite with epidote (wispy)									
		→	43.22 - 44.38m SILICEOUS, RHYOLITE?, slightly sanconized, bleby qtz., fine wispy groundmass (sanconia #4-80), light green-grey,									

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8503
NO.

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C.
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER 1-80
PAGE No 2 OF 2
LOGGED BY RFB
DATE

PROJECT N.L.R. TYPE OF HOLE D.D.H. ☐ R.D.H. ☐ P.D.H. ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRXY	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPBI	biotite porphyry	OVB	overburden	CB	carbonate	KA	kaolin	SA	sausserite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	kspar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	Sh	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SI	siliceous
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION ____ AZIM ____ DIP ____
COLLAR LATITUDE ____ DEPARTURE ____
ELEVATION COLLAR ____ BOTTOM ____
LENGTH ____ RECOVERY ____ CORE SIZE ____
PURPOSE ____
DATE STARTED ____ FNS ____

CORE: MINERALIZATION	TO	FROM	TO	DESCRIPTION	VISUAL ESTIMATE: %CPY	%BORN	%PY	SAMPLE: NUMBER	FROM	TO	THICKNESS	ASSAY: Au oz/T	% Cu	% Mo	g/gms	Ag
				trace - 1% pyrite, NO quartz veins, qtz. blebs give tapioca texture.												g=s/mtr.
				44.38 - 45.72m medium mottled green grey, chloritic rock.												
				46.09 - 46.12m iron carbonate filling weakly brecciated area.												
		48.16	74.07m	HORNBLENDE-QTZ-FELD GNEISS, noticably more mafic, few felsic bands and minor dioritic material, chl. alteration, minor epidote in diorite (coarse grained, conformable) ie: 49.07-49.93m, 55.72-55.90m, 54.25-55.17m, 45° to C.A.												
				64.68-67.36m, RHYOLITE?, creamy tinge green tapioca texture with qtz phenocrysts, massive, NO qtz. veins, tr. py.												
				66.14-67.36m qtz. more greenish, grdmass creamy brown.												
				→ 67.97-70.50m, CREAMY FELDSPAR PORPHYRY, massive, green chl. blebs in fine grey green light groundmass.												
				68.46-70.50m, 3% diss. pyrite in blebs and fine grains from ~~68.46~~.												
				67.97-68.46m, non-porphyritic, silicified, brownish green, chl., wispy texture.												
				68.46-68.52m 7cm qtz vein with 10% pyrite.												
				70.10-70.46m weak phyry, some mottling green grey, tr-2% disseminated pyrite.												
				73.12m quartz vein breccia @ 20° to C.A.												
				- 72.15 gneissosity 45° to C.A.												
				74.07 END OF HOLE												
				THIN SECTIONS 40.54m, 43.43m ~~46.~~												

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8503
NO.

LONG LAC MINERAL EXPLORATION LTD
#1680 1050 West Pender
Vancouver B C
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER 2-80
PAGE No 1 OF 5
LOGGED BY R.F. BROWN
DATE MARCH 11, 1980

PROJECT NORTHERN LIGHTS RESOURCES TYPE OF HOLE D.D.H. ☒ B.D.H. ☐ P.D.H. ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRXX	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPB	biotite porphyry	O/B	overburden	CB	carbonate	KA	kaolin	SA	sausserite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	kspar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	Sh	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SI	siliceous
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION
COLLAR: LATITUDE
ELEVATION COLLAR
LENGTH 62.03m RECOVERY
PURPOSE
DATE STARTED
AZIM 090° DIP -45°
DEPARTURE
BOTTOM
END
CORE SIZE B.Q.

METRES	CORE	LITHOLOGY	STRUCTURE	ALTERATION	MINERALIZATION	FROM	TO	DESCRIPTION	VISUAL ESTIMATE %CP %BO %M %Py	SAMPLE NUMBER	FROM	TO	METRES	ASSAY Cu	Pb	Zn	Mo	Ag oz/t
						Qm	6.71m	OVERBURDEN										
						6.71m	9.69m	MAFIC INTRUSIVE (DIABASE), massive fine grained 8.53m - 9.69m; 6.71 - 8.53m massive medium grained, 7.92 - 8.53m heavily broken carbonate blebs, contact 50° to C.A. at 9.69m. slightly magnetic.										
						9.69	62.03m	GREEN GREY TO GREY HORNBLENDE, QUARTZ-FELD. GNEISS - very weak magnetics, includes coarse grained massive conformable diorite, some siliceous sections, quartz veins and pegmatite, - medium grained, poor gneissosity, chlorite alteration of hornblende, some biotite, minor epidote, garnets and a few quartz veins.										
								10.06 - 10.08m fine grained diabase, 50° to C.A. contacts. 10.0m gneissosity 52°, core competent, breaks along gneissosity.										
								11.58 - 12.95m pegmatite (aplite?) coarse grained, massive, light apple green silicate in a white feldspar groundmass. 2.5cm qtz. vein at upper contact ~50°, tr. py., mostly in tiny hairline fractures.										
								12.95m contact 45° conformable with gneissosity.										
								13.41 - 13.62m 5-10% very fine banded disseminated pyrite										
								2.5cm qtz. vein at 13.53m with pyrite, chalcopyrite										
								14.59 - 14.60m coarse siliceous massive band contacts 50° to C.A. minor qtz. vein with 1-2% pyrite.										
								17.68 - 17.74m 3cm qtz. vein with cpy, py, breccia also with cpy/py, small py halo in surrounding gneiss for 2cm.										
								19.38 - 22.46 coarse diorite, minor chlorite, epidote, weak K-feld. hematite stain 21.03m, broken 19.51 - 20.12m, .30m lost.										

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 8503

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C.
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER 2-80
PAGE No. 2 OF 5
LOGGED BY
DATE

PROJECT _____ TYPE OF HOLE D.D.H. ☐ R.D.H. ☐ P.D.H. ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRXY	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPBI	biotite porphyry	OVB	overburden	CB	carbonate	KA	kaolin	SA	sausserite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	k-spar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	Sh	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	ML	malachite	SI	siliceous
				CL	chlorite	MS	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION _____ AZ M _____ DIP _____
COLLAR LATITUDE _____ DEPARTURE _____
ELEVATION COLLAR _____ BOTTOM _____
LENGTH _____ RECOVERY _____ % CORE SIZE _____
PURPOSE _____
DATE STARTED _____ FINISHED _____

CORE: METRES | LITHOLOGY | STRUCTURE ALTERATION | MINERALIZATION | TO

FROM	TO	DESCRIPTION	VISUAL ESTIMATE Cp Bo Sm Py	SAMPLE NUMBER	FROM	TO	METRES	ASSAY % Cu	% Mo	Au gms/ton Ag
		core in broken zone.								
		-gradational contact with gneiss for 6cm.								
→		22.52 - 23.47 RHYOLITE, light green, creamy with qtz phenocrysts (graphic texture) < .3cm								
		23.16m more siliceous white, less qtz phenocrysts.								
		-RUSTY ZONES (2cm) with chalcopyrite, pyrite and quartz vein N50° to C.A. at 22.68m, 22.80m, 22.86m, 23.16m, 23.45m, 23.22m.								
→		23.47 - 25.76m 5-10% py, disseminated in dark green to dark grey gneiss.								
		★ NOTE: a possible mistake exists on the meterage tags in the core box. The tag 21.95m is also marked 21.64m. Measuring back to a tag at 21.34m is obviously 0.61m, so the 21.95m marker is presumed correct. Unfortunately 3.05m along the tag is marked 24.69m. It should be 24.99m and was treated so when logging the pyrite zone. Beyond 27.43m the core logging was reverted back to the markings on the tags SO BEWARE !!?								
		26.21m garnets								
		qtz veins 26.88m, 26.21m, 26.27m (garnets also)								
		26.94 epidote and vuggy, red mineral, dark rusty, fine in gneiss at 26.97 - 27.28m, gneissosity 50° to C.A.								
		27.28m py in qtz vein at 20° to C.A.								
		27.43m folded 0.5cm qtz vein.								
		27.43 broken core								
		reverts to tags								
		-27.58 - 27.68m RHYOLITE, green medium grained, qtz phenocrysts								

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8503
NO.

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C.
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER 2-80
PAGE No 3 OF 5
LOGGED BY
DATE

PROJECT TYPE OF HOLE D.D.H. ☐ B.D.H ☐ P.D.H ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRXY	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPBI	biotite porphyry	OVB	overburden	CB	carbonate	KA	kaolin	SA	sausserite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	kspar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	Sh	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SI	siliceous
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION AZIM DIP
COLLAR LATITUDE DEPARTURE
ELEVATION COLLAR BOTTOM
LENGTH RECOVERY CORE SIZE
PURPOSE
DATE STARTED FINISHED

CORE: METRES	LITHOLOGY	STRUCTURE ALTERATION	MINERALIZATION	TO	FROM	TO	DESCRIPTION	VISUAL ESTIMATE F.-CP% BO%M %Py	SAMPLE NUMBER	FROM	TO	TYPE	ASSAY	A9
							27.83-28.32 m RHYOLITE, coarse medium grained, whitish-green, massive, trace pyrite minor qtz. veins.							
							29.66m qtz vein, 60° to c.A., as is gneissosity,							
							28.35-34.75 gneissosity 45°-60° to c.A.							
							29.72-32.16m fine 1% pyrite, disseminated and network in gneiss.							
							1.2cm qtz vein, py, 20° to c.A. at 29.72 and 30.02 qtz vein 40° parallel to gneissosity							
							30.18m q.v. 30° 1-2% py							
							30.75-30.81 minor diorite, qtz veins with minor breccia, 3-5% py blebs in gneiss.							
							31.70-32.16m qtz. vein cut by carbonate vein							
							31.70 10cm qtz vein, 60° to c.A.							
							31.85-32.16 qtz vein parallel to c.A., cut by carbonate with bleby pyrite.							
							34.23m 1cm qtz vein, py, 25° to c.A.							
							34.66m qtz vein, 1cm 30°, gneissosity 30° to c.A.							
							34.99-35.20m qtz. vein with chl., hornblende.							
							35.37 1cm qtz vein with py.							
							35.20-35.48 3% py.							
							→ Hole #2-80 has many more low angle qtz vein with pyrite than either 1-80 or 4-80.							
							the gneiss is the same, poorly banded, medium dark black grey to black green grey with minor anthophyllite diorite (coarse with minor epidote and chlorite)							
							36.55-36.70m. qtz. vein breccia, 30° to c.A., gneiss 45°-50°							
							37.22-37.40m., qtz veins, minor breccia, q.v. at 63° and 45°; minor disseminated pyrite.							
							39.84-39.93m, 2 qtz. veins 5cm dia., 20° to c.A., py							

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C.
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER L-80
PAGE No 4 OF 5
LOGGED BY
DATE

PROJECT TYPE OF HOLE D.D.H. ☐ B.D.H ☐ P.D.H ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRXY	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPBI	biotite porphyry	OVB	overburden	CB	carbonate	KA	kaolin	SA	saussurite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	kspar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	Sh	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SI	siliceous
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION AZIM DIP
COLLAR LATITUDE DEPARTURE
ELEVATION COLLAR BOTTOM
LENGTH RECOVERY CORE SIZE
PURPOSE
DATE STARTED END

METRES	LITHOLOGY	STRUCTURE ALTERATION	MINERALIZATION	CORE TO	FROM	TO	DESCRIPTION	VISUAL ESTIMATE %CP	%SM	%Py	SAMPLE NUMBER	FROM	TO	METRES	ASSAY
							41.91m .5cm, 10° qtz vein with py.								
							42.06m wispy <1/4° qtz vein with epidote.								
							42.82m 10cm qtz vein with py, chlorite, 20° and 60° to c.A.								
							43.28-43.37 qtz vein with pyrite and green silicate as in pegmatite.								
							43.80-44.20 5% py. in gneiss (40° to c.A), qtz vein 20° to c.A. with pyrite								
							44.96m 1cm qtz vein, 15°, py.								
							45.87-46.36m 2% py								
							46.18m 2.5cm qtz vein 10°-20° to c.A. with pyrite.								
							48.01m 2% semi-massive .5cm pyrite vein/etz with qtz.								
							48.59-48.71m silicified qtz veins and groundmass, very fine disseminated pyrite.								
							48.71-48.92m chlorite alteration around siliceous unit.								
							→ 48.92-50.63m COARSE GRAINED MASSIVE to weakly FOLIATED, QTZ-FELD. PEGMATITE with minor chlorite.								
							- slight tapioca texture, few mafic minerals, close to pre-described rhyolite except coarser and not so greenish.								
							48.92m contact 50° to c.A.; 50.63 contact 30° to c.A.								
							51.66-51.94m slightly brecciated gneiss.								
							→ 53.31-53.95m BUFF RHYOLITE, fine wispy groundmass with greyish green qtz (graphic), some black/grey blue quartz.								
							53.49 & 53.55m rusty qtz veins with pyrite.								
							53.55-53.95m qtz vein with diss. py., 30° to c.A., vuggy diss. blebs of graphite.								
							53.95-54.39 mylonitized, altered by chlorite and brecciation mafic rock, contorted, trace py to 2% py. near 53.95m.								

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C.
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER 2-80
PAGE No 5 OF 5
LOGGED BY
DATE

PROJECT TYPE OF HOLE D.D.H. ☐ B.D.H ☐ P.D.H ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRKY	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPBI	biotite porphyry	OVB	overburden	CB	carbonate	KA	kaolin	SA	saussurite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	kspar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	Sh	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SI	siliceous
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION AZIM DIP
COLLAR LATITUDE DEPARTURE
ELEVATION COLLAR BOTTOM
LENGTH RECOVERY CORE SIZE
PURPOSE
DATE STARTED FINISH

CORE: MINERALIZATION	STRUCTURE ALTERATION	LITHOLOGY	MINERALIZATION	TO	FROM	TO	DESCRIPTION	VISUAL ESTIMATE %CP %BO %M %PY	SAMPLE NUMBER	FROM	TO	METRES	ASSAY Cu %	Cu %	Mo %	Ag oz/T
							→ 54.99 - 56.51m FELDSPAR PORPHYRY - med.-coarse grained, med. buff grey, chl. blebs, massive, diss.+bleby py. - same unit as #1-80									
							56.51 - 56.60 m qtz. vein 20° to C.A., py.									
							56.60 - 56.66 m altered mafic rock, contorted, 30° banding, some brecciation, w/spy buff bands									
							56.48m - q.v. with py, rusty.									
							56.66 - 61.87m weakly foliated HORN-FELD-QTZ. ENCLS, dark green to grey, chloritic.									
							58.67m q.v. 30° to py.									
							58.83 - 59.28 qtz. with chlorite fill cracks parallel to C.A.									
							59.37 - 59.49 m breccia, qtz. vein system 0° - 50° to C.A., py.									
							60.05 m, 2.5 cm qtz. vein with pyrite ~20° to C.A.									
							→ 59.49 - 60.81 m coarse siliceous Feld. unit (pegmatite) massive, chloritized.									
							61.11m qtz. vein with pyrite, 20° to C.A., gneissosity 40°									
							61.72 - 61.87m. Fault gouge green-grey, altered to qtz-feld. bands and chlorite.									
							62.03 m END OF HOLE #2-80									

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8503
NO.

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C.
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER 3-80
PAGE No 1 OF 2
LOGGED BY R.E. BROWN
DATE MARCH 25, 1980

PROJECT NORTHERN LIGHTS RESOURCES TYPE OF HOLE D.D.H. ☒ B.D.H. ☐ P.D.H. ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRXY	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPBI	biotite porphyry	OVB	overburden	CB	carbonate	KA	kaolin	SA	saussurite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	kspar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	SH	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SI	siliceous
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION — AZIM 270° DIP -45°
COLLAR LATITUDE — DEPARTURE
ELEVATION COLLAR — BOTTOM
LENGTH 61.87m RECOVERY — CORE SIZE BQ
PURPOSE QUARTZ MTN., SIMILKAMEEN MINING DIVISION
DATE STARTED — FINISHED

CORE: METRES	LITHOLOGY	STRUCTURE ALTERATION	MINERALIZATION	TO	FROM	TO	DESCRIPTION	VISUAL ESTIMATE %CP %BO %PY	SAMPLE NUMBER	SAMPLE FROM	SAMPLE TO	SAMPLE METRES	ASSAY Au oz/T	ASSAY Ag oz/T	Ag g/mT
					0	5.49m	OVERBURDEN								
					5.49	30.42m	DIABASE, medium grained, anhedral amphiboles and feldspars, massive, dark greenish, minor serpentinization, chl. veins, dominate fractures 40° to C.A.								
							24.75m - 25.30 brecciated grey qtz. vein and gneiss, upper contact 60°, lower contact 40° to C.A.								
							0.61 LOST CORE between 26.82 - 28.04 m.								
							26.52 - 26.82 brecciated quartz vein, upper contact 55° to C.A.								
							25.30 - 30.42 diabase becomes fine grained, massive with carbonate blebs (1-2 mm. dia.), lower contact 60° to C.A.								
					30.42	61.87	HORNBLENDE - QUARTZ - FELDSPAR GNEISS with lesser sections of qtz - feld. vein material (pegmatic) and cross cutting and conformable pegmatic dykes and sills.								
							- very few quartz veins, dominate foliation 30°-40° to C.A.								
							30.42 - 33.04 massive medium grained, mottled green (sericitization) feldspar-quartz rock (pegmatic), fractures 55° to C.A., trace pyrite, tapioca like texture.								
							33.04 20° contact, also quartz vein 1cm. (grey quartz)								
							33.04 - 42.67 weakly foliated, 33.04 - 34.75 foliation 25° to C.A.								
							33.53m / 15°-20° to C.A. foliation.								
							33.04 - 41.03m 5-10% disseminated, bleby and minute stringer pyrite, a few qtz veins with calcopyrite, pyrite, graphite and another non magnetic, SH, grey streak, grey metallic mineral?								
							38.71 - 41.03m muscovite developed								
							36.58 - 36.97m qtz - feld pegmatite, upper contact 60° to C.A.								
							37.19 - 37.31m brecciated quartz vein, sauceritized, chlorite, pyrite								
							38.71m foliation 10° to C.A.								

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8503
NO.

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C.
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER 3-80
PAGE No 2 OF 2
LOGGED BY REB.
DATE

PROJECT _____ TYPE OF HOLE D.D.H. ☒ B.D.H. ☐ P.D.H. ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRXY	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPBI	biotite porphyry	OVB	overburden	CB	carbonate	KA	kaolin	SA	sausserite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	k-spar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	SH	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SI	siliceous
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION _____ AZIM _____ DIP _____
COLLAR LATITUDE _____ DEPARTURE _____
ELEVATION COLLAR _____ BOTTOM _____
LENGTH 61.87 m RECOVERY _____ CORE SIZE _____
PURPOSE _____
DATE STARTED _____ END _____

CORE: MINERALOGY	TEXTURE	STRUCTURE ALTERATION	MINERALIZATION	TO	FROM	TO	DESCRIPTION	VISUAL ESTIMATE %CP	%BO	%M	%Py	SAMPLE NUMBER	FROM	TO	METRE	ASSAY Cu	Ag	Mo	Au
							38.86m qtz vein 70° to c.A. tr chlorite and pyrite												
							39.01m " " 0.5 cm, disseminated graphite.												
							39.62m " " 7.5 cm, brecciated with chl, py, cpy, graphite and other metallic grey mineral - 60° to c.A.												
							40.29m quartz vein, 1cm, gn, py, chl. 60° to c.A.												
							40.69m " " 5cm, " " " 70° " "												
							41.06m " " 1 cm, " " " 70° " "												
							40.69 - 41.91m massive, medium grained tapioca texture siliceous rock (pegmatic)												
							42.67 - 61.87m. well foliated, 30° to c.A., medium grained, muscovite to 43.74m												
							43.74m - 44.81m quartz vein 0° to c.A., tr. epidote												
							45.48m, 8 cm pyritic zone												
							49.07; 49.68-49.77m conformable qtz veins.												
							50.90 - 52.73m 40% rock is quartz veins, both 0° and 30° to c.A.												
							53.71 - 56.08m calc-silicate rock mostly qtz with ~~coarse~~ heavy green and red mottled alteration (epidote, some chlorite, garnets?)												
							58.03m a few garnets.												
							58.52 - 58.83m 5% disseminated pyrite, very fine grained												
							61.81 - 61.87m quartz												
							58.09 - 60.05m medium to fine grained pale green weakly foliated gneiss.												
							61.87m END OF HOLE												

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8503
NO.

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER 4-80
PAGE No 1 OF 2
LOGGED BY R.E. BROWN
DATE MARCH 06, 1980

PROJECT NORTHERN LIGHTS RESOURCES TYPE OF HOLE D.D.H. ☒ B.D.H. ☐ P.D.H. ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRXY	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GH	graphite	Ox	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPB	biotite porphyry	OVB	overburden	CB	carbonate	KA	kaolin	SA	sausserite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	kspar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	Sh	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SI	siliceous
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION _____ AZIM. 090° DIP -45°
COLLAR LATITUDE _____ DEPARTURE _____
ELEVATION COLLAR _____ BOTTOM _____
LENGTH 49.68m RECOVERY _____ % CORE SIZE BQ.
PURPOSE Au, Ag showing, QUARTZ MTN, SIMILKAMEEN MINING DIV.
DATE STARTED " " END _____

CORE METRES	LITHOLOGY	STRUCTURE ALTERATION	MINERALIZATION	TO	FROM	TO	DESCRIPTION	VISUAL ESTIMATE %CP %BO %M %Py	SAMPLE NUMBER	FROM	TO	METRES	ASSAY % CuO	% Mo	Au g
					0	2.13m	OVERBURDEN								
					2.13	~~10.67~~ 12.13m	HORNBLENDE QTZ. FELDSPAR BIOTITE GNEISS, banding poorly developed N 60° to C.A., medium grained banded black and white, 0.62m lost core between 4.57 - 6.10m, core broken (platey) 3.05 - 6.10m; minor diorite sections upto 0.31m. 7.01 - 10.52m core becomes fine to med. grained, greenish white, much chl., 3mm cracks filled with carbonate and qtz. 8.53m vuggy ; 8.53 - 8.84m chl. and orange mineral (calc. silicate) 10.36m crack parallel to C.A. with chlorite alteration. 10.67 - 12.13, gneissosity weak 55°, qtz veins 55°, 40°, 20°, 60°, tr. epidote								
					12.13	56.5m	QUARTZ - FELDSPAR (PEGMATITE), massive, medium coarse grained qtz - feld, wispy chl., tr. py, tremolite ? at 12.95m ? - fracturing 60°, 30°, creamy white colour. 13.72 - 14.17m slightly mafic with hornblende 2-3% 13.41 garnets with qtz vein at 30° 16.70 - 16.77 mafic section with hornblende. 14.02 - 14.63 reddish bleby garnets upto ¼" diameter.								
					17.22	18.29m	H.Q. F. Gneiss, foliated 30°-45°, tr. arsenopyrite ? 17.43m - core broken 17.22 - 17.43m gouge zone limonite on cracks.								
					18.29	21.28m	COARSE GRAINED, QTZ - FELD - HORN. - CHL. PARAGNEISS, weak gneissosity, mafic - felsic bands								
					21.28	25.73m	HORN (CHL.) - QTZ - FELD - schist to gneiss 35°-45° to C.A. - minor carbonate, epidote, a few garnets 21.95m, <1% py. 21.64 - 23.62m ~ 5 10% diss. pyrite in siliceous qtz veins, contacts 22.24 - 23.36m 45° and 90° 22.71m 5cm qtz. vein, conformable with gneissosity								

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8503
NO.

LONG LAC MINERAL EXPLORATION LTD.
#1680 - 1050 West Pender
Vancouver, B.C
V6E 3S7

DRILL HOLE GEOLOGIC LOG

HOLE NUMBER 4-80
PAGE No. 2 OF 2
LOGGED BY A.F.B.
DATE

PROJECT _____ TYPE OF HOLE D.D.H. ☒ B.D.H. ☐ P.D.H. ☐

LEGEND

ARGL	argillite	MUDS	mudstone	AZ	azurite	CY	clay	M	molybdenite
BRKA	breccia	MYLN	mylonite	BI	biotite	EP	epidote	MG	magnetite
GREY	greywacke	RHYL	rhyolite	BL	bleached	GR	graphite	OX	oxide zone
GOUG	gouge	SILT	siltstone	BO	bornite	GY	gypsum	PY	pyrite
HORN	hornfels			CA	calcite	HE	hematite	QZ	quartz
PPBI	biotite porphyry	O/B	overburden	CB	carbonate	KA	kaolin	SA	sausserite
PPB	biotite hornblende porphyry	DYK	dyke	CC	chalcocite	KF	kspar	SE	serpentine
PPHO	hornblende porphyry			CI	cuprite	LI	limonite	Sh	shear
PPQB	quartz biotite porphyry			CP	chalcopyrite	MC	malachite	SI	siliceous
				CL	chlorite	MD	mud seam	TA	talc
						MO	molybdenum	X	shattered rock

HOLE LOCATION WITH RESPECT TO CLAIMS

LOCATION _____ AZIM _____ DIP _____
COLLAR LATITUDE _____ DEPARTURE _____
ELEVATION COLLAR _____ BOTTOM _____
LENGTH _____ RECOVERY _____ % CORE SIZE _____
PURPOSE _____
DATE STARTED _____ FINISHED _____

METRES	CORE	TO	FROM	TO	DESCRIPTION	VISUAL ESTIMATE %CP %BO %M %Py	SAMPLE	ASSAY
			25.73	30.33	SERICITIZED FELSIC VOLCANIC RHYOLITE, fine grained, sericitized light green groundmass with 3mm grains qtz (mylonite zone?), wispy texture, many narrow white qtz veins <12cm with py, chalcopyrite, conformable 5. 15° to c.A.			Ag
					26.82m metallic grey mineral, grey streak, non magnetic H<5 graphite?			
					- foliation 45° - 70°			
					- white bull qtz. 26.82 - 27.13m with tr graphite?, py, cpy.			
					- CORE ALREADY SPLIT 27.28 - 29.72m			
					- lost core 28.35 - 29.57m (.60m?), rare broken, rusty			
					29.57 - 30.23m badly broken core.			
			30.33	31.39m	MASSIVE FELDSPAR PORPHYRY.			
					- very fine, light-medium green grey grdmass with Feld. phenocrysts to 5mm., minor rusty alteration			
					- fractured 20° & 70° to c.A.			
					- 2% disseminated pyrite.			
			31.39	39.01m	PEGMATITE, QTZ-FELD., coarse, massive.			
					31.39 - 35.97m qtz-feld., minor chl., tinted sericite green colour.			
					- Fractures 70° - 90° to c.A.			
					35.97 - 39.01m more chlorite, some hornblende			
					- very weak foliation 37.49m (40° to c.A.), lower contact 80° to c.A.			
			39.01	49.66	HORNBLENDE (CHL) QTZ - FELD - GNEISS, medium grained, schistose, weak mineralization, a few coarser granitoid bands.			
					40.08 - 40.34m calc-silicate, altered, cpy, green & pink red, 1% py.			
					46.46 - 46.94m coarse pegmatite of qtz-feld-chl., contacts at 80° to c.A. (both contacts)			
					49.23m garnets and hematite			

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8503
NO.

Vancouver Petrographics Ltd.

JAMES R. VINNELL
JOHN G. PAYNE

P.O. BOX 460
HOPE, MAIN STREET
HOPE, B.C.
V0X 1L0

PHONE 604, 888-1323

19 March 1980

Mr. Robert Brown
Long Lac Mineral Exploration Ltd.
Suite 1680 - 1050 West Pender Street
Vancouver, B.C. V6E 3S7

Dear Mr. Brown:

Mission accepted. The rocks from the Princeton area have been identified as follows:

40.54m	DDH 1-80	133.0'	Chloritized biotite amphibolite (metaandesite?)
43.43m	DDH 1-80	142.5'	Albite pegmatite
8.69m	DDH 4-80	28.5'	Calcsilicate (metamorphosed impure calcareous sediment)
28.01m	DDH 4-80	91.9'	Siderite-quartz-sericite-pyrite schist
49.23m	DDH 4-80	161.5'	Brecciated plagiocase-chlorite-quartz-garnet-pyrite-hematite rock, metaigneous
11.28m	DDH 4-80	37.0'	Biotite-garnet amphibolite (metaandesite)
32.92m	DDH 4-80	108.0'	Albite pegmatite

This certainly represents a series of supracrustal rocks, andesites, andesitic tuffs (DDH 4-80 37.0'), and sediments, intruded by pegmatites and regionally metamorphosed to amphibolite grade. DDH 4-80 37.0' contains a classic amphibolite-facies assemblage, calcic plagioclase-hornblende-garnet-Kspar-biotite. Metamorphic temperatures exceeded 550-600°C.

The carbonate assemblage in DDH 4-80 28.5', clinopyroxene-garnet-quartz-calcite, is also typical of amphibolite-facies metamorphism. The presence of garnet indicates a water-rich fluid. Under these conditions (X_{H_2O}=.1 to .2; T=550°C) the total pressure must have been greater than 2-3 kb, or wollastonite would appear instead of calcite+quartz.

The stable assemblages are shown on Figure 1.

Extensive retrograde metamorphism and cataclastic deformation (recrystallization to much finer grain sizes because of high strain), shearing, and brecciation have affected all of these rocks to varying degrees. In some cases, e.g. DDH 4-80 91.9', not only the original parent but the amphibolite-facies metamorphic texture have been destroyed by the late event.

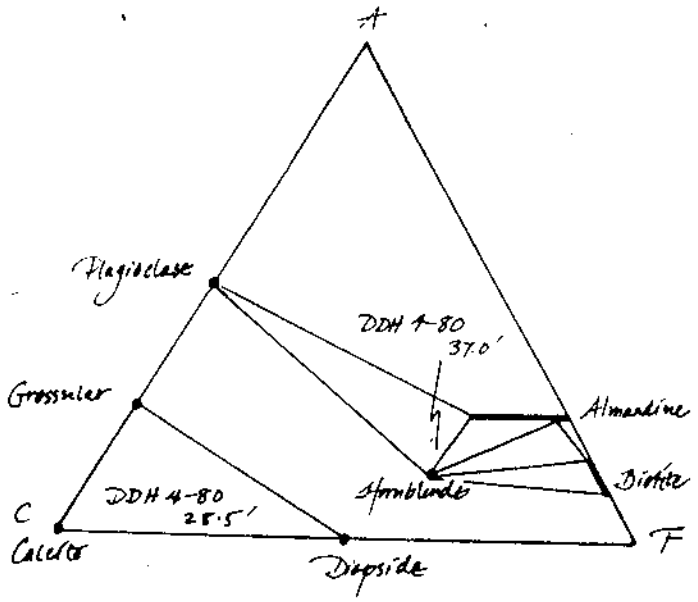
Pyrite and hematite are the only opaque phases observed in this suite.

I hope that this satisfactorily answers your questions. Should you wish further discussion I can be reached at 734-9494 or via Jim Vinnell.

Sincerely yours,

J. Nelson, M.Sc.

Figure 1 ACF plot of amphibolite-facies assemblages from Princeton Suite.



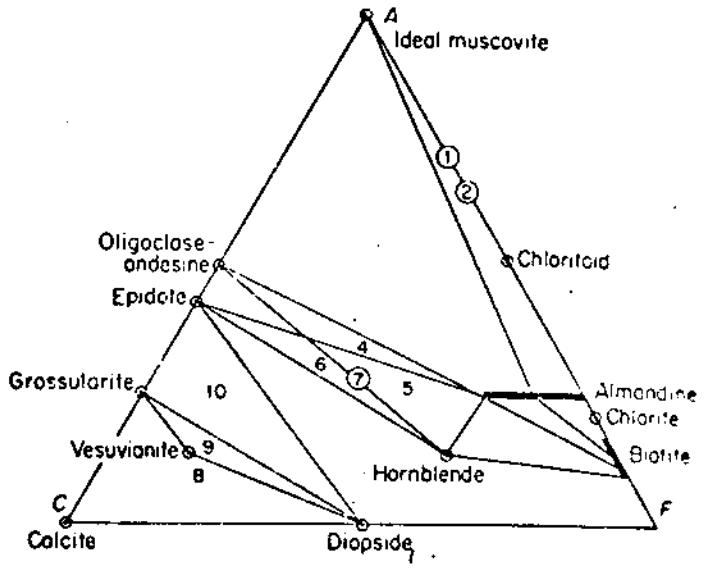


Fig. 7-23. Amphibolite facies, almandine zone, Dalradian, Scotland

DDH 1-80 133.0' Chloritized biotite amphibolite (metaandesite ?)

This sample appears to be similar in texture and metamorphic mineral composition to DDH 4-80, 37.0'. Chlorite has entirely replaced its original biotite and hornblende. It still shows a strong metamorphic foliation due to alignment and orientation of mafic phases. The average grain size is .5 to 1 mm, which would accord with a volcanic rather than a plutonic parent. Finer bands seem to be the result of late-stage cataclastic deformation.

Mode

42 albite
20 chlorite
15 sericite
8 quartz
8 carbonate
6 pyrite
1 rutile
.5 apatite

Albite (probably calcic plagioclase albitized at the same time as the chloritization and introduction of carbonate) is moderately to heavily sericitized. Sericite development tends to follow crystallographic directions in the host crystal. Plagioclase forms an even-grained aggregate of anhedra with concavo-convex outlines. This is a typical texture at higher grades of metamorphism.
Chlorite has two modes of occurrence. The first is as isolated or grouped clear green plates with "lensy" appearance. These are biotite pseudomorphs. The second is as finer grained masses mixed with sericite whose outlines are, like plagioclase, concavo-convex. These are probably hornblende pseudomorphs: compare the shapes of those in DDH 4-80, 37.0'. Chlorite in this sample has streaky purple, blue and brown anomalous birefringence.
Quartz occurs as aggregates of anhedra smaller than the plagioclase. Most are as interstitial clumps; a few discontinuous segregations run parallel to the metamorphic foliation. Subdomain formation was noted in some. This is a feature of late-stage strain.
Carbonate (not calcite) occurs in veins and fracture fillings which cut all of the phases present including chlorite. It also forms patchy growths in albite and with chlorite in the hornblende pseudomorphs.
Pyrite is visible in hand specimen. It occurs in cubes and as anhedra, either individually or in clumps. One pyrite cube grows around a chlorite plate, indicating that the introduction of pyrite at least post-dated the formation of the original biotite grain, if not the chlorite itself. Pyrite generally tends to associate with the chlorite rather than with the plagioclase. Some grains have partial haloes of quartz or recrystallized chlorite.
Rutile (high relief, strong brown pleochroism, high but not extreme birefringence, parallel extinction) occurs as isolated grains, prisms and needles.
Apatite grains are anhedral. They were observed inside plagioclase and intergrown with and included in rutile and pyrite.

DDH 1-80 142.5' Albite pegmatite

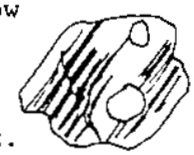
The coarse-grained texture of this sample (plagioclase grains to 2 mm in diameter) points to a plutonic parent in contrast to the metaandesites in the suite. Two small-scale features relate it most closely to DDH 4-80, 108.0'. Plagioclases commonly contain round quartz inclusions. This can form when the two phases crystallize simultaneously (eutectic conditions). During metamorphic readjustment, mineral phases by contrast tend to exclude one another (except during growth of poikilitic grains, and these inclusions are not numerous enough to qualify their hosts as poikilitic.) The second feature worth noting is the corrosion texture in plagioclase, in which a deeply embayed grain is hooded with further growth. This also occurs in pegmatites.

Quartz textures reflect high strain late in the rock's history.

Mode

40 albite
35 quartz
10 carbonate (calcite)
10 sericite, white mica
 5 pyrite
-trace of bright green chlorite in hand sample but not in thin section

Albite forms a relatively equigranular unfoliated aggregate of interlocking crystals. Where not obliterated by sericitization they show well-developed lamellar twins. These twins are commonly bent, a feature of late deformation. One albite grain has a corroded core. Many contain one or several round quartz inclusions. A few are euhedral against quartz.



Quartz originally had the same grain size as albite. These grains are now in the process of conversion to finer grained aggregates as a response to late-stage strong deformation. Strain features include : undulatory extinction, subgrain formation along parallel borders, sutured grain boundaries, and formation of fine aggregates. These are developed in the quartz of the vein which cuts the section as well as the matrix quartz. Carbonate occurs as ragged grains in albite but as euhedra within the quartz vein. It fills fine fractures.

Sericite forms small feathery plates in albite, some following crystallographic directions in the host. Scattered coarser grains accompany carbonate andpyrite. They contain very small pyrite grains.

Pyrite grains are visible in the hand sample. They are distributed in bands parallel to the quartz vein. They range from .02 to .4 mm in diameter, and are cubic, anhedral or clumped.

DDH 4-80 28.5' Calcsilicate (metamorphosed impure calcareous sediment)

This sample consists of a series of fine compositional bands of three main types: 1) diopside with lesser interstitial calcite and epidote 2) garnet in pink, nearly monomineralic bands with inclusions of diopside and quartz, partly altered to epidote and 3) quartz and calcite in varying proportions. Diopside is responsible for the green color of the rock. This sample probably had as a parent a calcareous tuff or siltstone with small-scale compositional layering.

Mode

50 diopside-hedenbergite
15 garnet (grandite?)
15 quartz
10 calcite
10 epidote
tr sphene
tr opaque (pyrite?)
tr apatite

A clinopyroxene of the diopside-hedenbergite solid solution dominates this section. It is green in hand sample and clear in thin section. Individual grains are prismatic to round. Some show lamellar twinning. The average grain size varies somewhat across the layering.
Pink garnet forms dense aggregates with sharp boundaries.
Quartz forms interlocking mosaics with calcite. It also fills concordant and cross-cutting veinlets. Quartz inclusions are abundant in garnet.
Calcite occurs in mosaics with quartz as clear grains with bent twins and uneven extinction, indicative of late strain. It fills fine veinlets that cut the garnet aggregates. Calcite surrounds round diopside grains in the pyroxene layers.
Epidote seems to be a retrograde phase. It forms webs replacing garnet as well as partial pseudomorphs of that mineral. It grows interstitial to diopside and in some cases replaces individual diopside grains.
A few sphene grains grow in the quartz-calcite layers.
Pyrite grains are small and scattered, as anhedra and rarely as cubes.
Apatite occurs as anhedra and subhedral prisms.

DDH 4-80 91.9' Siderite-quartz-sericite-pyrite schist (metawhatsit)

This sample is an enigma. At present it consists of carbonate, fine trains of sericite and pyrite, and coarse quartz segregations which are dismembered and rotated. This assemblage and texture reflect strong deformation (high strain rate at relatively low temperature) and hydrothermal alteration.

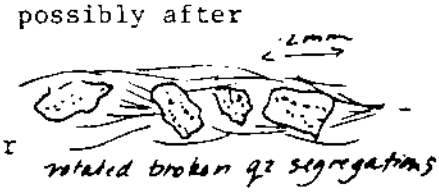
This strong late event unfortunately obliterates the earlier identity and parentage of the rock. There is no potassium present : either it has been leached, or never was there to begin with. The visible texture is very fine grained : but the quartz segregations are coarse, so we cannot eliminate the possibility of an original coarse-grained texture.

The most reasonable parent is a metamorphosed felsic volcanic, perhaps a dacite.

Mode

45 siderite
30 quartz
23 sericite
 2 pyrite

Siderite forms aggregates of ragged interlocking grains, possibly after feldspar. It has very high relief.



Quartz segregations are lensoid to truncated. They show pronounced subgrain formation with fine quartz beads at the new boundaries. This progression from coarse to finer grain sizes indicates textural re-equilibration under conditions of higher strain and lower temperatures than those under which the quartz segregations originally formed.

Sericite defines the schistosity in wavy anastomosing trains with simultaneous extinction. Sericite also accompanies siderite in unoriented aggregates between the trains.

Pyrite ranges from cubic to anhedral. Grains are between .01 and .1 mm in diameter. They grow in very fine bands along the foliation. This relation of pyrite to planes of greater permeability suggests that it was introduced after the present fine-grained highly foliated texture developed.

DDH 4-80 161.5 Brecciated plagioclase-chlorite-quartz-garnet-pyrite-hematite rock, metaigneous

This sample consists mainly of round plagioclase grains and lesser garnets in a chloritic matrix, which surrounds and isolates them. Some areas of the matrix are fine grained. A weak foliation is present, but not the compositional banding requisite for the term "gneiss". Prior to brecciation and massive chlorite development this may have been a coarse grained amphibolite. Plagioclase grains now measure up to 3 mm in diameter. A clear choice between intermediate plutonic or volcanic parentage cannot be made.

Mode

38 albite
30 chlorite
15 sericite
5 hematite
2 pyrite
5 carbonate (calcite)
5 quartz
tr epidote
tr apatite
tr garnet

Albites have rounded outlines. They are mildly to heavily sericitized, especially near their edges. Some show well-developed lamellar twinning. They are isolated within the chloritic matrix.
Chlorite is bright green pleochroic with interleaved blue to brownish purple anomalous birefringence. Aggregates of plates wrap around the plagioclase grains and define the foliation.
Sericite forms bands in the matrix parallel to the foliation. It replaces garnets, penetrating along fractures. It also occurs as fine plates intermixed with chlorite and calcite.
The reddish mineral has been tentatively identified as hematite without the aid of polished section examination. It is approximately hardness 4 and has a brick-red streak. A few euhedral grains are prismatic. Very small orange prisms in chlorite are certainly hematite. Hematite borders are uneven in detail. Hematite and pyrite tend to grow together in the hand sample. Lacking a polished section it is unclear whether this relationship denotes association or reaction.
Calcite occurs as ragged grains in the matrix and as more regular aggregates in veins. It forms sporadic lensoid segregations within chlorite.
Quartz segregations,which parallel to foliation, are dismembered and enclosed by chlorite. Individual quartz grains are much smaller than those of albite.
Round garnets are, like albites, isolated in the matrix. They are partly replaced by webs of white mica.
A few grains of epidote and apatite were seen.

DDH 4-80 37.0' Biotite-garnet amphibolite (metaandesite)

This is the least altered of the suite except for the calcsilicate DDH4-80, 28.5'. It exhibits typical amphibolite phases and texture : plagioclase, Kspar, quartz, biotite, and hornblende in a part-mosaic, part-lepidoblastic aggregate with scattered garnet porphyroblasts. The banding of Kspar versus plagioclase suggests a volcanic sediment or tuff as the parent.

Mode

37 plagioclase (An 45)
24 hornblende
15 Kspar
 8 quartz
 6 biotite
 3 chlorite
 2 garnet
 2 white mica
 1 epidote
 .5 pyrite
tr sphene
 2 calcite

Anhedral plagioclase grains form a mosaic in equilibrium with the other phases. Plagioclase inclusions occur in the garnet porphyroblasts.
Green amphibole grains are anhedral, forming concavo-convex borders against plagioclase.
Kspar concentrates in one band in the section about 2 cm wide. Like plagioclase and hornblende, grains are anhedral and form a mosaic. Myrmekite develops locally, and many Kspars contain round grains of quartz.
Quartz, with undulatory extinction, occurs in the mosaic with other phases and as small poorly-developed segregations.
Reddish brown subhedral biotite plates are unevenly distributed, suggesting original compositional layering. One plate near the altered area (see calcite) is replaced by a fine-grained green biotite aggregate.
Chlorite replaces scattered biotites. It has grey-blue anomalous birefringence.
Large poikilitic garnet porphyroblasts deflect the foliation. This identifies them as forming before or during deformation. They include biotite and plagioclase.
White mica occurs in fine discontinuous veinlets; and after plagioclase in the altered area near the largest garnet porphyroblast.
Patchy epidote, a late-stage alteration product, is most prominent in the small altered area.
Calcite forms aggregates in a small area of relatively intense alteration along with white mica, epidote, and chlorite.
Anhedral pyrites appear in textural equilibrium with the metamorphic fabric.
Scattered anhedral sphene grains tend to occur with hornblende.

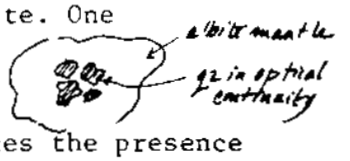
DDH 4-80 108.0' Albite pegmatite

This sample is coarse grained and inequigranular. Individual albite crystals range up to 1 cm in diameter. Original quartz grains were almost as large, but are now in the process of recrystallizing to finer grained aggregates. The occurrence of quartz both included in and interstitial to plagioclase indicates simultaneous growth, probably at a eutectic.

Mode

55 albite
30 quartz
10 sericite
 5 calcite , siderite
tr pyrite

Plagioclase grainsize is coarse and highly variable. Individual grains are subhedral to anhedral and interlocking. They contain round and blebby quartz inclusions. Twins are moderately bent, indicating late-stage strain.
Scattered sericite plates speckle albite. Sets of fine anastomosing sericite veinlets cut across earlier quartz veinlets.
Quartz forms aggregates of anhedra, some interstitial to albite. Discontinuous veinlike segregations are common. Quartz is included in albite. One instance of this may have involved corrosion of the quartz grain followed by albite growth around it. Late-stage strain features include recrystallization of single grains to finer aggregates with sutured borders; and in places the presence of very fine grained aggregates.



Some of the carbonate has very high relief and thus may be siderite. Some reacts with HCl. Carbonates occur as aggregates of ragged grains, and as fillings of fine fractures which cut the earlier quartz veins.
Uneven extinction was observed in the larger grains.
Pyrite occurs in a small knot and as disseminated very small cubes and anhedra .05 to .3 mm in diameter.