Geophysical Report

\- on the -

Crown Property

Kamloops Mining Division, British Columbia

N.T.S. 82M/12W

51°34'
119°49'

\- for -

Union Oil Company of Canada Ltd.,
335 - 8th Avenue S.W.,
Calgary, Alberta T2P 2K6

Prepared by;

G. Belik and Associates Ltd.,
#206 - 310 Nicola Street,
Kamloops, B. C. V2C 2P5

Gary D. Belik, M. Sc.
August 30, 1982

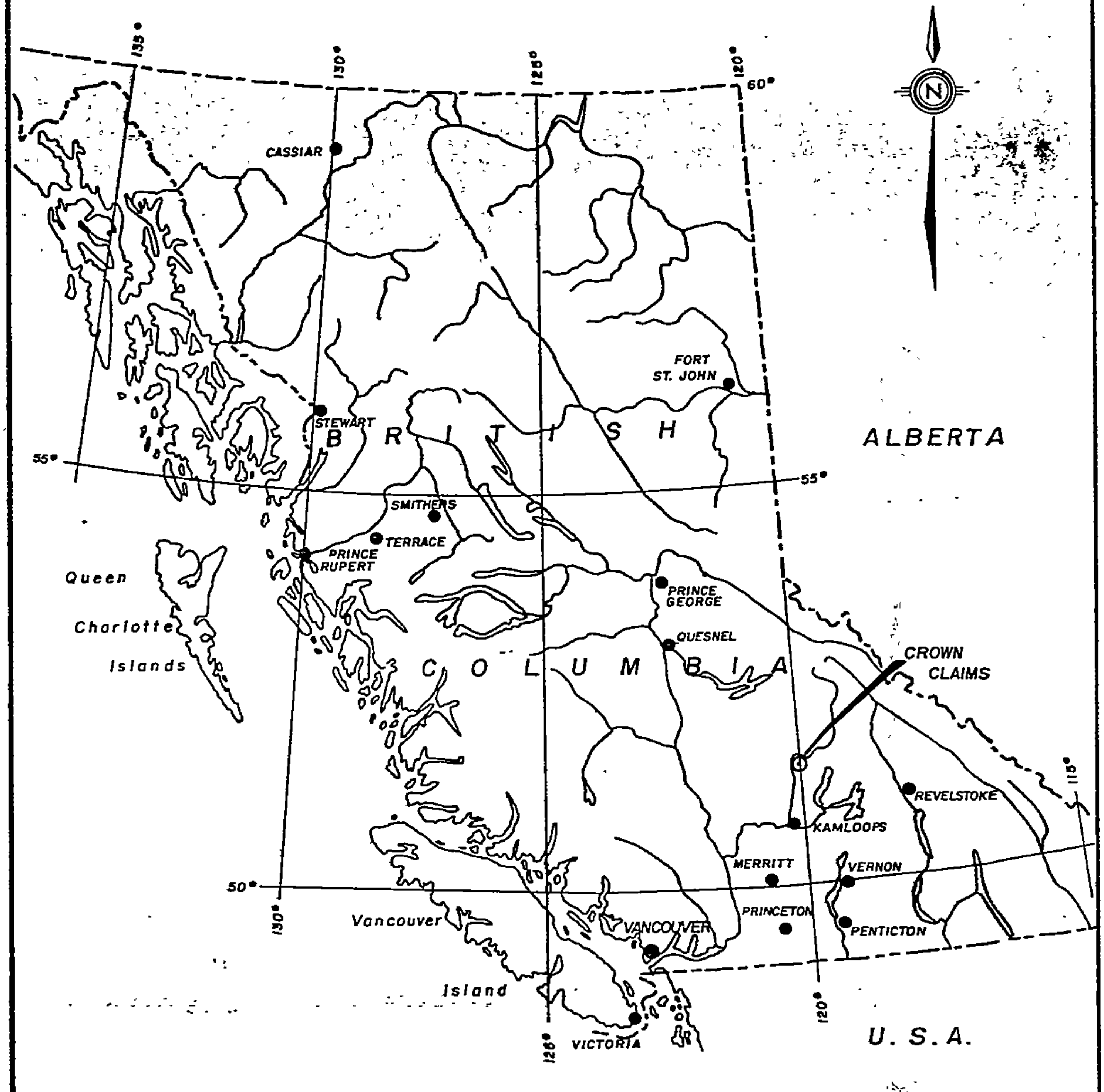
Table of Contents

Table of Contents (Continued)

Page No.

FIGURES:

APPENDICES:



UNION OIL COMPANY OF CANADA LTD.

LOCATION MAP

CROWN CLAIMS

KAMLOOPS MINING DIVISION, B.C.

Technical Work by: G. Belik and Assoc. Ltd.	Date: Aug. 1982.
Scale: 1cm. = 87 km.	Dwg No. 1015-1

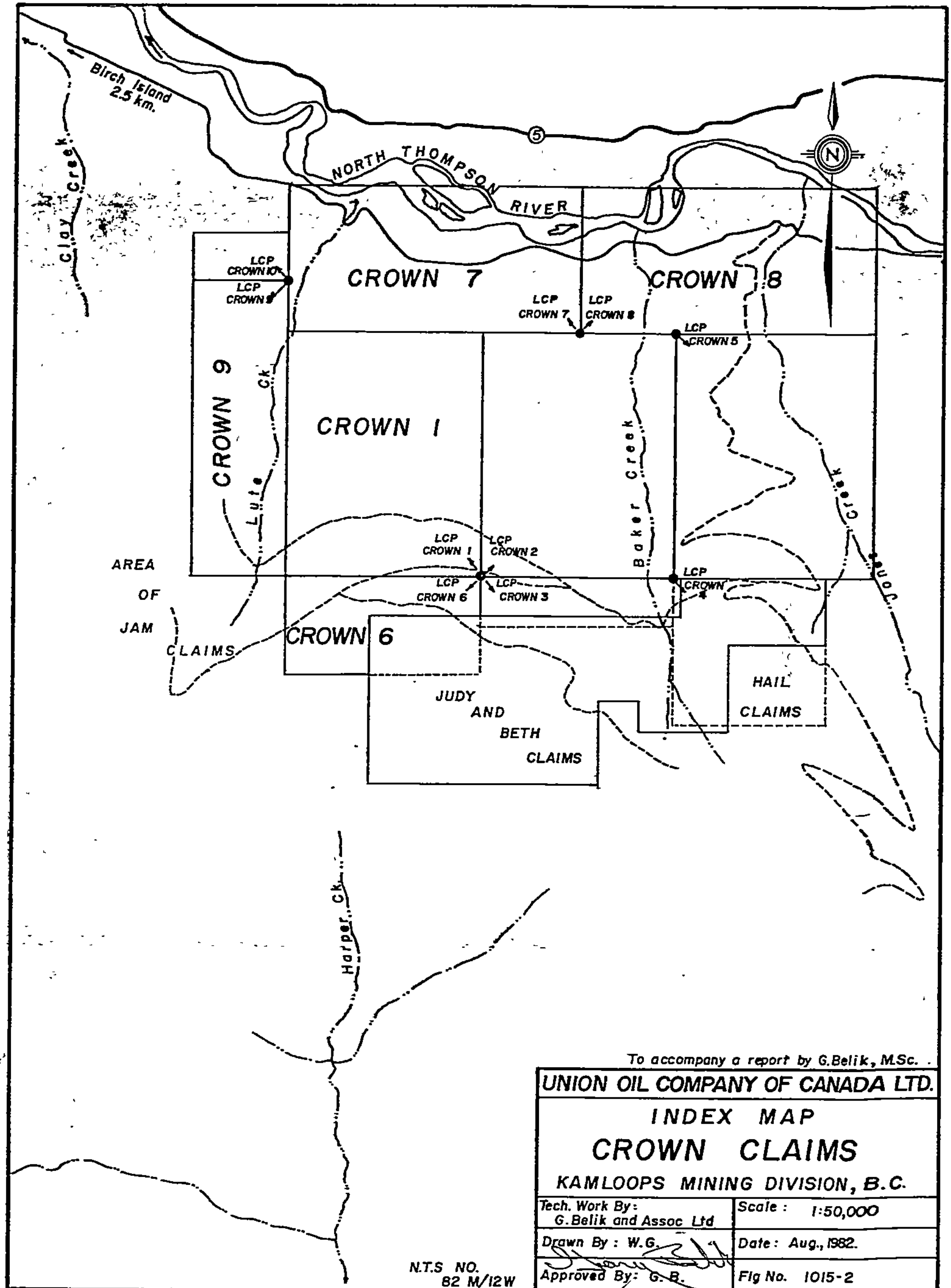
Introduction

During August 5 to August 12, 1982, 3.3 km of Induced Polarization/Resistivity and 5.1 km of ground magnetics were completed on the Crown 1 mineral claim situated about 15 km southeast of the town of Clearwater, B. C. Field work was supervised by G. Belik of G. Belik and Associates Ltd., #206 - 310 Nicola Street, Kamloops, B. C.

The Crown 1 claim is part of a 76-unit claim block, owned by Union Oil Co. of Canada Ltd., which extends along the south side of the North Thompson Valley, between Lute Creek and Jones Creek. A good gravel road, which connects Birch Island and Vavenby, passes through the north part of the property and a network of logging roads and skid trails traverse the southern part of the claim group.

The claim group is predominantly underlain by strongly deformed felsic to intermediate volcanic rocks of the Paleozoic, Eagle Bay Formation. Along the south edge of the Crown 1 claim a coarse pyroclastic unit is partly exposed along a road cut. This unit closely resembles 'mill rock' and is composed of 80% sub-angular to well rounded, stretched 'bombs' a few cm to 40 cm in size. The matrix consists predominantly of lapilli-size quartz and feldspar grains and fine volcanic fragments in a tuffaceous, chlorite - sericite groundmass. Most fragments, which commonly contain quartz eyes, are dacitic to rhyolitic in composition.

In 1979 Union Oil conducted a preliminary exploration programme in order to evaluate the massive sulphide potential within and peripheral to the felsic fragmental unit. This work, which included airborne E.M./Mag, ground V.L.F.-E.M., soil and silt geochemistry, prospecting and geological mapping defined numerous target areas. The 1982 programme, which is the subject of this report, was designed to further evaluate one of the higher priority target areas (north half of the Crown 1 claim).


Birch Island 2.5 km.
5
NORTH THOMPSON RIVER
Clay Creek
N
CROWN 7
CROWN 8
CROWN 9
CROWN 1
CROWN 6
LCP CROWN 10
LCP CROWN 9
LCP CROWN 7
LCP CROWN 8
LCP CROWN 5
LCP CROWN 1
LCP CROWN 2
LCP CROWN 6
LCP CROWN 3
LCP CROWN 4
Lute Ck.
Baker Creek
Creek
Jones
AREA OF JAM CLAIMS
JUDY AND BETH CLAIMS
HAIL CLAIMS
Harper Ck.
N.T.S NO. 82 M/12W
To accompany a report by G.Belik, M.Sc.
UNION OIL COMPANY OF CANADA LTD.
INDEX MAP
CROWN CLAIMS
KAMLOOPS MINING DIVISION, B.C.
Tech. Work By: G. Belik and Assoc Ltd
Scale: 1:50,000
Drawn By: W.G.
Date: Aug., 1982.
Approved By: G. B.
Fig No. 1015-2

This priority area, which is almost totally concealed by overburden, contains several conductive zones which locally correlate with soils & silts moderately to highly anomalous in copper, lead and zinc.

Claims

The property is comprised of 5 contiguous claims totalling 76 units as detailed below:

Mining Division	Claim Name	Units	Record No.	Date Recorded
Kamloops	Crown 1	20	1344(8)	Aug.14/78
"	Crown 6	8	1349(8)	Aug.14/78
"	Crown 7	18	1883(5)	May 30/79
"	Crown 8	18	1884(5)	May 30/79
"	Crown 9	12	1885(5)	May 30/79

The registered owner of the above claims is Union Oil Co. of Canada Ltd., 335 - 8th Avenue S.W., Calgary, Alberta.

General Geological Setting

The Crown claims are underlain by a tilted, strongly deformed, low-grade regionally metamorphosed sequence of volcanic and sedimentary strata of probable paleozoic age. Compbell (1962) mapped these rocks as part of the Eagle Bay Formation - a group of similarly deformed and metamorphosed rocks which are flanked on the east by the higher metamorphic grade Shuswap Metamorphic Complex and on the west by relatively undeformed and unmetamorphosed rocks of the Fennel Formation, Nicola Group and Cache Creek Group.

The structurally lowest and presumably oldest group of rocks exposed on the property (south part of the Crown 9 claim) include lustrous quartz-sericite, quartz-sericite-chlorite and carbonaceous to graphitic phyllites. These rocks display the effects of four periods of deformation, the first two of which are characterized by intense isoclinal folding. The most dominant structure present is a penetrative crenulation foliation which developed during the second period of deformation. Within the area of the Crown claims this foliation dips uniformly to the north at about 30°.

The lustrous phyllites are primarily of sedimentary origin and probably represents the metamorphic equivalent of marls, argillaceous arenites and carbonaceous shales. Immediately south of the claim group a tuffaceous component, represented by more chloritic varieties of phyllite, appears to be locally important.

In the central part of the property a predominantly volcanic succession of rocks of felsic to intermediate composition occur. This succession includes a coarse fragmental volcanic unit which is flanked by quartz-feldspar lapilli and crystal tuffs. Throughout the volcanics small lenses of volcaniclastic sediment and graphitic phyllite occur.

In the northwest part of the property the volcanics consist primarily of trachytic flows and pyritic rhyolite tuff. The trachyte has a high background uranium and thorium content and is host to the Rexspar uranium deposits which occur about 1 km west of the property.

1982 Program

Induced Polarization/Resistivity Survey

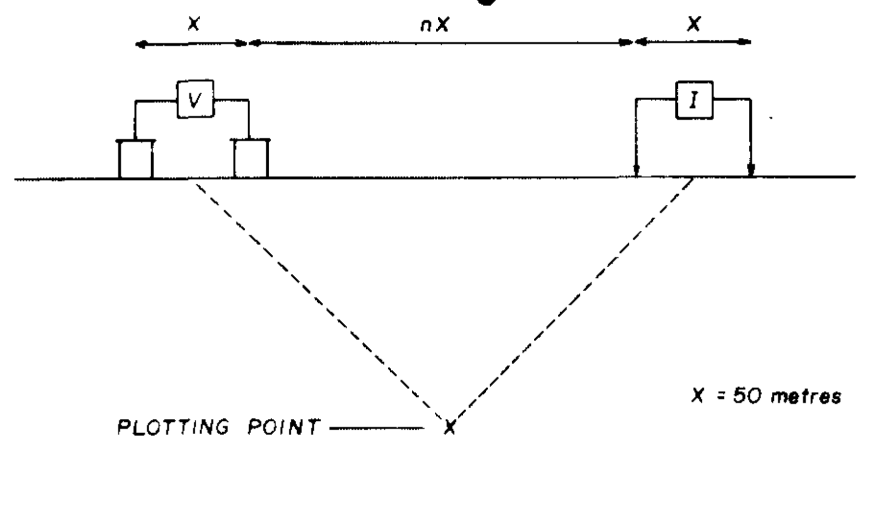
The Induced Polarization and Resistivity Survey was carried out by G. Belik and Associates Ltd., on lines 4+00E, 7+50E and 10+00E utilizing variable frequency I.P. equipment manufactured by Sabre Electronic Instruments Ltd., 4245 East Hastings Street, Vancouver, B. C.

The theory of Induced Polarization as applied in mining exploration is fully described in the literature. Briefly summarized, this phenomenon refers to the blocking action or capacitive-like effect of electronic conducting minerals' in rock through which an electrical current is being passed. This blocking action creates a resistance to current flow which increases with the length of time that a d.c. current is allowed to flow. Thus, assuming that appreciable conducting minerals are present, it can be seen that by varying the frequency of the transmitted current (ie. varying the length of time that current is allowed to flow in any one direction) the apparent resistivity of the rock mass being tested will change. The percent change in apparent resistivity when measured at two frequencies is recorded as Percent Frequency Effect or F.E. For this survey frequencies of 10 H_z and 0.3 H_z were utilized.

Method

A dipole-dipole electrode configuation was employed with an electrode separation of 50 meters. Readings were taken every 50 meters to n = 4 (ie. 50m, 100m, 150m and 200 meter separation between current electrodes and potential electrodes).

' includes most metallic sulphides, graphite, magnetite and some varieties of hematite.



SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE ————————
PROBABLE - - - - - - - -
POSSIBLE ....

CONTOUR INTERVALS

PFE - 3.0, 5.0, 7.5, 10, 15
RESISTIVITY - 10, 15, 20, 30, 50, 75, 100 ...
METAL FACTOR - 10, 15, 20, 30, 50, 75, 100 ...

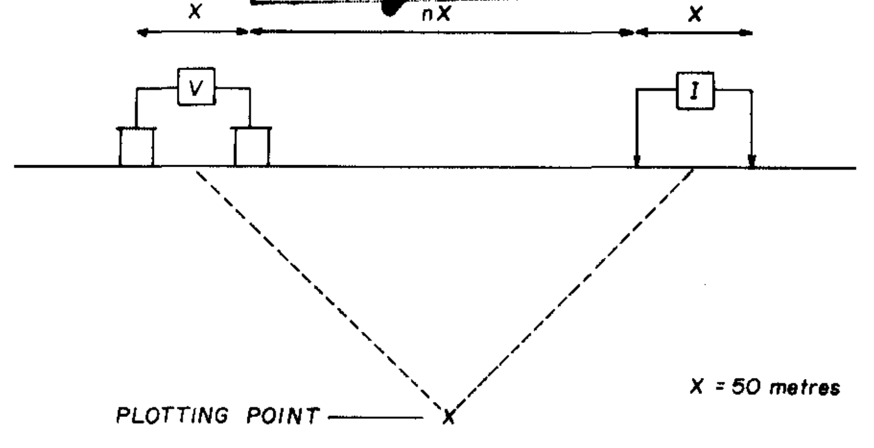
INDUCED POLARIZATION & RESISTIVITY SURVEY

LINE NO. 4+00 E

CROWN CLAIMS

KAMLOOPS MINING DIVISION, B.C.

TECHNICAL WORK BY: G. BELIK AND ASSOCIATES LTD.	DATE SURVEYED: AUGUST, 1982.
APPROVED BY: G. BELIK, M.Sc.	FIG. NO. 1015-3



10627

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE
PROBABLE
POSSIBLE

CONTOUR INTERVALS

P.F.E. - 3.0, 5.0, 7.5, 10, 15
RESISTIVITY - 10, 15, 20, 30, 50, 75, 100 ...
METAL FACTOR - 10, 15, 20, 30, 50, 75, 100 ...

INDUCED POLARIZATION & RESISTIVITY SURVEY

LINE NO. 7+50 E

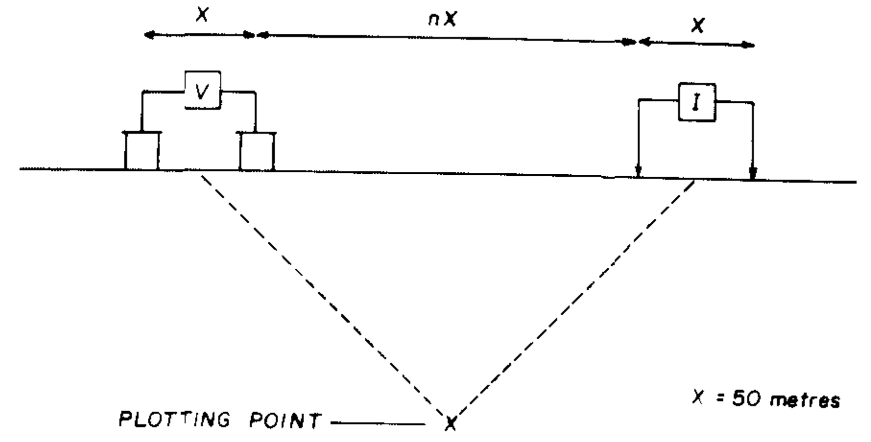
CROWN CLAIMS

KAMLOOPS MINING DIVISION, B.C.

TECHNICAL WORK BY: G. BELIK AND ASSOCIATES LTD.	DATE SURVEYED: AUGUST, 1982.
APPROVED BY: G. BELIK, M.Sc.	FIG. NO. 1015-4

MINERAL RESOURCES BRANCH ASSESSMENT REPORT

10,627



SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

PROBABLE

POSSIBLE

CONTOUR INTERVALS

PFE - 30, 50, 75, 10, 15

RESISTIVITY - 10, 15, 20, 30, 50, 75, 100 ...

METAL FACTOR - 10, 15, 20, 30, 50, 75, 100 ...

INDUCED POLARIZATION & RESISTIVITY SURVEY

LINE NO. 10+00 E

CROWN CLAIMS

KAMLOOPS MINING DIVISION, B.C.

TECHNICAL WORK BY: G. BELIK AND ASSOCIATES LTD.	DATE SURVEYED: AUGUST, 1982
APPROVED BY: G. BELIK, M.Sc.	FIG. NO. 1015-5

Presentation of Results

In this report the results of the Induced Polarization and Resistivity Survey are presented and contoured in profile form (maps 1015-1 to 1015-3) at a scale of 1:2500. Map 1015-6 shows the surface projection of anomalous zones at a scale of 1:10,000.

On the section maps, percent frequency effect values are plotted on the top line of the data profile above resistivity values. On the third line, below the resistivity values are plotted metal factors (Metal Factor = $\frac{\text{F.E. x 1000}}{\text{Resistivity}}$). Values are plotted midpoint between the locations of current and potential electrodes.

The separation between current and potential electrodes is only one factor which determines the depth of penetration at any one set up. Thus, while the section maps illustrate in a general way changes in frequency effect and apparent resistivity with depth this relationship is non-linear and may vary significantly depending on the resistivity of the ground being tested and the dipole separation utilized. As a general rule the depth of penetration is between 0.5 and 1.0 times the electrode spread for the first separtion (n = 1) and diminishes for successively greater separations.

In some situations the measured voltage at the low frequency setting (0.3 H_z) is too noisy to render a reliable F.E. reading. In this situation the symbol N/R is recorded on the data plot. A data plot followed by the symbol (N) indicates that the reading was noisy but considered reliable. Occasionally negative F.E. values are recorded (indicated in brackets () on the Data Plot). Small negative F.E. values fall within the range of instrument and/or operator error when little polarizable material is present within the groundmass being tested. Larger negative values may be a result of spurious electrical effects or unusual geological conditions.

Discussion of Results

Apparent resistivities within the area surveyed range from a high of 586 ohm - meters to a low of 18 ohm-meters. Background frequency effects are low and range from less than 1 P.F.E. to about 2 P.F.E.

Anomalous to highly anomalous frequency effect values have been noted on every line survey. Most of the I.P. anomalies are associated with zones of lower resistivity and 4 of the anomalies correlate directly with pronounced resistivity lows.

Line 4+00E

On line 4+00E three definite I.P. anomalies were defined which correlate with distinct resistivity lows. Values up to 13.0 P.F.E. were recorded on the north anomaly, up to 9.4 P.F.E. on the central anomaly and up to 13.2 P.F.E. on the southern anomaly. All three anomalies appear to be caused by steeply dipping, tabular, moderately conductive, polarizable bodies which project to within 20 meters of surface.

Line 7+50E

A strong I.P. anomaly with P.F.E. values up to 20.2 occurs on line 7+50E centered near 20+75N. This anomaly, which also correlates with a distinct resistivity low, appears to be steeply dipping, less than 100 meters wide and project to within 20 meters of surface.

On line 7+50E, between 14+50N and 18+50 north, is a zone characterized by P.F.E.'s of between 3.0 and 8.1 which correlate with lower than background resistivity values.

One distinct resistivity low is centered at about 15+25N. This relatively broad anomalous zone may be caused by a large weak to moderately polarizable zone or possibly by several narrow discrete moderately to highly polarizable zones.

Line 10+00E

A strong I.P. anomaly, very similar in character to the north anomaly on line 7+50E occurs on line 10+00E centered at 23+00N. A second, definitely anomalous zone occurs centered at about 17+50N. The southerly anomaly, in contrast to the north anomaly is associated with moderately high resistivity values. The I.P./Resistivity data also suggests that part of the south anomaly may be covered by relatively thick (+20 meters) moderately conductive overburden.

Correlation of Anomalous Zones

The results of the V.L.F.-E.M. survey conducted by Union Oil in 1979 (Map 1015-8) suggest that the I.P. anomalies located at the north end of lines 7+50E and 10+00E are connected. Based on the V.L.F.-E.M. survey this anomaly appears to close off about 100 meters west of line 7+50E and continue for at least 400 meters east of line 10+00E.

The southern I.P. anomaly on line 10+00E probably correlates with the cluster of anomalous I.P. zones located near the central part of line 7+50E.

The I.P. anomalies defined on line 4+00E do not appear to be connected with the I.P. anomalies defined on lines 7+50E and 10+00E. The V.L.F.-E.M. data suggests that these discrete conductive/polarizable zones extend in a general east-west direction over a strike length of between 200 meters and 400 meters.

Proton Magnetic Survey

A magnetic survey was carried out on lines 4+00E, 7+50E and 10+00E utilizing a GeoMetric's 'Unimag', portable, proton magnetometer (Model 6-830). The Unimag measures the total intensity of the earth's magnetic field over a range of 20,000 to 100,000 gammas with an accuracy of $\pm$ 10 gammas. General information and operating procedure for the Unimag is given in Appendix VI.

Procedure

For the magnetic survey, readings were taken at 25 meter intervals. In total 5.1 line kms of grid were surveyed.

Prior to beginning the survey the magnetometer was tuned to the local magnetic field (60,000 gammas). During the course of the survey, base station readings were established in order to correct for diurnal variation.

Presentation of Results

The results of the magnetic survey are presented in profile form in drawing 1015-6 at a scale of 1:5,000.

Discussion of Results

Magnetic relief within the surveyed area is low with a relatively uniform background of between 58,000 gammas and 58,100 gammas.

On line 4+00E a distinct 100$\pm$ gamma high occurs centered over the northern I.P. anomaly at about 17+25N. A second, mag high (150 gammas$\pm$) occurs on line 4+00E centered at 19+50N. This anomaly, which is narrow, is situated outside the I.P. survey area.

On line 10+00E a +150 gamma anomaly occurs between 13+00N and 13+50N. This anomaly, which is also outside of the I.P. survey area, correlates with soil anomalous in copper.

Conclusions and Recommendations

Within the area of the Crown claims, the general geological setting suggests a potential for volcanogenic massive sulphide deposits. On the Crown 1 claim numerous, potentially significant I.P. anomalies have been defined which generally correlate with zones of low apparent resistivity and locally correlate with mag highs and soils and silts moderately to highly anomalous in copper, lead and zinc.

To further evaluate the area of coincident geophysical and geochemical anomalies and to determine if diamond drilling is warranted the following 2 - phase programme is recommended.

Recommended Program

Phase I

Approximately 10 kms of Induced Polarization and Ground Magnetic surveys followed by detailed prospecting, geological mapping and fill-in soil sampling are proposed for Phase I.

The Induced Polarization/Ground Magnetic survey should be carried out on lines 2+50E, 6+25E, 9+25E and 12+50E between 7+00N and 24+00N. In addition, I.P. coverage should be extended on line 4+00E (18+00N - 24+00N) and 10+00E (7+00N - 16+00N). Once completed, these surveys should adequately delineate the extent of the anomalous zones defined by the 1982 surveys and possibly locate additional target areas for follow-up prospecting, detailed mapping and fill-in soil sampling (second stage of Phase I programme).

Phase II

Phase II would consist of:

1. Construction of approximately 3 km of road access through the main anomaly areas.

2. Test pitting of priority target areas utilizing a track-mounted, excavator-type backhoe.

Cost of Recommended Programme

<u>Phase I</u> - 10 kms line cutting, I.P., Mag.; detailed prospecting, geological mapping, fill-in soil sampling.

-utilizing a 4-man crew,
-field duration of 17 days,
-mobilization from Kamloops, B. C.

1. Labour (field);	$10,000.00
2. Truck Rental (rental, insurance, maintenance & operation cost);	900.00
3. Room and Board;	2,500.00
4. Equipment Rental;	700.00
5. Preparation, Mobilization & Demobiliation;	1,000.00
6. Geochemical Analyses;	1,000.00
7. Report Preparation;	2,400.00
10. Consumables;	200.00
11. Contingency;	1,300.00
Total Phase I	$20,000.00

Phase II

1.	3 kms road construction; -including equipment, culverts, mobilization/demobilization, supervision		$6,000.00
2.	Test Pitting;		
	a). Excavator-type backhoe;		
	-70 hrs @ $80.00/hr	$5,600.00	
	-mob/demob.	900.00	
			6,500.00
	b). Supervision, mapping & sampling pits, geochemical analyses, report preparation;		3,500.00
		Total Phase II	$16,000.00
		TOTAL PROGRAM	$36,000.00

Respectfully Submitted by:

G. Belik, M. Sc.,

Kamloops, B. C.
August 30, 1982

Appendix I

Statement of Expenditures

Statement of Expenditures

Union Oil Company of Canada Ltd.

Induced Polarization, Resistivity and Magnetic Survey, Crown Property, Kamloops Mining Division, British Columbia.

1.	LABOUR:		
	G. Belik, M. Sc. (Aug 5 - Aug 11, 1982)		
	1 day preparation and travel		
	6 days field		
	7.0 days @ $250.00/day	$1,750.00	
	W. Gruenwald, B. Sc.		
	(Aug 5 - Aug. 12, 1982)		
	1 day travel		
	6 days field		
	7.0 days @ $185.00/day	1,295.00	
	R. Henderson, assistant,		
	(Aug 5 - Aug 12, 1982)		
	1 day travel		
	6 days field		
	7.0 days @ $120.00/day	840.00	
			$3,885.00
2.	TRUCK RENTAL:		
	6.0 days @ $35.00	210.00	
	750 kms @ 0.20/km	150.00	
			360.00
3.	FOOD AND ACCOMMODATION:	784.93	
	+ 10%	78.49	
			863.42

Continued

4. EQUIPMENT RENTAL:

I.P./Resistivity Unit	$360.00	
Proton Magnetometer	60.00	
		420.00

5. CONSUMABLES: 60.00

6. REPORT PREPARATION: 1,300.00

$6,888.42

Appendix II

Statement of Qualifications

Gary D. Belik

GARY D. BELIK, M.Sc.
Consulting Geologist
Mineral Exploration

#6 NICOLA PLACE, 310 NICOLA STREET • KAMLOOPS, B.C. V2C 2P5 • PHONE (604) 374-4247

CERTIFICATE

I. GARY D. BELIK, OF THE CITY OF KAMLOPS, BRITISH COLUMBIA, DO HEREBY CERTIFY THAT:

(1). I am a member of the Canadian Institute of Mining and Metallurgy, and a fellow of the Geological Association of Canada.

(2). I am employed by G. Belik and Associates Ltd., with my office at #206 - 310 Nicola Street, Kamloops, B. C.

(3). I am a graduate of the University of British Columbia with a B. Sc. in Honors Geology and a M. Sc. in Geology.

(4). I have practised continuously as a geologist since May, 1970.

(5). I have gained considerable geophysical experience over the past 10 years including extensive use of Induced Polarization and ground magnetic systems.

(6). This report is based on an exhaustive study of all available data, published reports and unpublished company reports.

(7). Permission is hereby granted to Union Oil Co. of Canada Ltd. to use this report for financing purposes, and to satisfy the requirements of the Securities Commission, the Stock Exchange and the B.C. Ministry of Mines.

Gary D. Belik, M. Sc.
GEOLOGIST

August 30, 1982

G. BELIK AND ASSOCIATES LTD.
Consulting Geologist

Appendix III

I.P./Resistivity Data

G. BELIK AND ASSOCIATES LTD., - I. P. DATA SHEETS

CLIENT:	UNION OIL CO. OF CANADA LTD.
PROPERTY:	CROWN CLAIMS
OPERATOR:	G. BELIK
FREQ'S USED:	10 Hz./0.3 Hz.
DATE:	AUGUST 6 - AUGUST 11, 1982

LINE 4+00 E

Tx Location:	16+00N	
Calibration:	14+50 - 15+00N	+0.9%
	15+00 - 15+50N	+0.3%
	15+50 - 16+00N	+0.3%
	16+00 - 16+50N	+2.0%
	16+50 - 17+00N	+1.5%
	17+00 - 17+50N	+1.2%

Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
19+00–19+50N	17+00–17+50N	159	100	300	10.2	9.0	80
	16+50–17+00N	394	10	200	14.0(N)	12.5	59
=50–19+00N	17+00–17+50N	280	100	250	10.2	9.0	67
	16+50–17+00N	674	10	200	10.8	9.3	51
	16+00–16+50N	156	10	250	15.0(N)	13.0	19
18+00–18+50N	17+00–17+50N	150	IV	300	9.0	7.8	75
	16+50–17+00N	179	100	200	13.0	11.5	54
	16+00–16+50N	370	10	250	16.0	14.0	22
	15+50–16+00N	334	10	400	14.0(N)	13.7	25
+50–18+00N	16+50–17+00N	668	100	200	12.0	10.5	50
	16+00–16+50N	100	100	250	15.0	13.0	24
	15+50–16+00N	074	100	400	14.0	13.7	28
	15+00–15+50N	346	10	350	12.0	11.7	30

G. BELIK AND ASSOCIATES LTD., - I. P. DATA SHEETS (Continued

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\Pi$
17+00-17+50N	16+00-16+50N	304	100	250	14.0	12.0	18
	15+50-16+00N	168	100	400	12.0	11.7	25
	15+00-15+50N	268	10	350	12.0	11.7	29
	14+50-15+00N	246	10	300	N/R	--	25
16+50-17+00N	15+50-16+00N	310	IV	350	3.9	3.6	133
	15+00-15+50N	782	100	350	4.5	4.2	134
	14+50-15+00N	172	100	300	4.5	3.4	86
15+00-15+50N	16+00-16+50N	319	IV	250	4.2	2.2	191
14+50-15+00N	15+50-16+00N	368	IV	400	1.5	1.2	138
	16+99-16+50N	860	100	250	3.0	1.0	206
14+00-14+50N	15+00-15+50N	259	IV	350	3.0	2.7	111
	15+50-16+00N	870	100	400	4.2	3.9	131
	16+00-16+50N	233	100	250	5.4	3.4	140
	16+50-17+00N	502	10	200	6.9	5.4	75
13+50-14+00N	14+50-15+00N	138	IV	300	7.8	6.9	69
	15+00-15+50N	668	100	350	6.0	5.7	114
	15+50-16+00N	315	100	400	5.4	5.1	118
	16+00-16+50N	910	10	250	6.6	4.6	109
13+00-13+50N	14+50-15+00N	550	100	300	4.5	3.6	110
	15+00-15+50N	306	100	350	5.7	5.4	131
	15+50-16+00N	160	100	400	4.0	3.7	120
12+50-13+00N	14+50-15+00N	172	100	300	6.0	5.1	86
	15+00-15+50N	897	10	300	6.0	5.7	90
12+00-12+50N	14+50-15+00N	525	10	250	4.0	3.1	63

G. BELIK AND ASSOCIATES LTD., - I. P. DATA SHEETS (Continued)

LINE 4+00E

Tx Location: 12+00N

Calibration:

10+50 - 11+00N	+2.1%
11+00 - 11+50N	+1.8%
11+50 - 12+00N	+2.0%
12+00 - 12+50N	+0.6%
12+50 - 13+00N	+1.0%
13+00 - 13+50N	+0.8%

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
14+00-14+50N	13+00-13+50N	135	IV	400	7.5	6.7	51
	12+50-13+00N	462	100	500	8.7	7.7	55
	12+00-12+50N	172	100	450	10.0	9.4	57
	11+50-12+00N	325	10	250	10.0	8.0	39
13+50-14+00N	12+50-13+00N	272	IV	450	1.7	0.7	91
	12+00-12+50N	810	100	400	6.9	6.3	121
	11+50-12+00N	153	100	250	5.7	3.7	92
	11+00-11+50N	357	10	200	14.0	12.2	54
13+00-13+50N	12+00-12+50N	226	IV	400	4.8	4.2	84
	11+50-12+00N	344	100	250	6.0	4.0	83
	11+00-11+50N	726	10	200	14.0	12.2	54
	10+50-11+00N	212	10	175	14.0	11.9	36
12+50-13+00N	11+50-12+00N	103	IV	250	4.5	2.5	62
	11+00-11+50N	167	100	200	15.0	13.2	50
	10+50-11+00N	433	10	175	12.0	9.9	37
11+00-11+50N	12+00-12+50N	104	IV	400	5.7	5.1	39
10+50-11+00N	11+50-12+00N	073	IV	250	12.0	10.0	44
	12+00-12+50N	419	100	400	11.0	10.4	63

G. BELIK AND ASSOCIATES LTD., - I. P. DATA SHEETS (Continued)

[illegible]x Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
10+00-10+50N	11+00-11+50N	634	100	200	9.0	7.2	48
	11+50-12+00N	120	100	250	12.5	10.5	29
	12+00-12+50N	107	100	400	10.5	9.9	40
	12+50-13+00N	335	10	450	10.0	9.0	22
[illegible]+50-10+00N	10+50-11+00N	740	100	175	5.1	3.0	63
	11+00-11+50N	110	100	200	12.5	10.7	33
	11+50-12+00N	404	10	250	10.0	8.0	24
	12+00-12+50N	449	10	400	7.5	6.9	34
[illegible]+00-9+50N	10+50-11+00N	154	100	175	7.5	5.4	53
	11+00-11+50N	380	10	200	14.0	12.2	28
	11+50-12+00N	250	10	250	9.0(N)	7.0	30
[illegible]+50-9+00N	10+50-11+00N	687	10	175	8.0	5.9	59
	11+00-11+50N	204	10	200	14.0	12.2	31
[illegible]+00-8+50N	10+50-11+00N	657	10	350	7.5	5.4	56

G. BELIK AND ASSOCIATES LTD. - I. P. DATA SHEETS (Continued)

LINE 7+50E

Tx Location:	9+50N	
Calibration:	8+50 - 9+00N	+4.5%
	9+00 - 9+50N	+5.4%
	9+50 - 10+00N	+5.1%
	10+00 - 10+50N	+3.5%
	10+50 - 11+00N	+3.6%

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
6+00-6+50N	8+50-9+00N	709	10	63	N/R		337
6+50-7+00N	8+50-9+00N	663	10	65	N/R		153
	9+00-9+50N	206	10	65	N/R		95
7+00-7+50N	8+50-9+00N	517	100	120	4.8	(0.3)	258
	9+00-9+50N	139	100	130	5.4	0	160
	9+50-10+00N	759	10	150	6.0(N)	0.9	152
7+50-8+00N	8+50-9+00N	205	IV	60	6.6	1.5	512
	9+00-9+50N	346	100	66	6.6	1.2	314
	9+50-10+00N	135	100	82	4.5	(0.6)	246
	10+00-10+50N	797	10	180	5.4	1.9	133
8+00-8+50N	9+00-9+50N	299	IV	125	6.0	0.6	358
	9+50-10+00N	801	100	82	6.0	0.9	586
	10+00-10+50N	943	10	90	5.1	1.6	157
	10+50-11+00N	135	100	225	4.8	1.2	180
8+50-9+00N	9+50-10+00N	194	IV	80	6.3	1.2	363
	10+00-10+50N	277	100	96	5.4	1.9	173
	10+50-11+00N	300	100	230	4.5	0.9	195
10+00-10+50N	9+00-9+50N	826	100	68	6.0	0.6	182

G. BELIK AND ASSOCIATES LTD. - I. P. DATA SHEETS (Continued)

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
10+50-11+00N	9+50-10+00N	999	100	82	5.6	0.4	182
	9+00-9+50N	169	100	68	6.6	1.2	149
11+00-11+50N	10+00-10+50N	567	100	96	4.8	1.3	89
	9+50-10+00N	208	100	84	6.3	1.2	279
	9+00-9+50N	112	100	130	7.2	1.8	129
	8+50-9+00N	618	10	125	4.2(N)	(0.9)	148
11+50-12+00N	10+50-11+00N	103	IV	125	4.8	1.2	123
	10+00-10+50N	279	100	94	5.1	1.6	178
	9+50-10+00N	137	100	82	7.5	2.4	251
	9+00-9+50N	104	100	130	7.8	2.4	240
12+00-12+50N	10+50-11+00N	275	100	120	6.0	2.4	137
	10+00-10+50N	098	100	94	6.9	3.4	156
	9+50-10+00N	657	10	82	7.2	2.1	240
12+50-13+00N	10+50-11+00N	101	100	125	5.7	2.1	121
	10+00-10+50N	819	819	175	5.7	2.2	140
13+00-13+50N	10+50-11+00N	875	10	230	5.4	1.8	114

G. BELIK AND ASSOCIATES LTD. - I. P. DATA SHEETS (Continued)

LINE 7+50E

Tx Location:	13+00N	
Calibration:	12+00 - 12+50N	+3.6%
	12+50 - 13+00N	+3.3%
	13+00 - 13+50N	+4.5%
	13+50 - 14+00N	+2.7%
	14+00 - 14+50N	+3.0%

Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
1[illegible]+00-11+50N	12+00-12+50N	377	100	50	3.0	(0.6)	113
	12+50-13+00N	126	100	74	6.3	3.0	102
	13+00-13+50N	162	100	160	6.3	1.8	152
	13+50-14+00N	199	100	260	N/R	–	230
1[illegible]+50-12+00N	12+50-13+00N	955	100	76	5.4	2.1	188
	13+00-13+50N	239	100	68	6.6	2.1	211
	13+50-14+00N	435	100	240	5.5	2.8	272
	14+00-14+50N	122	100	160	7.5	4.5	229
12+00-12+50N	13+00-13+50N	772	100	66	5.1	0.6	175
	13+50-14+00N	544	100	125	3.6	0.9	261
	14+00-14+50N	223	100	165	5.1	2.1	203
1[illegible]+50-14+00N	12+50-13+00N	126	IV	74	6.6	3.3	255
1[illegible]+00-14+50N	13+00-13+50N	599	100	64	5.1	0.6	140
	12+50-13+00N	300	100	72	6.0	2.7	250
14+50-15+00N	13+50-14+00N	131	IV	125	5.1	2.4	147
	13+00-13+50N	127	100	86	6.6	2.1	89
	12+50-13+00N	098	100	95	6.9	3.6	153
	12+00-12+50N	127	100	245	6.3	2.7	155

G. BELIK AND ASSOCIATES LTD. - I. P. DATA SHEETS (Continued)

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
15+00-15=50N	14+00-14+50N	727	100	110	7.8	4.8	99
	13+50-14+00N	237	100	165	6.9	3.2	86
	13+00-13+50N	567	10	160	9.3	4.8	53
	12+50-13+00N	526	10	180	8.4(N)	5.1	88
15+50-16+00N	14+99-14+50N	164	100	110	11.1	8.1	90
	13+50-14+00N	154	100	310	9.0	6.3	75
	13+00-13+50N	244	10	160	10.0(N)	5.5	46
16+00-16+50N	14+00-14+50N	164	100	210	7.2	4.2	117
	13+50-14+00N	105	100	320	6.3	3.6	98
16+50-17+00N	14+00-14+50N	948	10	215	7.2	4.2	132

G. BELIK AND ASSOCIATES LTD., - I. P. DATA SHEETS (Continued)

LINE 7+50E

Tx Location: 17+00N

Calibration:		
	15+50 - 16+00N	+3.3%
	16+00 - 16+50N	+2.7%
	16+50 - 17+00N	+4.0%
	17+00 - 17+50N	+3.0%
	17+50 - 18+00N	+1.8%
	18+00 - 18+50N	+2.7%

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
14+50-15+00N	15+50-16+00N	497	100	125	9.0	5.7	60
	16+00-16+50N	260	100	150	6.3	3.6	104
	16+50-17+00N	110	100	115	8.4	4.4	143
	17+00-17+50N	893	10	140	6.3	3.3	191
15+00-15+50N	16+00-16+50N	132	IV	150	5.7	3.0	132
	16+50-17+00N	294	100	115	7.4	3.4	153
	17+00-17+50N	185	100	140	6.9	3.9	198
	17+50-18+00N	212	100	380	6.0	4.2	167
15+50-16+00N	16+50-17+00N	127	IV	115	9.0	5.0	165
	17+00-17+50N	407	100	140	8.7	5.7	174
	17+50-18+00N	214	100	210	6.6	4.8	153
	18+00-18+50N	118	100	190	9.3	6.6	186
16+00-16+50N	17+00-17+50N	159	IV	145	6.3	3.3	164
	17+50-18+00N	506	100	220	5.1	3.3	138
	18+00-18+50N	216	100	190	6.6	3.9	171
17+50-18+00N	16+50-17+00N	148	IV	100	5.4	1.4	222
18+00-18+50N	17+00-17+50N	150	IV	125	9.6	6.6	180
	16+50-17+00N	322	100	90	7.8	3.8	215

B. BELIK AND ASSOCIATES LTD. - I. P. DATA SHEETS (Continued)

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\Pi$
18+50-19+00N	17+50-18+00N	152	IV	190	8.1	6.3	120
	17+00-17+50N	374	100	125	9.0	6.0	180
	16+50-17+00N	106	100	100	9.3	5.3	159
	16+00-16+50N	440	10	125	9.0	6.3	106
19+00-19+50N	18+00-18+50N	236	IV	160	4.8	2.1	221
	17+50-18+00N	362	100	175	7.5	5.7	124
	17+00-17+50N	123	100	125	9.9	6.9	148
	16+50-17+00N	836	10	175	10.5(N)	6.5	143
19+50-20+00N	18+00-18+50N	773	100	160	6.6	3.9	290
	17+50-18+00N	190	100	190	7.8	6.0	150
	17+00-17+50N	724	10	125	11.0	8.0	174
20+00-20+50N	18+00-18+50N	200	100	300	3.6	0.9	100
	17+50-18+00N	311	10	175	3.6	1.8	53
20+50-21+00N	18+00-18+50N	535	10	270	3.3	0.5	59

G. BELIK AND ASSOCIATES LTD. - I. P. DATA SHEETS (Continued)

LINE 7+50E

Tx Location:	21+00N	
Calibration:	19+50 - 20+00N	+3.0%
	20+00 - 20+50N	+4.8%
	20+50 - 21+00N	+1.5%
	21+00 - 21+50N	+1.8%
	21+50 - 22+00N	+3.6%
	22+00 - 22+50N	+3.6%

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\Pi$
18+50-19+00N	19+50-20+00N	383	IV	125	4.2	1.2	459
	20+00-20+50N	556	100	175	9.9	5.1	191
	20+50-21+00N	892	10	350	12.	10.5	38
	21+00-21+50N	758	10	500	14(N)	12.2	45
19+00-19+50N	20+00-20+50N	303	IV	175	9.3	4.5	259
	20+50-21+00N	206	100	350	16.	14.5	35
	21+00-21+50N	106	100	350	15.	13.2	45
	21+50-22+00N	372	10	190	13.	9.4	59
19+50-20+00N	20+50-21+00N	660	100	350	14.	12.5	28
	21+00-21+50N	280	100	350	15.	13.2	48
	21+50-22+00N	814	10	175	12.	8.4	70
	22+00-22+50N	780	10	125	6.6	3.0	187
20+00-20+50N	21+00-21+50N	488	100	300	22.	20.2	24
	21+50-22+00N	773	10	165	15.	11.4	28
	22+00-22+50N	702	10	125	10.5	6.9	84
21+50-22+00N	20+50-21+00N	914	100	350	8.4	6.9	39
22+00-22+50N	21+00-21+50N	158	IV	350	6.6	4.8	68
	20+50-21+00N	317	100	400	12.0	11.5	48

G. BELIK AND ASSOCIATES LTD. — I. P. DATA SHEETS (Continued)

k Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
2+50-23+00N	21+50-22+00N	896	100	175	6.6	3.0	78
	21+00-21+50N	356	100	350	6.6	4.8	61
	20+50-21+00N	140	100	400	9.0	7.5	53
	20+00-20+50N	370	10	175	11.0	6.2	63
3+00-23+50N	22+00-22+50N	561	100	125	4.5	0.9	67
	21+50-22+00N	281	100	175	7.2	3.6	96
	21+00-21+50N	152	100	350	8.1	6.3	65
	20+50-21+00N	794	10	350	8.5	7.0	68
23+50-24+00N	22+00-22+50N	212	100	125	5.4	1.8	102
	21+50-22+00N	128	100	175	8.1	4.5	109
	21+00-21+50N	920	10	350	8.0	6.2	79
4+00-24+50N	22+00-22+50N	680	10	120	N/R		85
	21+50-22+00N	336	10	160	6.0(N)	2.4	63

G. BELIK AND ASSOCIATES LTD. – I. P. DATA SHEETS (Continued)

Line 10+00E

Tx Location: 22+50N

Calibration:		
	21+00 – 21+50N	+5.5%
	21+50 – 22+00N	+4.5%
	22+00 – 22+50N	+3.0%
	22+50 – 23+00N	+3.8%
	23+00 – 23+50N	+3.5%
	23+50 – 24+00N	+3.3%

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
25+00-25+50N	23+50-24+00N	260	100	60	4.5	1.2	260
	23+00-23+50N	394	100	125	9.6	6.1	473
	22+50-23+00N	306	10	70	10.0	6.2	131
24+50-25+00N	23+50-24+00N	916	100	64	3.3	0	215
	24+00-23+50N	580	100	90	6.3	2.6	386
	22+50-23+00N	126	100	100	15.0	11.2	189
	22+00-22+50N	364	10	65	10.0(N)	7.0	168
24+00-24+50N	23+00-23+50N	224	IV	150	7.5	4.0	224
	22+50-23+00N	688	10	100	14.0	10.2	41
	22+00-22+50N	568	10	150	13.0(N)	10.0	57
	21+50-22+00N	274	10	105	12.0(N)	7.5	78
23+50-24+00N	22+50-23+00N	538	100	105	10.8	7.0	77
	22+00-22+50N	812	10	175	10.5(N)	7.5	28
	21+50-22+00N	341	10	115	14.0	9.0	44
	21+00-21+50N	271	10	100	12.0(N)	6.5	81
23+00-23+50N	22+00-22+50N	160	100	85	15.0	12.0	28
	21+50-22+00N	093	100	110	19.0	14.5	51
	21+00-21+50N	664	10	100	15.0	9.5	100

G. BELIK AND ASSOCIATES LTD., - I. P. DATA SHEETS (Continued)

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
21+50-22+00N	22+50-23+00N	185	IV	125	4.5	0.7	222
21+00-21+50N	22+00-22+50N	276	IV	95	3.0	0	435
	22+50-23+00N	454	100	125	5.1	1.3	217
20+50-21+00N	21+50-22+00N	137	IV	70	6.6	2.1	293
	22+00-22+50N	696	100	100	5.0	2.0	417
	22+50-23+00N	139	100	130	7.2	3.2	160
	23+00-23+50N	644	10	170	9.5(N)	6.0	114
20+00-20+50N	21+00-21+50N	120	IV	65	7.5	2.0	277
	21+50-22+00N	350	100	70	7.5	3.0	300
	22+00-22+50N	246	100	100	4.8	1.8	369
	22+50-23+00N	114	100	250	7.4	3.6	137
19+50-20+00N	21+00-21+50N	264	100	68	6.0	0.5	232
	21+50-22+00N	107	100	72	6.9	2.4	223
	22+00-22+50N	155	100	180	5.7	2.7	258
19+00-19+50N	21+00-21+50N	148	100	125	8.1	2.6	178
	21+50-22+00N	684	10	130	6.3	1.8	158
18+50-19+00N	21+00-21+50N	109	100	110	8.4	2.9	297

G. BELIK AND ASSOCIATES LTD. - I. P. DATA SHEETS (Continued)

Line 10+00E

Tx Location:	18+50N	
Calibration:	17+00 - 17+50N	+3.3%
	17+50 - 18+00N	+3.5%
	18+00 - 18+50N	+3.5%
	18+50 - 19+00N	+3.0%
	19+00 - 19+50N	+3.0%
	19+50 - 20+00N	+4.2%

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
20+50-21+00N	19+50-20+00N	205	IV	125	4.2	0	246
	19+00-19+50N	319	100	110	4.5	1.5	174
	18+50-19+00N	264	100	150	5.0	2.0	264
	18+00-18+50N	276	100	250	6.0	2.5	331
20+00-20+50N	19+00-19+50N	728	100	110	4.2	1.2	99
	18+50-19+00N	466	100	150	6.0	3.0	186
	18+00-18+50N	438	100	250	5.7	2.3	262
	17+50-18+00N	194	100	200	7.5	4.0	291
19+50-20+00N	18+50-19+00N	109	IV	125	4.5	1.5	130
	18+00-18+50N	717	100	200	4.2	0.7	215
	17+50-18+00N	310	100	175	7.5	4.0	265
	17+00-17+50N	194	100	175	8.1	4.8	332
19+00-19+50N	18+00-18+50N	188	IV	250	5.4	2.4	113
	17+50-18+00N	520	100	200	7.8	4.3	156
	17+00-17+50N	254	100	175	8.0	4.7	217
17+50-18+00N	18+50-19+00N	156	IV	175	7.2	4.2	134

G. BELIK AND ASSOCIATES LTD. - I. P. DATA SHEETS (Continued)

Rx Loc.	Tx Loc.	Vernier Voltage	Voltage Scale	I	F.E.	Cor. F.E.	$\rho_a/2\pi$
7+00-17+50N	18+00-18+50N	280	IV	250	5.4	1.9	168
	18+50-19+00N	564	100	174	7.5	4.5	193
16+50-17+00N	17+50-18+00N	275	IV	225	5.4	1.9	183
	18+00-18+50N	100	IV	300	6.9	3.4	200
	18+50-19+00N	276	100	175	6.6	3.6	236
	19+00-19+50N	098	100	125	9.0	6.0	235
16+00-16+50N	17+00-17+50N	336	IV	225	5.4	2.1	224
	17+50-18+00N	102	IV	250	9.0	5.5	245
	18+00-18+50N	559	100	350	5.7	2.2	240
	18+50-19+00N	204	100	150	8.7	5.7	408
5+50-16+00N	17+00-17+50N	714	100	200	5.1	1.8	214
	17+50-18+00N	313	100	225	6.6	3.1	208
	18+00-18+50N	202	100	300	6.3	2.8	202
15+00-15+50N	17+00-17+50N	362	100	200	6.0	2.7	271
	17+50-18+00N	186	100	225	7.5	4.0	248
4+50-15+00N	17+00-17+50N	160	100	200	8.1	4.8	210

Appendix IV

Magnetic Data

MAGNETOMETER SURVEY

PROPERTY: CROWN CLAIMS

MAGNETOMETER & OPERATOR: Geometrics Proton Mag. W. Gruenwald

DATE: Aug 6/82 PAGE: 7

TIME	LINE	STN.	RDG.	DRF. CORR.	VALUE	REMARKS
	10+00E	9+25	[illegible]	-7	5806	
	"	9+00	[illegible]	-7	5806	
		8+75	[illegible]	-7	5808	
		8+50	[illegible]	-7	5808	
		8+25	[illegible]	-7	5808	
		8+00	[illegible]	-7	5807	
		7+75	[illegible]	-7	5807	
		7+50	[illegible]	-7	5809	
		7+25	[illegible]	-8	5807	
		7+00	[illegible]	-8	5807	
		6+75	[illegible]	-8	5809	
		[illegible]	[illegible]	-8	5809	
[illegible]		[illegible]	5819	-8	5810	
[illegible]	[illegible]	[illegible]	5817			BASE #1

MAGNETOMETER SURVEY

PROPERTY: [illegible]

MAGNETOMETER & OPERATOR: [illegible] [illegible] gruenwald

DATE: [illegible] 6/82 PAGE: 6

TIME	LINE	STN.	RDG.	DRF. CORR.	VALUE	REMARKS
[illegible]	10+00E	[illegible]		-6	5801	
	"	15+00	[illegible]	-6	5801	
	"	14+75		-6	5800	
	"	[illegible]	[illegible]	-6	5801	
	"	14+25		-6	5801	
	"	[illegible]		-6	5803	
	"	[illegible]		-6	5808	
	"	[illegible]	[illegible]	-6	5821	
	"	[illegible]	[illegible]	~~5822 -6~~ -6	~~5816~~ 5814	
	"	[illegible]	[illegible]	-6	5816	
	"	12+75	[illegible]	-6	5811	
	"	12+50	[illegible]	-7	5806	
	"	12+25	[illegible]	-7	5805	
4:50	"	[illegible]		-7	5806	
	"	[illegible]	[illegible]	-7	5804	
	"	[illegible]	[illegible]	-7	5804	
	"	[illegible]	[illegible]	-7	5803	
	"	[illegible]	[illegible]	-7	5802	
	"	[illegible]	[illegible]	-7	5803	
	"	[illegible]	[illegible]	-7	5807	
	"	[illegible]	[illegible]	-7	5807	
	"	[illegible]	[illegible]	-7	5805	
	"	9-75	[illegible]	-7	5805	
	"	[illegible]	[illegible]	-7	5805	

MAGNETOMETER SURVEY

PROPERTY [illegible]

MAGNETOMETER & OPERATOR Geometrics Proton Mag / H Grunwald

DATE [illegible]/82 PAGE 5

TIME	LINE	STN.	RDG.	DRF. CORR.	VALUE	REMARKS
	10+00	21+25	5811	-5	5806	
	"	21+00	5814	-5	5809	
[illegible]	"	20+75	5814	-5	5809	
	"	20+50	5816	-5	5811	
	"	20+25	5814	-5	5809	
	"	20+00	5815	-5	5810	
	"	19+75	5813	-5	5808	
	"	19+50	5812	-5	5807	
	"	19+25	5813	-5	5808	
	"	19+00	5813	-5	5808	
	"	18+75	5813	-5	5808	
	"	18+50	5811	-5	5806	
	"	18+25	5813	-5	5808	
	"	18+00	5812	-5	5807	
	"	17+75	5810	-5	5805	
	"	17+50	5809	-5	5804	
	"	17+25	[illegible]	-5	5803	
	"	17+00	[illegible]	-5	5803	
	"	16+75	5809	-5	5804	
	"	16+50	5808	-5	5803	
	"	16+25	5809	-5	5804	
	"	16+00	5810	-5	5805	
	"	15+75	5809	-6	5803	
	10+00	15+50	5809	-6	5803	

MAGNETOMETER SURVEY

PROPERTY [illegible]

MAGNETOMETER & OPERATOR Geometrics Proton Mag. / [illegible] Grunwald

DATE [illegible] PAGE [illegible]

TIME	LINE	STN.	RDG.	DRF. CORR.	VALUE	REMARKS
	7+50E	21+75	5810	-3	5807	
2:50	"	22+00	5811	-3	5808	
	"	22+25	5811	-3	5808	
	"	[illegible]	5811	-3	5808	
		[illegible]	5812	-3	5809	
			5811	-3	5808	
			5813	-3	5810	
			5814	-3	5811	
			5813	-3	5810	
		[illegible]	12	-3	5809	
3:00 pm	"	[illegible]	5814	-4	5810	
3:20 pm	10+00E	24+50	5816	-4	5812	
	"	24+25	5817	-4	5813	
	"	24+00	5816	-4	5812	
	"	23+75	5816	-4	5812	
	"	[illegible]	5815	-4	5812	
	"	[illegible]	5814	-4	5810	
	"	[illegible]	5810	-5	5805	
	"	22+75	5811	-5	5806	
	"	22+50	5805	-5	5800	
	"	[illegible]	5815	-5	5810	
	"	[illegible]	5814	-5	5809	
	"	21+75	5813	-5	5808	
	10+00E	21+50	5811	-5	5806	

MAGNETOMETER SURVEY

PROPERTY [illegible]

MAGNETOMETER & OPERATOR [illegible]

DATE Aug 6/82 PAGE 3

TIME	LINE	STN.	RDG.	DRF. CORR.	VALUE	REMARKS
	7+50E	15+75N	5802	-2	5800	
	"	16+00	5809	-2	5807	
	"	16+25	5809	-2	5807	
	"	16+50	5806	-2	5804	
	"	16+75	5809	-2	5807	
	"	17+00	5807	-2	5805	
[illegible]	"	17+25	5805	-2	5803	
	"	17+50	5806	-2	5804	
	"	17+75	5812	-2	5810	
	"	18+00	5811	-2	5809	
	"	[illegible]	5811	-2	5809	
	"	[illegible]	5811	-3	5808	
	"	[illegible]	5810	-3	5807	
	"	[illegible]	5809	-3	5806	
		19+25	5806	-3	5803	
		19+50	5806	-3	5803	
		19+75	5806	-3	5803	
		20+00	5806	-3	5803	
		20+25	5809	-3	5806	
		20+50	5811	-3	5808	
		20+75	5808	-3	5805	
		21+00	5810	-3	5807	
		21+25	5809	-3	5806	
		21+50	5811	-3	5808	

MAGNETOMETER SURVEY

PROPERTY [illegible]

MAGNETOMETER & OPERATOR [illegible]

DATE [illegible] PAGE 2

TIME	LINE	STN.	RDG.	DRF. CORR.	VALUE	REMARKS
12:30pm	[illegible]	9+50N	5810	0		
	"	10+00	5811	-1	5810	
	"	[illegible]	5807	-1	5806	
	"	10+50	5809	-1	5808	
	"	[illegible]	5811	-1	5810	
	"	[illegible]	5808	-1	5807	
	"	[illegible]	[illegible]	-1	5806	
12:45pm	"	[illegible]	5806	-1	5805	
	"	[illegible]	5806	-1	5805	
	"	[illegible]	5807	-1	5806	
	"	12+25	5809	-1	5808	
	"	12+50	5806	-1	5805	
	"	12+75	5806	-1	5805	
	"	13+00	[illegible]	-1	5805	
	"	13+25	5807	-1	5806	
	"	13+50	5805	-2	5803	
	"	13+75	5805	-2	5803	
	"	14+00	5805	-2	5803	
	"	14+25	5806	-2	5804	
	"	[illegible]	5806	-2	58.4	
	"	[illegible]	5806	-2	5804	
2:20pm	"	15+00	5805	-2	5803	
	"	15+25	5800	-2	5798	
	"	15+50	5805	-2	5802	

MAGNETOMETER SURVEY

PROPERTY

MAGNETOMETER & OPERATOR

DATE

PAGE 3

TIME	LINE	STN.	RDG.	DRF. CORR.	VALUE	REMARKS
	4+00E	19+50N	5830	NIL		
		19+62N	5817			
		19+75N	5813			
		20+00N	5818			
			5817			
			5811			
			5811			
2:28	4+00E	21+00N	5811			
3:23pm			5813			Base #2
3:25pm	4+00E	7+75N	5810	NIL		
		7+50N	5810			
			5809			
		7+00N	5809			
			5810			
			5809			
			5809			
3:33pm		6+00N	5810			
3:38pm			5805			Base #1

MAGNETOMETER SURVEY

PROPERTY [illegible]

MAGNETOMETER & OPERATOR [illegible]

DATE [illegible]

PAGE 2

TIME	LINE	STN.	RDG.	DRF. CORR.	VALUE	REMARKS
[illegible]	[illegible]	[illegible]	[illegible]	0		
	"	[illegible]	[illegible]	-1	5810	
	"	[illegible]	5807	-1	5806	
	"	[illegible]	5809	-1	5808	
	"	[illegible]	5811	-1	5810	
	"	[illegible]	5808	-1	5807	
	"	[illegible]	[illegible]	-1	5806	
1:45pm	"	[illegible]	5806	-1	5805	
	"	11+75	5806	-1	5805	
	"	[illegible]	5807	-1	5806	
	"	12+25	5809	-1	5808	
	"	12+50	5806	-1	5805	
	"	12+75	5806	-1	5805	
	"	13+00	5806	-1	5805	
	"	13+25	5807	-1	5806	
	"	13+50	5805	-2	5803	
	"	13+75	5805	-2	5803	
	"	14+00	5805	-2	5803	
	"	[illegible]	5806	-2	5804	
	"	[illegible]	5806	-2	5804	
	"	[illegible]	5806	-2	5804	
2:20pm	"	[illegible]	5805	-2	5803	
	"	[illegible]	5800	-2	5798	
	"	15+50	5805	-2	5802	

MAGNETOMETER SURVEY

PROPERTY: CROWN CLAIMS

MAGNETOMETER & OPERATOR: Geometrics Proton Mag
N Gruenwald

DATE: [illegible] 6/88 PAGE: 1

TIME	LINE	STN.	RDG.	DRF. CORR.	VALUE	REMARKS
12:30	Base	—	5804			
1:05	"		5104			
		6+50N	5810			
		6+75N	5809			
		7+00N	5808			
		7+25N	5809			
		7+50N	5809			
		7+75N	5810			
		8+00N	5811			
		8+25N	5812			
		8+50N	5812			
1:25	[illegible]	Station	5804			Base #1
[illegible]	4+50E	7+00N	5810	0		
	4+50E	7+25	5810	0		
	"	7+50	5808	0		
	"	7+75	5809	0		
	"	8+00N	5809	0		
		8+25	5809	0		
		8+50	5810	0		
		8+75	5809	0		
		9+00	5810	0		
		9+25	5809	0		
		9+50	5810	0		

MAGNETOMETER SURVEY

PROPERTY: Crown Claims

MAGNETOMETER & OPERATOR: Geometrics Proton
G. Belik

DATE: Aug 11/87 PAGE: 1

TIME	LINE	STN.	RDG.	DRF. CORR.	VALUE	REMARKS
1:18pm			5814			Base St. #2
1:20pm	4+00E	8+00N	5812	NIL		
			5808			
			5812			
			5812			
		9+00N	5813			
			5815			
			5814			
			5814			
		10+00N	5814			
			5813			
			5813			
			5813			
1:35		11+00N	5811			
			5808			
			5809			
			5810			
		12+00N	5808			
			5808			
			5812			
			5810			
1:46		13+00N	5808			
			5804			

Appendix V

Sabre Model 21 I.P. System

OPERATING INSTRUCTIONS

This section should be read carefully before attempting to operate the equipment. Proper operating procedures will ensure reliable field results. The equipment is ruggedly constructed but it is electronic equipment and should be handled as such.

Operating Procedure for Transmitter

The functions of the transmitter are as follows:

1. Provide current
2. Measure current
3. Adjust & control current
4. Provide required alternating current frequencies. (square waveform)

Caution: Voltages ranging to 500 volts across the output terminals will exist and cre must be maintained to prevent electric shock.

Operation

Power switch & timer switch must be off.

Connect output terminals to current electrodes.

Voltage switch set 125.

Frequency switch 10 Hz or 3 Hz.

Capacity switch set counter-clockwise.

Range set 1000 (milliameter now reads 0-1000 m A)

Current controls set mid-point.

Turn on power switch, then timer switch.

Current flow will be indicated on the Milliameter. Frequency of the alternating current will be indicated by the pulsing neon lamp. The D.C.--D.C. converters in operation will emit a high pitch aqueal. The required amount of current will vary, depending upon ground resistivity & electrode spread but should be adjusted to provide a steady noise-free signal on the receiver. This is accomplished by adjusting the voltage setting. Power & timing must be turned off while changing the voltage setting to prevent contact arcing and eventual breakdown of this switch.

Once a suitable current is obtained, small adjustments (setting the current needle on a division line) are made with the current control knobs. At this point the current range switch should be set to the lowest setting possible to enable an accurate current measurement. When the current is stable, the reading is transmitted by radio to the receiver operator. The receiver operator records the current in milliamps and proceeds to measure the induced voltage.

Upon command from the receiver operator the frequency of the trans-mitted current is switched to .3 Hz. with power on, the frequency switch is set to .3 Hz. Any change in the current from the original current at 10 Hz must be corrected by adjusting the current control. As soon as the current is returned to the original setting, (as transmitted at 10 Hz) the reading is repeated to the receiver operator. When the receiver operator has taken his reading at .3 Hz frequency, he will again ask for 10 Hz current as a check. Transmitter current is then switched to the 10 Hz on the frequency control, current readjusted to original value and again repeated to receiver operator. If the check reading is satisfactory, equipment is turned off and moved to the next set up.

Important

At each set up, the initial current recorded at 10 Hz must be exactly maintained at .3 Hz and again at 10 Hz.

Any change in transmitted current will appear as a change in the induced voltage at the receiver producing a false frequency effect reading.

Note: Two switching controls must not be adjusted with the power on. These are:

Voltage switch

Capacity switch

Maximum current is limited by the D.C. Converter to 0.8 amps on each setting.

If maximum current is exceeded the D.C. Converters cease operation thereby acting as automatic overload protectors.

The capacity switch need only be adjusted if at high current values the pulsing circuitry ceases to function. If pulsing ceases the SCR commutating circuits require additional capacity, provided by increasing the capacity switch. This switch setting should be kept as low as possible and should not be changed while a reading is taken at any one set up.

Operating Prodedures for Receiver

The receiver is a sensitive AC and DC millivolt-meter with a circuit capable of measuring small voltage deviations. When the equipment is used as described, this deviation measured as a percent change is read directly as % frequency effect. Prior to measuring a voltage across a pair of potential electrodes, the wires from these electrodes are connected to the input terminals. Check that the controls are positioned as follows:

Frequency at 10 or 3 Hz

Deviation set 15 (Deviation meter will read ± 15%)

MV potentiometer set 1000

Turn power supply on, checking batteries + & - in passing.

The transmitter is asked for "current on" at 10 Hz or 5 Hz. When transmitter current has been set and is stable, reduce MV switch to progressively lower settings until monitor needle exceeds ~~38~~ 20, then increase switch setting one step. Next, reduce potentiometer setting (increasing gain) until the monitor needle reads approximately ~~38~~ 20 and Deviation needle comes to rest centered on 0. The voltage between the potential electrodes is read as follows:

If the switch is on the 100 MV. range, the potentiometer dial has a span of 100 MV. For instance if the dial reads 465 then the voltage is 46.5 MV. Other ranges are read in similar fashion.

To minimize reading errors, record both the multiplier reading and the range setting. Then as the transmitter for low frequency (.3 Hz). <u>Do not touch</u> range switch or multiplier potenticmeter.

Turn - frequency setting to DC

Turn - meter speed switch to slow (if desired).

The meter needles now fluctuate with each half cycle of transmitted current. The end point is reached when the deviation needle swings to the same point (to the left) with each half cycle. This point is read and recorded as the % F.E. It may be necessary to change the deviation switch to 15% or 50% to obtain the reading, and to adjust the S.P. controls to reach a clean end point.

It is now necessary to recheck the 10 Hz or 3 Hz reading. Call for 10 Hz or 3 Hz current again. If no drift has occurred, the deviation meter will return to 0. If it does not quite return to zero, the difference of this reading and the % F.E. may be averaged with the original % F.E. reading. If too great a discrepancy exists the reading should be repeated.

Calibration

The receiver has been calibrated as accurately as possible to give equal readings at all frequencies used. This calibration should be checked periodically in the field during the course of a survey. This may be done at the beginning of each day. The procedure consists of taking a normal reading. However the receiver input terminals are connected to the calibration terminals on the transmitter. This places the receiver across a one ohm resistor in series with the normal current electrodes. This procedure also checks transmitter current and receiver voltage accuracy. The current in milliamps should equal the voltage reading in millivolts. Calibration accuracy should be known to within 0.5%. If the % F.E. error is greater than 0.75-1.00% it should be corrected for throughout the survey.

Electrodes

Porous pots with Cu:$CuSO_4$ are recommended for receiver electrodes. Current electrodes may be either buried aluminum foil or steel stakes driven into the ground. To reduce the electrode resistance of the stakes, the hole should be enlarged by orbiting the stake while driving. With both methods salted water and detergent should be used to wet the soil around the electrode.

third power of the distance between the dipoles. Hence, any line spacing error produces large errors in the calculated resistivity values.

This restriction does not apply to the measured % F.E. and may in some areas prove to be a useful array.

Calculation & Plotting

Resistivity:

The apparent resistivity at each set up is calculated using the following formulae:

Dipole-Dipole

$$\frac{\rho_a}{2\pi} = \frac{V}{I}(x)(G)$$

Where V = millivolts
I = milliampere
x = electrode spread (dipole length)
G = geometric constant

G = 3 when n = 1
G = 12 when n = 2
G = 30 when n = 3
G = 60 when n = 4
G = 105 n = 5

Equitorial Dipole (Square Array & Rectangular Array)

$$\frac{\rho_a}{2\pi} = \frac{V}{I}(x)\ G$$

Square Array - G = 1.5
Rectangular Array, G = 9 (separation of dipoles = 2 dipole lengths)

Percent Frequenty Effect

For both arrays, the % F.E. is measured direct. The % F.E. is not dependent upon electrode configuration and may be recorded as a useful perameter whenever a direct voltage measurement is of value. (Induced voltage surveys).

Metal Factor

The M.F. is a non dimensional parameter combining % F.E. and $\frac{Pa}{2\pi}$.

$$M.F. = \frac{\%\ F.E.}{\frac{Pa}{2\pi}} \times 1000.$$

Plotting Methods

Results of the I.P. survey may be plotted either on a pseudo-section (Figure 2) or on a plan map of the survey grid.

The pseudo section plot is normally used when more than one dipole separation is read. For reconnaissance surveys using a single dipole separation, the results plotted on a plan map may be contoured or profiled.

Description of Circuitry

This section is included to allow trouble shooting by electronic technicians.

Power Supply

Power for the transmitter currents is supplied by 12 Volt lead-acid storage batteries. If two or more batteries are required they should be connected in parallel.

Receiver power consists of four 9 Volt transistor batteries. (MALLORY DURACELL MN-1604). Expected battery life is approximately 100 hours.

Transmitter

The transmitter block diagram is shown in Figure 3. The D.C.-D.C. converter steps up the 12 Volt input providing output voltages of 125, 250, 375 & 500 Volts. ~~Two~~ converters are used and their outputs may be connected in series or parallel. Power switching is accomplished with silicon controlled rectifiers. Triggering of this switching circuit is provided by a unijunction fired flip-flop circuit.

The D.C.-D.C. Converter circuitry is shown in Figure 4. The circuitry also shows voltage switching S. along with current measuring meter M, and current Control rheostat. The output of this section connects to the Power switching circuit through the mode switch S4 (Figure 5).

The power switching is accomplished by diagonally opposite SCR's being fired alternately (Figure 5) by triggering pulses from the flip-flop trigger circuit to the control gates.

The conducting SCR's are commutated by the discharge of the capacitor(s), connected across the output, through L1 & L2 creating an inductive back voltage. With each trigger pulse the process is reversed. If the load resistance is low and currents high additional capacity is required to provide sufficient kickback voltage to cut off the SCR's. Switch S5 (capacity switch) controls the capacity value. As soon as this non-pulsing condition is recognized, the power should be turned off and the next high capacity setting used. The D.C.-D.C. converters provide overload protection by ceasing to operate into a very low load resistance.

The triggering pulses are provided by the flip-flop circuit Figure 6. Pulses from the unijunction oscillator are coupled into the emitters of the flip-flop. Each pulse causing alternate transitors to conduct, their outputs alternately producing pulses in transformers T1 and T2.

Receiver

The receiver is a sensitive AC-DC. voltmeter capable of measuring the voltage range from 1-10,000 millivolts at three frequencies and D.C. The schematic is shown in Figure 7.

Three stages of amplification are used with feedback providing filtering and controlling the gain of each stage. The filter switch S1 has two stages of filtering which act by capacitor coupling of the first two stages. The second stage has trimmer potentiometers for calibrating all frequencies to near zero % deviation.

The Range Switch S1 controls the input level in four steps. The multiplier acts as the fine gain control for the third amplifier stage. Amplifier output is rectified by the 1N695 diodes. The rectified signal drives the Monitor meter M2 and the expanded scale meter circuit. The zener diode 1N5223A provides the reference voltage for nulling the Deviation Meter M. The monitor meter M2 will read approximately 38 when the deviation meter M1 indicates mid-point zero null.

The balance of the second stage is provided by the 100 K potentiometer. Very little adjustment of this control should be necessary. (INTERNAL)

J.T. Walker April, 1971

Pseudo-Section Plotting
Frequency Effect & Resistivity Results
Dipole - Dipole Electrode Configuration

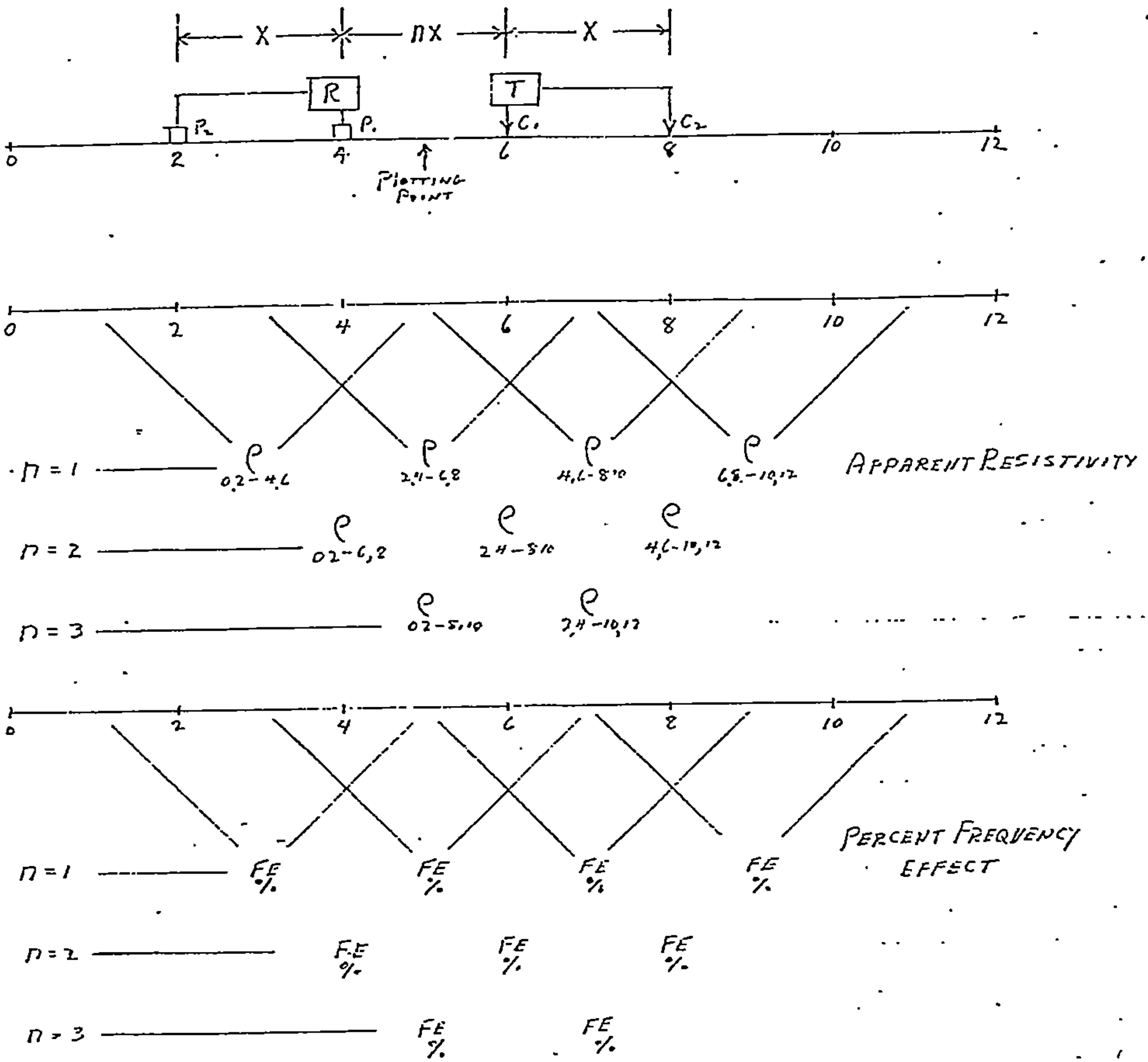
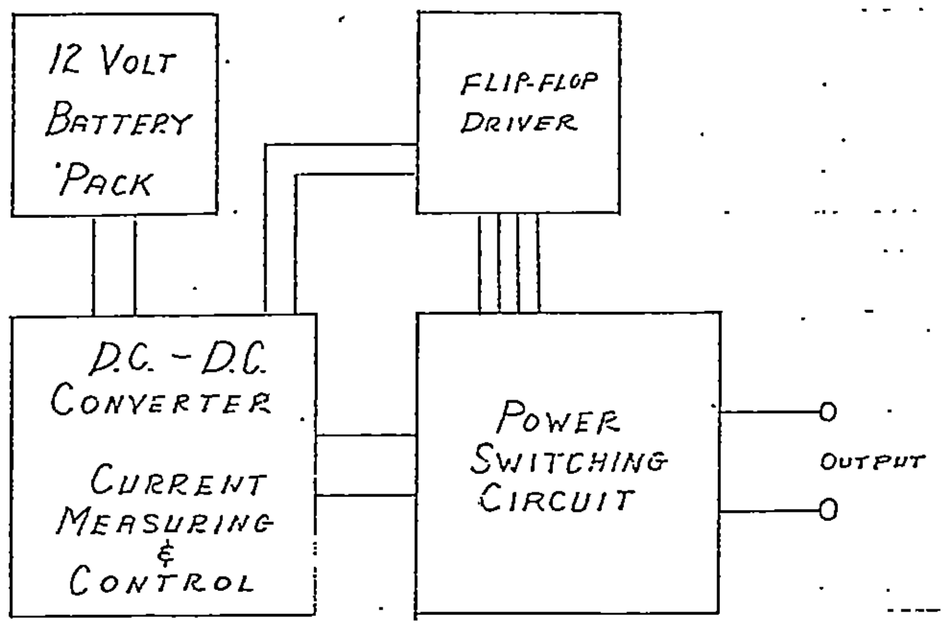


Figure 2



TRANSMITTER - BLOCK DIAGRAM.
FIGURE 3

Appendix VI

Unimag Portable Proton Magnetometer

1.0 GENERAL INFORMATION

1.1 INTRODUCTION

The UniMag™ Portable Proton Magnetometer, Model G-836, is a complete system designed for general field applications requiring simple operation and stable measurements of the total intensity of the earth's magnetic field. UniMag provides 10 gamma resolution over a range from 20,000 to 100,000 gammas. Since the instrument measures total field intensity, the accuracy of each measurement is independent of sensor leveling. Furthermore, each measurement is based upon an atomic constant* and is independent of temperature, humidity, and battery conditions. The unified simplicity of UniMag allows rapid, accurate measurements to be obtained from a single, compact field instrument without the need for external batteries, cables or a sensor and staff. UniMag is a precision instrument and reasonable care should be exercised to avoid damage from unnecessary field abuse.

I-M-P-O-R-T-A-N-T

Read Chapter 3.0 Before Using UniMag on a Survey

1.2 MAGNETIC ENVIRONMENT

During survey operation, it is important that the earth's magnetic field is not biased or disturbed by allowing unwanted magnetic objects to come close to the sensor. Such objects include jewelry, keys, watches, belt buckles, pocket knives, mechanical pencils, zippers, some hats, notebooks, other survey equipment, etc. In normal use, UniMag is suspended from the adjustable shoulder strap, and held in front of the operator. This places the sensor approximately 2 ft. (61 cm) away from the operator, and typically 3 ft. (91 cm) above the ground. Under such conditions, 10 gamma surveys can be quickly and accurately performed.

Prior to survey use, however, objects that are suspected to be magnetic may be checked in the following manner:

1. Go to a magnetically clean area away from buildings, roads, automobiles, AC power-lines, etc.

2. Place the suspected object far away from UniMag, and take several readings by depressing the black pushbutton - releasing - and waiting for a digital readout to appear.

3. Observe the displayed readings. Each reading should repeat to within 10 gammas, i.e., the least significant digit (extreme right-hand number) should NOT change by more than one count.

* Proton Gyromagnetic Ratio: $(2.67513 \pm 0.00002) \times 10^4$ Radians/Gauss second.

4. Now place the suspected object at the distance from the sensor expected during actual survey operation. Take several more readings and note the measurements.

5. If the measurements made in Step 4 above differ by more than ± 1 count (extreme right-hand number) from these measurements made in Step 3, then the object is magnetic.

IF THE ARTICLE IS HIGHLY MAGNETIC, OR IF UniMag IS OPERATED INSIDE OR NEAR A BUILDING OR VEHICLE, THE SIGNAL WILL BE LOST, GIVING COMPLETELY ERRATIC READINGS AND LOSS OF ± 1 COUNT REPEATABILITY.

UniMag should not be operated in areas that are known sources of radio frequency energy, power line noise (transformers), or operated in buildings. UniMag will NOT operate properly if it is placed directly on the ground.

1.3 SPECIFICATIONS

Resolution:	10 gamma throughout tuning range
Tuning Range:	20, 000 to 100, 000 gammas (world-wide)
Tuning Mechanism:	Multi-position switch with twenty-four overlapping steps.
Sampling Rate:	Manual pushbutton, new reading every 4 seconds.
Output:	4 digit, illuminated display directly in gammas.
Power Requirements:	12V DC, 500 ma average
Power Source:	Two internally mounted and rechargeable 6 volt, 1 amp/hr non-spill gelled electrolyte batteries. Charge state or replacement signified by flashing readout display.
AC Battery Charger:	Input: 115/220V, 50/60 Hz AC Output: 14V DC
Temperature Range:	-40° to +60°C Note: Battery capacity decreases with low temperature operation.
Accuracy (Total Field):	10 gamma through -20° to +60°C temperature range

Sensor:	Noise cancelling, high signal. Internally mounted in console.
Console Size:	$22\frac{1}{2}$" l. × $3\frac{1}{4}$" w. × 5" h. (58 × 8.3 × 12.7 cm)
Console Weight:	7 lbs. (3.2 kg) Includes batteries, sensor and shoulder harness.

1.4 INVENTORY INSPECTION

When received from the manufacturer, the UniMag™ Proton Magnetometer should include the following items:

1.	UniMag Console including sensor	1 ea
2.	AC battery charger	1 ea
3.	Adjustable shoulder strap	1 ea
4.	Battery Pack	2 ea
5.	Operator's manual	1 ea
6.	Applications Manual	1 ea
7.	Attaché Case	1 ea
8.	Teflon pipe tape	1 strip

2.0 FIELD OPERATION

2.1 INTRODUCTION

UniMag is completely self-contained, and is ready for field survey operation. A few simple procedures should be observed to obtain optimum results, and it is recommended that the operator follow each step as outlined in this chapter to initially become familiar with the operation of the instrument. Refer to Figure 2-1 for identification of UniMag's controls and indicators.

2.2 CONSOLE OPERATION

PRELIMINARY CONSIDERATIONS: BEFORE USING UniMag, CHECK FOR:

1. Presence of sensor fluid:

   The sensor is located in the forward, cylindrical portion of the instrument as shown in Detail "A" of Figure 2-1. Shake the instrument GENTLY and listen for a "sloshing" sound. If fluid is not present, or cannot be heard, it is necessary to fill the sensor PRIOR to operation:

   a) Hold the UniMag console vertically with the sensor pointed up. Remove the slotted Fill Plug from the convex end of the sensor as shown in Detail "A" of Figure 2-1.

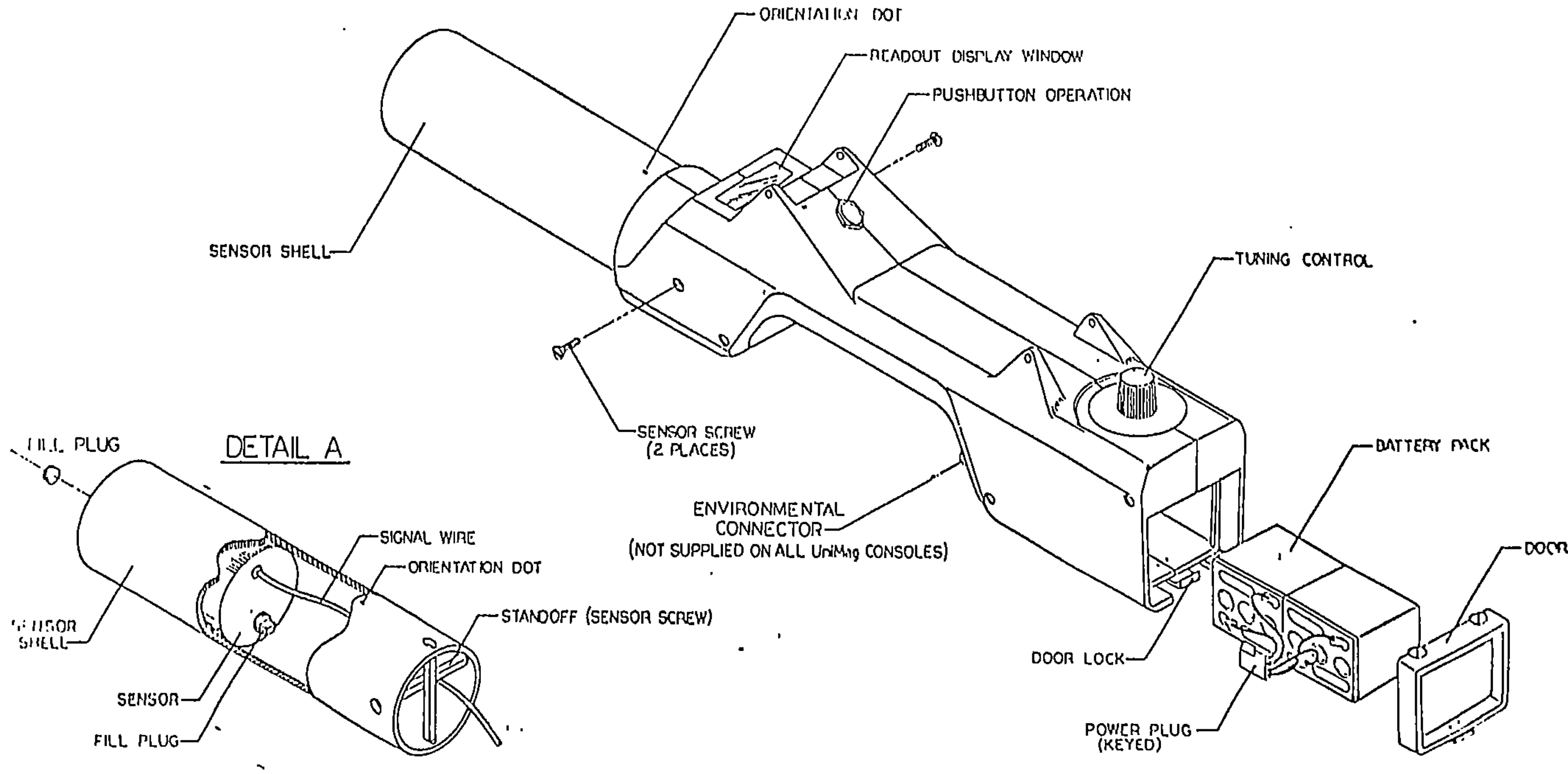
   b) Fill the sensor with STRAINED* kerosene or unleaded gasoline completely. Then REMOVE approximately 2 tablespoons of fluid.

      *Note: The fluid MUST be strained several times through paper filters, i.e., paper towels, coffee filters, etc. NEVER use kerosene or gasoline directly from a pump or storage can as it may be contaminated with metal particles.

   c) Lightly wrap the Fill Plug with Teflon tape and replace in the sensor. Do NOT use excessive pressure to tighten the Fill Plug - a "snug" fit is sufficient.

2. Battery pack is fully charged:

   To check the battery voltage, simply press the black pushbutton and observe the readout - if it "flashes" on/off during the display period, the battery pack is NOT fully charged. Refer to Chapter 3.0 for instructions of recharging the battery PRIOR to survey operation.



SENSOR ASSEMBLY

UNLESS OTHERWISE NOTED

NEXT ASSEMBLY | USED ON

APPLICATION

MATERIAL:

FINISH

DO NOT SCALE THIS DRAWING

SIGNATURE | DATE

DFT R. Brown

CHECK

APP'D

APP'D

geoMetrics

CONTROLS & INDICATORS

UniMag, MODEL G-836

FIGURE 2-1

SIZE C | G-836

ONLY THREE SIMPLE STEPS ARE NECESSARY TO CORRECTLY TUNE AND OPERATE UniMag:

1. Lift the UniMag console out of the padded attaché case, and adjust the shoulder strap for a comfortable fit. Typically, the magnetometer is used on the operator's right or left side, with the shoulder strap suspended across the operator's chest from the OPPOSITE shoulder.

2. Adjust the TUNING-KILOGAMMAS knob to a position that correlates with the earth's known magnetic field. The earth's field, in any general location, can be estimated by using the world intensity map on Page II at the beginning of this manual.

3. Press the black pushbutton, and release; wait 2 seconds. and observe the 2 second illuminated display of the earth's total field directly in gammas.

   NOTE: A true and repeatably correct reading can be made with the TUNING-KILOGAMMAS knob set in 3 or 4 tuning positions on either side of the "estimated" local magnetic field i. e., the tuning is quite broad and non-critical in most cases. Unless high field changes on the order of 4 or 5 thousand gammas occur during operation, it will not be necessary to retune the console.

2.3 SENSOR ORIENTATION

* not applicable in North America

In low magnetic latitudes (where the field dips less than 40°, or below 40, 000 gammas) such as near the magnetic equator where the field is horizontal, it may be necessary to rotate the black cylindrical sensor 90° as described below.

The small dot or line on the sensor is provided to allow proper orientation of the internal sensor axis, which must be placed perpendicular to the earth's field to produce optimum signal. The following procedure is recommended for easy rotation of the black sensor (Refer to Figure 2-1 for parts identification):

1. Remove the two slotted-head Sensor Screws completely.

2. Gently rotate the sensor 90° in either direction until the sensor holes are properly re-aligned to the corresponding holes in the UniMag console - secure with the two Sensor Screws. The orientation dot or line on the sensor should now be facing the SIDE of the UniMag console.

   NOTE: The sensor should be rotated ONLY in survey areas where the local field intensity is less than 40,000 gammas.

2.4 SURVEY OPERATION

During survey operation and after UniMag has been tuned to the local field intensity (see Section 2.2), the operator need only depress the black pushbutton and note the reading in a log or field notebook. If a reading is in question, i.e., a sudden shift of several hundred gammas, several readings should be taken with the console held as still as possible.

UniMag SHOULD EXHIBIT ONE COUNT STABILITY, WHICH CAN BE VERIFIED BY REPEATING A MEASUREMENT WITH THE CONSOLE HELD IN THE SAME LOCATION. If one count stability is not possible, * then an unwanted ferromagnetic article is present (buried pipe, etc.) or an extremely high magnetic gradient has been encountered.

2.5 DATA DISPLAY

UniMag provides an illuminated 4-digit display of the earth's magnetic field directly in gammas. Since the resolution of UniMag is 10 gammas, only the four most significant digits are displayed in the readout window. For example, given an earth's field intensity of 51,240 gammas, UniMag will display "5-1-2-4" with the least significant digit ("0") being omitted. It should be remembered, however, that the readout (5-1-2-4) actually represents a ten gamma measurement of the earth's field ranging from 51,235 gammas to 51,245 gammas.

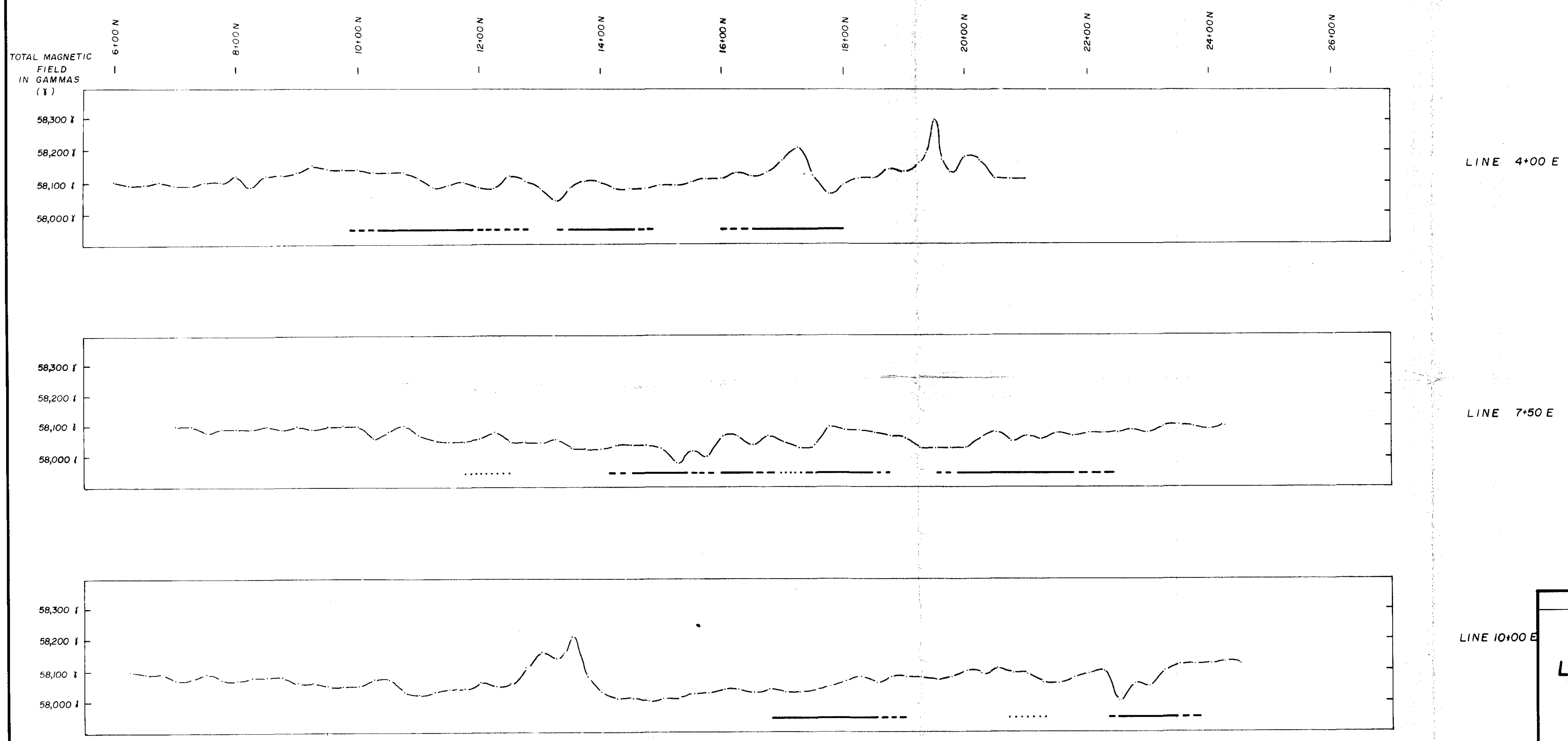
2.6 READOUT TEST

Occasionally, it is advisable to check the numeric readout display to guard against an erroneous reading due to a non-illuminating segment of the display. Simply depress and HOLD DOWN the black pushbutton until four number 8's appear (8888) - check each number. If any segments are missing, notify GeoMetrics and return the magnetometer immediately.

2.7 INSTRUMENT STORAGE

When not in use, all of the components except the battery packs should be stored in the attaché case to prevent damage, loss, or possible contact with magnetic particles that could be embedded in the sensor. If extended storage (1 week or longer) is anticipated, the battery pack MUST be stored in a refrifgerator (see Chapter 3.0) to prevent permanent damage to the internal charge plates of the battery. After any storage time, always re-charge the battery pack.

NOTE: Gelled electrolyte batteries provide an excellent power/weight ratio, but do require special handling considerations. TO PREVENT DAMAGE FROM EXCESSIVE BATTERY DISCHARGE, READ CHAPTER 3.0 COMPLETELY BEFORE USING THE UniMag MAGNETOMETER ON A SURVEY.



SURFACE PROJECTION OF I.P. ANOMALIES

DEFINITE

PROBABLE

POSSIBLE

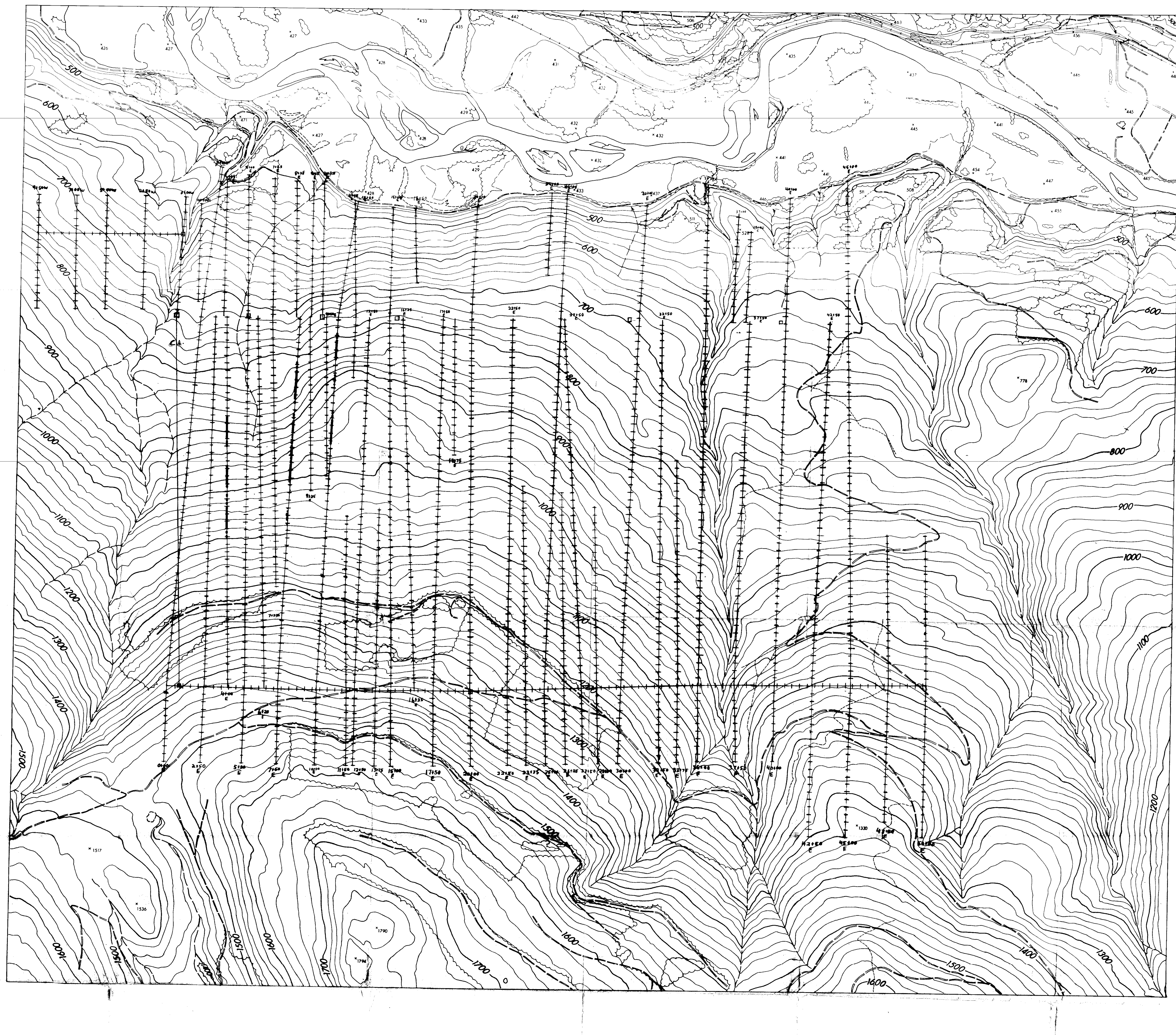
MAGNETIC PROFILES

LINES 4+00E, 7+50E, 10+00E

CROWN CLAIMS

KAMLOOPS MINING DIVISION, B.C.

TECH WORK BY: G. BELIK AND ASSOC. LTD.	SCALE: 1:5,000
DRAWN BY: W.G.	DATE: AUG., 1982
APPROVED BY: G. BELIK, M.Sc.	FIG. NO. 1015-6



LEGEND

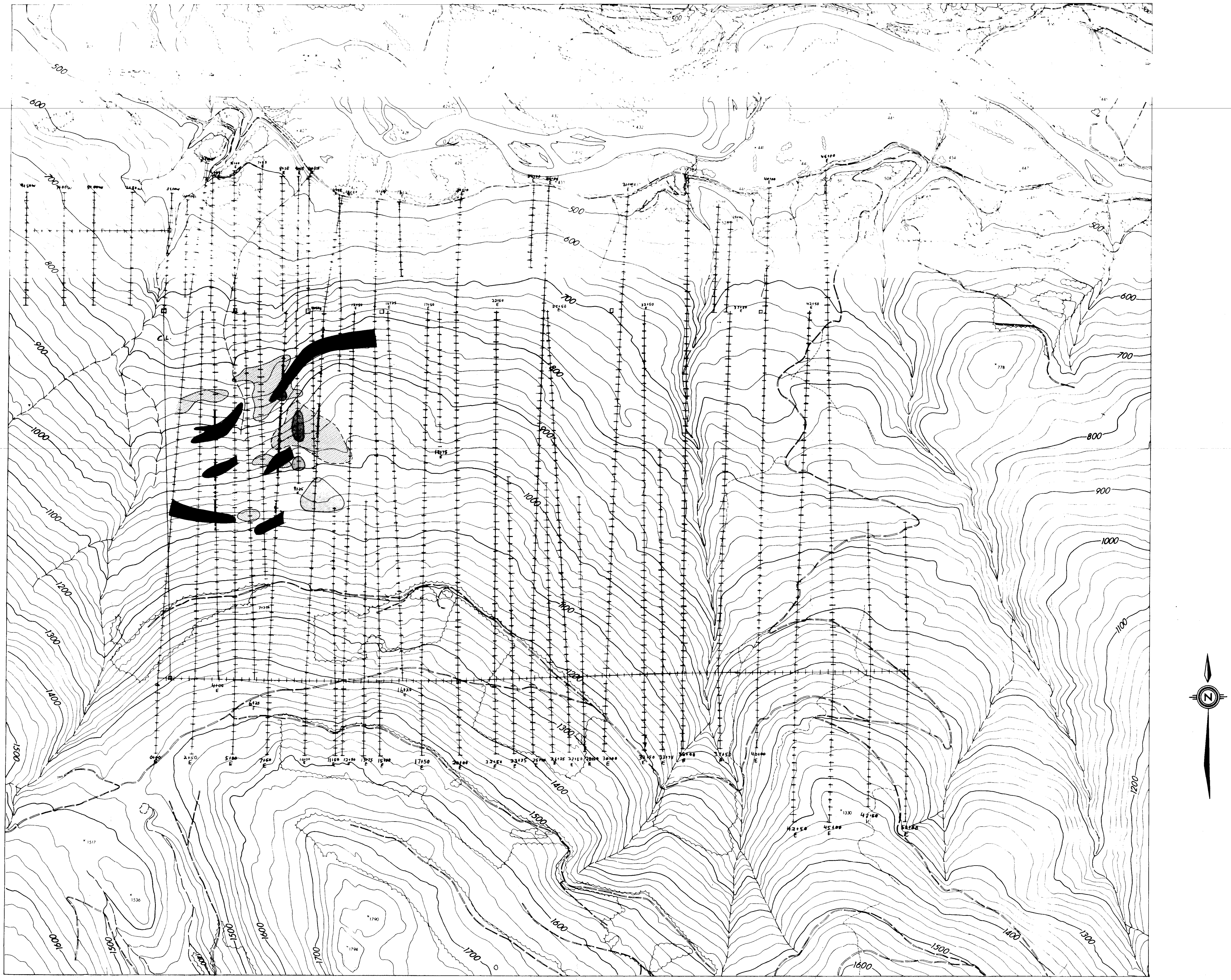
SURFACE PROJECTION OF I.P. ANOMALIES

DEFINITE
PROBABLE
POSSIBLE

MI[illegible] RE[illegible]URCES BRANCH
A[illegible] REPORT
10,627

UNION	CROWN CREEK AREA
AUTHOR	SURFACE PROJECTION OF ANOMALOUS I.P. ZONES CROWN #1 CLAIM
DATE APRIL 1979	
SCALE 1:10,000	
CONTOUR INTERVAL 20M with 10M	
DRAWN BY MN	
APPROVED	

UNION OIL COMPANY OF CANADA LIMITED CALGARY ALBERTA	FILE NO. N.T.S. NO.	FIG. NO. 1015-7



- LEGEND -

- VLF-EM ANOMALY
- OUTLINE OF COPPER SOIL ANOMALY
- " " ZINC " "

SURFACE PROJECTION OF I.P. ANOMALY

- DEFINITE
- PROBABLE
- POSSIBLE

10,627

union	CROWN CREEK AREA
AUTHOR DATE APRIL 1979 SCALE 1 10,000 CONTOUR INTERVAL 20M with 10M DRAWN BY MN APPROVED	COMPILATION PLAN OF GEOCHEMICAL & GEOPHYSICAL TARGET AREAS CROWN #1 CLAIM
UNION OIL COMPANY OF CANADA LIMITED CALGARY ALBERTA	FILE NO. NTS NO. — FIG. NO. 1015-8