82-479

GEOPHYSICAL REPORT

CRYSTAL CREEK PROJECT

COG 12 STUDY

GOLDEN M.D.
82K/14E, 15W
50°56' 116°58

FOR:

COCHRANE OIL & GAS LTD.

AND

BLUESKY MINING LTD.

BY: ~~JUNE 21/82~~

82-K-14E,15W,15E

GARY A. NOLIN, P.Geol.
GANolin

LEGEND

CERTIFICATE OF QUALIFICATION

I, Gary A. Nolin, Professsional Geologist in the City of Calgary, in the Province of Alberta, hereby certify:

1. THAT I am s Registered Professional Geologist in the Province of Alberta and reside at 68 Woodborough Crescent S.W., Calgary, Alberta.

2. THAT I am a graduate with a Bachelor's degree in Geology from Westers Washington State University in Bellingham Washington and that I have practised in this profession for a period of ten (10) years.

3. THAT I am familar with and have physically examined this property on numberous occassions as a consequence of directing this program as well as the overall program conducted in 1981.

4. THAT I have not, nor do I presently hold any interest in this report.

5. THAT to the best of my knowledge, all available data pertinent to this property was examined during the preparation of this report.

6. THAT all data acquired as a result of the surveys conducted on COG 12 was acquired in a professional and respectable manner.

GARY A. NOLIN, P.Geol.

Gnolin

I SUMMARY AND RECOMMENDATIONS

The 1982 reconnaissance program over the COG 12 claims consisted predominately of geophysical work and because of the scarcity of outcrop, the rough terrain and the isolation of the area only a generalized geological interpretation was possible.

The area was gridden with approximately 8350 meters of line over which magnetic, shoot back CEM-EM, VLF-EM, topographic and reconnaissance geological surveys were run.

The geophysics was of some help in interpreting geology and indicated the presence of two conductors which appear to be of bed rock origin.

Soil sampling, detailed geology and prospecting and possible trenching are recommended as follow up work on these anomalies.

II INTRODUCTION

The Crystal Creek Project was acquired through an option agreement dated August 5, 1981 between Bluesky Mining Ltd. and Cochrane Oil and Gas Ltd. Bluesky was the operator for the 1981 exploration program and has returned the operatorship back to Cochrane for the 1982 program. Cochrane has contracted Nolin Geo Enterprises Ltd. to conduct the 1982 exploration program. The work over COG 12 was the first part of an extensive program designed to evaluate and explore several areas of the Crystal Creek Project.

Lines L2E, L3E, L4E were surveyed between June 4, 1982 and June 9, 1982 and Lines LO, L1W, L2W, L4W, L5W, L1N to L4N beteeen July 11, 1982 to July 13, 1982.

As a result of very rough terrain, difficult access and poor weather there were work delays and progress was generally quite slow.

Two probable bed rock conductor anomalies were defined which will require further evaluation.

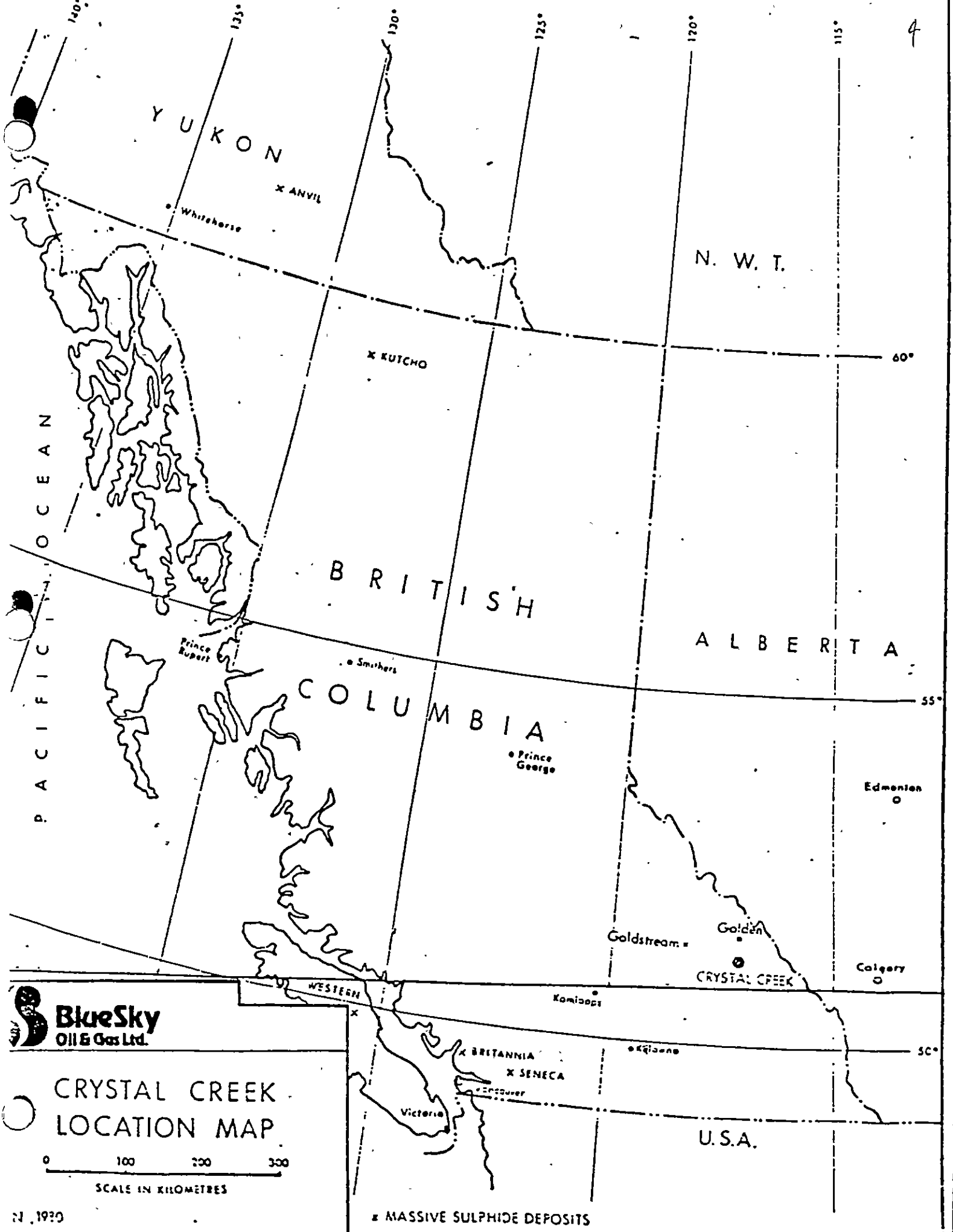
III LOCATION AND ACCESS

The Crystal Creek Project centres on an area located in the Purcell Mountains approximately 40 kilimeters south of the town of Golden, British Columbia. The project area lies within the Golden Mining Division of N.T.S. sheets 82-K-14E, 15W, 15E.

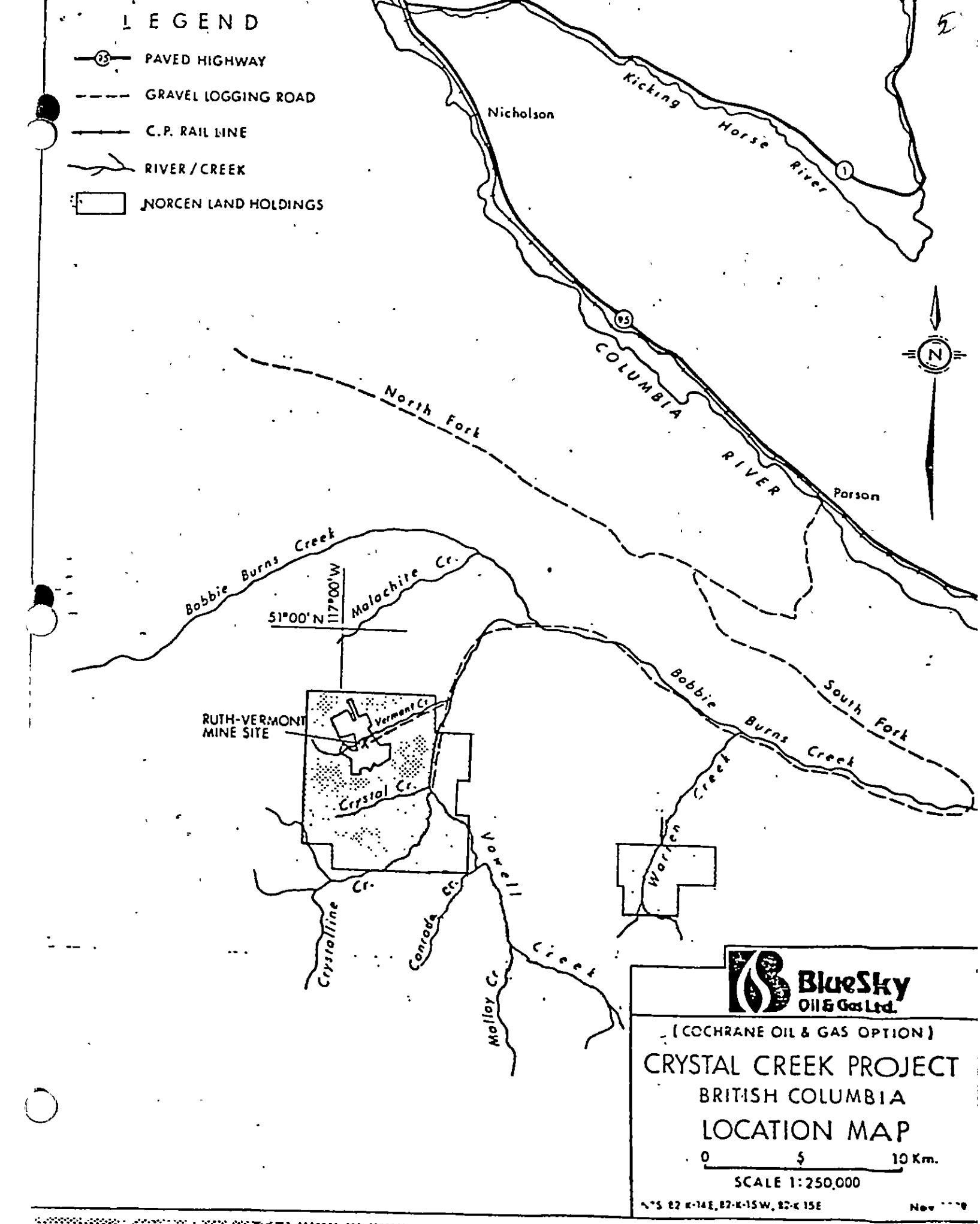
Access to the property is provided by Provincial Highway 95 south from Golden to Parson, followed by 51 kilometers (32 miles) along a gravelled logging road which traverses the main block of claims. Several abandoned logging roads and cat trails also traverses the area and can be travelled by 4-wheel drive vehicles.

Rail services would likely be available on the Canadian Pacific line that the main logging road intersects at Parson, British Columbia.

The topography varies from approximately 1,200 meters above sea level at the creek beds of Vowell, Crystalline, Conrad and Warren Creeks, to approximately 2,700 meters above sea level at the peaks of Azurite and Vermont Mountains.


YUKON
N. W. T.
BRITISH COLUMBIA
ALBERTA
PACIFIC OCEAN
ANVIL
Whitehorse
KUTCHO
Prince Rupert
Smithers
Prince George
Edmonton
Goldstream
Golden
CRYSTAL CREEK
Calgary
WESTERN
Kamloops
Kelowna
BRITANNIA
SENECA
Vancouver
Victoria
U.S.A.
60°
55°
50°
140°
135°
130°
125°
120°
115°
BlueSky
Oil & Gas Ltd.
CRYSTAL CREEK
LOCATION MAP
0 100 200 300
SCALE IN KILOMETRES
x MASSIVE SULPHIDE DEPOSITS

N , 1990


LEGEND
PAVED HIGHWAY
GRAVEL LOGGING ROAD
C.P. RAIL LINE
RIVER / CREEK
NORCEN LAND HOLDINGS
Nicholson
Kicking Horse River
COLUMBIA RIVER
North Fork
Parson
Bobbie Burns Creek
Malachite Cr.
51°00' N
117°00' W
RUTH-VERMONT MINE SITE
Vermont Cr.
Crystal Cr.
Bobbie Burns Creek
South Fork
Crystalline Cr.
Conrad Cr.
Morell Creek
Malloy Cr.
Creek
N
BlueSky Oil & Gas Ltd.
(COCHRANE OIL & GAS OPTION)
CRYSTAL CREEK PROJECT
BRITISH COLUMBIA
LOCATION MAP
0 5 10 Km.
SCALE 1:250,000
82 K-14E, 82-K-15W, 82-K 15E

IV HISTORY

Mining exploration in the Crystal Creek area dates back to the late 19th century. Showings were first reported in the Crystal and Vermont valleys. The latter developed into a deposit (Ruth Vermont Mine) and has been sporadically produced since 1898.

The showings on the north side of Crystal Creek were first reported in 1890, these and other showings were located and staked by Mr. R. Renn in 1965.

The property was optioned to Purcell Range Mines Ltd. who completed bulldozer stripping with little success. Ownership of the claims was transferred to Medesto Exploration Ltd. in 1967. They completed a limited amount of trenching and two short diamond drill holes. A soil geochemistry survey and eighty meters of diamond drilling were reported in 1974. In 1978, Medesto became Cochrane Oil & Gas Ltd. Cochrane completed more soil geochemistry surveying, trenching and diamond drilling. The property also covers a copper showing near Warren Creek. This showing was originally discovered in the 1920's and was partially explored by two small tunnels. In 1960 and 1961, airborne and ground geophysics and 1,100 meters of diamond drilling, with several good shows, were completed for St. Andrews Mining Co. Further electromagnetic surveying, trenching and 700 meters of diamond was done in 1968. In 1972 and 1973, geological, soil geochemical and self potential surveys were carried out for the Caroline Mines Ltd.

Norcen Energy Resources acquired the Crystal Creek property from Cochrane Oil & Gas Ltd. under an option agreement dated August 14, 1979. Work carried out by Norcen in 1979 was restricted mainly to a gridded area which included the showings north of Crystal Creek. The 1979 exploration included geological mapping, soil geochemical surveying, electromagnetic surveying and the diamond drilling of twelve holes totalling 763 meters. The 1980 Norcen program was similar to 1979 with 530.03 meters of diamond drilling.

Norcen concluded that most geochemical anomalous areas were found to be coincidental with axial plane traces of major folds which have acted to localize mineralization. They believed that for their economics they had discovered no significant mineralization and that most mineralization was related to quartz veins. Norcen allowed their option with Cochrane Oil & Gas Ltd. to terminate.

Under an agreement dated August 5, 1981, between Bluesky Mining Ltd. and Cochrane Oil & Gas Ltd., Bluesky obtained the Crystal Creek property.

In the summer of 1981, Bluesky undertook a program of extensive geochemical sampling, and geological mapping and evaluation. They also drilled 440 meters. The 1981 program encountered several areas of mineralization and was used in designing an ongoing program for 1982.

V LAND STATUS

COG 12, record number 331, expiry date June 18, 1982 was acquired from Cochrane Oil Ltd. by option under the terms of the August 5, 1981 agreement.

VI GEOLOGY

The Crystal Creek Project lies within an area underlain by the Proterozoic Windermere rock of the Horsethief Creek Group. J. E. Ressor of the Geological Survey of Canada mapped the Lardeau area (within which is the Crystal Creek Property) on a scale of 1:250,00 (approximately 1 inch to 4 miles).

Ressor described the Horsethief Creek Group as a "thick sequence (3,000 to 8,000 feet) of slate, argillite and phyllite as well as lesser amounts of quartzite, greywacke and limestone. In addition, it contains considerable thicknesses of quartz pebble conglomerate and pebbly grit".

In general, the lower part of the Horsethief Creek consists dominately of argillite and state with some limestone. The middle part is characterized by quartzite, grit and pebble conglomerate along with the slate and phyllite. The upper portion is predominantly purple and red slate and siltstone with minor limestone.

The regional metamorphic grade of the Horsethief Creek within the Crystal Creek Project area is lower to middle greenschist facies. The level of metamorphism increases southward as the Bugaboo intusive is approached. Locally contact metamorphism superimposed on the regional metamorphism has locally given rise to lower almandine-amphibolite facies.

The mesozoic structure patterns within the Crystal Creek Project area are dominated by the Purcell anticlinorium. The Purcell anticlinorium is essentially a very complicated belt consisting of open folds in successions of relatively competent strata and more complex tighter folds in less competent, thinner bedded sections. The structural picture is often further disturbed by local faulting.

Local Geology

The former reports and maps on the property, predominately those of Norcen and Cochrane Resources, Nolin's geological reports and maps for Bluesky, area reports, as well as the grid controlled mapping and a limited number of geological traverses were utilized in formulating a preliminary geological description and interpretation of the property.

Lithology

Several rock types were identified including a variety of argillites, phyllites, limestone, arkose, quartzite, grits, and quartz pebble conglomerates. A brief description of each is given below:

1. Argillite (and its foliated equivalent phyllite) is the predominant rock type located on the grid. Several variations are present ranging from light grey to near black in color, and from massive and structureless to thinly laminated, bedded, and sometimes varved varieties. The darker colored argillites frequently contain pyrite or marcasite crystals. The many varieties are commonly interbedded and may not be calcareous. Soft sediment and structural deformation is often visible in the laminated and bedded varieties.

2. Limestone is not abundant on the property. Typically the limestone is dark colored, fine grained, impure and interbedded with thin beds of argillite. In several area, calcareous arkosic or sandy layers were identified and these may represent an impure coarse variety of the limestone.

   A unique calcareous unit was located in the eastern portion of the grid. The rock appears to contain oolites or pisolites as well as angular clasts of a variety of rock types common to the local area. The current interpretation is that this represents slump brecciation within a shallow water environment. This carbonate breccia has a thickness of 3 to 5 meters (perhaps locally up to 10 meters) and represents a marker horizon that may assist in the unravelling of the stratigraphy on the Crystal Creek property.

3. Quartzite, Arkose, Grits, and Pebble Conglomerates - rocks of varying clastic composition ranging in grain size up to 10mm are found on the Crystal Creek grid area. For the most part the clastic rocks are light grey and green colored although dark brown and dark grey varieties are present. The coarser varieties are dotted with white and blue quartz clasts. Several arkosic and gritty sections are calcareous.

   The western and southern portion of the grid area is primarily underlain by clastic rocks. Although outcrop exposures are limited, the clastic section would appear to be several tens perhaps hundreds of meters thick with interbeds of argillite (phyllite).

   Most of the particles consist of quartz which may occur as aggregates of grains as in the quartz pebble conglomerates. The pebbles in the conglomerates are predominantly of quartz, although feldspar, chert, quartzite dolmite, and argillite pebbles are recognizable. The coarse (up to 50mm) pebble conglomerates were not seen on the grid area however several outcrops are visible along the main access logging roads to the east.

In the southern Tect claims grid area, thick sequences (in excess of 35 meters) of quartzite and pebbly grit was intersected at the bottom of drill hole 79-11. The quartzite and pebbly grits were highly altered by sericitization and contained a high percentage of disseminated pyrite and arsenopyrite (up to 15% disseminated sulphides in places).

Stratigraphy and Structure

One limestone bed, on the order of 30 meters thick was traceable over several kilometers in the western portion of the property. Although this limestone is volumetricly insignificant within the section it appears to mark a very sharp change in the depositional regime during Horsethief Creek time. Below the limestone, the sediments are dominated by relatively coarse grained clastics such as arenites and conglomerates, occurring in fining upward cycles of various thicknesses.

Overlying the limestone are thick sequences of predominately greywacke with subordinate arenite and shale. All are fine grained and reflect an increase in the amount of clay being supplied to the area. Graded bedding and fining upward sequences are common. Higher in the section black shales become more common, as opposed to the grey and green shales lower down.

Certain of the shale horizons have a varved appearance suggestive of differential settling of a suspended sediment load. These are features of deep water deposition. Hence, it would appear that after the deposition of the limestone, the area experienced extensive transgression creating the deep water sediments observed in the western portion of the property.

The major fold on the property is an anticlinorium whose axis, or more precisely, axial area, runs through the Ruth Vermont Mines deposit and through the showings on the north side of Crystal Creek. This fold is well exposed on the north and south sides of the Vermont Creek and it was found that, while structure was easily definable within the flanks, the central or axial area was highly foliated and contorted. This zone was some 1.5 kilometers wide. Along the strike, this zone is largely obscured by the overburden within Vowell Creek but may be recognized in isolated outcrops by an associated strong foliation. Such a major anticlinorium should have adjacent synclinoria. The one to the southwest was not observed, being out of the area of interest. The one to the northeast is within the property boundaries but is not documented. It would appear that the axial area of the syclinorium passes through the vicinity of the Warren Creek shouldings. A limestone bed outcrops in that area which may be correlatable with the one previously mentioned as no other limestone was observed to the west. If such is the case it would mark the exposure of younger rocks in the trough of the syclinorium.

The secondary folds in the limbs of these major structures are generally parallel and upright. The wavelength of these folds appears to be on the order of 0.5 kimometers. They are seen to plunge either north or south or to have horizontal

axes. It was observed in the western portion of the property that some anticlines die out to the north by changing along strike from anticlines to structural teraces. At those points the folds had a gently northerly plunge.

Fracturing was observed in most folds parallel to the axial planes. These fractures seem to have localized quartz veining which in turn is often accompanied by sulphide mineralization. It was also observed that anticlinal axial planes were often highly altered and hematized. Faults are neither major or common within the map area.

VII COG 12

1982 PROGRAM

Survey lines were laid out in a north-south direction with some east-west cross lines. The initial lines surveyed were 2+00E, 3+00E and 4+00E. The majority of the work on these lines was at 25 meter station intervals and all later lines were surveyed at 50 meter intervals.

(A) Magnetic Survey

Measurements were made using the backpack configuration. The survey was conducted in a series of loops to check the drift and the error corrected in the normal manner. Due to the slow speed due to the thick bush and snow conditions, closures could not be made, in the preferred time interval of approximately 2 hours, possible introducing errors caused by diurnal variation of short time periods.

(B) VLF Survey

Two of the initial lines, 2+00E and 3+00E were surveyed using both Seattle (24.0 kH_2) and Cutler (17.8 kH_2) stations and at 25 meter intervals. The best of the survey was conducted at 50 meter intervals with Cutler being used on the east-west cross lines and Seattle on the north-south survey lines.

(C) CEM Survey

The CEM was used in the shootback configuration in order to eliminate any effect produced by differences in elevation between stations. The system consists of two similar units, each capable of transmitting and receiving. One coil transmits in the horizontal mode and the dip angle is measured at the receiving coil 50 meters away. The modes are reversed and the dip angle measured at the other station. If there is no conduction present the sum of the dip angles will be zero, thereby eliminating the effect of elevation difference on the readings. A conductor will be indicated by a positive anomaly over the axis of the conductor.

A frequency of 1830 kH_2 was selected in order to minimize near surface conductivity which should be obvious on the VLF results.

Interpretation

The geophysical results generally show a weak response over the survey area but some trends have been indicated in the electromagnetic results and these have been indicated on the mags.

The high inphase angles shown on the VLF system are characteristic of the response over a series of phyllites. Conductors usually are produced by different conductivities within the phyllite sequence, or by faulting. The north west trend indicated by some of the interpreted conductors are probably parallel to the lithology and regional foliation, whereas the north-south trend may be due to faulting. The response produced by the CEM system is probably of greater significance although the variation is very weak as expected from poor conductors at depth, or possibly associated with dissmenated spholerite. There is some agreement with the VLF results and there are two areas which are worthy of future work.

(1) Line 5S at West End of Line

Anomalous conditions are indicated on the VLF and CEM systems but the location of the source would appear to be on the Pro claims. No definitive direction can be established for the conductor axis.

(2) Line 6W at Station 1 South

This anomaly shows a definite north-west trend on the VLF and good response on the CEM system. A dip to the north-east is indicated on the CEM results. The magnetic data shows a trend to higher values to the north-east in this area suggesting a change in rock type but the variation is gradual and no specific contact can be interpreted from the magnetic results.

VIII CONCLUSION AND RECOMMENDATIONS

The 1981 COG 12 program added to our knowledge of the property and gave information which will be of use in correlating different geophysical measurements to both structure and lithology.

The geophysical surveys located and defined two anomalies along a regional trend of shearing with often associated mineralization.

Detailed geology, prospecting, sampling and possible trenching are recommended to further evaluate the potential of the anomalies defined by this study.

IX 1982 EXPENDITURES

This summary was conduced between June 4, 1982 and June 9, 1982 and consisted of approximately 8350 meters of gridded geophysics and reconnaissance geology. The following personnel were used on the program.

Personnel

1 Geophysicist	9 days
1 Geologist	3 days
2 Technicians	15 days each

Equipment

1 VLF-EM unit	9 days
1 Magnetometer	9 days
1 Crone CEM System	9 days
1 4x4 Jeep	9 days
1 Jet Ranger Helicopter	1 hour
General Field Camp Equipment	9 days

*TOTAL PRICE: $6,500.00

*NOTE: This program is a portion of a larger program on the Crystal Creek Property which is being done on a one price turn key basis. The $6,500.00 (although low), corresponds to the portion of the over all program allotted to COG 12.

X APPENDICES

A Equipment Specifications

(A) Magnetic Survey

Instrument	:	Geometrics G-816 proton magnetometer S/N 60648
Range	:	20,000 - 90,000 gammas - total field
Gradient Tolerance	:	Exceeds 150 gammas/foot
Sensitivity	:	± 1 gamma
Accuracy	:	± 1 gamma on staff
	:	± 5 gammas on backpack

(B) VLF Survey

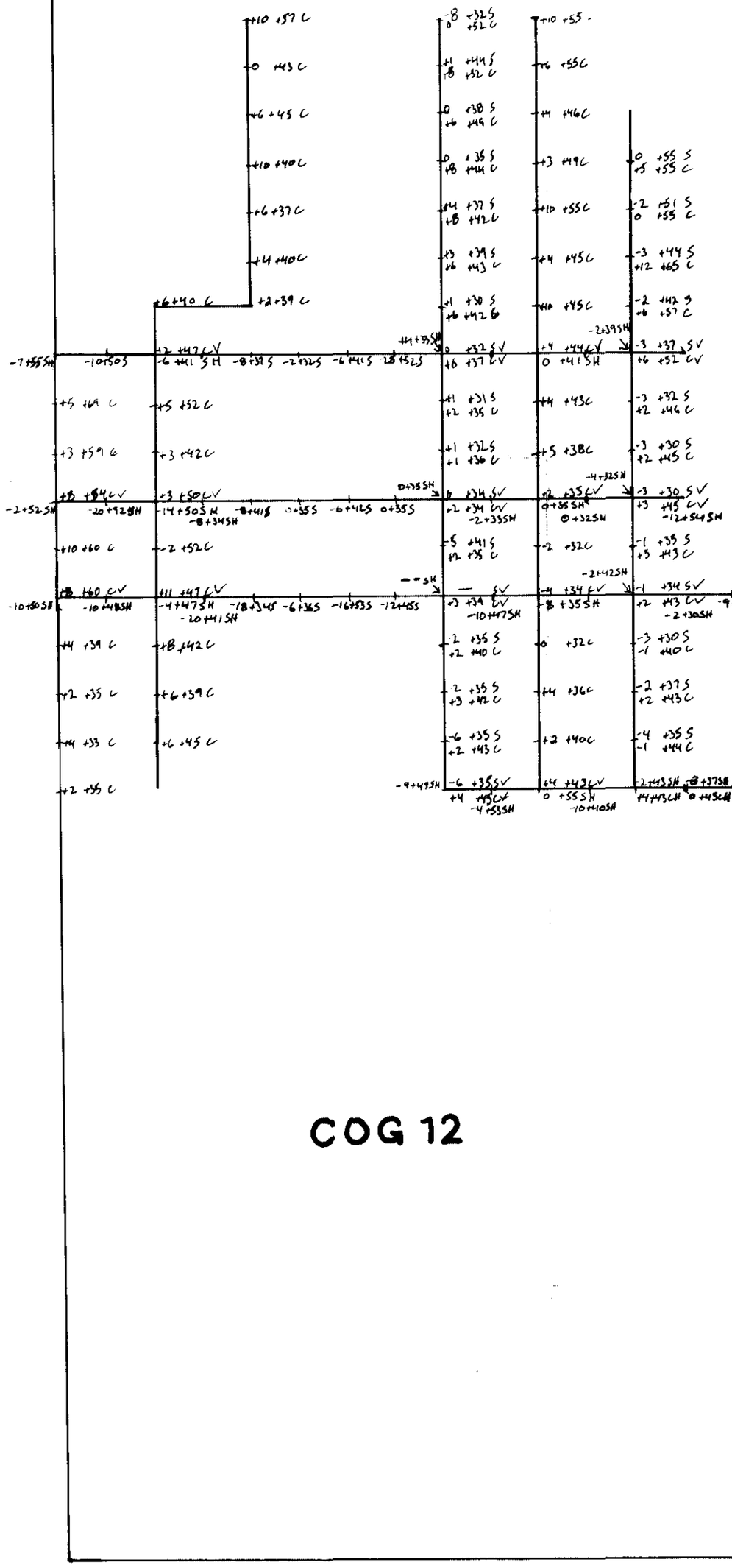
Instrument	:	Geonics EM 16 S/N 10590
Transmitting Stations	:	Two selectable on plug-in units
Frequency Range	:	15-25 kHz
Parameters Measured	:	Vertical in-phase and quadrature components
Scale Range	:	In-phase ± 150%; quadrature ± 40%
Readability	:	± 1%

(C) CEM Survey

Instrument	:	Crone CEM system
Frequency	:	390, 1830, 5010 H_2
Inclinometer Range	:	200°
Accuracy	:	± ½°
Null Method	:	Visual on field strength meter
Range	:	Up to 600 feet
Operation	:	Horizontal shootback, vertical or horizontal loop methods

B Accompanying Maps

1. Geology and Topography
2. Mag Survey
3. CEM Survey
4. VLF Survey I Profiles
5. VLF Survey II Data
6. Crystal Creek Property Map



Legend

- C CUTLER
- S SEATTLE
- V VERTICAL (N/S) LINE
- H HORIZONTAL (E/W) LINE

COG 12

Scale 1:5,000

100 0 100 200 300 400 500

METERS

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
[redacted]
NO.

COCHRANE OIL AND GAS

CRYSTAL CREEK PROJECT

BRITISH COLUMBIA

VLF SURVEY

TO ACCOMPANY REPORT BY:
GARY NOLIN P. GEOL.

NOLIN-GEO ENTERPRISES	CALGARY ALBERTA	SCALE-1:5000	DATE:82-06-16
		JOB NO:	FIGURE NO
			DRAWN BY: MZ

LEGEND

- 1a Phyllite, well developed foliation
- b Phyllite, Intermediate foliation
- c Phyllite, with quartz lenses
- 2 Quartz Arenite
- Foliation,
- Legal Claim Post (l.c.p.)
- Boulder field
- Outcrop

COG 12

0S 1S 2S 3S 4S 5S 10N 9N 8N 7N 6N 5N 4N 3N 2N 1N ON l.c.p.

6W 5W 4W 3W 2W 1W 0 1E 2E 3E 4E

Scale 1:5,000

100 0 100 200 300 400 500 600

METERS

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 10,536

COCHRANE OIL & GAS

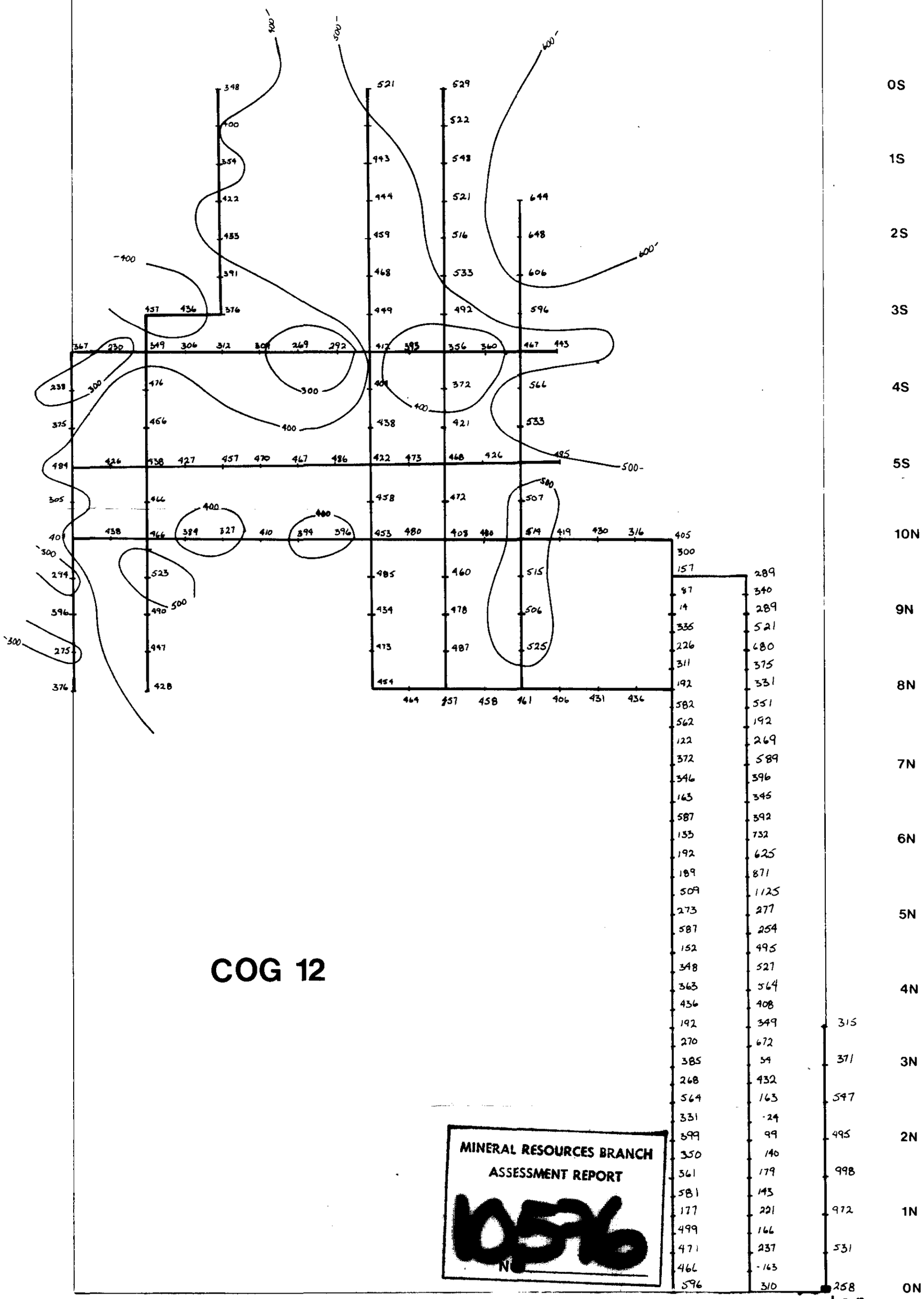
CRYSTAL CREEK PROJECT

BRITISH COLUMBIA

GEOLOGY & TOPOGRAPHY

TO ACCOMPANY REPORT BY: GARY NOLIN P. GEOL.

NOLIN GEO ENTERPRISES LTD. CALGARY ALBERTA	SCALE: 1:5,000	DATE: 82-06-16
	JOB NO.:	FIGURE NO.:
	C.I.: 25m	DRAWN BY MZ/da



Scale 1:5,000

100 0 100 200 300 400 500 600

METERS

COCHRANE OIL & GAS LTD.

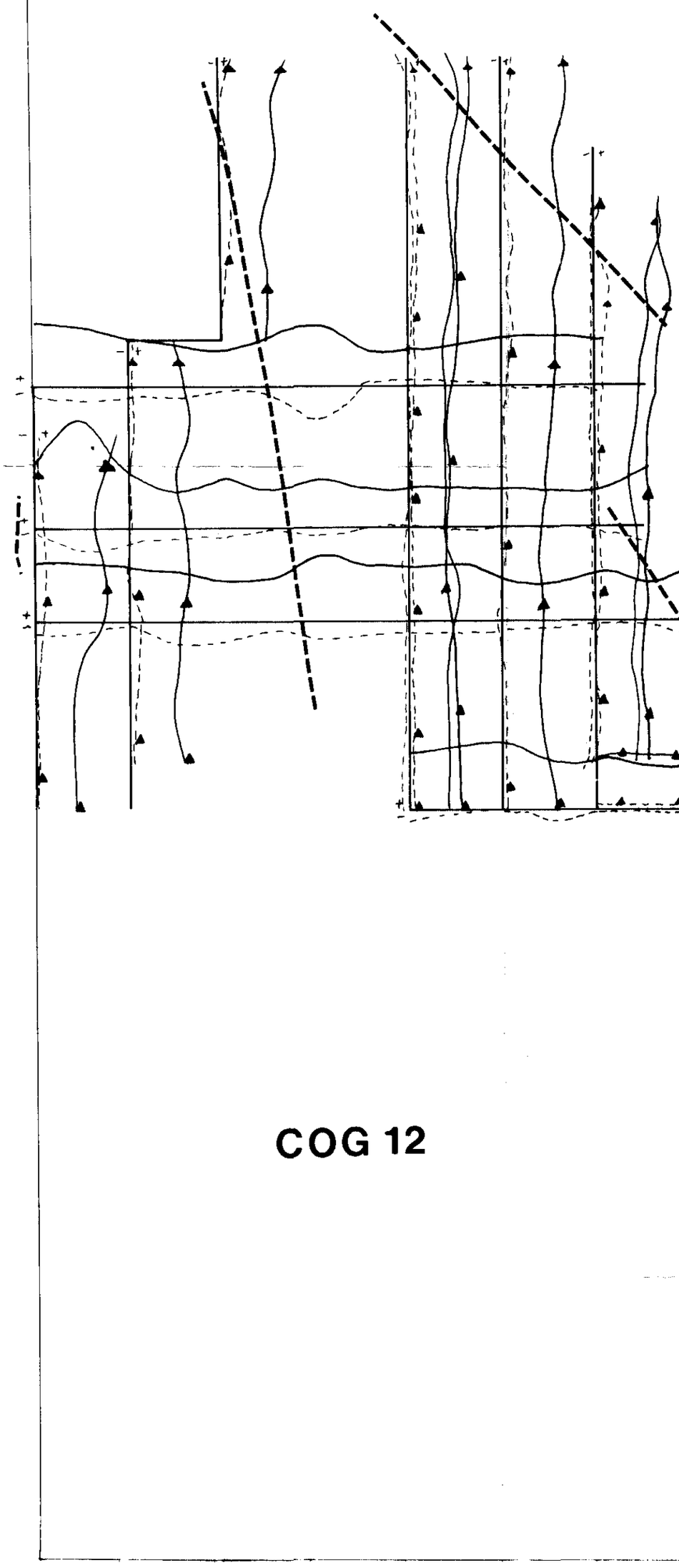
CRYSTAL CREEK PROJECT

BRITISH COLUMBIA

MAG SURVEY

TO ACCOMPANY REPORT BY: GARY NOLIN P. GEOL.

NOLIN GEO ENTERPRISES LTD. CALGARY ALBERTA	SCALE: 1:5,000	DATE: 82-06-16
	BASE 58,000 ɣ	FIGURE NO.:
	C.I.: 100 gammas	DRAWN BY: D.A.



COG 12

Scale 1:5,000

100 0 100 200 300 400 500 600

METERS

LEGEND

Cutler dip angle

Cutler quadrature

Seattle dip angle

Seattle quadrature

Vertical scale — 1 cm : 40 deg

INTERPRETED ANOMALY - - - - -

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
10,576
N

COCHRANE OIL & GAS LTD.

CRYSTAL CREEK PROJECT

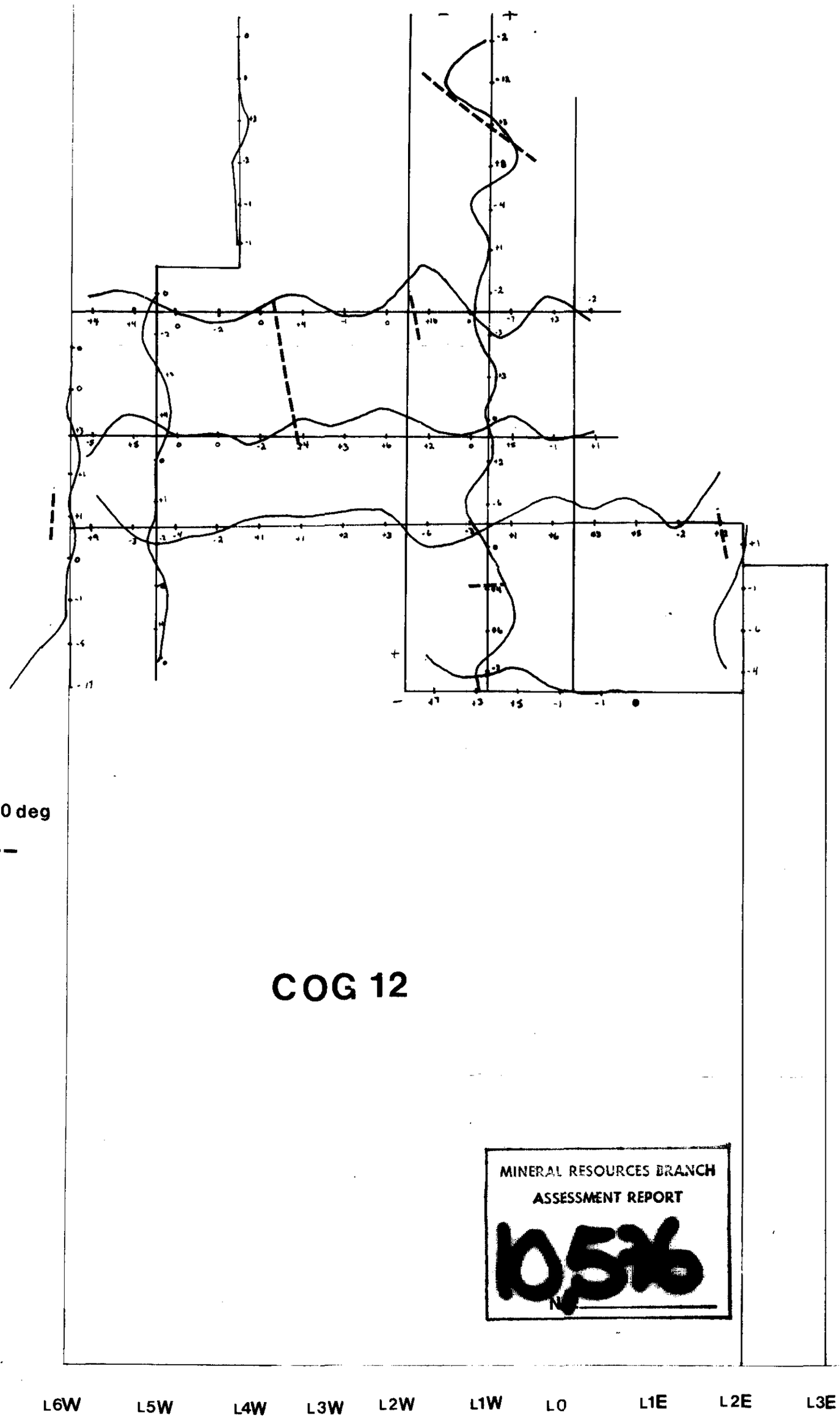
BRITISH COLUMBIA

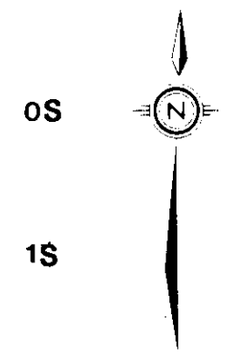
VLF SURVEY

TO ACCOMPANY REPORT BY: GARY NOLIN P. GEOL.

NOLIN — GEO ENTERPRISES LTD. CALGARY ALBERTA		SCALE: 1:5 000	DATE: 82-06-16
		JOB NO.:	FIGURE NO.:
		C.I.:	DRAWN BY: MZ

TO ACCOMPANY REPORT BY: G. Nolin P. Geol.





LEGEND

CEM READINGS—
HORIZONTAL MODE

VERTICAL SCALE — 1 cm : 10 deg

INTERPRETED ANOMALY - - - - -

COG 12

Scale 1:5,000

100 0 100 200 300 400 500 600

METERS

COCHRANE OIL & GAS LTD.

CRYSTAL CREEK PROJECT

BRITISH COLUMBIA

CEM SURVEY

TO ACCOMPANY REPORT BY: GARY NOLIN P. GEOL.

NOLIN-GEO ENTERPRISES LTD	CALGARY ALBERTA	SCALE: 1:5,000	DATE: 82-06-16
		JOB NO.:	FIGURE NO.:
		C.I.:	DRAWN BY: MZ/da