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GEOLOGICAL AND GEOPHYSICAL REPORT
on the property of
GLEN AUDEN RESOURCES LIMITED
Keith Township

by
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SUMMARY

The Glen Auden Resources property consists of two separate claim groups which lie along strike to the east and west of the Tarzan/Noranda J.V. Joburke Mine Project, all of which are situated in Keith Township (Figure 2). The western group is comprised of 71 claims staked by Glen Auden and 22 claims subject to an option agreement (the Meunier Claim Group). The eastern group consists of 63 claims (Groundhog claims) staked by Glen Auden which border the Groundhog River. The property is situated in the North Swayze metavolcanic-metasedimentary greenstone belt and is located 85 km southwest of Timmins, Ontario (Figure 1).

Detailed geological mapping was carried out on the eastern Groundhog claims from June 17 to June 30 and October 12 to October 17 of 1989. Major rock types found on the property were mapped as mafic and intermediate metavolcanic rocks, felsic metavolcanic rocks with lesser outcroppings of mafic and ultramafic intrusives and sedimentary iron formation.

Fifty rock samples were collected and analyzed for gold and various trace and rare earth elements. Selected samples also underwent whole rock analysis. There were no anomalous gold values to report. Four samples had anomalous copper values between 1160 and 7920 ppm and four samples had anomalous nickel values between 1080 and 1430 ppm. These copper and nickel anomalies came from mafic to ultramafic rocks which straddle the CN railway tracks. A further discussion of assay results can be found on page 13.

Induced polarization and magnetometer surveys were completed on the Groundhog claims from August 8 to September 7, 1989 and from October 14 to October 16 of 1989. The results of these surveys will be discussed later in this report.

Further exploration is recommended in two phases. Phase I begins with examining existing core, stored at the core library in Timmins, from diamond drill programs conducted on the property by previous workers (see section on Previous Work). Detailed relogging and sampling of this core is not possible because only representative samples of core from each hole is stored at the regional core library. Trenching and stripping complete Phase I for a budget of $37,000. Phase II consists of diamond drilling of target areas as outlined in the report and is budgeted at $130,900. The total proposed budget for the Groundhog claims is $167,900.00.

Reconnaissance sampling and induced polarization and magnetometer surveys were also completed on the Meunier claim group in 1989. The sampling program was carried out from June 14 to June 16 of 1989. The purpose of the sampling program was to investigate specific geophysical expressions and to resample weakly anomalous areas of gold tenure found by Garner, 1987 (see Report on the Geology of the Meunier claim group, Don Garner, 1987). Eleven rock samples were collected and analyzed for Au, copper and zinc. One anomalous Au value of 30 ppb came from a banded Fe formation. Weak copper anomalies between 150 and 200 ppm also occurred in the iron formation rocks. Further exploration for the Meunier Claim group is recommended in two phases. Phase I consists of trenching and stripping and a proposed budget of $36,400.00 is recommended. A diamond drilling program will complete Phase II at a cost of $71,500. A total budget of $107,900 is proposed for the Meunier 22 claims and brings the total cost of further exploration on Glen Auden's property to $275,800.

INTRODUCTION

Robert S. Middleton Exploration Services Inc. was contracted by Glen Auden Resources Limited to carry out geological mapping programs on Glen Auden's property in Keith Township, Porcupine Mining Division, approximately eighty-five kilometers southwest of Timmins, Ontario (Figure 1). The geological mapping was carried out from June 14 to June 30 and October 12 to October 17 of 1989, and was completed by traversing cut lines of a controlled grid on both the Meunier and Groundhog claims.

Rock samples were collected and sent to X-Ray Assay Laboratories, Toronto for geochemical analysis. All the samples were analyzed for gold, with selected samples being assayed for copper, nickel, zinc and whole rock analysis. Table 1 gives the method and detection limit for each element.

The purpose of this program was to determine the geology of the property in detail and to study its potential for gold mineralization.

For a list of claim numbers and their respective expiry dates please refer to Table 2.

LOCATION, ACCESS, FACILITIES

The Glen Auden property is situated in Keith Township and is located approximately 85 km southwest of Timmins, Ontario (Figure 1).

The western group Keith 71 and Meunier 22 claims are accessed via the Foleyet Lumber Road which extends southwards from Highway 101. The base line of the Meunier grid was extended 300m to intercept the road at a point 12 km south of the highway. Access to the Groundhog claims is via road 616 south from Highway 101 to the west shore of the Groundhog River.

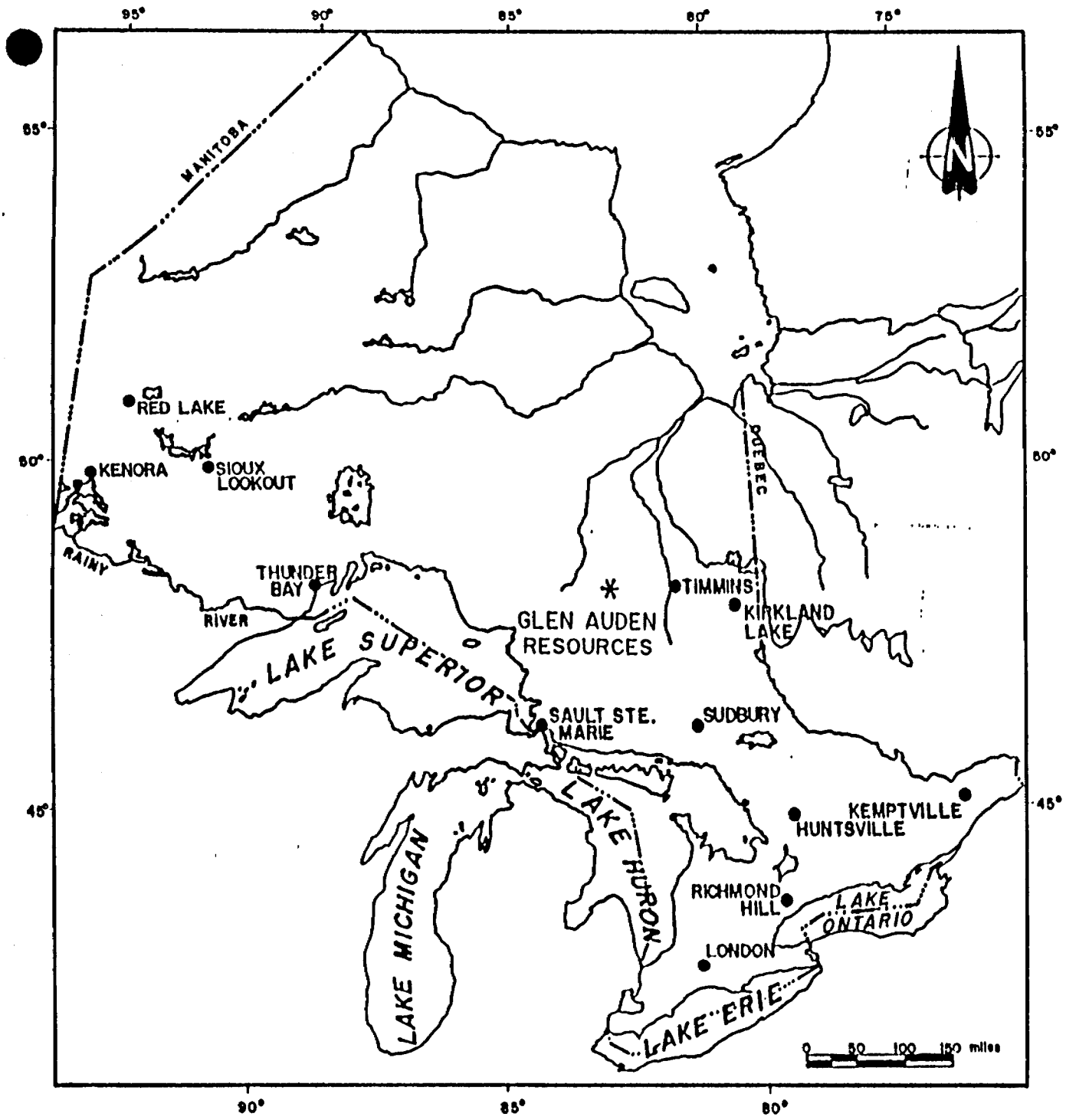
TABLE 2

Groundhog Claims

Claim Numbers	*No.*	*Township*	*Due Date*
1035686-1035715 incl.	*30*	*Keith*	*May 16, 1990*
1035717-1035738 incl.	*22*	*Keith*	*May 16, 1990*
1035740	*1*	*Keith*	*May 16, 1990*
1035785-1035786 incl.	*2*	*Keith*	*May 16, 1990*
1071623-1071626 incl.	*4*	*Keith*	*May 16, 1990*
1087290-1087292 incl.	*3*	*Keith*	*September 27, 1990*
1087293	*1*	*Keith*	*July 31, 1990*

Meunier 22 Claims

Claim Numbers	*No.*	*Township*	*Due Date*
946195-946215	*21*	*Keith*	*September 2, 1990*
946234	*1*	*Keith*	*September 2, 1990*



PROVINCE OF ONTARIO

REVISIONS	ROBERT S. MIDDLETON EXPLORATION SERVICES INC.		
	for GLEN AUDEN RESOURCES LTD.		
	title PROPERTY LOCATION MAP Fig. 1		
	Date:	Scale: 1"=160mi.	N.T.S.:
	Drawn:	Approved:	File: M-310

TABLE 1

	METHOD	DETECTION LIMIT
AU PPB	FADCP	1.
LI PPM	ICP	10.
BE PPM	DCP	5.
B PPM	DCP	10.
WRMAJ %	WR	0.01
S PPM	XRF	100.
SC PPM	NA	0.5
V PPM	DCP	10.
CR PPM	NA	2.
MN PPM	ICP	2.
CO PPM	ICP	1.
NI PPM	ICP	1.
CU PPM	XRF	1.
CU PPM	ICP	0.5
ZN PPM	XRF	2.
ZN PPM	ICP	0.5
GE PPM	DCP	10.
AS PPM	XRF	3.
AS PPM	NA	1.
SE PPM	NA	3.
WRMIN PPM	WR	10.
MO PPM	ICP	1.

	METHOD	DETECTION LIMIT
AG PPM	AA	0.5
CD PPM	ICP	1.
IN PPM	AA	1.
SN PPM	XRF	10.
SB PPM	NA	0.2
CS PPM	NA	1.
LA PPM	NA	0.5
CE PPM	NA	3.
ND PPM	NA	5.
SM PPM	NA	0.1
EU PPM	NA	0.2
TB PPM	NA	0.5
YB PPM	NA	0.2
LU PPM	NA	0.1
HF PPM	NA	1.
TA PPM	NA	1.
W PPM	NA	3.
PB PPM	ICP	2.
BI PPM	ICP	3.
TH PPM	NA	1.
U PPM	NA	0.5

Facilities used during the mapping program were hunting/fishing lodges located on Highway 101 and on the eastern shore of the Groundhog River.

TOPOGRAPHY AND VEGETATION

There is generally little topographic relief on the Glen Auden property. Several south west trending eskers occur in the northeastern section of the Keith 71 claim group and rise approximately ten to twenty meters above the surrounding terrain. Deposits of sandy boulder till flank the low ridges and form some of the more prominent features on the property.

Vegetation on the property is mainly mixed forest of poplar, birch, balsam and spruce. Low lying areas of cedar and alder swamp occur in all claim groups. The western part of the Keith 71 claim group has been recently clear cut and replanted with pine trees.

PREVIOUS WORK

The following description of previous work has been compiled from reports by Don Garner (1987) and Margaretha Zeeman (1988) on the geology of the Glen Auden property (see references).

The earliest reported work in the area was by W.A. Parks from the Ontario Bureau of Mines in 1899. He mapped the area around Horwood and Ivanhoe Lakes. This area was later remapped by the forerunner agencies of the O.G.S. by W.G. Miller (1902), T.L. Tanton (1916), W.W. Todd (1924) and K.V. Prest in 1947 whose map is the most detailed.

Consolidated Mining and Smelting Company

In 1946, Consolidated Mining and Smelting Company performed geological mapping on four patented claims (52450, 52451, 52452, 52453) adjacent to and west

of the Groundhog claims. The area was mapped as andesite and rhyolite with an east-west trending iron formation 200' wide at the bend of the Groundhog River.

Joburke Mine

In 1946, Joseph Burke and Maynard Bromley staked a gold showing approximately 5 km east of the Meunier claims for Rush Lake Gold Mines. Since the 1970's the Joburke Mines has produced 390,000 tons at 0.107 oz/ton Au and has reserves of 500,000 tons at 0.13 oz/ton Au.

The Hoyle Mining Company

Also in 1946, The Hoyle Mining Company drilled six holes on the present Groundhog claims 1035717, 1071623, 1035724 (see Groundhog Geology Map: South Sheet). Diamond drill hole KG#4 yielded samples which assayed up to 0.005 oz/ton Au. Hole KG#6 intersected a 26 foot wide quartz-carbonate vein hosted by andesite which assayed 0.01 oz/ton Au. Core sections are stored at the Timmins Core Library.

Wejack Gold Mines Ltd.

In 1947, eight holes were drilled by Wejack Gold Mines Ltd. in a north-south fence pattern in the southeastern part of the Meunier 22 claim group and extend beyond the southern boundary of the claims. 4,000 feet of stratigraphic information was obtained and later summarized by Prest in his 1948 geological compilation of the Keith Township area.

Purdy Mica Mines Ltd.

Purdy Mica Mines drilled ten holes on the present Groundhog claims in 1947. Nine holes were drilled on claims 1087293, 1035694 and 1035695, with the tenth hole being drilled south of the CN tracks on claim 1035701. PM#1, located on the Groundhog Drill Hole Location Map, is the only hole for which assays are reported and included a five foot sample on weakly sheared basic lava assaying 0.005 oz/ton

Au. Between 1947 and 1955, Purdy Mica Mines drilled an additional fifteen holes south of the CN rail tracks on present claims 1087290, 1087291 and 1087292. These holes intersected locally carbonatized andesite with pyrite, pyrrhotite and chalcopyrite mineralization. No gold assays were reported. Drill core logs are available at the Regional Core Library in Timmins.

Algoma Ore Properties

In 1960, Algoma Ore Properties completed a magnetometer survey on the west side of Groundhog River and north of the CN tracks. The company also drilled two holes, one on the west side of the river and on the east side of the river which would place it on present claim 1071623. The eastern drill hole intersected banded iron formation throughout its depth. The core from this hole is stored on patented claim 52450, 200 feet from the river.

Keevil Mining Group

In 1965, the Keevil Mining Group acquired a group of claims in Keith Township which included the northern part of the Meunier property. Ground magnetometer and electromagnetic surveys outlined a strong conductor 2,400 feet long trending N75E in the north-eastern part of the Keevil property. Mapping and trenching revealed graphitic, brecciated sediments with zones of sulphides. No economic mineralization was reported.

Kukatush Mining Corporation Ltd.

Kukatush Mining Corporation Ltd. drilled four holes in 1966, two of which occur on the present Glen Auden Resources Limited Groundhog property. Drill hole KM#7 located on claim 1035740 intersected andesite at the top and rhyolite at the bottom of the hole. No significant mineralization was encountered. Diamond drill hole KM#9 located on claim number 1087293 intersected chloritic diorite at the top of the hole and then volcanic tuff at the lower end. A 22 foot section of tuff,

contained blue quartz and fine pyrite but no assays were reported. The drill core described can be found in the Core Library in Timmins.

Hollinger Mines Ltd.

In 1971, Hollinger Mines Ltd. drilled three holes for a total of 271 meters in the northern half of the Meunier 22 claim group. The company was apparently drill testing EM conductors outlined by the Keevil Group. All three holes encountered graphite but no assay information was available from the government files.

Dome Exploration

In 1980, Dome Exploration conducted a ground magnetometer survey over their property which included the northern part of Glen Auden's Groundhog property. A very strong mag high trending east-northeast was outlined and interpreted to be magnetic iron formation. This conclusion coincides with outcrops of iron formation mapped on Groundhog claims 1035785 and 1035733 (L19W 0+50N).

Glen Auden Resources Limited

Dighem Surveys and Processing was contracted in 1988 to conduct airborne magnetic and VLF-EM surveys over the Keith 71 claim group. Several east-west and south-east trending magnetic high anomalies were interpreted to represent either iron formation or high magnetic mafic volcanic flow sequences.

Also in 1988, Robert S. Middleton Exploration Services Inc. was contracted to conduct a reconnaissance mapping program over Glen Auden's entire property. The basic geology of the area was identified and general areas of alteration and sulphide mineralization were delineated.

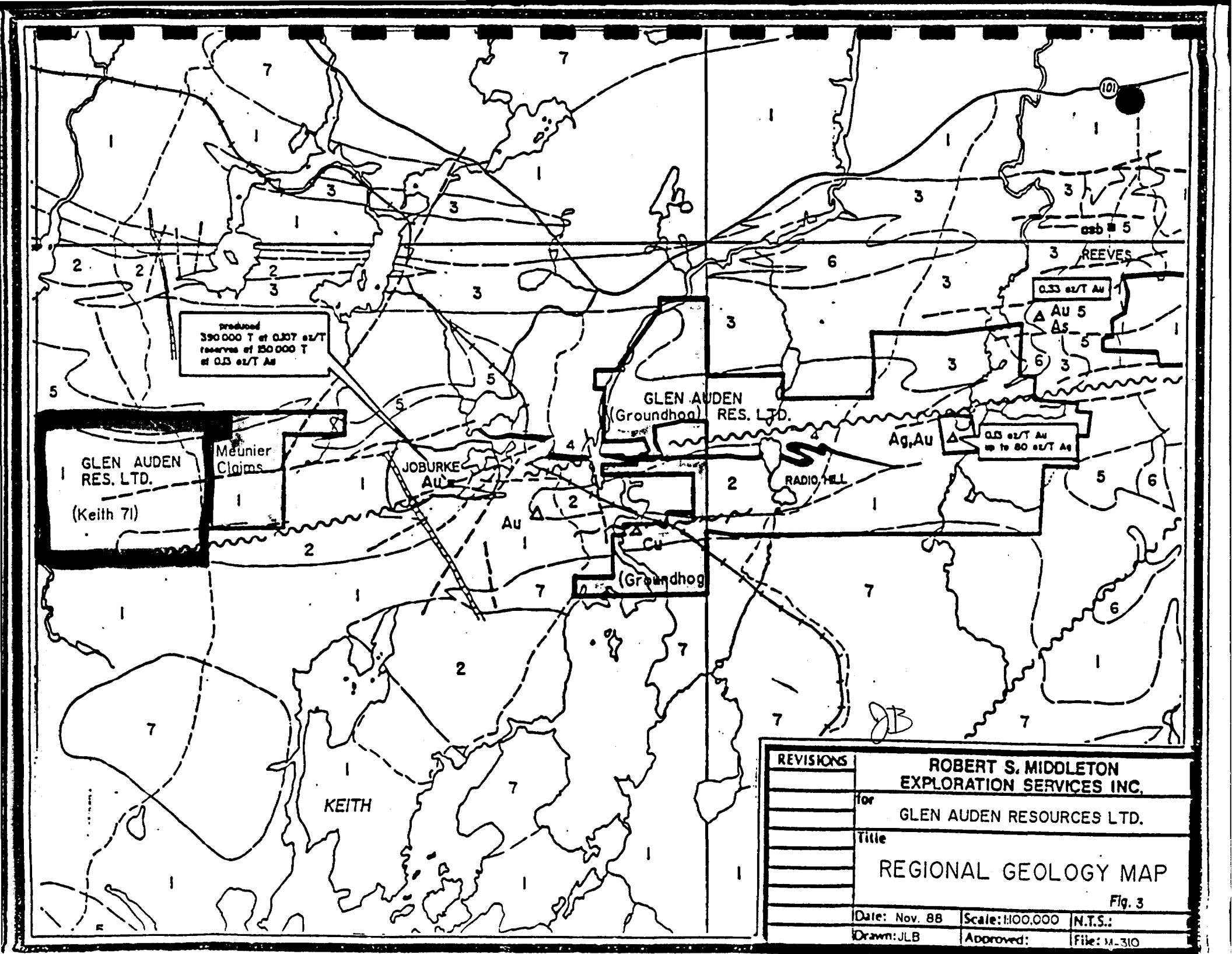
Further exploration was recommended in the form of ground magnetic and induced polarization surveys and detailed geological mapping and sampling.

Sangold Project

At the present time the Sangold Project operates a few kilometers west of Glen Auden's Groundhog claims. Extensive stripping and sampling have been carried out and diamond drilling is in progress. Significant gold assays have been obtained from quartz-carbonate veins containing pyrite and chalcopyrite mineralization.

REGIONAL GEOLOGY

The Keith Township area was mapped by V.K. Prest and reported by the Ontario Department of Mines in 1950 (ODM Vol.LIX, Pt. VII). The area is situated on an east-west trending metavolcanic-metasedimentary belt known as the Archean Swayze greenstone belt. The belt is predominantly comprised of Keewatin mafic and intermediate to felsic metavolcanic sequences, and thin associated epiclastic sedimentary rocks, intrusive rocks and iron formation (Prest, 1950)(Figure 3). The local stratigraphy trends east-west with a steep north dip. Oxide and sulphide facies iron formations strike across the region paralleling the trend of the mafic and felsic volcanic sequences (Figure 3). Intruding the mixed complex of volcanic and sedimentary rocks are sill like bodies of dioritic composition. The sill and dyke character of these diorites is readily apparent when associated with magnetically quiet metasediments. Ultramafic intrusive rocks, believed to be younger than the diorites appearing as serpentine, may represent altered diorites and/or peridotites (Prest, 1950). These rocks contain abundant carbonate alteration due to the carbonate being released during metamorphosis of the serpentine (Prest, 1950). Granite plutons occur to the north and south of the greenstone belt. Proterozoic diabase intrudes all of the rocks of the region and generally trend north-northwest.



REVISIONS	ROBERT S. MIDDLETON EXPLORATION SERVICES INC.		
	for GLEN AUDEN RESOURCES LTD.		
	Title REGIONAL GEOLOGY MAP		
			Fig. 3
	Date: Nov. 88	Scale: 1:100,000	N.T.S.:
	Drawn: JLB	Approved:	File: M-310

A series of east-west orientated faults was mapped by Prest (1950) along the margin of a felsic sequence and which extends into the Penhorwood Township. Milne (1972) who mapped the Penhorwood Township area has discussed the possibility that these structures represent the western extension of the Destor-Porcupine Fault.

Pyke (1987) has proposed that the supracrustal sequences of the Swayze greenstone belt are similar, texturally and compositionally, to the volcanic sequences of the Timmins Mining Camp. Based on these interpretations of the geology of the Archean Swayze greenstone belt, it is suggested that the Glen Auden property and the adjoining Joburke Mine lie along the western extension of the Destor-Porcupine Fault or a major splay of it (Garner, 1987).

The following geological time table illustrates the age relations (Prest, 1950);

TABLE OF FORMATIONS

CENOZOIC	
	Glacio-fluvial sands and gravels
PLEISTOCENE:	*Till.*
PRECAMBRIAN	
MATACHEWAN:	*Diabase.*
	Quartz veins, carbonate veins
ALGOMAN:	*Lamprophyre.*
	Granite, granite gneiss; granodiorite, hornblende-quartz diorite, syenite; porphyries.
	Feldspar porphyry.
	Granite porphyry, associate feldspar porphyry.
ALGOMAN(?):	*Quartz-feldspar porphyry.*
	Felsite and felsite breccia
	Quartz porphyry and quartz porphyry breccia.
	Serpentinite.
HAILEYBURIAN(?):	*Granodiorite, quartz diorite, gabbro.*
KEEWATIN(?):	*Feldspar porphyry, granite porphyry.*
	Banded iron formation.
	Conglomerate, arkose, greywacke, argillite; phyllite, slate.
KEEWATIN:	*Acidic volcanics and associated intrusives; minor dioritic tuffs and dykes; derived schists.*
	Intermediate to basic volcanics and associated intrusives; minor acidic volcanics and sediments; derived schists.

PROPERTY GEOLOGY

MEUNIER 22 CLAIMS

The geology of the twenty-two Meunier claims was mapped by Garner (1988). The claim group is underlain by a thick sequence of tholeiite mafic metavolcanic rocks with metasedimentary rocks occurring in the south east corner of the property. Oxide iron formation was located in the north-eastern part of the property but the continuity of the unit could not be traced. Rocks encountered during the 1989 sampling program included mafic metavolcanic rocks and the oxide iron formation.

Mafic Metavolcanic Rocks

These volcanic rocks underlie the majority of the Keith 71 claims and Meunier 22 claims property and include massive, pillowed and foliated varieties. Outcrops are dark green to grey-green, fine grained and massive to weakly foliated in texture. Mineral assemblages are comprised of plagioclase and actinolite with minor chlorite. Strong iron carbonatization was seen in several outcrops.

Iron Formation

This rock consists of alternating narrow bands of magnetite rich and quartz rich material. The bands vary in width from two centimeters to less than half of a centimeter. Thin orange, rusty bands occasionally occur at the margin between the magnetite and chert bands. The iron formation is weakly deformed with small local isoclinal folding.

GROUNDHOG CLAIMS

Key geological features on the Groundhog claim group which were determined from geological mapping or interpreted from geophysical data are indicated, along with rock sample locations, on Map 4 (Geology Map: Groundhog Grid).

In general, the geology of the property is comprised of an east-west trending sequence of Keewatin mafic and intermediate to felsic metavolcanic rocks, iron formation and intrusions of granite, diorite and serpentine, quartz-feldspar porphyry and diabase.

ROCK TYPES

Mafic Metavolcanic Rocks

These rocks are dark green to green black, fine to medium grained and include massive, pillowed and foliated varieties. The rocks were mapped as andesite and basalt in composition. Chlorite content was low in the massive rocks but significantly higher in the foliated types. Strong iron carbonate alteration was found in several outcrops of the volcanic rock, usually near the contacts with ultramafic intrusions. The metamorphic grade throughout this volcanic sequence is upper greenschist to locally, amphibolite facies. Mineral assemblages which characterize these rocks are plagioclase, actinolite, and chlorite.

Intermediate Metavolcanic Rocks

These volcanic rocks comprise a minute part of the map area. They are pale green to green, fine grained and massive in texture. Compositionally they range from andesite to dacite. These rocks are relatively unaltered but do exhibit weak chlorite and silica alteration.

Felsic Metavolcanic Rocks

The rocks that comprise this group form a wide east-west trending sequence across the property. They are light pinkish to pale white and are made up of lavas, tuffs and brecciated forms of the latter. Most are rhyolitic in composition but some of these volcanic rocks have been altered to a sericite schist.

Sedimentary Rocks

Banded iron formation is the only sedimentary unit observed on the Groundhog claim group. This iron formation is very similar to the unit seen on the Meunier 22 claims and is possibly an extension of the same iron formation. Narrow bands of magnetite rich and quartz rich material characterize this rock.

Ultramafic Rocks

From field mapping these rocks have been identified as serpentinites and talc chlorite schists. Originally these rocks appear to have been in the range of pyroxene diorite, peridotite-picrite, olivine gabbro and diabasic diorite (Prest, 1950). Characteristically they are strongly foliated, fine grained and have a soft, soapy texture. Color ranges from pale green to green-grey. Major mineral components are pyroxene, olivine, tremolite and talc.

Early Mafic and Intermediate Intrusive Rocks

These rocks consist of medium grained diorite sills and dykes. They resemble coarse grained mafic volcanic rocks and have been misinterpreted as such (Prest, 1950). Mineralogically, major components are plagioclase, hornblende with accessory quartz and biotite. Surface weathers to a light brown color and fresh surface is equally brown.

Early Felsic Intrusive Rocks

These are narrow, elongate granitic bodies that have been mapped as quartz-feldspar porphyry. The rock is composed of coarse grained feldspar and quartz grains in a fine grained ground mass of feldspar, quartz and muscovite. This unit has been traced across the southern part of the claim group, both north and south of the CN rail tracks.

Late Mafic Intrusive Rocks

Diabase dikes intrude all of the above mentioned rock types. These dykes vary from quartz diabase and porphyritic diabase and trend north-northwest. Characteristically the rock is dark grey, medium grained, and has a light red brown weathered surface.

PLEISTOCENE GEOLOGY

Approximately eighty-five percent of the Glen Auden property is covered by a blanket of glacial overburden and lacustrine sediments of variable thickness. Deposits of sandy boulder till occur as low ridges, the clast composition of which is both granitic and volcanic in composition. This boulder till can be observed in the western part of the Meunier 22 claim group where an area has been bulldozed for jack pine re-forestation. Topographic glacial features in Keith Township such as eskers as well as glacial striae suggest an ice movement of approximately north to south (Prest, 1950).

STRUCTURAL GEOLOGY

Measurements of the strike and dip of outcrops on the Groundhog claims shows a predominantly east-west trend in foliation. The mafic volcanic and iron formation rocks to the north were massive with some outcrops showing weak foliation. The degree of foliation increases southward where very strong foliation is noted in the mafic to ultramafic rocks situated in claims 1087290, 1087291, 1087292, 1035695. Strong slatey cleavage was observed in sericite schists interpreted to represent felsic volcanic rocks. This sericitized zone of felsic volcanic rock is located north of the mafic to ultramafic rocks on claim 1087293. Several sets of quartz veins infill, tension fractures were mapped in the mafic

volcanic rocks in the southern part of the grid. Quartz vein occurrences at L0W-1600S, L5W-1850S and L8W-1925S have similar strikes and dips of Az 030°-040°/40-45N and all fall along a coincident strike plane. These quartz veins may represent intermittent outcrops of a continuous vein system crosscutting the host mafic volcanic rocks.

Prest (1950) mapped a series of north-south and east-west trending faults which would be located on the present Groundhog claims 1087290, 1087291 and 1071623. These faults were not observed during the 1989 mapping program.

ALTERATION AND MINERALIZATION

The 1989 mapping program of the Groundhog claims confirmed reports by Zeeman (1988) that significant hydrothermal alteration and high strain deformation is confined to the mafic volcanic and ultramafic rocks located in the south-central part of the property which straddles the CN rail tracks. These rocks have been altered to talc-chlorite schists. Moderate to strong iron carbonatization and minor amounts of green chromium mica (fuchsite) occur in these talcose mafic to ultramafic rocks. Pyrite, pyrrhotite and chalcopyrite are the major sulphides present in the mafic to ultramafic rocks. Occurrences vary as 2-3% fine grained disseminated sulfides, thin stringers and localized 10-20% massive pyrite, with minor chalcopyrite and pyrrhotite in gossanized rock. Within this altered mafic to ultramafic zone occurs minor outcrops of diabase, magnetic diorite and a quartz-feldspar porphyry dyke that has been traced east-west for over 1500 meters.

The quartz-feldspar porphyry dyke intrudes the altered mafic and ultramafic rocks and parallels the east-west strike of the volcanic host rocks. The dyke is weakly to moderately carbonatized and contains up to 2% disseminated pyrite. Iron

sulfides also occur as massive clots and elongate pods up to 1 cm long at the margin of the dyke.

Alteration and mineralization of rocks on the Meunier 22 claim group consists of carbonatization of tholeiitic basalts. Pyrite and pyrrhotite occur as 2-3% disseminated sulfides in the mafic volcanic rocks and up to 5% as massive stringers and clots in the iron formation located in the north of the property.

DISCUSSION OF ASSAY RESULTS

During the mapping of the Groundhog claims, fifty samples were collected for assay for gold with selected samples assayed for copper, zinc, nickel and whole rock analysis. All samples are located on "Geology Map: Groundhog Grid."

Four samples (0435, 0440, 0451, 5846) had anomalous nickel values of 1100, 1280, 1080 and 1430 ppm respectively. All four of the anomalous samples were taken from hydrothermally altered mafic volcanic and ultramafic rock which contained 2-3% disseminated and massive pyrite and pyrrhotite. These samples occurred on claim numbers 1087290, 1087291, 1087292 and 1035695.

Four samples (0444, 0445, 0458, 0468) had anomalous copper values of 1390, 7920, 1160 and 4140 ppm respectively. The host rock for these anomalies is the mafic volcanic and ultramafic rocks as was the case for the nickel anomalies. The rocks are altered to carbonatized talc chlorite and chlorite schists, which contain trace to >5% disseminated and massive pyrite, chalcopyrite and pyrrhotite. These samples were located on claims 1087290 and 1087291.

The eleven samples taken from the Meunier 22 claim group were assayed for gold, copper and zinc. The assay values were low and only two samples were designated as having anomalous gold and copper values. Sample 5838 was taken from a strongly gossaned and hematite stained banded iron formation and recorded

gold and copper assays of 30 ppb and 150 ppm. Sample 5841 was also taken from an outcrop of oxide iron formation rock with blue-black quartz veins which contained trace disseminated pyrite. This sample assayed 200 ppm copper and weak zinc of 450 ppm.

These two samples were taken from banded oxide iron formation located in the south-east part of the property on claim 946201. An area between L13+50E 2+80S and L14+20E 2+60S of the Meunier Grid has been targeted for a trenching and stripping program to enable detailed sampling of the bedrock.

GEOPHYSICAL SURVEYS AND INTERPRETATION

Introduction

From August 8, 1989 to September 7, 1989, and from October 14 to October 16, 1989, a program of geophysical surveying was conducted on the Keith Township Property for Glen Auden Resources Limited of 301-121 Richmond Street West, Toronto, Ontario.

The geophysical survey consisted of total field magnetics and time-domain induced polarization.

The survey was conducted as a follow-up to an airborne electromagnetic survey done by DIGHEM (McConnell, 1988), and a geological report (Zeeman, 1988) which delineated structures and anomalies which might be indicative or associated with possible economic mineral deposits.

Induced Polarization

Theory

The induced polarization (IP) and resistivity exploration methods are electrical methods based on measuring the response of the earth to an applied direct current.

The principle is to apply a known electric current to the earth, and measure the electric potential created by it at the survey location. The resistivity, a bulk property of the rock itself, is calculated from the difference between the applied current and the measured potential, corrected for the geometry of the current and potential electrode configuration.

The induced polarization measurement is based on the "over-voltage" effect. Most of the electric current carried by the earth is conducted by the flow of ions in the solutions filling the pore spaces in the rock. At the surface of any metallic particle in the path of current low, the ionic flow in the solution is changed to an electronic flow in the metal. In the process of the change, an electric charge of trapped ions is built up at the surface of the metal, storing a small voltage. If the voltage increases, the apparent resistance of the rock also increases. If the applied current flow is decreased or stopped, the voltage will create a potential in the opposite direction to the original applied current, and start a current flowing in the opposite direction.

In time domain induced polarization the applied current is abruptly stopped, and the reverse potential created by the over-voltage effect is measured over time as it quickly decays. The definition of chargeability is:

$$M = \frac{V\ (t = \infty)\ -\ V\ (t = 0)}{V(t = \infty)}$$

where $V(t = 0)$ is the voltage at turnoff, and $V(t = \infty)$ is the late-time voltage. This is usually measured over a certain time period after turn-off as an integral of voltage over time, corrected for the length of the time period, and normalised to the voltage at time 0. It is usually expressed in millivolts per volt (mV/V).

The over-voltage charge taken time to build-up or decay, so that if the applied current is caused to oscillate more and more frequently, the apparent

resistance will decrease, as the over-voltage does not have time to build at higher frequencies. This effect is used to measure the IP effect in frequency domain IP surveys, wherein the current is applied at two or more frequencies, and the "percent frequency effect" (PFE) is calculated from the change in resistivities (P) between the different frequencies.

$$PFE = \frac{P\ (low\ freq) - P\ (high\ freq)}{P\ (high\ freq)} \times 100\%$$

Although not identical, for most purposes the PFE is approximately equal to the chargeability.

Because the IP effect responds to effects on small metallic particles, it is particularly useful for detecting disseminated metallic minerals. Also because of this, it will respond strongly to the "membrane polarization" created by the electric charges resident on clay particles or layered or fibrous minerals.

Field Method

The survey was conducted using a pole-dipole array with a dipole length of 50m and array spacings of n = 1,2,3,4 dipole. This array configuration involves having a dipole for the receiver measuring Vp, the potential and a single current transmitter electrode on the grid, separated from the receiver dipole by each 'n' interval in turn. The other current electrode, 'the infinity' is situated 2 kilometers or more from the grid.

For this survey the measurements were taken in the time domain, so the transmitted current was a bipolar on-off square wave with each on or off lasting two seconds. Measurements of resistivity and chargeability were taken.

Magnetics

Theory

The magnetic method is based on measuring alteration in the shape and magnitude of the earth's naturally occurring magnetic field caused by changes in the magnetization of the rocks in the earth.

These changes in magnetization are due mainly to the presence of the magnetic minerals, of which the most common is magnetite, and to a lesser extent ilmenite, pyrrhotite, and some less common minerals.

Magnetic anomalies in the earth's field are caused by changes in two types of magnetization: induced and remanent (permanent). Induced magnetization is caused by the magnetic field being altered and enhanced by increases in the magnetic susceptibility of the rocks, which is a function of the concentration of the magnetic minerals.

Remanent magnetism is independent of the earth's magnetic field, and is the permanent magnetization of the magnetic particles (magnetite, etc.) in the rocks. This is created when these particles orient themselves parallel to the ambient field when cooling. This magnetization may not be in the same direction as the present earth's field, due to changes in the orientation of the rock or the field.

The most common method of measuring the total magnetic field in ground exploration is with a proton precession magnetometer. This device measures the effect of the magnetic field on the magnetic dipole of hydrogen protons. This dipole is caused by the "spin" of the proton, and in a magnetometer these dipoles in a sample of hydrogen-rich fluid are oriented parallel to a magnetic field applied by an electric coil surrounding the sample. After this magnetic field is removed, the dipoles begin to precess (wobble) around their orientation under the influence

of the ambient earth's magnetic field. The frequency of this precession is proportional to the earth's magnetic field intensity.

Field Method

The magnetics data was collected with an EDA PPM 350 proton procession magnetometer, which measures the absolute value of the earth's magnetic field to an accuracy of ± 1 gammas. The magnetometer was carried down the survey line by a single operator, with the sensor mounted on an aluminum pole to remove it from any surface geologic noise. Readings were normally taken at 25m intervals, and at 12.5m intervals where a high gradient or anomaly was observed by the operator.

The readings were corrected for changes in the earth's total field (diurnal drift) with an EDA PPM 400 base station magnetometer, which recorded readings every 20 seconds as the survey was being conducted. The data from both magnetometers was then dumped with a computer and base corrected values were computed.

Personnel and Equipment

The following personnel from Middleton Exploration Services Inc. conducted the geophysical surveys:

Richard Lachapelle, Geophysicist
Brad Malpage, Technician
Tom V. Cardinal, Technician
Paul Edwards, Labourer
Melvin Booth, Labourer
Rodney Booth, Labourer
Tom Bolton, Technician

The equipment used were a Scintrex IPR-11 time-domain induced polarization receiver, a Scintrex TSQ-3, 3 kw transmitter, a Huntec 7.5 kw transmitter, an EDA Instruments PPM 350 field magnetometer and an EDA Instruments PPM 400 base

station magnetometer. Specifications for these instruments are included in Appendix A.

GROUNDHOG CLAIMS

Survey Statistics

The line cutting totalled 55.0 km on which 25.95 line km of time-domain induced polarization and 35.32 line km of total field magnetics were surveyed.

The surveys required 29 days to complete, of which 3 days were lost due to inclement weather and 2.5 days were used for mobilization/demobilization.

Interpretation
North Part (Map 1)
Magnetic Survey

The magnetic survey delineated three domains of distinct magnetic signature, denoted M1, M2 and M3 respectively.

Magnetic domain M1 is characterized by a very high and disturbed magnetic signature ranging from approximately 2000 Gammas above base level to 13000 Gammas above base level. This domain is intersected by a northwesterly to westerly trending interpreted fault extending from approximately station 4+50N on line 19+00W to station 3+00N on line 9+00W. This domain is interpreted to possibly represent an oxide-facies iron formation with magnetic horizons.

Magnetic domains M2 are oblong to spheric-shaped and are characterized by a medium magnetic signature of approximately 800 to 1200 Gammas above base level. These domains are interpreted to possibly represent mafic to ultramafic intrusive rocks.

Magnetic domain M3 is characterized by a quiet magnetic signature ranging from approximately 200 Gammas below base level to 600 Gammas above base level. This domain is intersected by an extensive northeasterly to easterly trending

interpreted fault, extending from approximately station 2+75S on line 18+00W to station 3+00N on line 0+00. Domain M3 is also intersected by the previously discussed northwesterly to westerly trending interpreted fault. Domain M3 is interpreted to possibly represent mafic volcanic units.

Induced Polarization Survey

The induced polarization survey delineated several chargeability axes as well as a few isolated chargeability anomalies. The former are denoted CIII, CIV, CVA and CVB.

CIII is a weak to strong chargeability anomaly axis extending from approximately station 1+00N on line 20+00W to station 1+25N on line 17+00W. This anomaly axis is located within domain M1 and is therefore interpreted to possibly represent sulfide and/or magnetite horizons within the oxide-facies iron formation.

CIV is a weak chargeability anomaly axis located within domain M3, and extends from approximately station 2+75S on line 19+00W to station 1+50S on line 13+00W, and is also sub-parallel to the major northeasterly to easterly trending interpreted fault discussed earlier.

Anomaly axis CV consists of two splays, denoted CVa and CVb, that are weak chargeability anomaly axes extending respectively from approximately station 2+25N on line 19+00W to station 3+75N on line 15+00W and from approximately station 4+00N on line 19+00W to station 3+75N on line 15+00W. Both splays are located within domain M3. Axis CVb is sub-parallel to the major northwesterly to westerly trending interpreted fault discussed earlier.

Axes CIV and CV are interpreted to possibly represent sulfide horizons within mafic volcanic rocks.

Several isolated anomalies worth mentioning are:

- *at station 5+75N on line 3+00W*
- *at stations 2+50S and 4+50S on line 11+00W.*

These anomalies are interpreted to be of the same nature as CIV and CV.

South Part (Map 2)
Magnetic Survey

The magnetic survey delineated three domains of distinct magnetic signature denoted M4, M5 and M6. Domain M4 is characterized by a quiet magnetic signature ranging from approximately 1500 to 2000 gammas above base level. Domain M5 is characterized by a very quiet magnetic signature of approximately 1000 gammas above base level. Both of these domains are interpreted to possibly represent mafic volcanic units.

Domain M6 is characterized by a very disturbed magnetic signature ranging from approximately 1500 to 3000 gammas above base level. This domain is interpreted to possibly represent a series of easterly trending intercalated mafic and ultramafic units.

Induced Polarization Survey

The induced polarization survey delineated two chargeability anomaly axes denoted CI and CII within domain M6.

CI is a weak to strong chargeability anomaly axis extending from approximately station 20+25S on line 15+00W to station 20+25S on line 1+00W. CII is a weak chargeability anomaly axis extending from approximately station 21+00S on line 7+00W to station 20+50S on line 5+00W. These axes are interpreted to represent sulfide units within the intercalated mafic and ultramafic units. Ground geological investigation by Burton revealed that "sulfide stringers within a quartz feldspar porphyry" were observed in the immediate vicinity of CI and CII.

CONCLUSIONS AND RECOMMENDATIONS

Groundhog Claims

Two zones of interest have been delineated by detailed geological mapping and geophysical data. The first zone occurs in the northern part of the claim group and consists of banded iron formation in a mafic volcanic sequence. This iron formation was sampled and assayed the highest gold value of 38 ppb. The scarcity of outcrop prevented the iron formation from being traced but was delineated by the magnetometer survey and found to extend from L19W 50N to L7W 300N. Induced polarization chargeability anomalies over the iron formation suggest the possible presence of localized sulfide facies.

The most significant alteration and deformation occurs in the south-central portion of the claim group on claims 1087290, 1087291, 1087292 and 1035695 within an east-west trending zone of mafic volcanic to ultramafic rocks. These rocks are commonly talcose, chloritic and show varying degrees of carbonatization. This sequence of rocks as well as the felsic volcanic rocks to the north may be stratigraphically related to a similar sequence of rocks found at the Joburke Mine, located a few kilometers to the west of the Groundhog claim group. Included in this zone of mafic and ultramafic rocks is a north-east trending series of fracture fill quartz veins and the quartz feldspar dyke which warrants further investigation due to its varying degrees of carbonatization and local pyritic zones.

This southern zone of hydrothermal alteration and strong deformation is recommended to be further investigated by mechanical trenching and diamond drilling.

The induced polarization surveys delineated several chargeability anomaly axes coincident with magnetic highs and isolated chargeability anomalies worthy of further work. The anomalies of particular interest are the weak to moderate

anomalies located in the interpreted mafic volcanic rocks. Anomaly axes CIV and CV should be investigated by means of diamond drilling in order to determine their cause and possible economic mineral potential. Selected areas of axis CI and CII should be stripped since a shallow overburden cover was observed in the western part of CI and parts of CII. The isolated chargeability anomalies located at station 5+75N on line 3+00W and at stations 2+50S and 4+50S on line 11+00W should be investigated by means of diamond drilling and/or trenching if possible.

Existing diamond drill core from previous work on the Groundhog claims should be examined as this information may be vital to the targeting of future drill hole sites. However, it should be noted that such information may be of limited value as only representative samples of core from most of the previous drilling have been retained. The core is stored at the regional core library in Timmins, Ontario.

Meunier 22 claims

The cursory sampling and prospecting of the Meunier 22 claim group confirmed the presence of a banded iron formation to the north of the property. Assay of the iron formation showed weakly anomalous gold and copper values and should therefore be investigated further by means of stripping and trenching to effectively sample the bedrock. A program of diamond drilling is recommended contingent upon the results of the stripping and trenching. Further investigation of the carbonatized tholeiitic basalts in the southeast portion of the claim group is warranted, since this form of hydrothermal alteration is found in the tholeiitic basalts of the Timmins camp and is typical of Archean Lode gold deposits.

The following are budgets proposed for further exploration on the Groundhog claims and the Meunier 22 claims.

GROUNDHOG CLAIMS

BUDGET

Phase I

Examination of existing core	
1 Geologist - 2 days @ $300./day	$ 600.00
Trenching - backhoe-dozer	
14 days @ $1,200./day	16,800.00
1 Geologist	
14 days @ $300./day	4,200.00
1 Assistant	
10 days @ $200./day	2,000.00
Rock saw and sampling	3,000.00
Assaying	6,000.00
Subsistence: 14 days @ $100./day	1,400.00
Report	3,000.00
Subtotal	$ 37,000.00

Phase II

Diamond drilling	
4,000 feet @ $25./foot	100,000.00
Supervision	
1 geologist - 30 days @ $300./day	9,000.00
Assaying	4,000.00
Reports	3,000.00
Subsistence: 30 days @ $100./day	3,000.00
Contingency (10%)	11,900.00
TOTAL PHASES I & II	$167,900.00

MEUNIER 22 CLAIMS

BUDGET

Phase I

Trenching - Backhoe-dozer	
14 days @ $1,200./day	$ 16,800.00
1 Geologist	
14 days @ $300./day	4,200.00
1 Assistant	
10 days @ $200./day	2,000.00
Rock saw and sampling	3,000.00
Assaying	6,000.00
Subsistence: 14 days @ $100./day	1,400.00
Report	3,000.00
Subtotal	$ 36,400.00

Phase II

Diamond drilling	
2,000 feet @ $25./foot	50,000.00
Supervision	
1 geologist - 20 days @ $300./day	6,000.00
Assaying	4,000.00
Reports	3,000.00
Subsistence: 20 days @ $100./day	2,000.00
Contingency (10%)	6,500.00
Subtotal	$ 71,500.00
TOTAL PHASES I & II	$107,900.00
Total budget for Glen Auden's Property	$275,800.00

Respectfully submitted

John Burton, B.Sc.

Richard Lachapelle, B.Sc.Ing.Jr.

REFERENCES

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1988 — *Dighem III Survey for Glen Auden Resources Limited, Keith-Penhorwood Townships, Ontario.*

GARNER, D.
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1972 — *Geology of the Kukatush-Sewell Lake Area ODM, GR7*

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ZEEMAN, M.
1988 — *Geological Report on the property of Glen Auden Resources Limited, Groundhog Claims, Keith Township, Ontario*

1988 — *Geological Report on the property of Glen Auden Resources Limited, Keith "71" Claims, Keith Township, Ontario*

CERTIFICATION

I, John A. Burton, B.Sc., of 38 Fourth Avenue, in the town of Schumacher, Province of Ontario, certify as follows concerning my report on the Keith Township, Ontario property of Glen Auden Resources Limited and dated January 15, 1990.

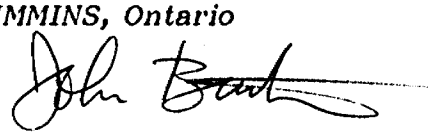
1. *I am a graduate of Mount Allison University, Sackville, New Brunswick, with a B.Sc. degree specializing in geology obtained in 1987.*

2. *I have been practising my profession in Canada for the past 3 years.*

3. *I have no direct or indirect interest in the properties, leases or securities of Glen Auden Resources Limited, nor do I expect to receive any.*

4. *The attached report is a product of:*
   a) *Data listed in the references;*
   b) *Previous work files at the Offices of the Ontario Ministry of Natural Resources;*
   c) *A personal visit to the property to conduct geological mapping.*

Dated this January 15, 1990
TIMMINS, Ontario



John A. Burton, B.Sc.

CERTIFICATION

I, Richard Lachapelle, of 136 Cedar Street South, in the City of Timmins, Province of Ontario, certify as follows concerning my report on the Glen Auden Resources Limited property in Keith Township, Province of Ontario and dated January 15, 1990:

1. *I am a junior member in good standing of l'Ordre des Ingenieurs du Quebec.*

2. *I am a graduate of l'Universite de Sherbrooke, Sherbrooke, Quebec with a B.Sc. degree in Physics, obtained in 1984.*

3. *I am a graduate of l'Ecole Polytechnique de Montreal, Montreal, Quebec with a B.Ing degree in Geological Engineering obtained in 1987.*

4. *I have been practising in Canada since 1987.*

5. *I have no direct interest in the properties, leases, or securities of Glen Auden Resources Limited, nor do I expect to receive any.*

6. *The attached report is a product of:*
   a) *Examination of data included in the report which was collected on the property concerned.*

Dated this 15th day of January, 1990
TIMMINS, Ontario

Richard Lachapelle, B.Sc.Ing.Jr.
Geophysicist

APPENDIX A

Technical Description of the IPR-11 Broadband Time Domain IP Receiver

Input Potential Dipoles	1 to 6 simultaneously.
Input Impedance	4 megohms.
Input Voltage (Vp) Range	100 microvolts to 6 volts for measurement. Zener diode protection up to 50V.
Automatic SP Bucking Range	± 1.5 V.
Chargeability (M) Range	0 to 300 mV/V (mils or 0/00)
Absolute Accuracy of Vp, SP and M	Vp; ± 3% of reading for Vp > 100 microvolts. SP; ± 3% of SP bucking range. M; ± 3% of reading or minimum ± 0.5m V/V.
IP Transient Program	Ten transient windows per input dipole. After a delay from current off of t, first four windows each have a width of t, next three windows each have a width of 6t and last three windows each have a width of 12t. The total measuring time is therefore 58t. t can be set at 3, 15, 30 or 60 milliseconds for nominal total receive times of 0.2, 1, 2 and 4 seconds.
VP Integration Time	In 0.2 and 1second receive time modes; 0.51sec. In 2 second mode; 1.02sec. In 4 second mode; 2.04 sec.
Transmitter Timing	Equal on and off times with polarity change each half cycle. On/off times of 1, 2, 4 or 8 seconds with ± 2.5% accuracy are required.
Header Capacity	Up to 17 four digit headers can be stored with each observation.
Data Memory Capacity	Depends on how many dipoles are recorded with each header. If four header items are used with 6 dipoles of SP, Vp and 10 M windows each, then about 200 dipole measurements can be stored. Up to three Optional Data Memory Expansion Blocks are available, each with a capacity of about 200 dipoles.
External Circuit Check	Checks up to six dipoles simultaneously using a 31Hz square wave and readout on front panel meters, in range of 0 to 200k ohms.
Filtering	RF filter, spheric spike removal; switchable 50 or 60Hz notch filters, low pass filters which are automatically removed from the circuit in the 0.2 sec receive time.
Internal Calibrator	1000 mV of SP, 200 mV of Vp and 2.43 mV/V of M provided in 2 sec pulses.

Technical Description of the IPR-11 Broadband Time Domain IP Receiver

Digital Display	Two, 4 digit LCD displays. One presents data, either measured or manually entered by the operator. The second display: 1) indicates codes identifying the data shown on the first display, and 2) shows alarm codes indicating errors.
Analog Meters	Six meters for: 1) checking external circuit resistance, and 2) monitoring input signals.
Digital Data Output	RS-232C compatible, 7 bit ASCII, no parity, serial data output for communication with a computer, digital printer, digital storage device or modem.
Standard Rechargeable Power Supply	Eight rechargeable NiCad D cells provide approximately 15 hours of continuous operation at 25°C. Supplied with a battery charger, suitable for 110/230V, 50 to 400 Hz, 10W.
Disposable Battery Power Supply	At 25°C, about 40 hours of continuous operation are obtained from 8 Eveready E95 or equivalent alkaline D cells. At 25°C, about 16 hours of continuous operation are obtained from 8 Eveready 1150 or equivalent carbon-zinc D cells.
Dimensions	345 mm x 250 mm x 300 mm, including lid.
Weight	10.5 kg, including batteries.
Operating Temperature Range	-20 to + 55°C, limited by display.
Storage Temperature Range	-40 to + 60°C.
Standard Items	Console with lid and set of rechargeable batteries, RS-232C cable and adapter, 2 copies of manual, battery charger.
Optional Items	Multidipole Potential Cables, Data Memory Expansion Blocks, Crystal Clock, SOFT II Programs, Printer, Cassette Tape Recorder, Disk Drive or Modem.
Shipping Weight	25 kg includes reusable wooden shipping case.

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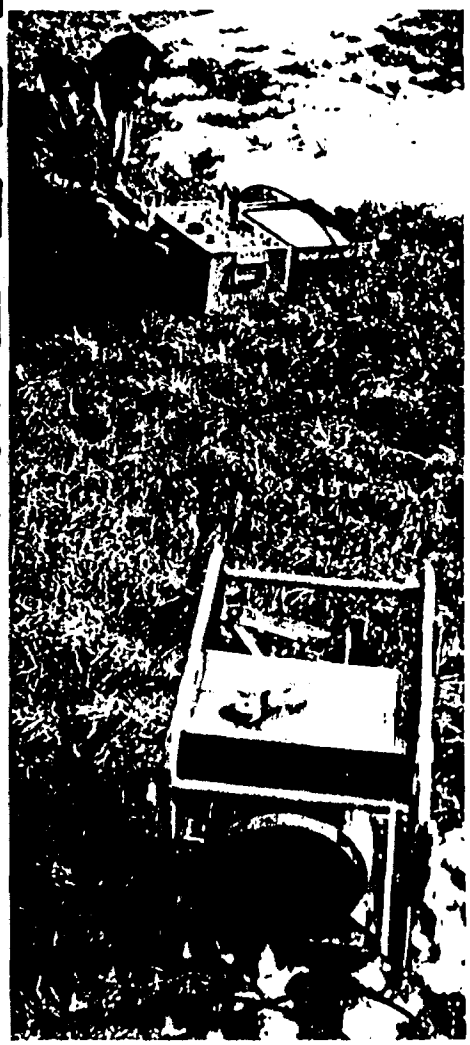
Geophysical and Geochemical
Instrumentation and Services

Technical Description of TSQ-3000W Time and Frequency Domain IP and Resistivity Transmitter



TSQ-3 transmitter with portable motor generator unit

Transmitter Console	
Output Power	3000 VA maximum
Output Voltages	300, 400, 500, 600, 750, 900, 1050, 1200, 1350 and 1500 volts, switch selectable
Output Current	10 amperes maximum
Output Current Stability	Automatically controlled to within ±0.1% for up to 50% external load variation or up to ±10% input voltage variation
Digital Display	Light emitting diodes permit display up to 1999 with variable decimal point; switch selectable to read input voltage, output current, external circuit resistance. Dual current range, switch selectable
Absolute Accuracy	± 3% of full range
Current Reading Resolution	10 mA on coarse range (0-10A) 1 mA on fine range (0-2A)
Frequency Domain Waveform	Square wave, continuous with approximately 6% off time at polarity change
Frequency Domain Frequencies	Standard: 0.033, 0.1, 0.3, 1.0 and 3.0 Hz, switch selectable Optional: any number of frequencies in range 0 to 5 Hz.
Time Domain Cycle Timing	t:t:t:t,on:off:on:off;automatic
Time Domain Polarity Change	each 2t; automatic
Time Domain Pulse Durations	Standard: t = 1, 2, 4, 8, 16 or 32 seconds Optional: any other timings
Period Time Stability	Crystal controlled to better than .01%. An optional high stability clock provides stabilization to better than 1 ppm over -20/ + 50° C.
Efficiency	.78
Operating Temperature Range	-30° C to + 50° C
Overload Protection	Automatic shut-off at 3300 VA
Underload Protection	Automatic shut-off at current below 100 mA
Thermal Protection	Automatic shut-off at internal temperature of + 85° C
Dimensions	350 mm x 530 mm x 320 mm
Weight	25.0 kg.
Power Source	
Type	Motor flexibly coupled to alternator and installed on a frame with carrying handles.
Motor	Briggs and Stratton, four stroke, 8 H.P.
Alternator	Permanent magnet type, 800 Hz, three phase 230 V AC.
Output Power	3500 VA maximum
Dimensions	520 mm x 715 mm x 560 mm
Weight	72.5 kg.
Total System	
Shipping Weight	150 kg includes transmitter console, motor generator, connecting cables and re-usable wooden crates.

GEOSCINTREX

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Geophysical and Geochemical Instrumentation and Services

HUNTEC

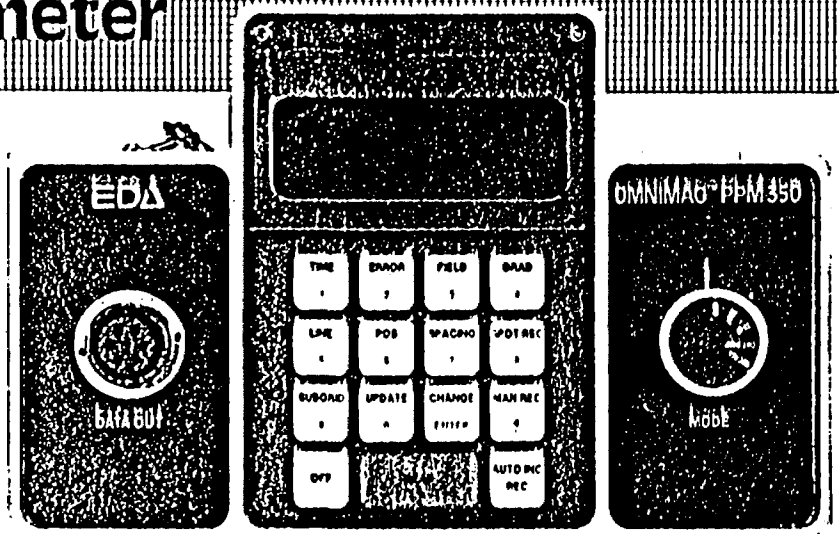
M4 7.5 KW IP TRANSMITTER

SPECIFICATIONS

a)	Power:	96-144 V line to neutral, 3 phase, 400 Hz (from Huntec generator set), 7500W
b)	Output:	Voltage: 100-3200V dc in 10 steps Current: 16A maximum on low ranges
c)	Current regulator:	<.1% current change for 10% change in load resistance Settling time to 1% approx. 15 msec.
d)	Output frequency (selectable on front panel):	1/16 Hz to 1 Hz (time domain and complex resistivity) 1/16 Hz to 4 Hz (frequency domain)
e)	Frequency accuracy:	± 50 ppm, -30°C to 60°C
f)	Output duty cycle-defined as $t_{ON}/(t_{ON} + t_{OFF})$:	½ to 15/16 in increments of 1/16 (time domain) 15/16 (complex resistivity) 3/4 (frequency domain)
g)	Output current meter:	Two ranges - 0-10A, 0-20A
h)	Ground resistance meter:	Two ranges - 0-10K ohms, 0-100K ohms
i)	Input voltage meter:	0-150V
j)	Dummy load:	Two levels: 2000W, 6000W
k)	Temperature range:	-34°C to 50°C
l)	Size:	53 x 43 x 43cm (21 x 17 x 17 ins)
m)	Weight:	50 kg (110 lbs.)

OMNIMAG PPM-350
Total Field Magnetometer

EDA



The PPM-350 is the latest addition to EDA's OMNIMAG*™ series of magnetometers and gradiometers. It is engineered to provide users with the latest state-of-the-art advances in microprocessor technology, including many features that are unique in the field.

Major benefits and features include:

- Significant increase in productivity
- Lowered survey costs
- Automatic diurnal correction
- Programmable grid coordinates
- Highly reproduceable data
- Ergonomic design
- Simplified fieldwork
- Computer-compatible

EDA

Specifications

Dynamic Range	18,000 to 93,000 gammas
Sensitivity	±0.02 gamma
Statistical Error Resolution	0.01 gamma
Standard Memory Capacity	1383 data blocks or readings
Absolute Accuracy	±15 ppm at 23°C, 50 ppm over the operating temperature range
Display Resolution	0.1 gamma
Capture Range	±25% relative to ambient field strength of last stored value
Display	Custom-designed, ruggedized liquid crystal display with an operating temperature range from −35°C to +55°C
Gradient Tolerance	5,000 gammas per meter
Sensor	Optimized miniature design. Magnetic cleanliness is consistent with the specified absolute accuracy
Sensor Cable	Remains flexible in temperature range; includes low strain connector
Operating Environmental Range	−35°C to +55°C; 0–100% relative humidity; weather-proof
Power Supply	Non-magnetic rechargeable sealed lead acid battery cartridge or belt; or, Disposable "C" cell battery cartridge or belt
Battery Cartridge Life	2,000 to 5,000 readings, depending upon ambient temperature and rate of readings
Weight and Dimensions	
Instrument Console only	3.4 kg, 238 x 150 x 250 mm
Lead Acid Battery Cartridge	1.9 kg
Sensor	1.2 kg, 56 mm diameter x 200 mm
System Complement	Electronics console; sensor with 3-meter cable; sensor staff; power supply; harness assembly; operation manual.

EDA is a pioneer in the development of advanced geophysical systems and has created many innovations that increase field productivity and lower survey costs.

EDA's OMNIMAG series consists of the PPM-350 Total Field Magnetometer, PPM-400 Base Station Magnetometer, and the PPM-500 Vertical Gradiometer. Contact us *now* for details.

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E D A Instruments Inc.
5151 Ward Road
Wheat Ridge, Colorado
U.S.A. 80033
Telex: 00 450681 DVR
(303) 422-9112

A P P E N D I X B

ROCK SAMPLE DESCRIPTIONS

Sample #	*Anomalous Element*	*Description*
31411	*38 ppb Au*	*banded iron formation, chert/magnetite layers, strong Fe staining trace py, cpy.*
0435	*1100 ppm Ni*	*ultramafic rock with moderate pervasive talc and ankerite alteration.*
0440	*1280 ppm Ni*	*mafic volcanic rock with moderate pervasive Fe carbonate alteration, 1-2% fine, disseminated pyrite.*
0444	*1390 ppm Cu*	*mafic volcanic with massive sulfide: chalcopyrite, pyrrhotite and pyrite with bornite on weathered surface.*
0445	*7920 ppm Cu*	*massive sulfide: chalcopyrite, pyrrhotite, pyrite with bornite on weathered surface.*
0451	*1080 ppm Ni*	*mafic volcanic with strong Fe carbonate, fine laminations of Fe carbonate and chlorite.*
0458	*1160 ppm Cu*	*mafic volcanic with strong Fe carbonate, 1-2% wisps of pyrite, chalcopyrite, pyrrhotite, 2% milky white quartz-carbonate veinlets.*
0468	*4140 ppm Cu*	*mafic volcanic rock with strong Fe carbonate and chlorite alteration, semi-massive pyrite, chalcopyrite.*
5846	*1430 ppm Ni*	*mafic volcanic with very strong Fe carbonate alteration.*

A P P E N D I X C

SAMPLE	AU PPB	CU PPM	ZN PPM
5833	3	66.0	20.0
5834	2	4.0	820.
5835	<1	62.0	14.0
5836	<1	7.5	28.0
5837	5	77.0	150.
5838	30	150.	150.
5839	4	77.0	49.0
5840	1	2.5	9.0
5841	3	200.	450.
5842	5	81.0	92.0
5843	1	88.0	62.0

SAMPLE	AU PPB	LI PPM	BE PPM	B PPM	S PPM	SC PPM	V PPM	CR PPM	MN PPM
31408	33	--	--	--	--	--	--	--	--
31409	5	28	<5	30	175	22.9	180	400	--
31410	8	--	--	--	--	--	--	--	--
31411	38	--	--	--	--	--	--	--	--
0469	15	--	--	--	--	--	--	--	--
0470	<1	--	--	--	--	--	--	--	--
0471	2	<10	<5	<10	152	30.0	200	--	--
0472	10	12	<5	40	481	5.4	60	150	102
0473	<1	39	<5	10	<100	28.4	160	--	--

SAMPLE	CO PPM	NI PPM	CU PPM	CU PPM	ZN PPM	ZN PPM	GE PPM	AS PPM	AS PPM
31408	--	--	--	--	--	--	--	<3	--
31409	32	133	--	43.5	--	106.	20	--	100
31410	--	--	190	--	112	--	--	<3	--
31411	--	--	72	--	112	--	--	<3	--
0469	--	--	39	--	--	--	--	<3	--
0470	--	--	5	--	--	--	--	<3	--
0471	86	729	--	25.0	--	76.4	20	--	2
0472	14	48	--	9.8	--	29.9	<10	--	2
0473	87	921	--	38.9	--	168.	30	--	670

SAMPLE	SE PPM	MO PPM	AG PPM	CD PPM	IN PPM	SN PPM	SB PPM	CS PPM
31408	..	..	..	..	..	..	..	..
31409	<3	1	<0.5	<1	<1	<10	0.8	3
31410	..	..	..	..	..	..	..	..
31411	..	..	..	..	..	..	..	..
0469	..	..	..	..	..	..	..	..
0470	..	..	..	..	..	..	..	..
0471	<3	2	<0.5	<1	<1	<10	0.6	<1
0472	<3	<1	<0.5	<1	<1	<10	0.3	<1
0473	<3	<1	<0.5	<1	<1	<10	2.8	<1

SAMPLE	LA PPM	CE PPM	ND PPM	SM PPM	EU PPM	TB PPM	YB PPM	LU PPM
31408	--	--	--	--	--	--	--	--
31409	77.0	158	67	12.5	3.5	1.1	1.4	0.2
31410	--	--	--	--	--	--	--	--
31411	--	--	--	--	--	--	--	--
0469	--	--	--	--	--	--	--	--
0470	--	--	--	--	--	--	--	--
0471	1.2	3	<5	0.6	0.3	<0.5	0.8	0.1
0472	27.0	52	24	2.8	0.9	<0.5	0.4	<0.1
0473	1.3	3	<5	0.6	0.3	<0.5	0.9	0.1

SAMPLE	HF PPM	TA PPM	W PPM	PB PPM	BI PPM	TH PPM	U PPM
31408	--	--	--	--	--	--	--
31409	5	<1	<3	<2	<3	6	1.2
31410	--	--	--	--	--	--	--
31411	--	--	--	--	--	--	--
0469	--	--	--	--	--	--	--
0470	--	--	--	--	--	--	--
0471	<1	<1	<3	<2	4	<1	<0.5
0472	4	<1	<3	<2	<3	4	1.0
0473	1	<1	<3	<2	<3	<1	<0.5

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	MNO	TIO2	P2O5	CR2O3	LOI	SUM
31409	40.9	11.7	11.0	6.46	1.12	1.92	8.30	0.16	0.82	0.62	---	17.2	100.3
0471	42.8	8.44	3.36	18.1	2.13	0.03	11.3	0.20	0.44	0.04	0.41	11.5	98.8
0472	66.6	17.2	0.93	0.84	8.82	0.90	2.03	---	0.42	0.13	---	2.08	100.1
0473	39.4	7.67	3.81	17.2	0.33	0.02	11.7	0.24	0.44	0.05	0.37	19.1	100.4

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

SAMPLE \ PPM	RB	SR	Y	ZR	NB	BA
31409	55	293	32	171	16	652
0471	18	<10	<10	33	<10	91
0472	21	369	24	125	11	606
0473	17	55	12	25	19	103

SAMPLE	AU PPB	AU OZ/TON	LI PPM	BE PPM	B PPM	S PPM	SC PPM	V PPM	CR PPM
0435	--	0.001	--	--	--	--	--	--	--
0436	--	TRACE	--	--	--	--	--	--	--
0437	<1	--	46	<5	60	<100	7.1	50	61
0438	--	NIL	--	--	--	--	--	--	--
0439	--	NIL	--	--	--	--	--	--	--
0440	--	NIL	--	--	--	--	--	--	--
0441	--	NIL	--	--	--	--	--	--	--
0442	<1	--	13	<5	30	543	7.7	60	110
0443	4	--	26	<5	80	987	53.2	620	39
0444	--	TRACE	--	--	--	--	--	--	--
0445	--	NIL	--	--	--	--	--	--	--
0446	--	NIL	--	--	--	--	--	--	--
0447	--	NIL	--	--	--	--	--	--	--
0448	--	NIL	--	--	--	--	--	--	--
0449	--	NIL	--	--	--	--	--	--	--
0450	6	--	11	<5	30	446	3.7	30	85
0451	--	NIL	--	--	--	--	--	--	--
0452	--	NIL	--	--	--	--	--	--	--
0453	--	NIL	--	--	--	--	--	--	--
0454	--	NIL	--	--	--	--	--	--	--
0455	--	NIL	--	--	--	--	--	--	--
0456	<1	--	15	<5	<10	236	27.8	160	1800
0457	--	NIL	--	--	--	--	--	--	--
0458	--	0.002	--	--	--	--	--	--	--
0459	--	NIL	--	--	--	--	--	--	--
0460	--	NIL	--	--	--	--	--	--	--
0461	--	TRACE	--	--	--	--	--	--	--
0462	--	TRACE	--	--	--	--	--	--	--
0463	--	0.001	--	--	--	--	--	--	--
0464	--	TRACE	--	--	--	--	--	--	--
0465	--	TRACE	--	--	--	--	--	--	--
0466	--	0.002	--	--	--	--	--	--	--
0467	--	0.002	--	--	--	--	--	--	--
0468	--	NIL	--	--	--	--	--	--	--
5844	--	NIL	--	--	--	--	--	--	--
5845	--	NIL	--	--	--	--	--	--	--
5846	--	NIL	--	--	--	--	--	--	--
5847	6	--	27	<5	20	<100	33.1	210	2700
5848	--	NIL	--	--	--	--	--	--	--
5849	--	NIL	--	--	--	--	--	--	--
5850	--	NIL	--	--	--	--	--	--	--

SAMPLE	MN PPM	CO PPM	NI PPM	NI PPM	CU PPM	CU PPM	ZN PPM	GE PPM	AS PPM	AS PPM
0435	--	--	1100	--	24	--	--	--	<3	--
0436	--	--	590	--	16	--	--	--	129	--
0437	124	6	--	22	--	3.5	90.0	<10	--	6
0438	--	--	32	--	41	--	--	--	<3	--
0439	--	--	38	--	16	--	--	--	8	--
0440	--	--	1280	--	284	--	--	--	88	--
0441	--	--	19	--	157	--	--	--	<3	--
0442	363	10	--	49	--	26.4	71.4	<10	--	18
0443	--	36	--	43	--	112.	155.	<10	--	5
0444	--	--	803	--	1390	--	--	--	<3	--
0445	--	--	142	--	7920	--	--	--	<3	--
0446	--	--	9	--	49	--	--	--	<3	--
0447	--	--	3	--	11	--	--	--	<3	--
0448	--	--	697	--	572	--	--	--	47	--
0449	--	--	19	--	162	--	--	--	<3	--
0450	117	4	--	19	--	54.0	51.1	<10	--	1
0451	--	--	1080	--	42	--	--	--	<3	--
0452	--	--	16	--	16	--	--	--	<3	--
0453	--	--	11	--	17	--	--	--	<3	--
0454	--	--	946	--	5	--	--	--	100	--
0455	--	--	4	--	3	--	--	--	<3	--
0456	--	46	--	716	--	27.3	124.	<10	--	12
0457	--	--	71	--	319	--	--	--	<3	--
0458	--	--	117	--	1160	--	--	--	<3	--
0459	--	--	111	--	59	--	--	--	<3	--
0460	--	--	71	--	109	--	--	--	<3	--
0461	--	--	39	--	160	--	--	--	<3	--
0462	--	--	<2	--	3	--	--	--	<3	--
0463	--	--	25	--	11	--	--	--	31	--
0464	--	--	71	--	82	--	--	--	<3	--
0465	--	--	16	--	<1	--	--	--	6	--
0466	--	--	158	--	7	--	--	--	<3	--
0467	--	--	36	--	317	--	--	--	<3	--
0468	--	--	191	--	4140	--	--	--	<3	--
5844	--	--	173	--	8	--	--	--	58	--
5845	--	--	94	--	2	--	--	--	17	--
5846	--	--	1430	--	20	--	--	--	151	--
5847	--	88	--	884	--	4.3	124.	<10	--	970
5848	--	--	73	--	51	--	--	--	23	--
5849	--	--	<2	--	25	--	--	--	<3	--
5850	--	--	705	--	557	--	--	--	43	--

SAMPLE	SE PPM	MO PPM	AG PPM	CD PPM	IN PPM	SN PPM	SB PPM	CS PPM
0435	--	--	--	--	--	--	--	--
0436	--	--	--	--	--	--	--	--
0437	<3	<1	<0.5	<1	<1	<10	0.2	1
0438	--	--	--	--	--	--	--	--
0439	--	--	--	--	--	--	--	--
0440	--	--	--	--	--	--	--	--
0441	--	--	--	--	--	--	--	--
0442	<3	<1	<0.5	<1	<1	<10	0.3	3
0443	<3	<1	<0.5	<1	<1	<10	0.2	1
0444	--	--	--	--	--	--	--	--
0445	--	--	--	--	--	--	--	--
0446	--	--	--	--	--	--	--	--
0447	--	--	--	--	--	--	--	--
0448	--	--	--	--	--	--	--	--
0449	--	--	--	--	--	--	--	--
0450	<3	<1	<0.5	<1	<1	<10	<0.2	<1
0451	--	--	--	--	--	--	--	--
0452	--	--	--	--	--	--	--	--
0453	--	--	--	--	--	--	--	--
0454	--	--	--	--	--	--	--	--
0455	--	--	--	--	--	--	--	--
0456	<3	<1	<0.5	<1	<1	<10	<0.2	<1
0457	--	--	--	--	--	--	--	--
0458	--	--	--	--	--	--	--	--
0459	--	--	--	--	--	--	--	--
0460	--	--	--	--	--	--	--	--
0461	--	--	--	--	--	--	--	--
0462	--	--	--	--	--	--	--	--
0463	--	--	--	--	--	--	--	--
0464	--	--	--	--	--	--	--	--
0465	--	--	--	--	--	--	--	--
0466	--	--	--	--	--	--	--	--
0467	--	--	--	--	--	--	--	--
0468	--	--	--	--	--	--	--	--
5844	--	--	--	--	--	--	--	--
5845	--	--	--	--	--	--	--	--
5846	--	--	--	--	--	--	--	--
5847	<3	<1	<0.5	24	<1	<10	1.5	1
5848	--	--	--	--	--	--	--	--
5849	--	--	--	--	--	--	--	--
5850	--	--	--	--	--	--	--	--

SAMPLE	LA PPM	CE PPM	ND PPM	SM PPM	EU PPM	TB PPM	YB PPM	LU PPM
0435	--	--	--	--	--	--	--	--
0436	--	--	--	--	--	--	--	--
0437	21.3	46	18	3.2	1.1	<0.5	1.0	0.1
0438	--	--	--	--	--	--	--	--
0439	--	--	--	--	--	--	--	--
0440	--	--	--	--	--	--	--	--
0441	--	--	--	--	--	--	--	--
0442	39.7	86	41	5.1	1.4	<0.5	0.5	0.1
0443	7.4	22	15	3.6	1.3	0.7	3.1	0.5
0444	--	--	--	--	--	--	--	--
0445	--	--	--	--	--	--	--	--
0446	--	--	--	--	--	--	--	--
0447	--	--	--	--	--	--	--	--
0448	--	--	--	--	--	--	--	--
0449	--	--	--	--	--	--	--	--
0450	8.6	17	7	1.1	0.3	<0.5	0.2	<0.1
0451	--	--	--	--	--	--	--	--
0452	--	--	--	--	--	--	--	--
0453	--	--	--	--	--	--	--	--
0454	--	--	--	--	--	--	--	--
0455	--	--	--	--	--	--	--	--
0456	1.6	7	<5	0.9	0.6	<0.5	0.9	0.1
0457	--	--	--	--	--	--	--	--
0458	--	--	--	--	--	--	--	--
0459	--	--	--	--	--	--	--	--
0460	--	--	--	--	--	--	--	--
0461	--	--	--	--	--	--	--	--
0462	--	--	--	--	--	--	--	--
0463	--	--	--	--	--	--	--	--
0464	--	--	--	--	--	--	--	--
0465	--	--	--	--	--	--	--	--
0466	--	--	--	--	--	--	--	--
0467	--	--	--	--	--	--	--	--
0468	--	--	--	--	--	--	--	--
5844	--	--	--	--	--	--	--	--
5845	--	--	--	--	--	--	--	--
5846	--	--	--	--	--	--	--	--
5847	1.9	8	6	0.7	0.3	<0.5	0.9	0.1
5848	--	--	--	--	--	--	--	--
5849	--	--	--	--	--	--	--	--
5850	--	--	--	--	--	--	--	--

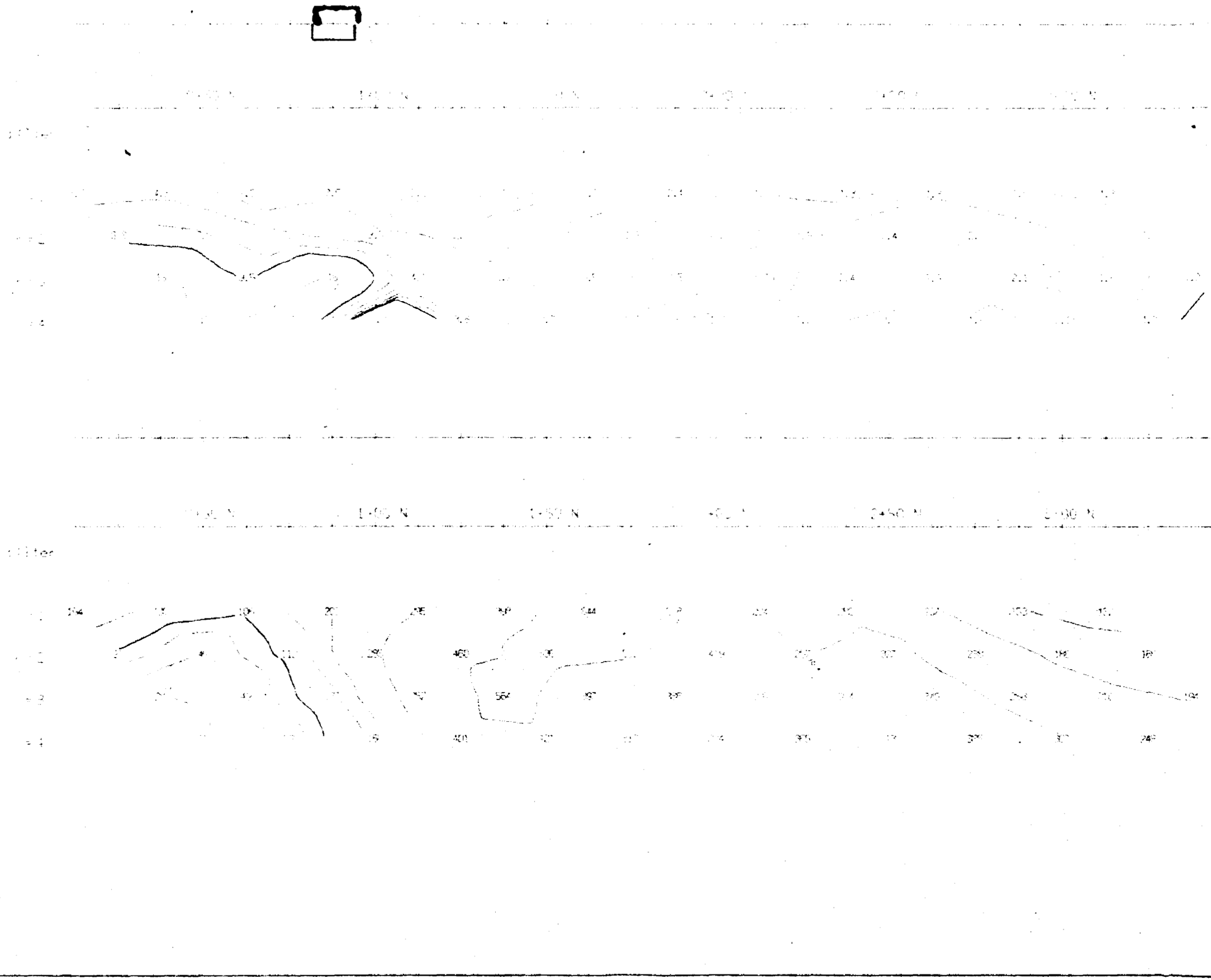
SAMPLE	HF PPM	TA PPM	W PPM	PB PPM	BI PPM	TH PPM	U PPM
0435	--	--	--	--	--	--	--
0436	--	--	--	--	--	--	--
0437	5	<1	<3	<2	<3	3	0.8
0438	--	--	--	--	--	--	--
0439	--	--	--	--	--	--	--
0440	--	--	--	--	--	--	--
0441	--	--	--	--	--	--	--
0442	5	<1	<3	<2	<3	5	1.2
0443	4	<1	8	<2	<3	<1	0.8
0444	--	--	--	--	--	--	--
0445	--	--	--	--	--	--	--
0446	--	--	--	--	--	--	--
0447	--	--	--	--	--	--	--
0448	--	--	--	--	--	--	--
0449	--	--	--	--	--	--	--
0450	3	<1	<3	<2	<3	2	1.0
0451	--	--	--	--	--	--	--
0452	--	--	--	--	--	--	--
0453	--	--	--	--	--	--	--
0454	--	--	--	--	--	--	--
0455	--	--	--	--	--	--	--
0456	1	<1	3	<2	<3	<1	<0.5
0457	--	--	--	--	--	--	--
0458	--	--	--	--	--	--	--
0459	--	--	--	--	--	--	--
0460	--	--	--	--	--	--	--
0461	--	--	--	--	--	--	--
0462	--	--	--	--	--	--	--
0463	--	--	--	--	--	--	--
0464	--	--	--	--	--	--	--
0465	--	--	--	--	--	--	--
0466	--	--	--	--	--	--	--
0467	--	--	--	--	--	--	--
0468	--	--	--	--	--	--	--
5844	--	--	--	--	--	--	--
5845	--	--	--	--	--	--	--
5846	--	--	--	--	--	--	--
5847	1	<1	<3	<2	10	<1	0.7
5848	--	--	--	--	--	--	--
5849	--	--	--	--	--	--	--
5850	--	--	--	--	--	--	--

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	MNO	TIO2	P2O5	LOI	SUM
0437	70.7	15.8	0.59	0.97	3.31	1.24	3.48	---	0.63	0.20	2.70	99.7
0442	61.8	15.4	3.84	2.01	2.54	3.01	3.46	---	0.64	0.24	6.47	99.6
0443	53.6	14.4	5.48	2.71	1.34	1.73	9.29	0.18	2.06	0.14	8.70	99.7
0450	70.9	15.5	0.69	0.59	5.90	2.29	1.73	---	0.27	0.08	1.54	99.7
0456	49.2	8.13	6.99	17.7	1.06	0.05	9.79	0.21	0.49	0.05	4.93	98.6
5847	38.0	9.58	2.13	13.9	0.94	1.61	13.7	0.20	0.56	0.05	18.8	99.5

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

SAMPLE \ PPM	RB	SR	Y	ZR	NB	BA
0437	36	471	12	155	<10	427
0442	84	451	<10	170	<10	1070
0443	47	111	42	107	19	457
0450	71	506	<10	71	<10	793
0456	24	35	<10	26	13	76
5847	51	36	<10	44	<10	492

A P P E N D I X D



1+00W

Pole-Dipole Array

C1 ——— P1 ——— P2 ——— C2

I ——— V

a = 25 m

n = 1, 2, 3, 4

plot point

Filtered Profiles

Resistivity ————

Chargeability ————

Metal Factor - - - - - - - -

Logarithmic Cycles 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IRIS-11

Transmitter: Huntec T-3 kW

Operator: B. Malpass

I.P. ANOMALIES

WEAK	+	RESISTIVITY CONTRAST
MODERATE	±	CONDUCTOR
STRONG	$	SHEAR

START

DEPTH

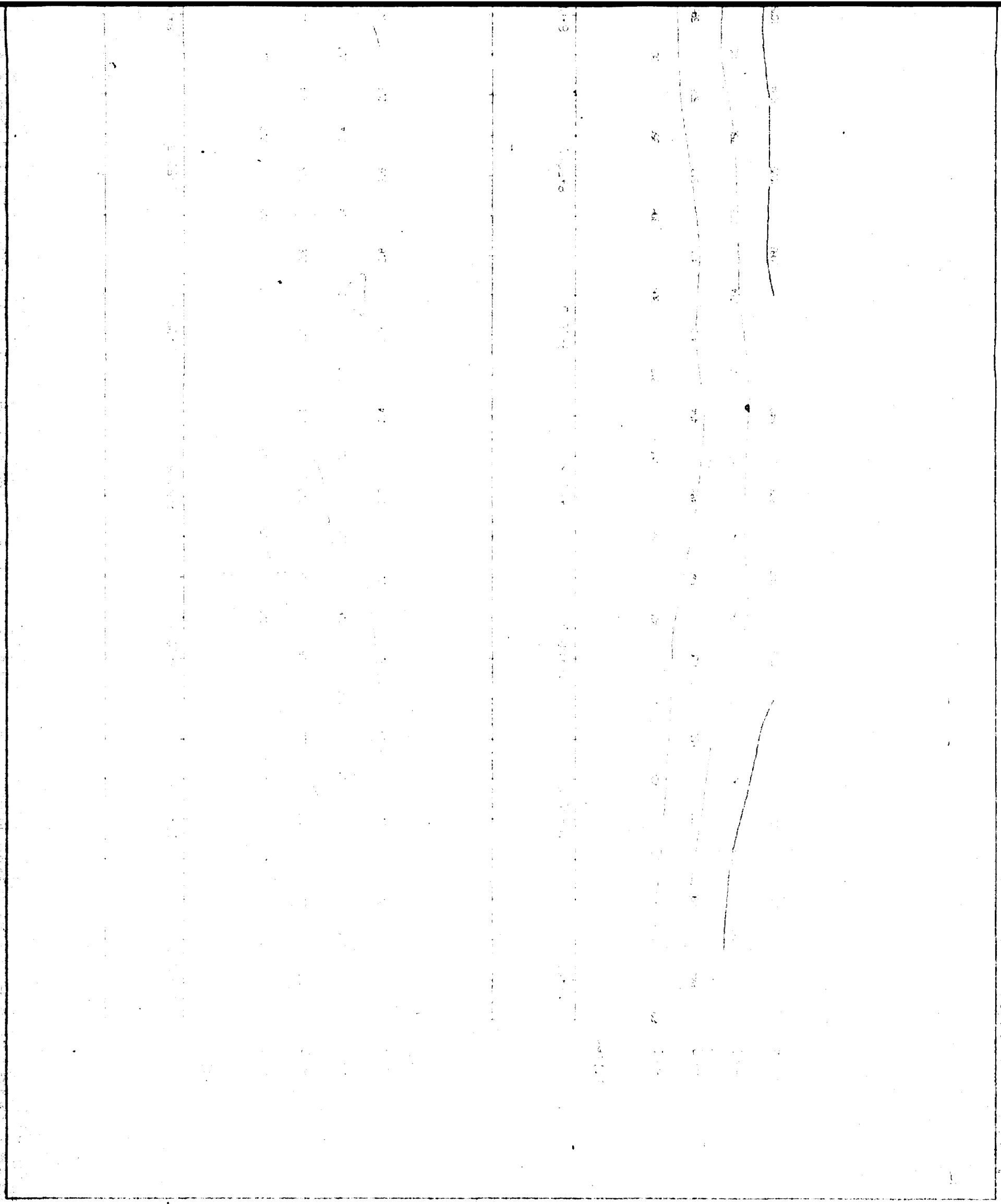
2,13177

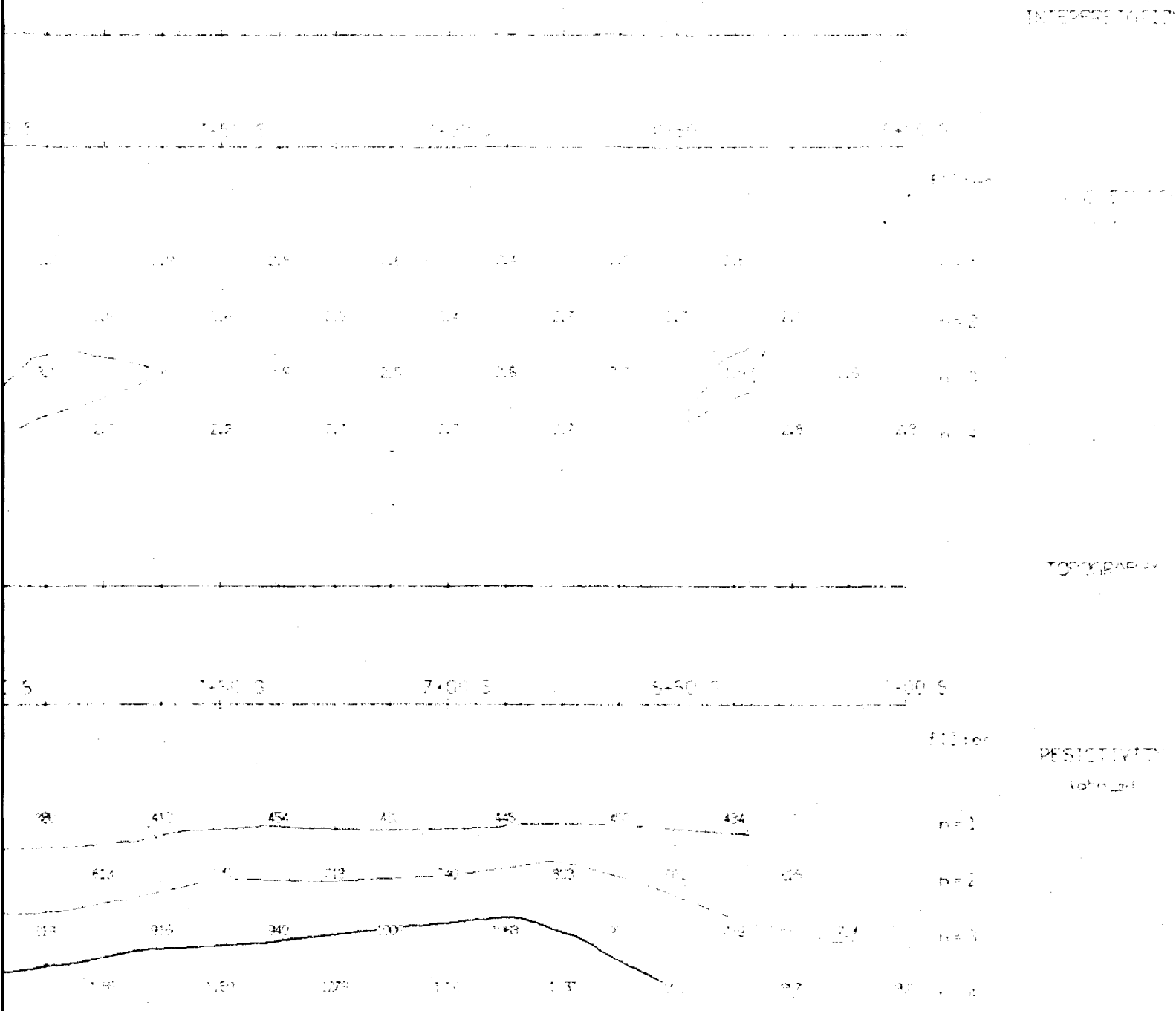
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES

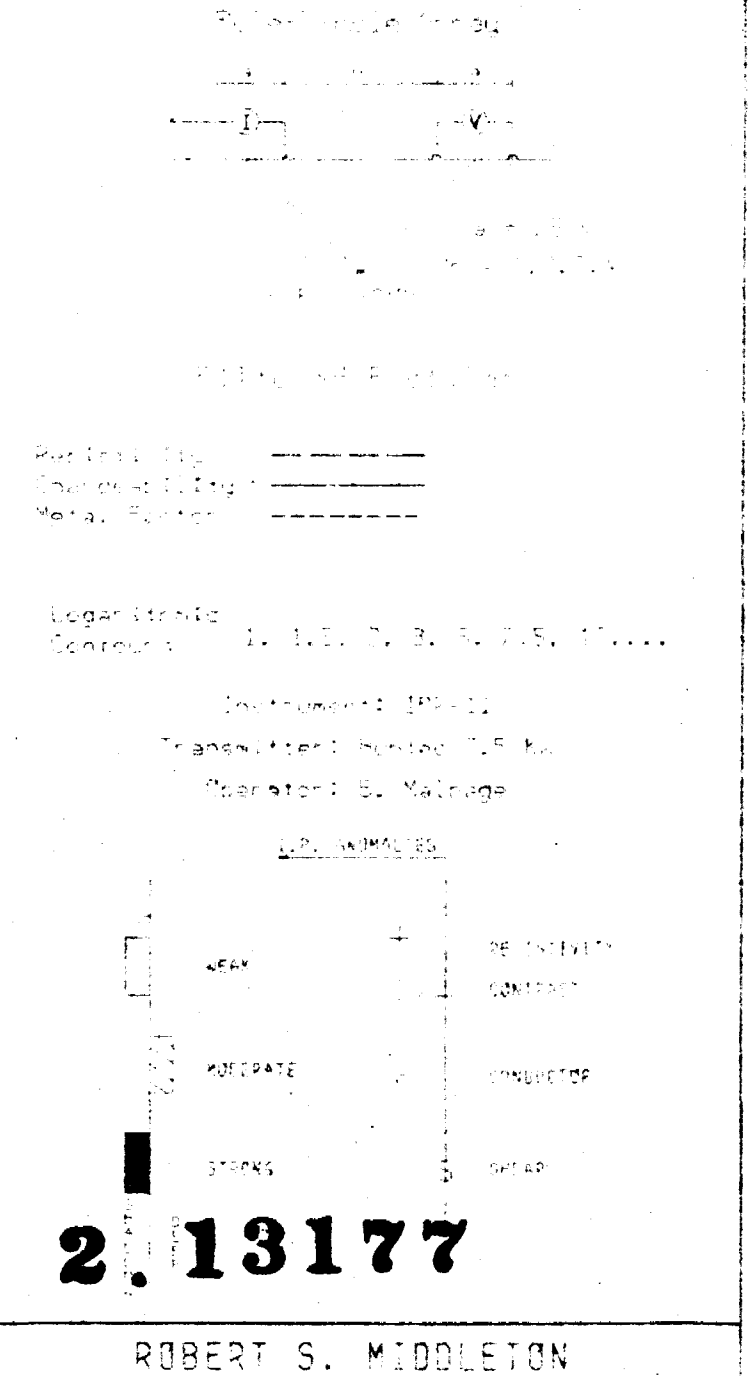
Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Kirkland Lake, Ont.

Date: Aug. 21, 1989	Scale: 1 : 1250
Interp. by: R.S.M.	Drawn by: D.M.





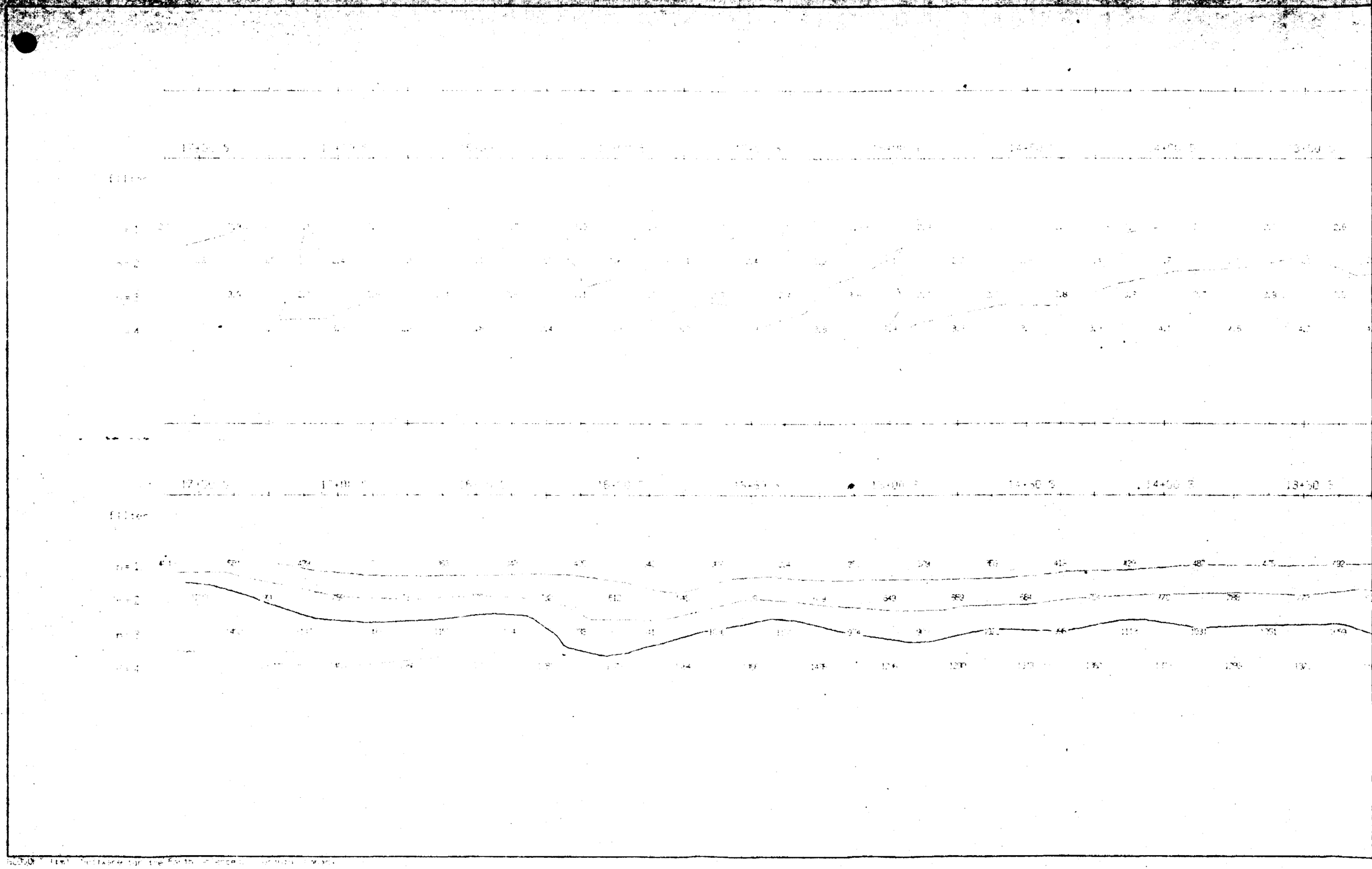
1+00W

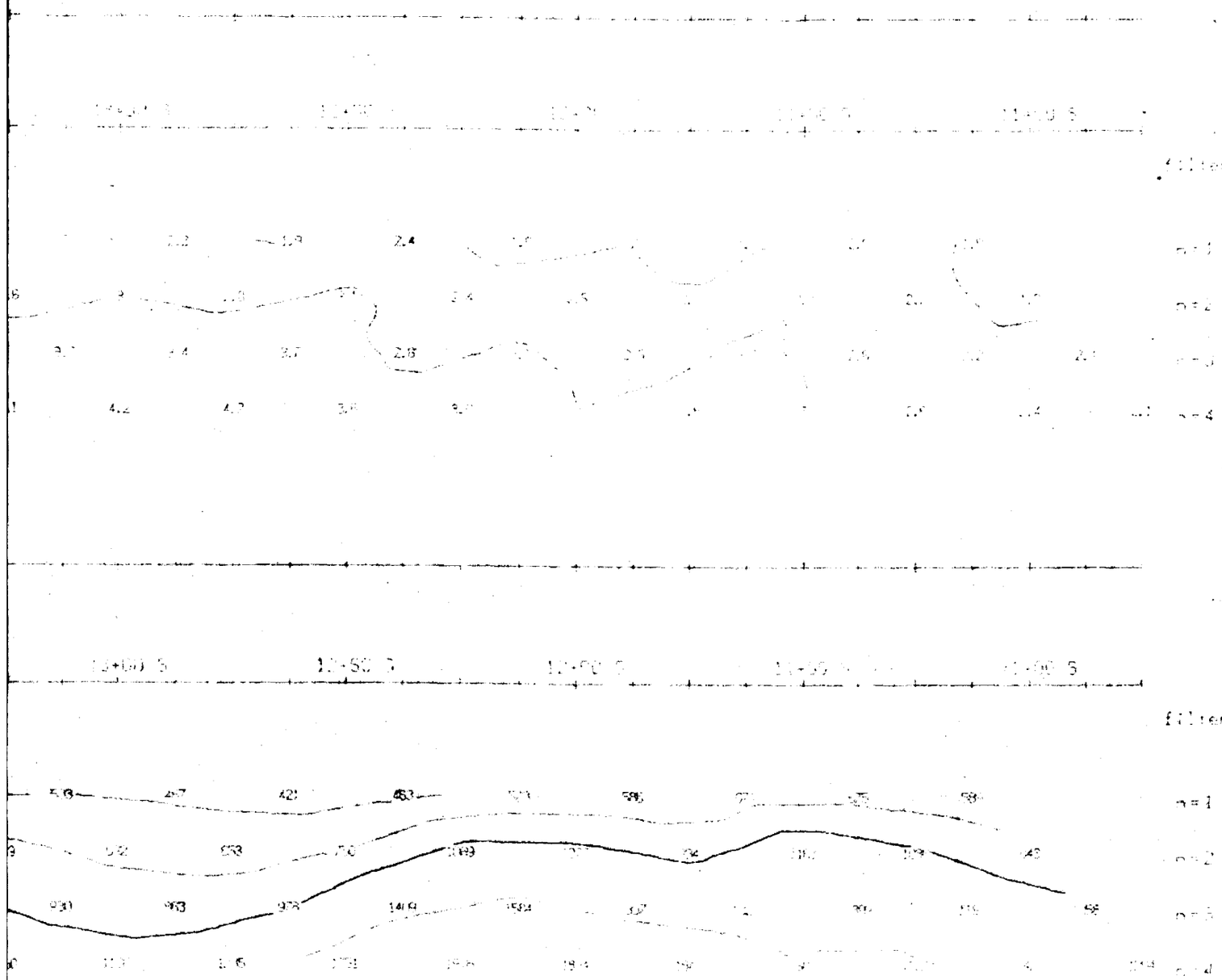


ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project





1+00W

Pole-Dipole Array

plot point n = 1...3.4

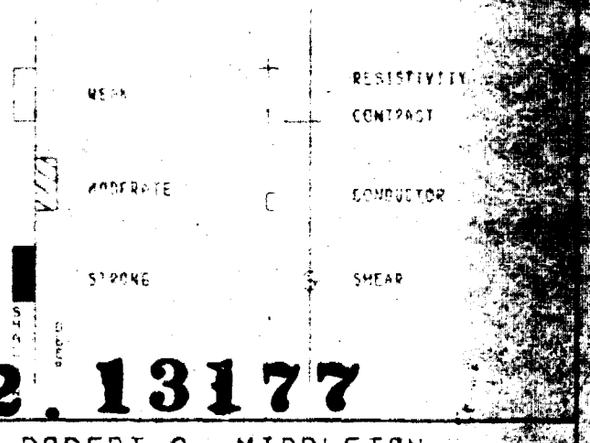
Filtered Profiles

Resistivity ————
Chargeability ————
Metal Factor - - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10...

Instrument: IRIS II
Transmitter: Hunter 1.5 KW
Operator: B. Malpage

I.P. ANOMALIES



2.13177

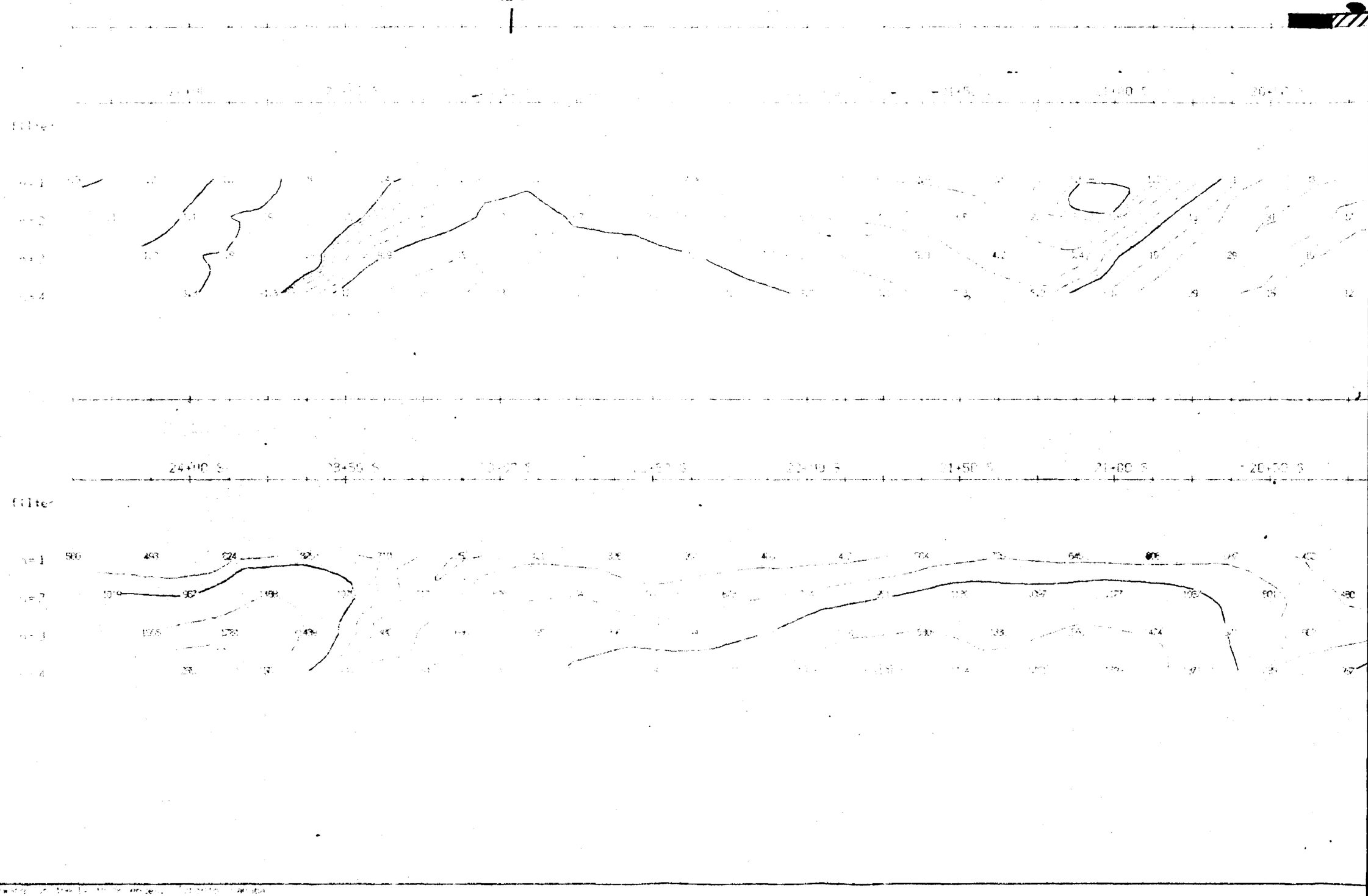
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

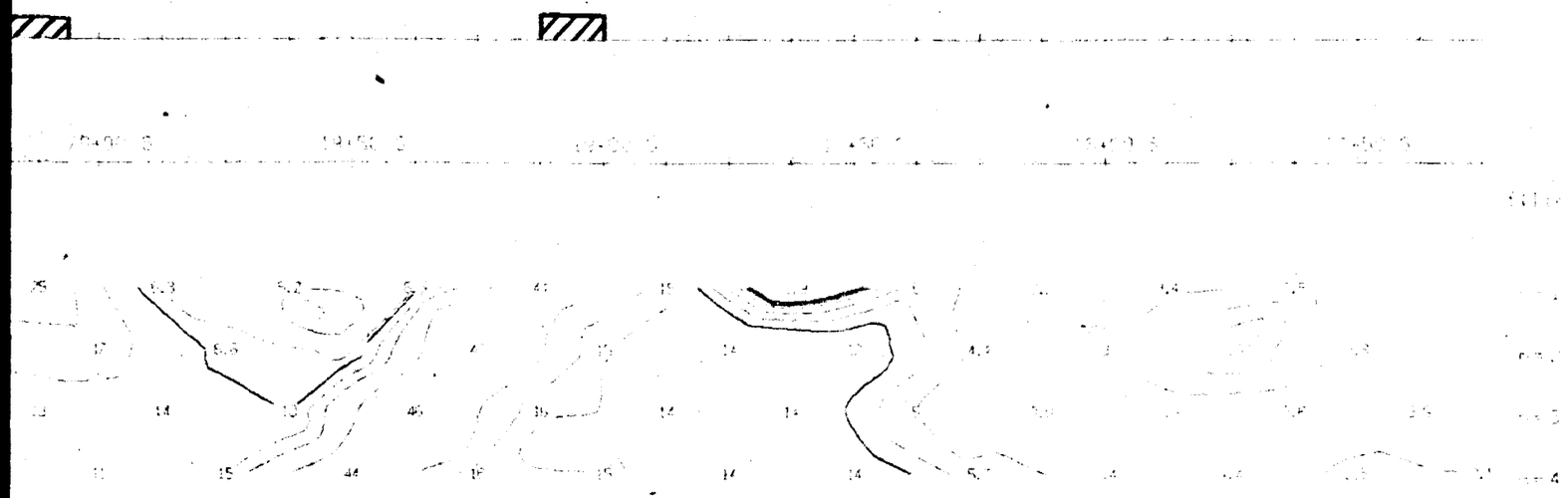
for GLEN AUDEN RESOURCES

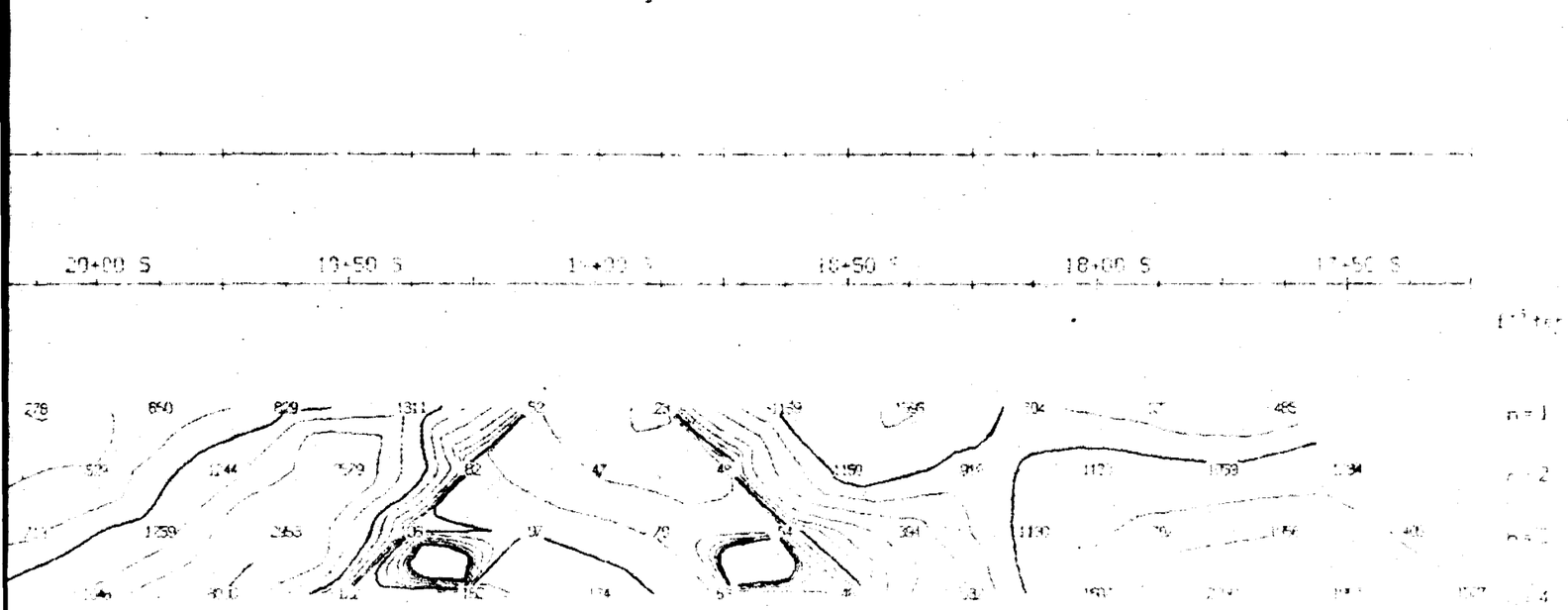
Title: Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: Aug 19, 20, 1989	Scale: 1" = 125'
Interp. by: R.L.	Job # M-311

R.R.







1+00W

Pole-Dipole array

a = 25 m
n = 1 to 4
plot point

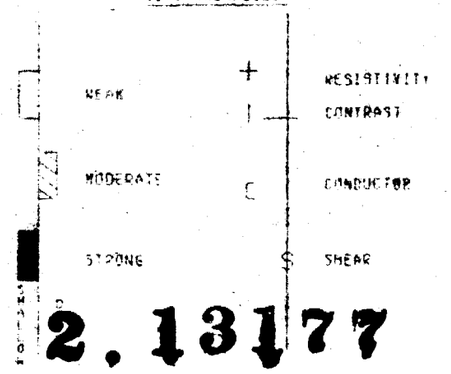
Filtered profiles

Resistivity ————
Chargeability ————
Metal Factor - - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IFR 11
Transmitter: Huntec 7.5 KW
Operator: B. Malpage

I.P. ANOMALIES



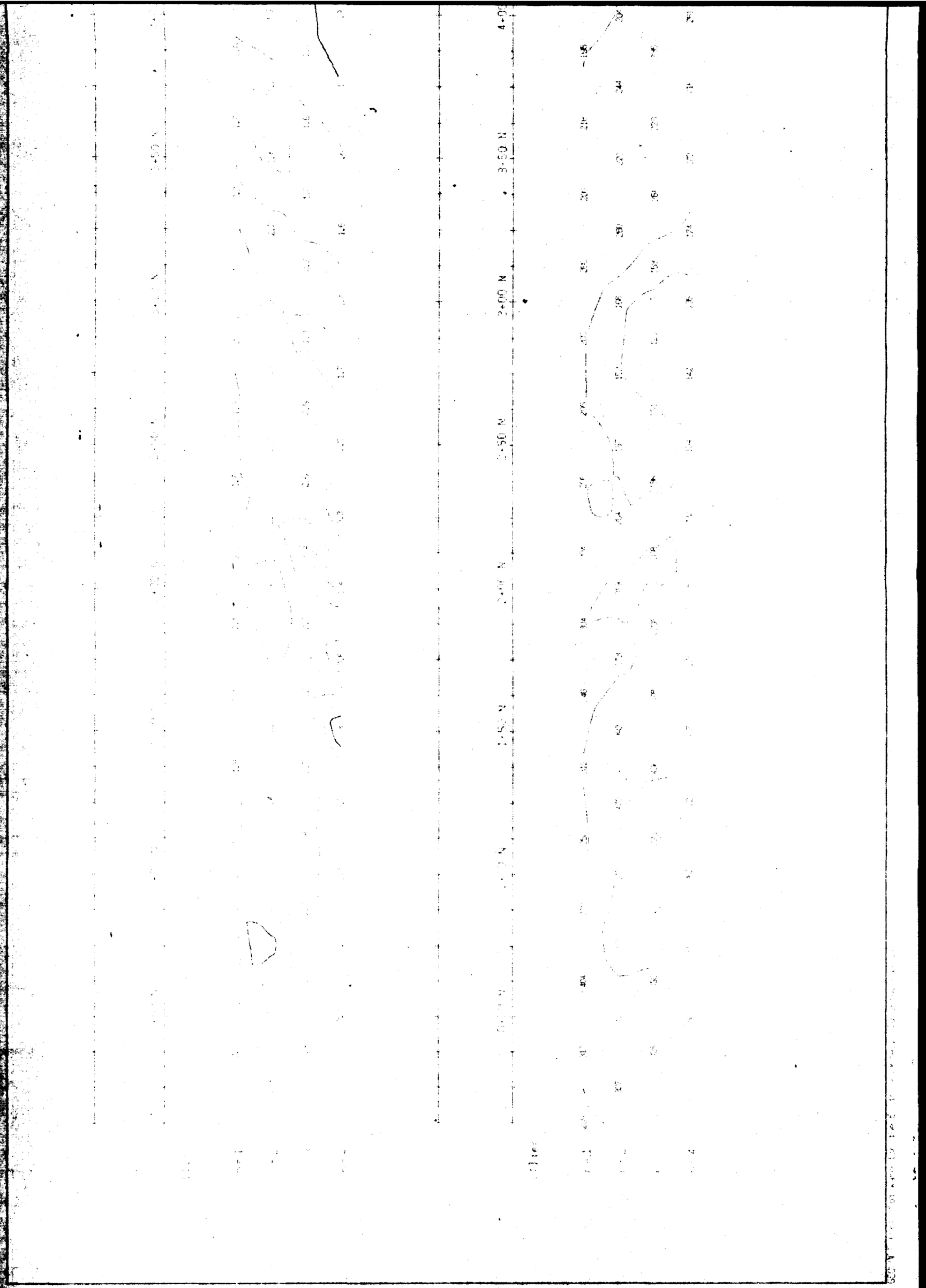
2.13177

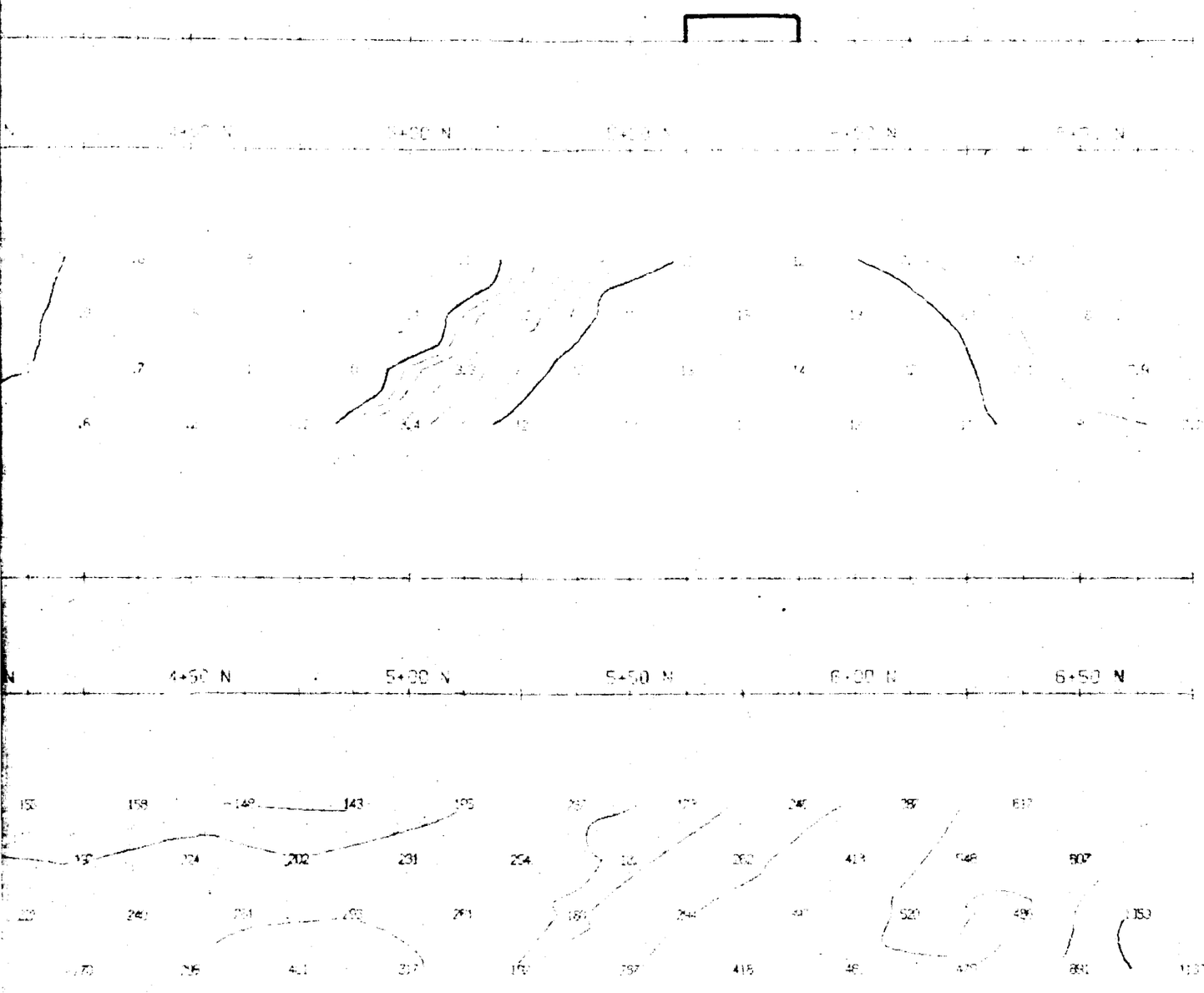
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

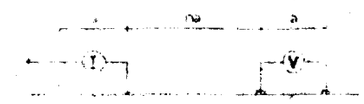
Date: Aug 13, 1983	Scale: 1" = 1250'
Interp. by: R.L.	Job # M-810


3+50 N
3+00 N
2+50 N
2+00 N
1+50 N



3+00W

Pole Dipole Array



a = 25 m
n = 1,2,3,4

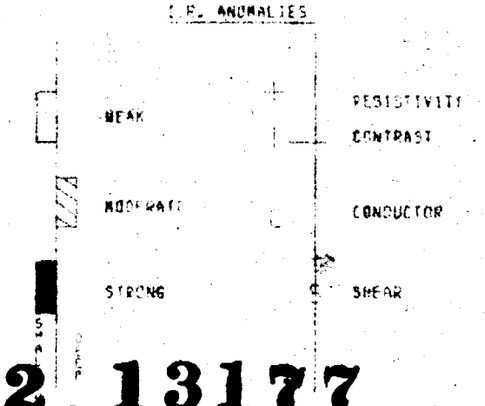
Pulse Interval

Resistivity ——————
Chargeability ——— · ———
Metal Factor ——— — ———

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10...

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: B. Malpage

I.P. ANOMALIES



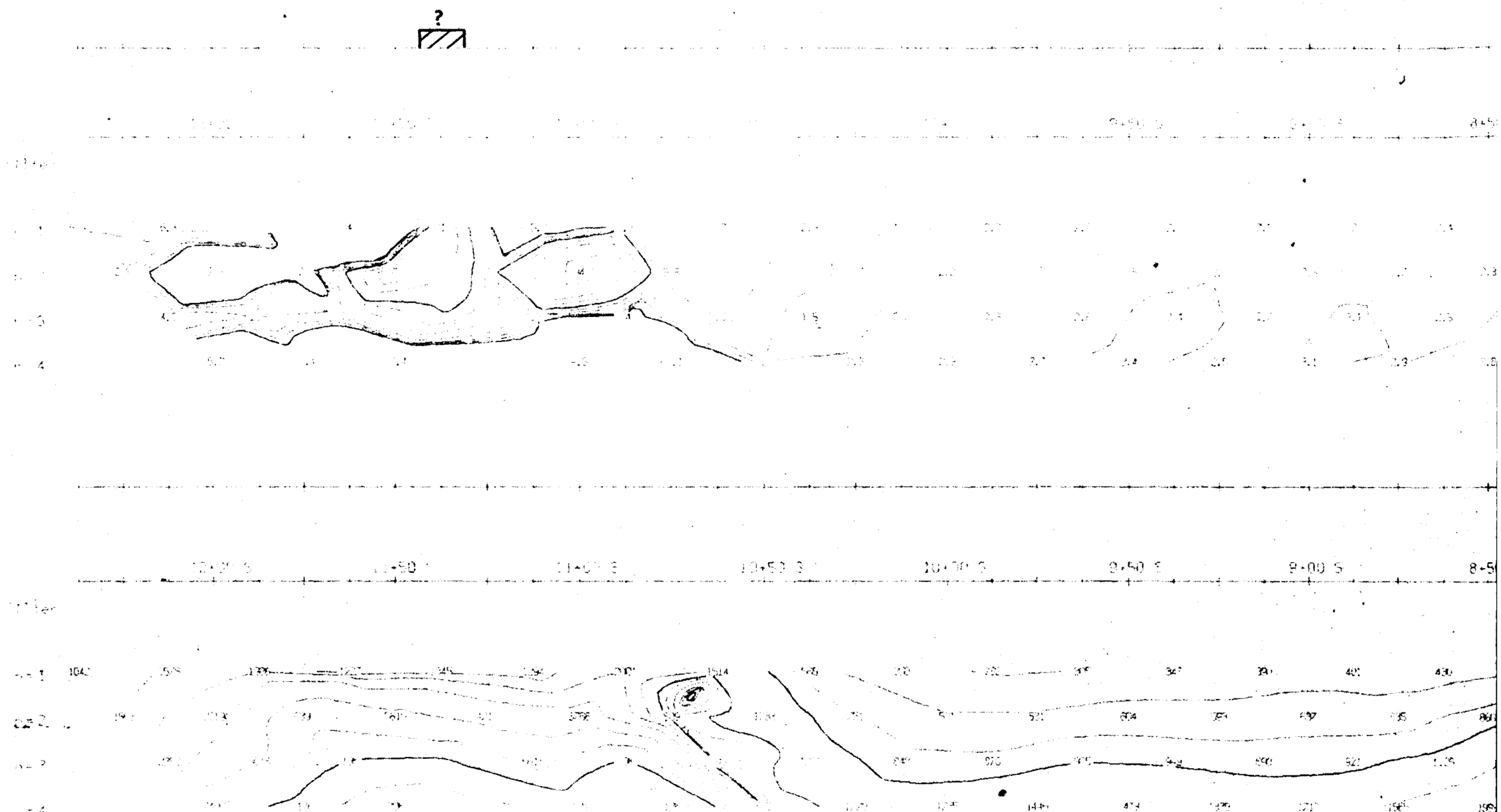
2.13177

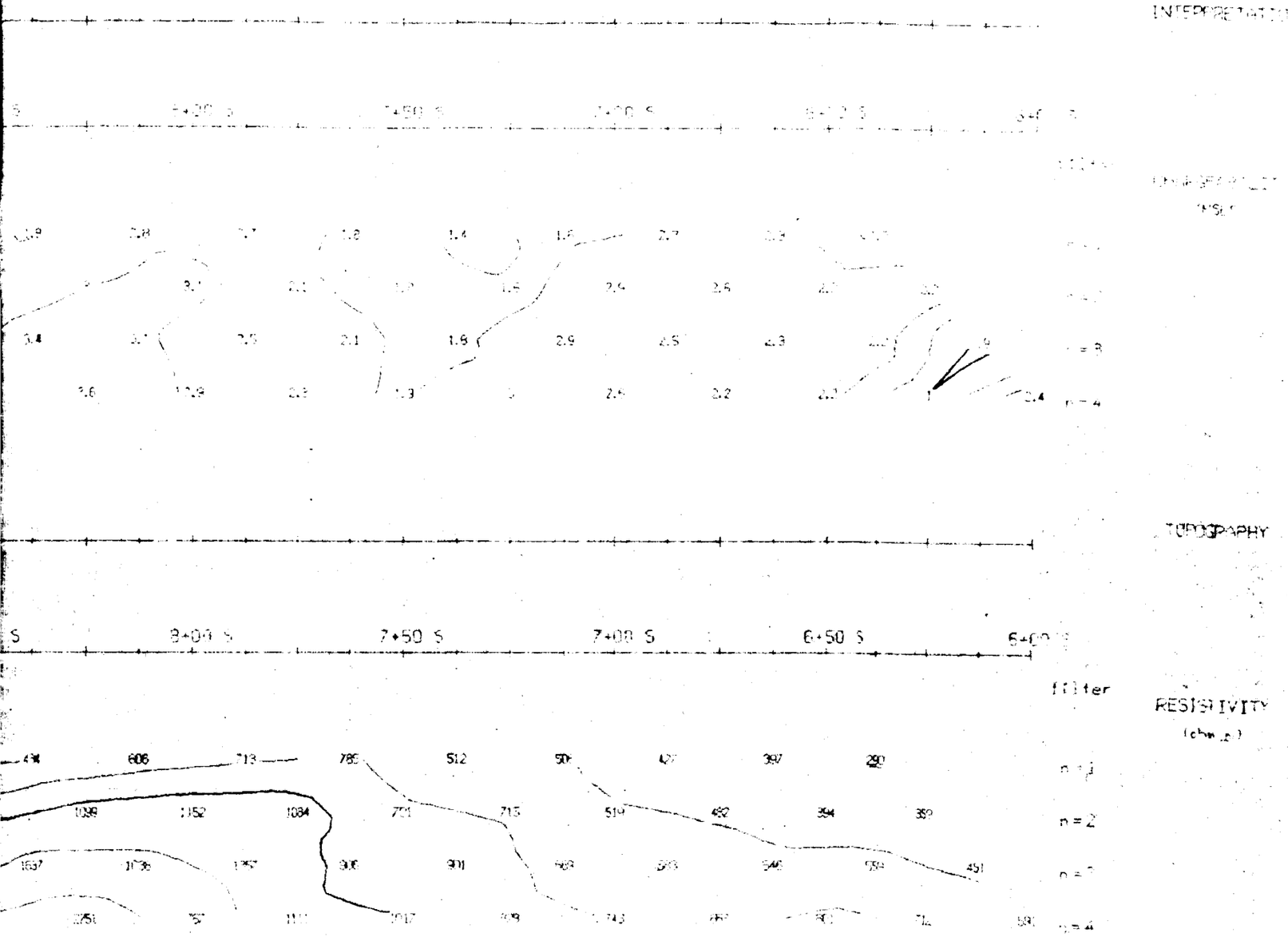
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

For: GLEN AUDEN RESOURCES

Title:
Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: Aug 22,1983	Scale: 1 : 1250
Interp. by: P.I.	Job # M-310





3+00W

Pole-Dipole Array

a = 25 m
n = 1,2,3,4

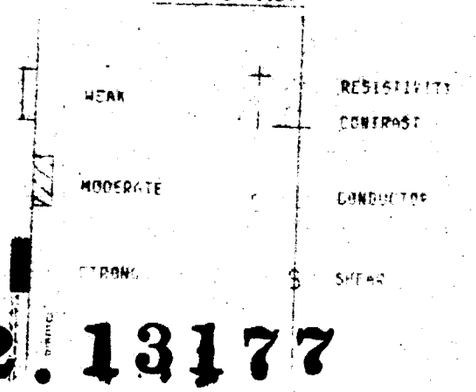
Filtered Profiles

Resistivity ———
Chargeability ———
Metal Factor - - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IFR-11
Transmitter: Huntec 7.5 KW
Operator: B. Malpage

I.P. ANOMALIES



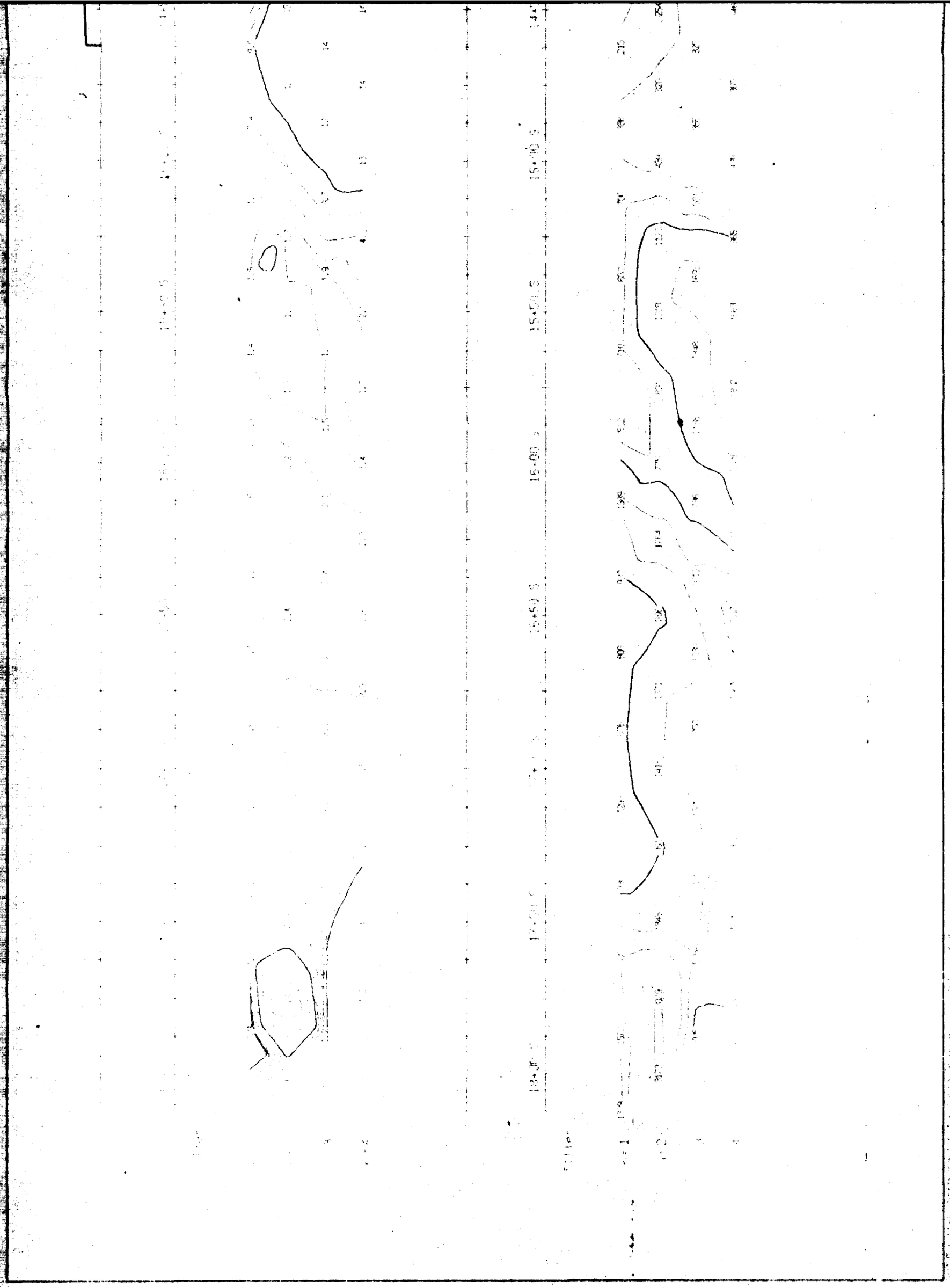
2.13177

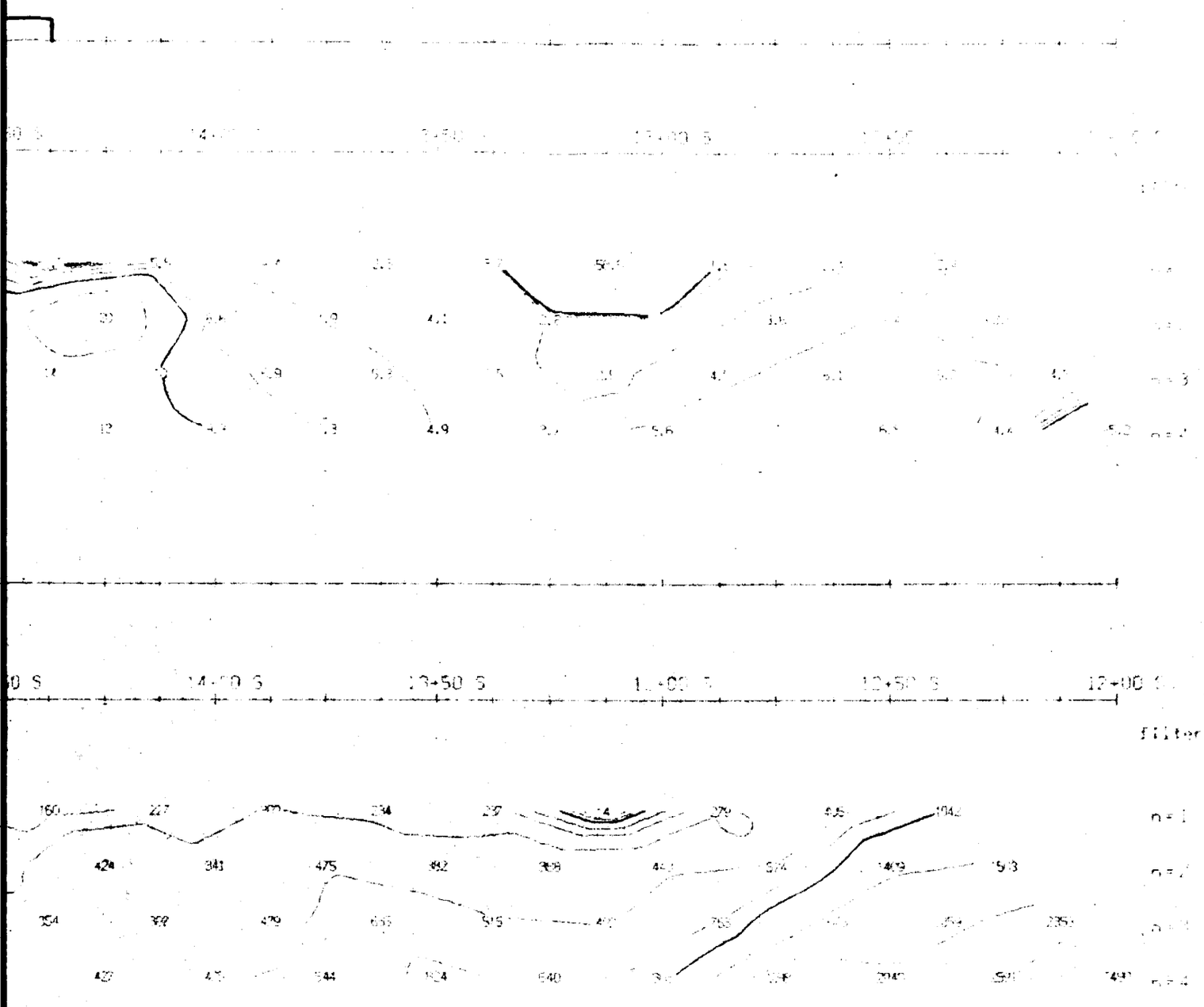
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for
GLEN AUDEN RESOURCES

Title
Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: April, 1989	Scale: 1 : 1250
Interp. by R.L.	Job # M-310





3+00W

Pole-Dipole Array

a = 25 m

Plotted Profiles

Resistivity ————
Chargeability ————
Metal Factor --------

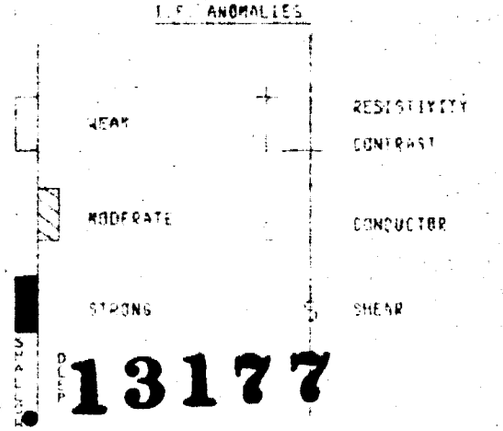
Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IPR-11

Transmitter: Huntec 7.5 kW

Operator: B. Malpass

I.P. ANOMALIES



2.13177

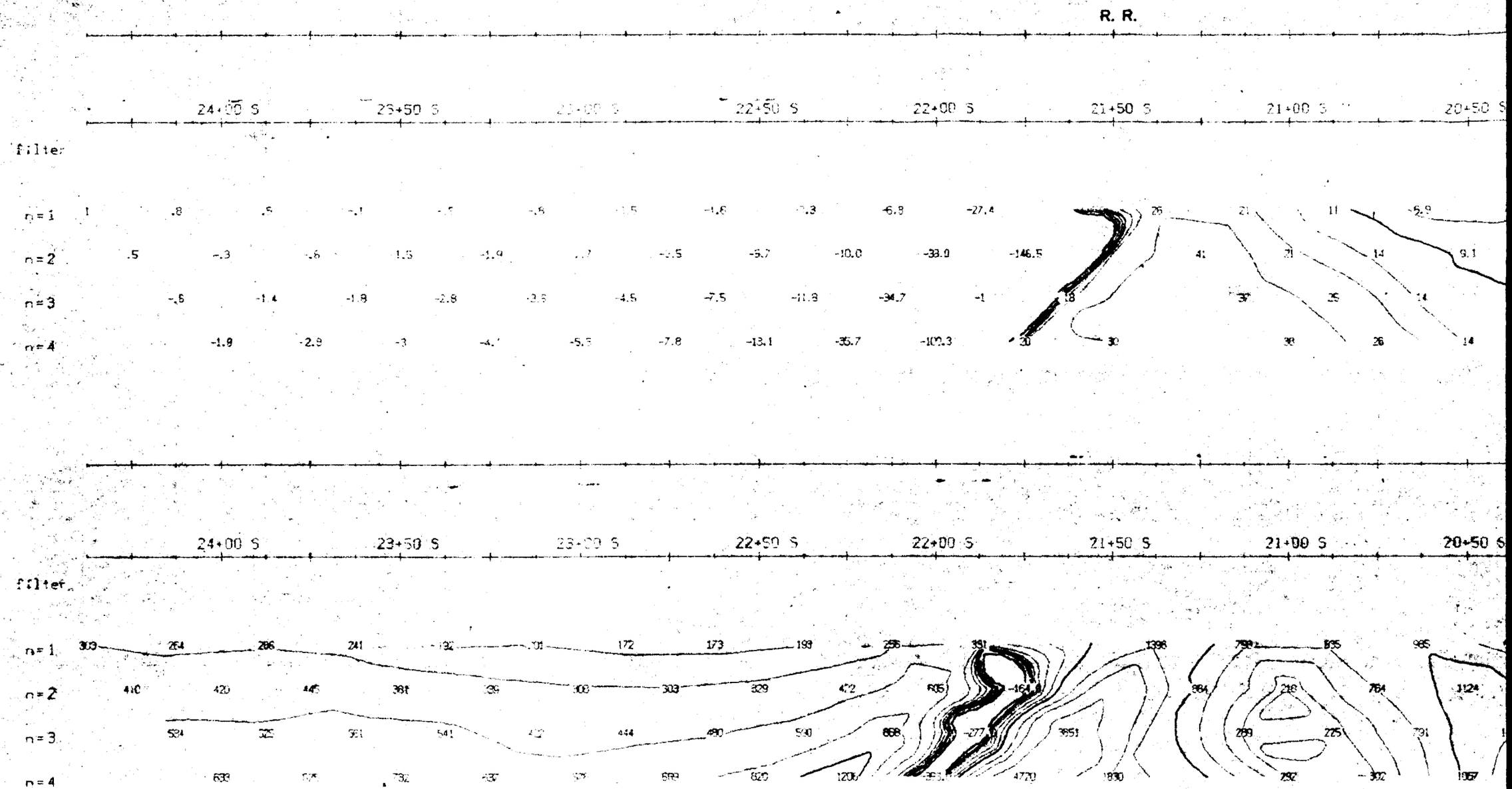
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for
GLEN AUDEN RESOURCES

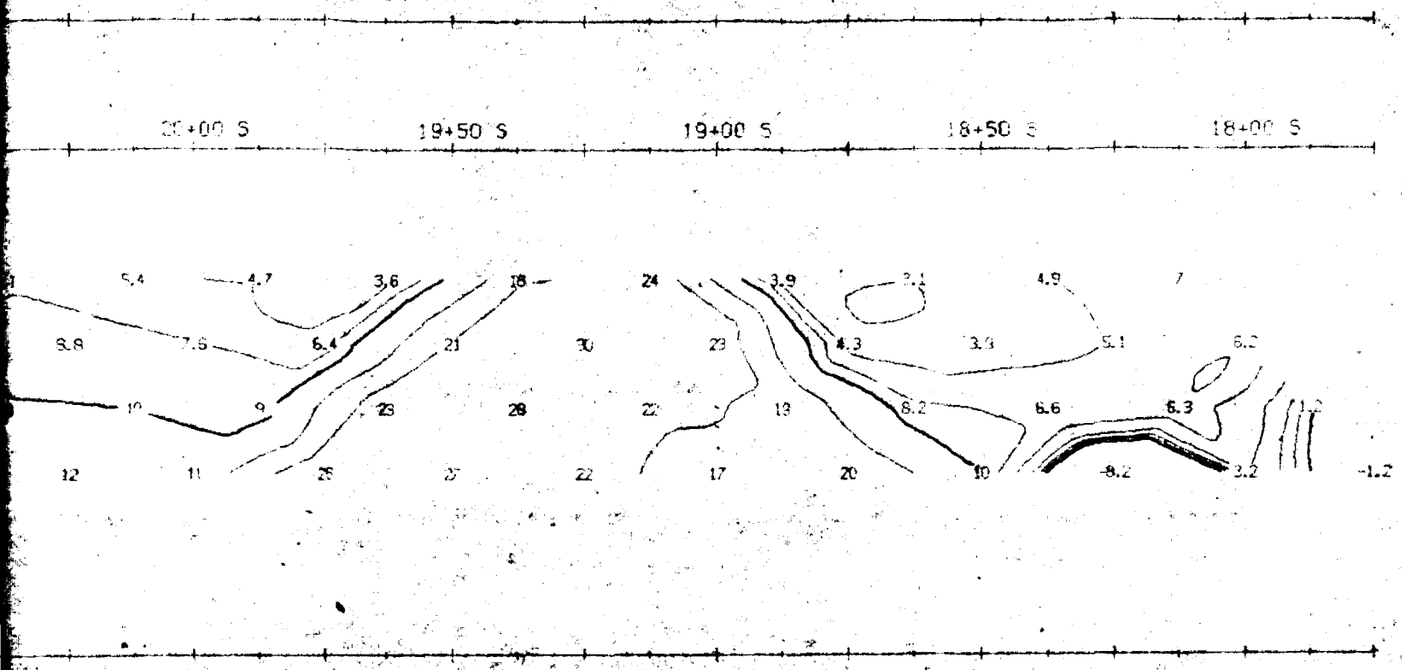
Title
Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: Aug 18, 1989	Scale: 1 : 1250
Interp. by: P.L.	Job # M-310

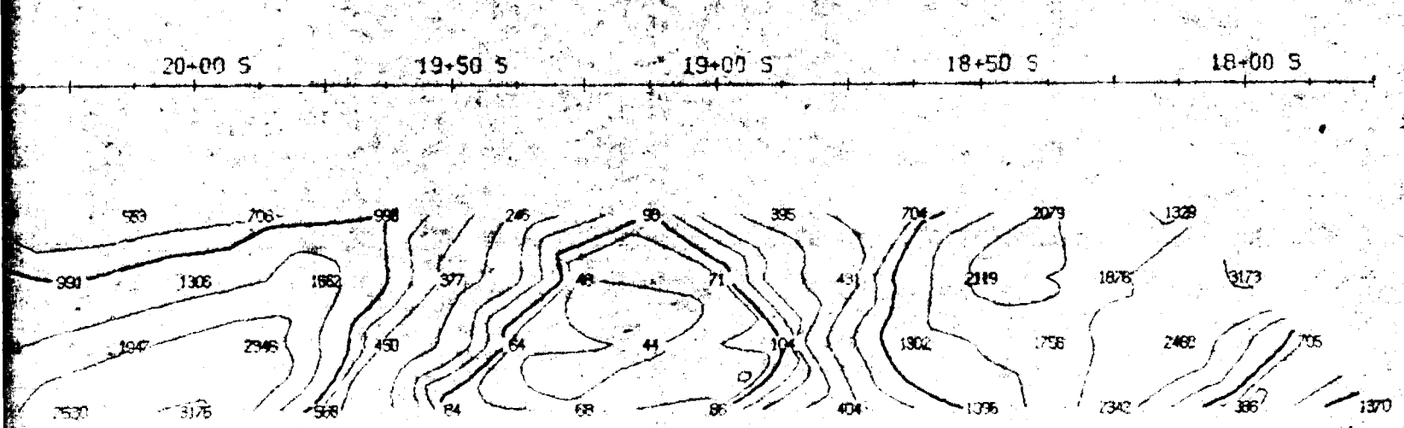
R. R.


24+00 S
23+50 S
23+00 S
22+50 S
22+00 S
21+50 S
21+00 S
20+50 S
filter
n=1
n=2
n=3
n=4

INTERPRETATION

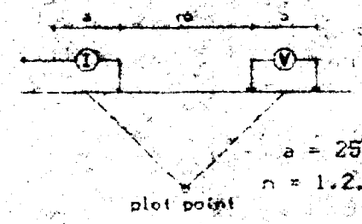


TOPOGRAPHY



3+00E

Pole-Dipole Array



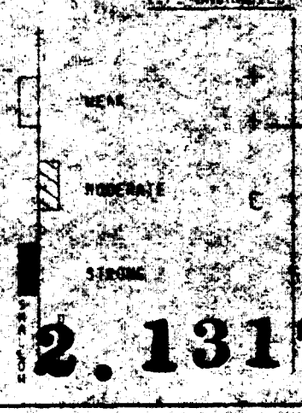
Filtered Profiles

Resistivity
Chargeability
Metal Factor

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10...

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: D. Halbage

I.P. ANOMALIES

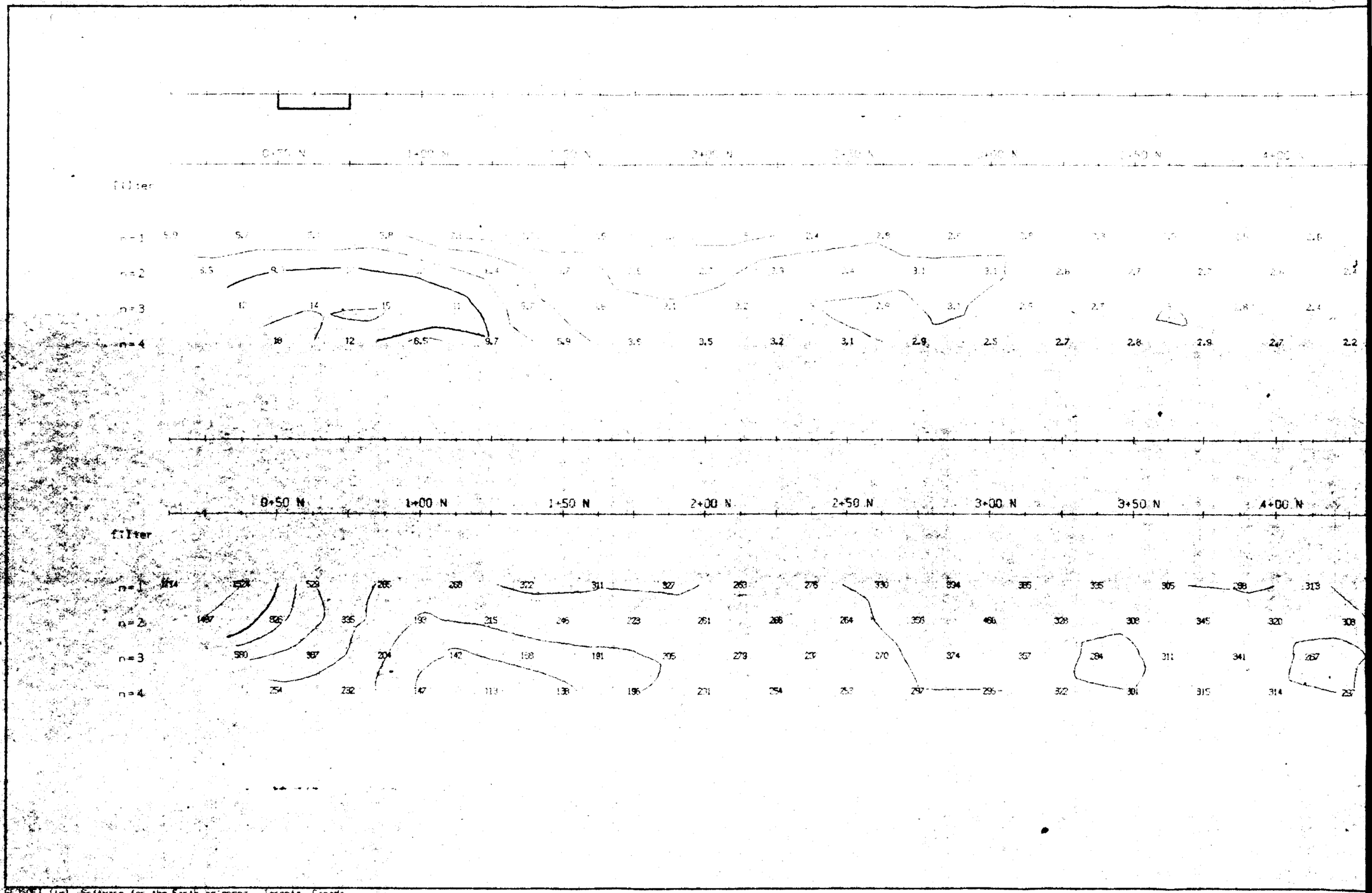


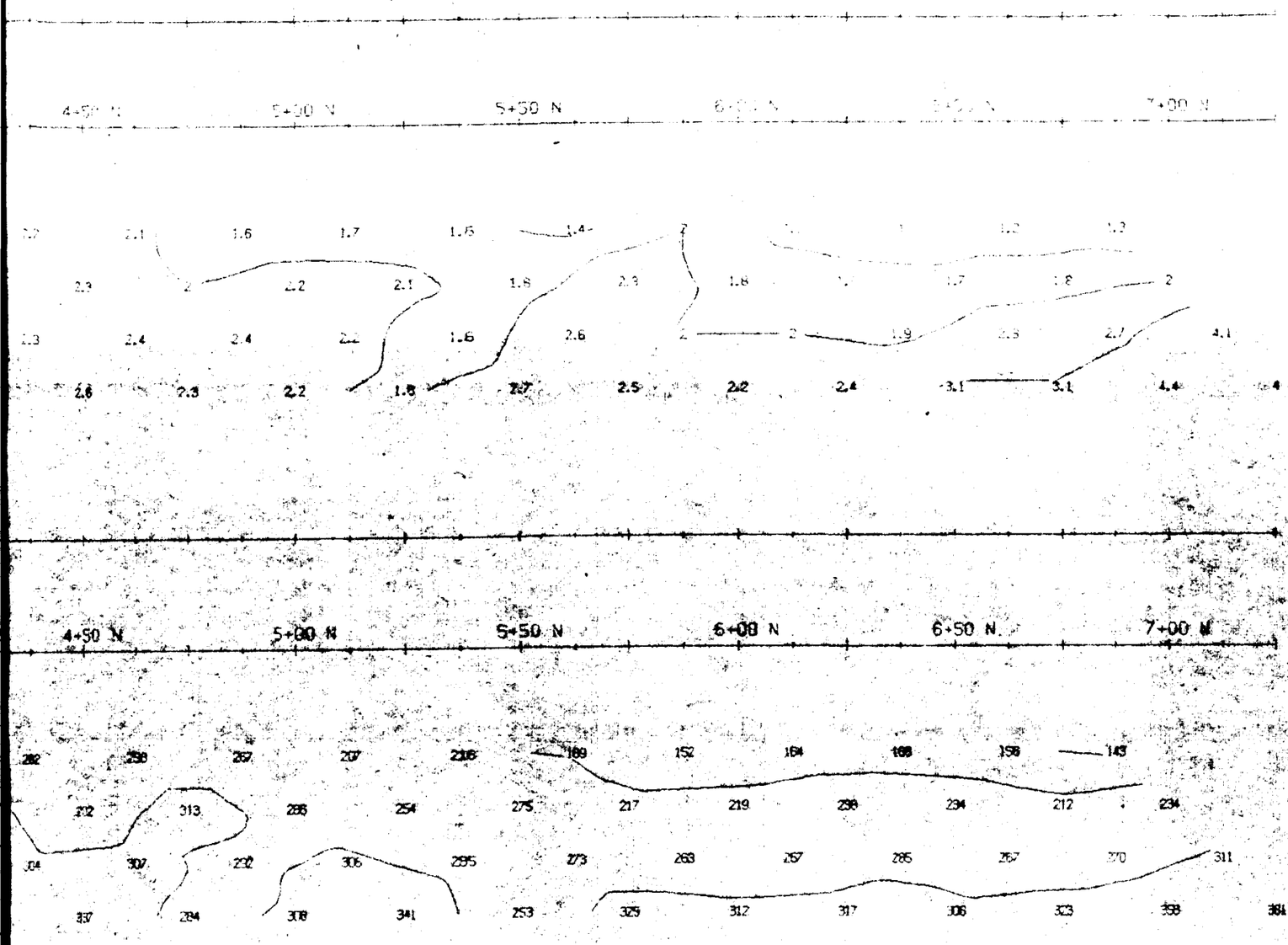
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for GLEN AUDEN RESOURCES

Title: Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp, Ont.

Date: Aug 18, 1989	Scale: 1 : 1250
Interp. by: R.L.	Job # M-310





INTERPRETATION

5+00W

Pole-Dipole Array

a = 25 m
n = 1,2,3,4
plot point

Filtered Profiles

Resistivity
Chargeability
Metal Factor

Logarithmic Contours: .1, .15, .2, .3, .5, .7, .5, 1.0

Instrument: IPR-11
Transmitter: Ronka 7.5 KW
Operator: G. Helgoe

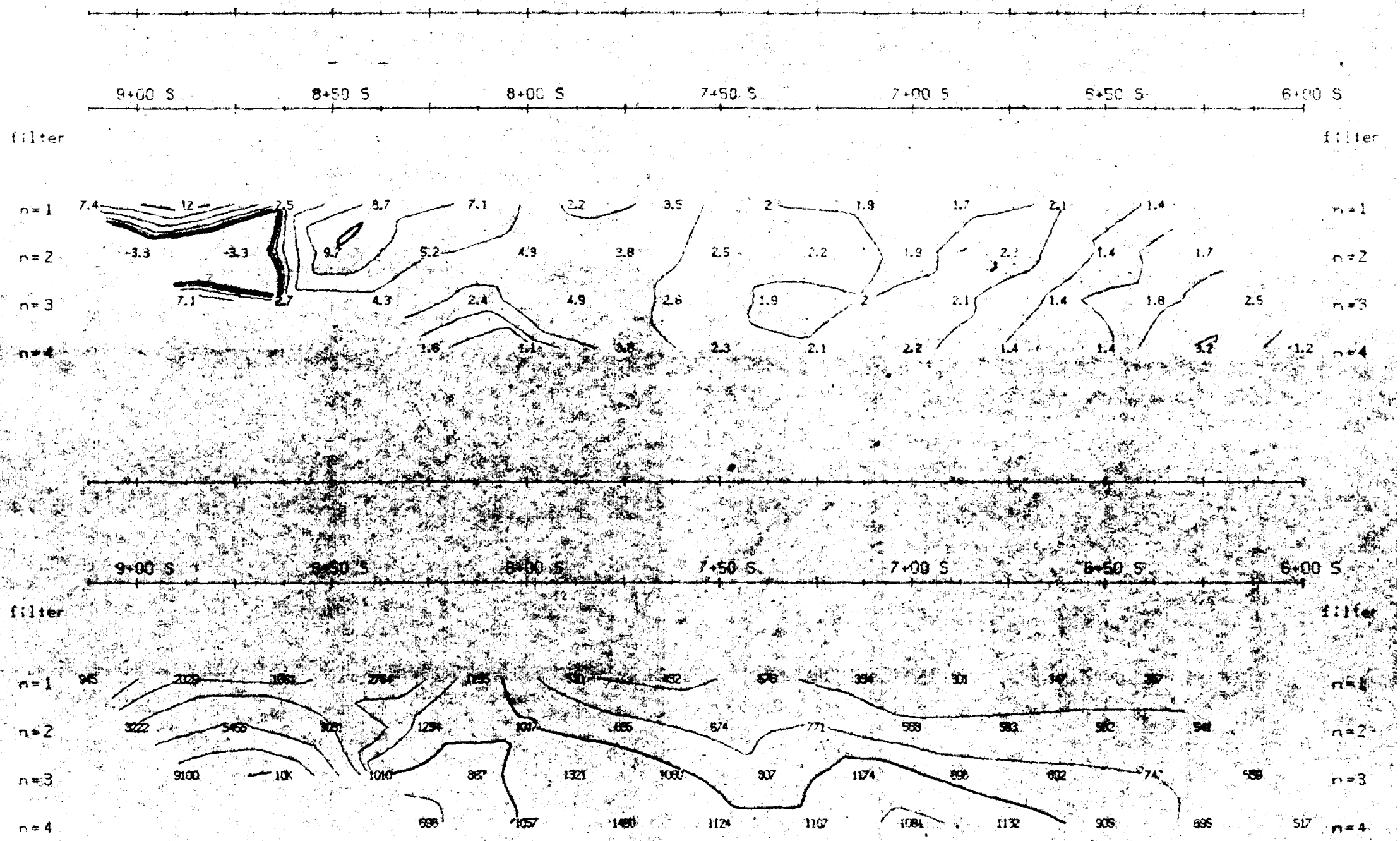
2.13177

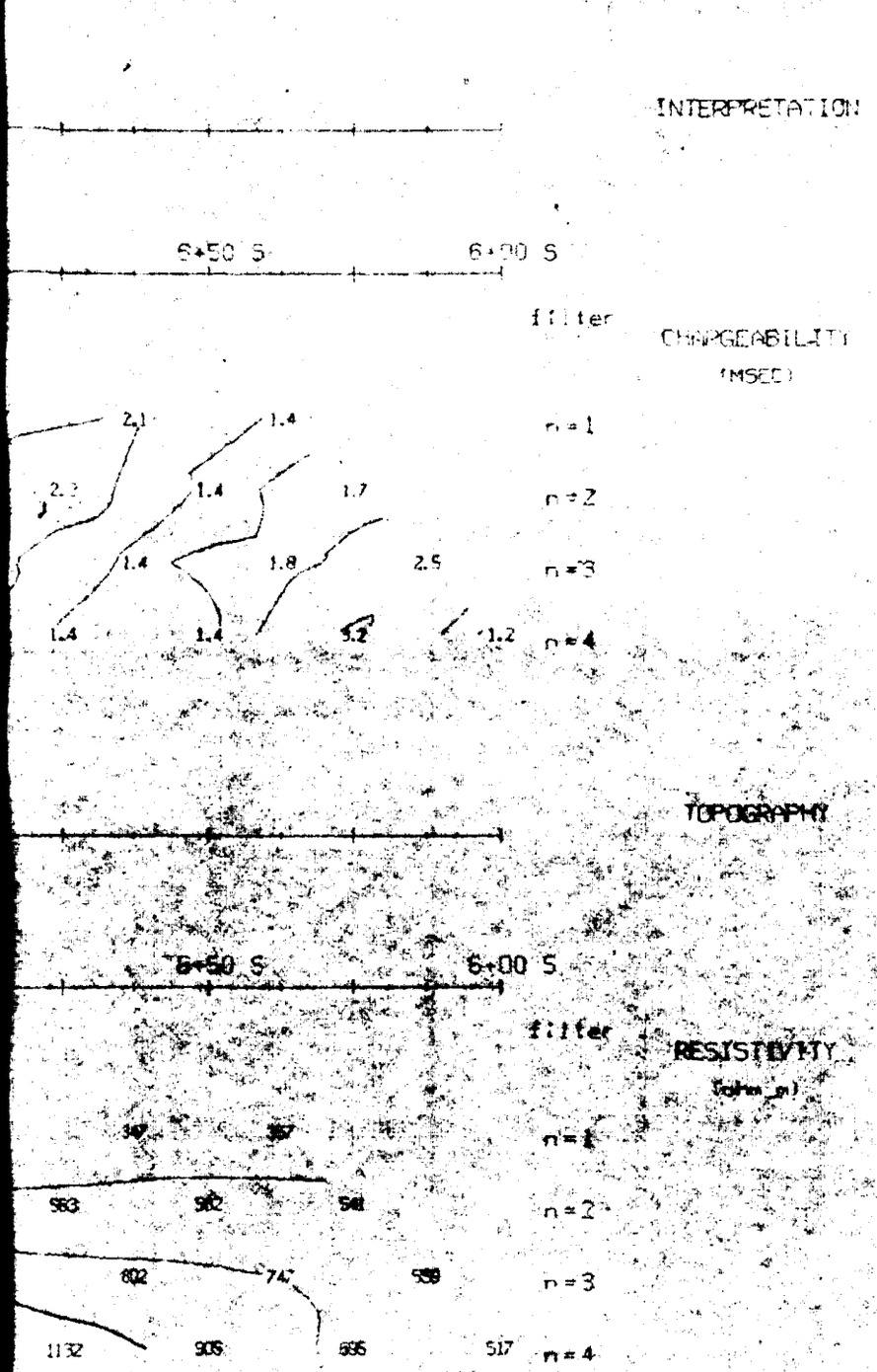
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for GLEN AUDEN RESOURCES

Title: Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp., Ont.

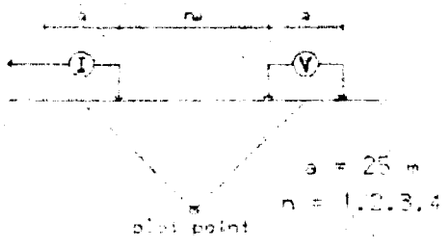
Date: Aug 23, 1989 | Scale: 1" = 1250'
Interp. by: R.L. | Job # M-310


9+00 S
8+50 S
8+00 S
7+50 S
7+00 S
6+50 S
6+00 S
filter
filter
n = 1
n = 2
n = 3
n = 4
n = 1
n = 2
n = 3
n = 4



5+00W

Pole-Dipole Array

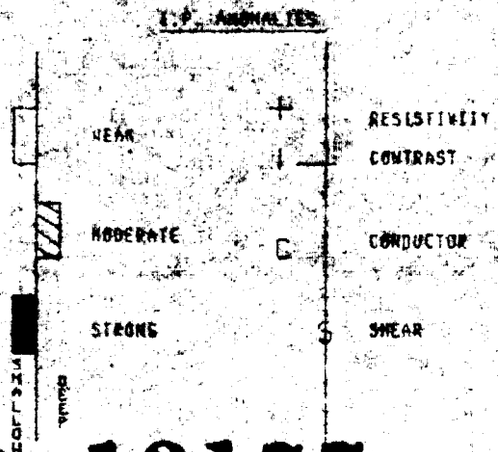


Filtered Profiles

Resistivity ————
Chargeability ————
Metal Factor - - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: B. Malpage



2 13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

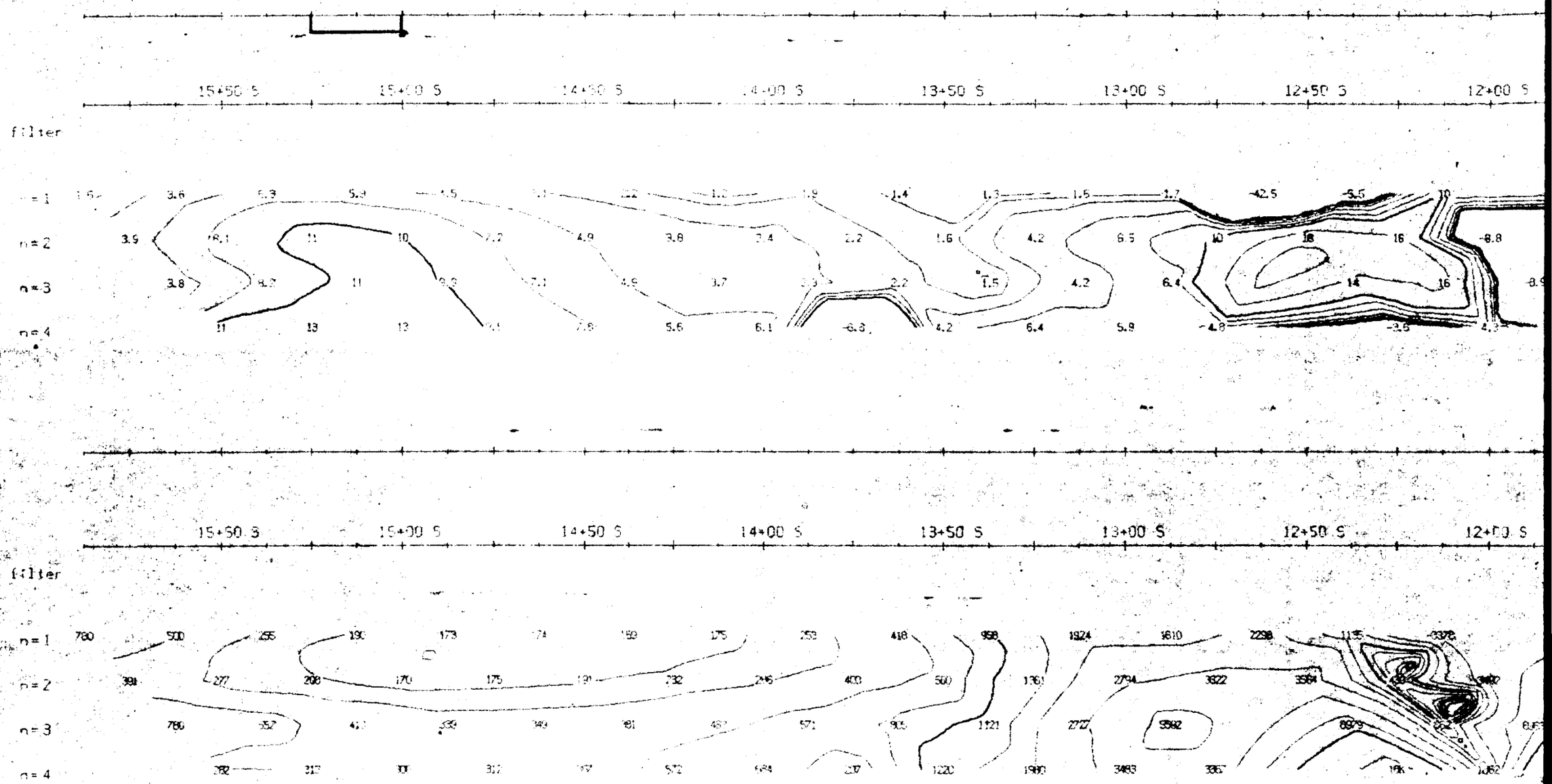
for

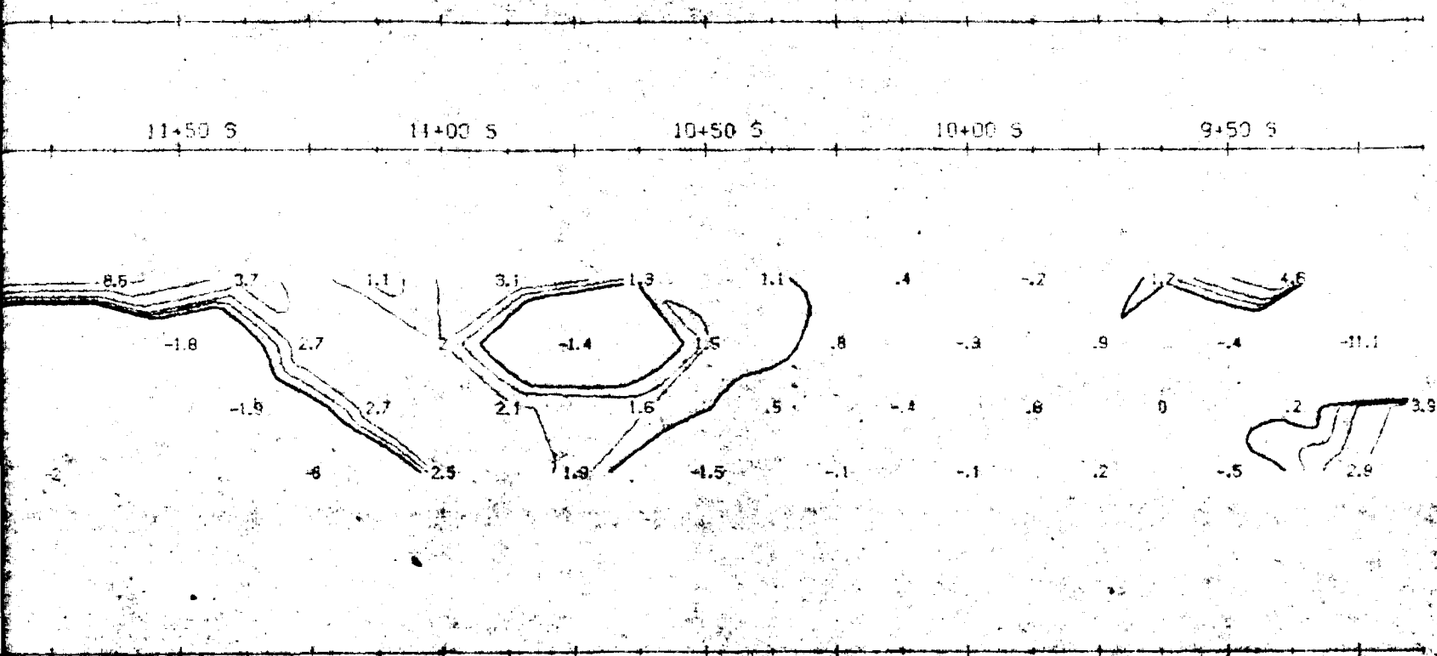
GLEN AUDEN RESOURCES

Title

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: Aug 17, 1989	Scale= 1 : 1250
Interp. by: R.L.	Job # M-310

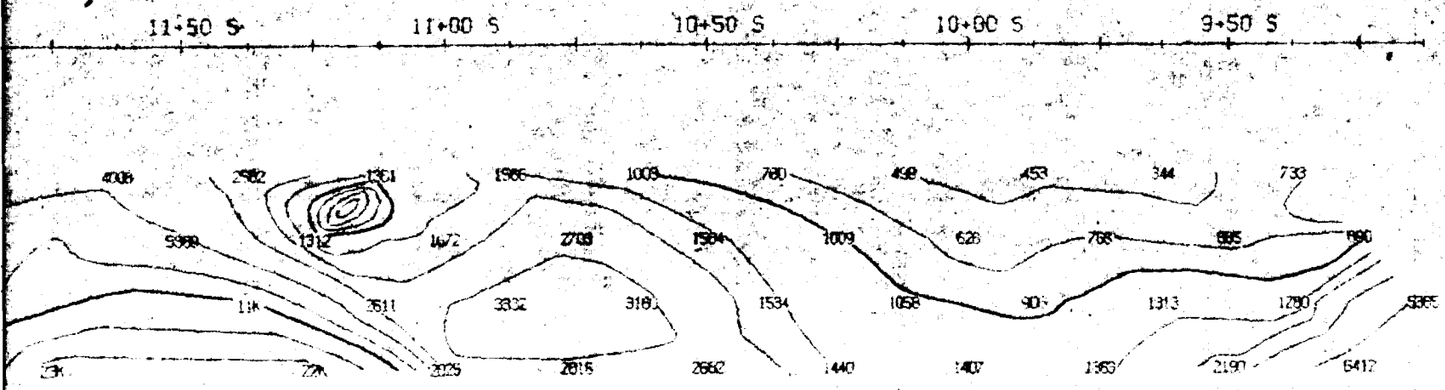




INTERPRETATION

CHARGEABILITY
(MSEC)

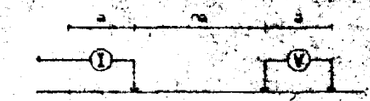
TOPOGRAPHY



RESISTIVITY
(ohm-m)

S-1000

Pole-Dipole Array



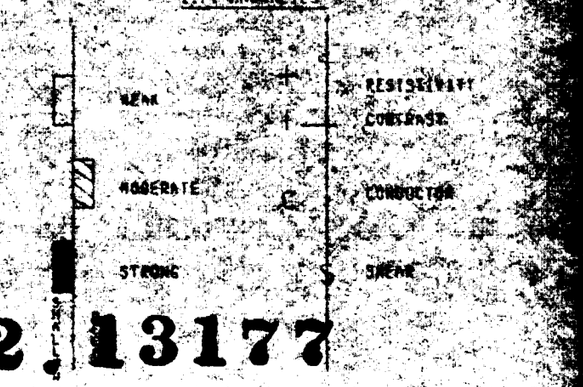
a = 25 m
n = 1,2,3,4
plot point

Filtered Profiles

Resistivity
Chargeability
Metal Factor

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10...

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: B. Malpage



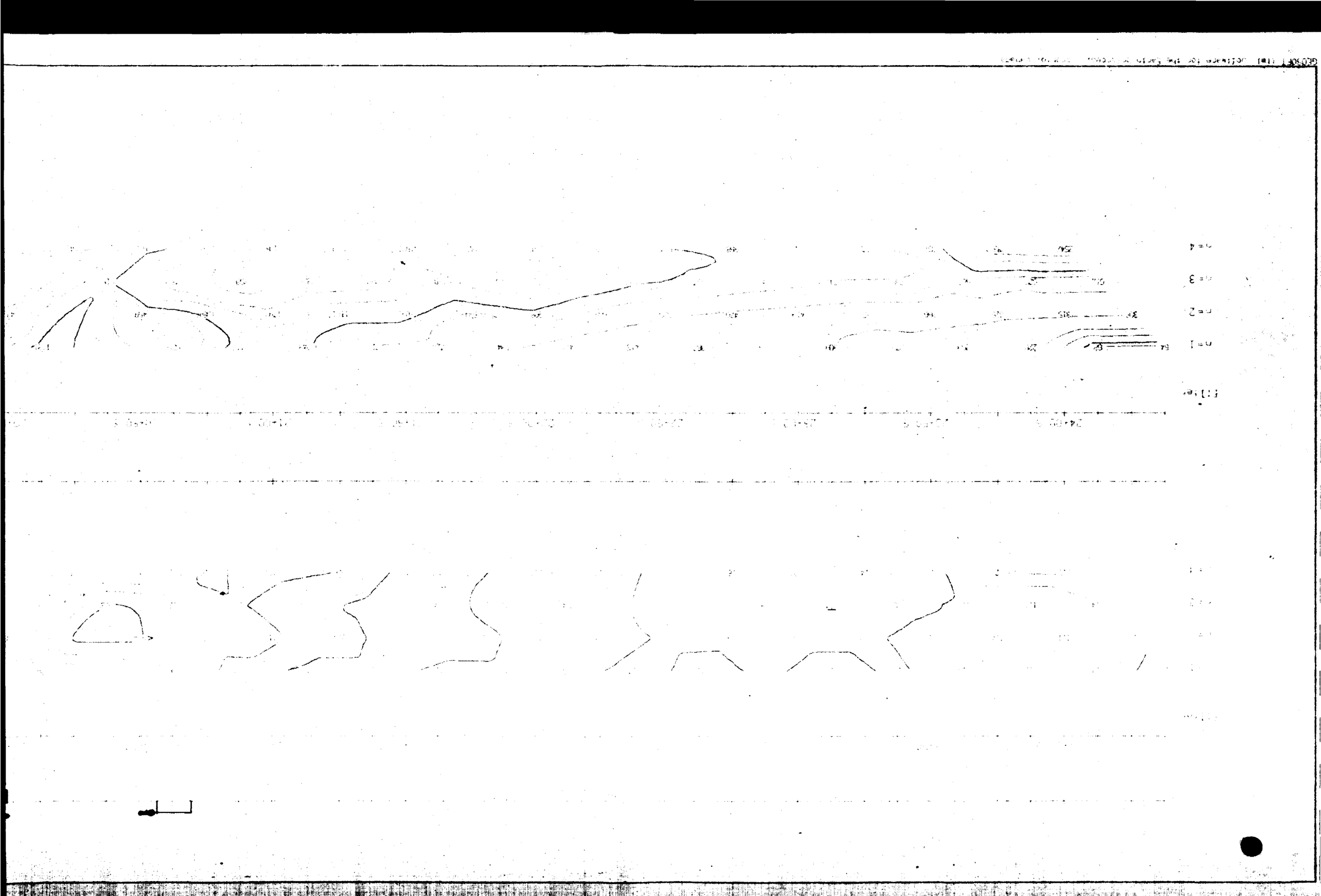
2,13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

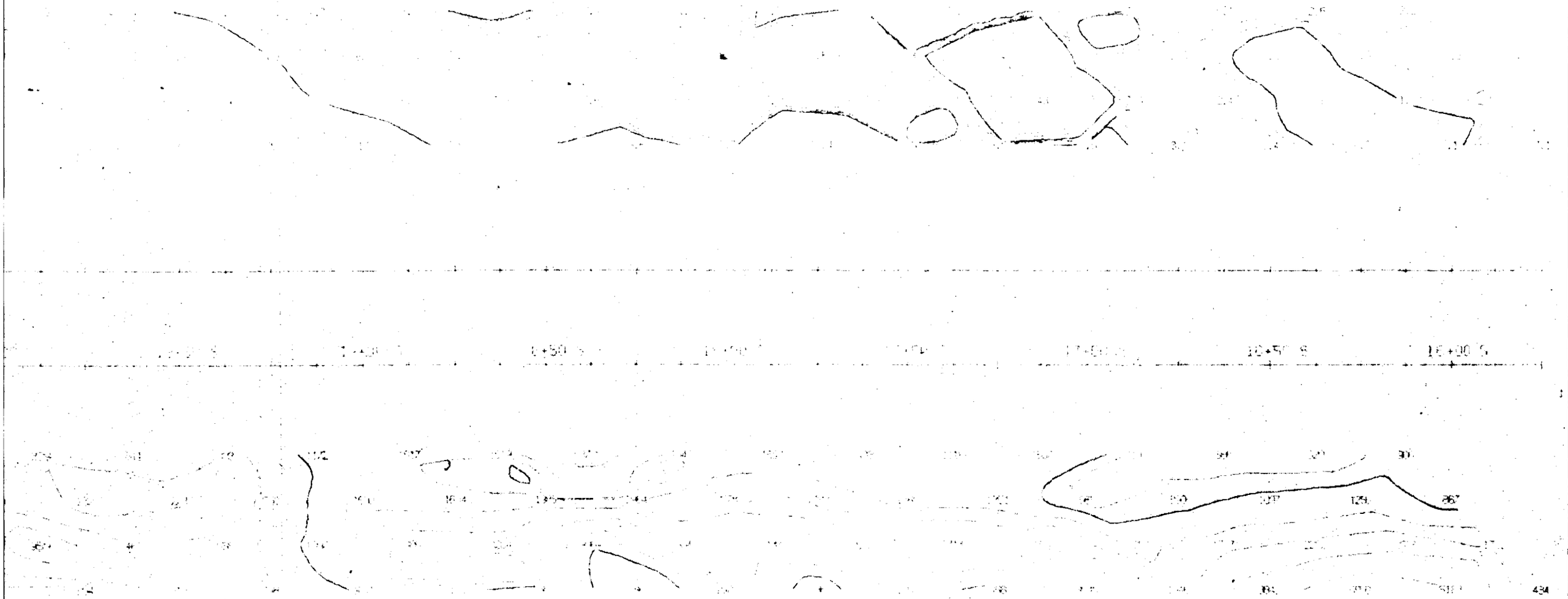
for GLEN AUDEN RESOURCES

title Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp, Ont.

Date: Aug 17, 1989	Scale: 1 : 1250
Interp. by: R.L.	Job # M-310

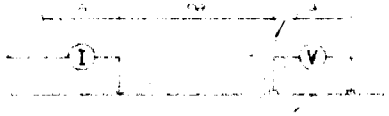

n = 4
n = 3
n = 2
n = 1

R.R.



5+00W

Pole-Dipole Array

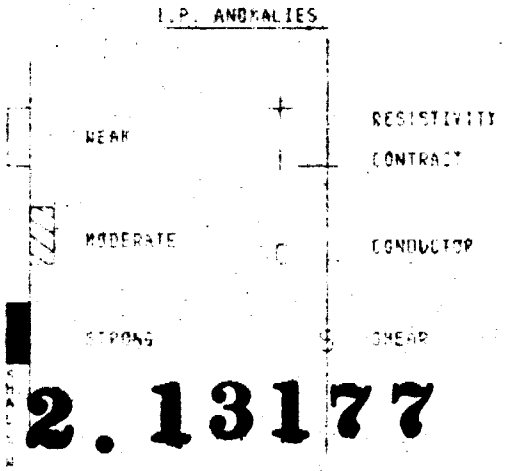


Filtered Profiles

Resistivity ————
Chargeability ————
Metal Factor ----------

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10,...

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: R. Malbaga

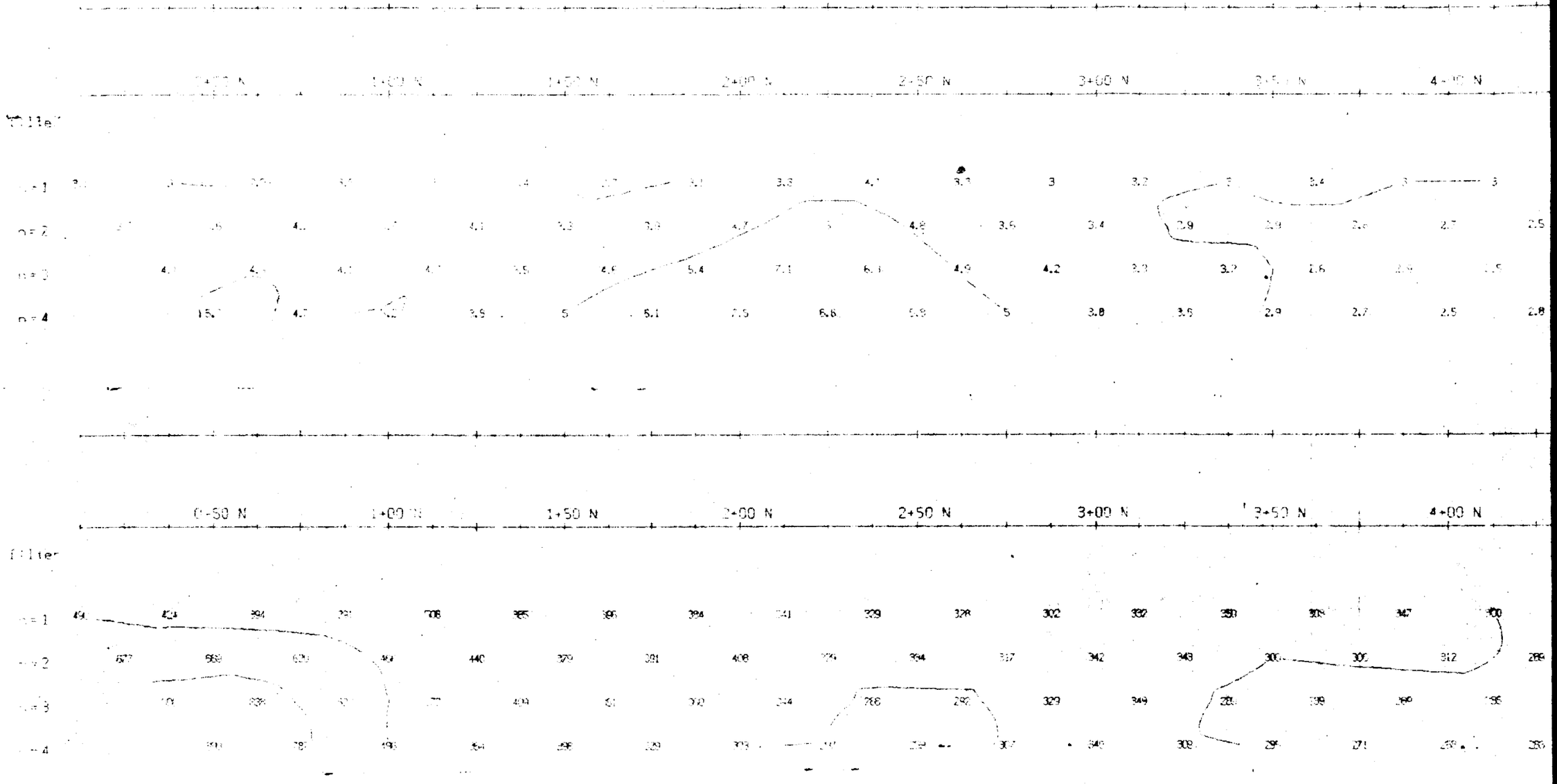


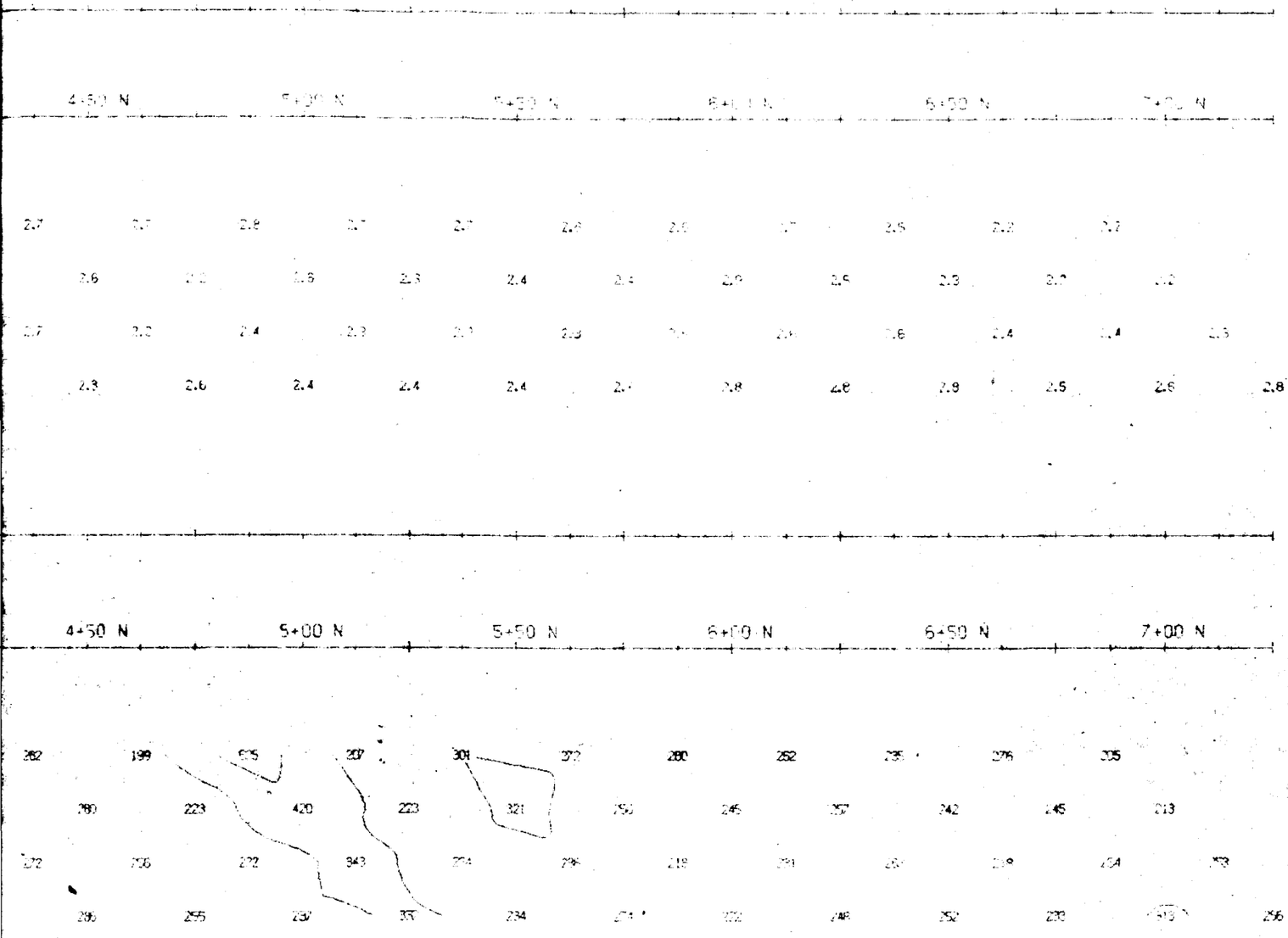
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

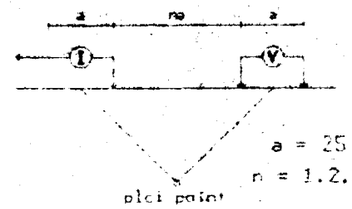
Date: Aug. 1989	Scale: 1 : 1250
Interp. by: P.G.	Job # N-310


0+50 N
1+00 N
1+50 N
2+00 N
2+50 N
3+00 N
3+50 N
4+00 N
filter
n = 1
n = 2
n = 3
n = 4



7+00W

Pole-Dipole Array



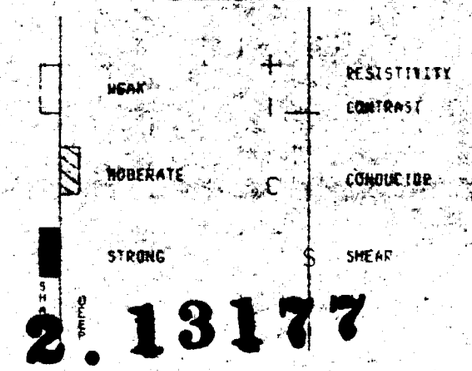
Filtered Profiles

Resistivity ———
Chargeability ——————
Metal Factor - - - - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IPR-11
Transmitter: Huntec 7.5 kW
Operator: B. Malpage

I.P. ANOMALIES



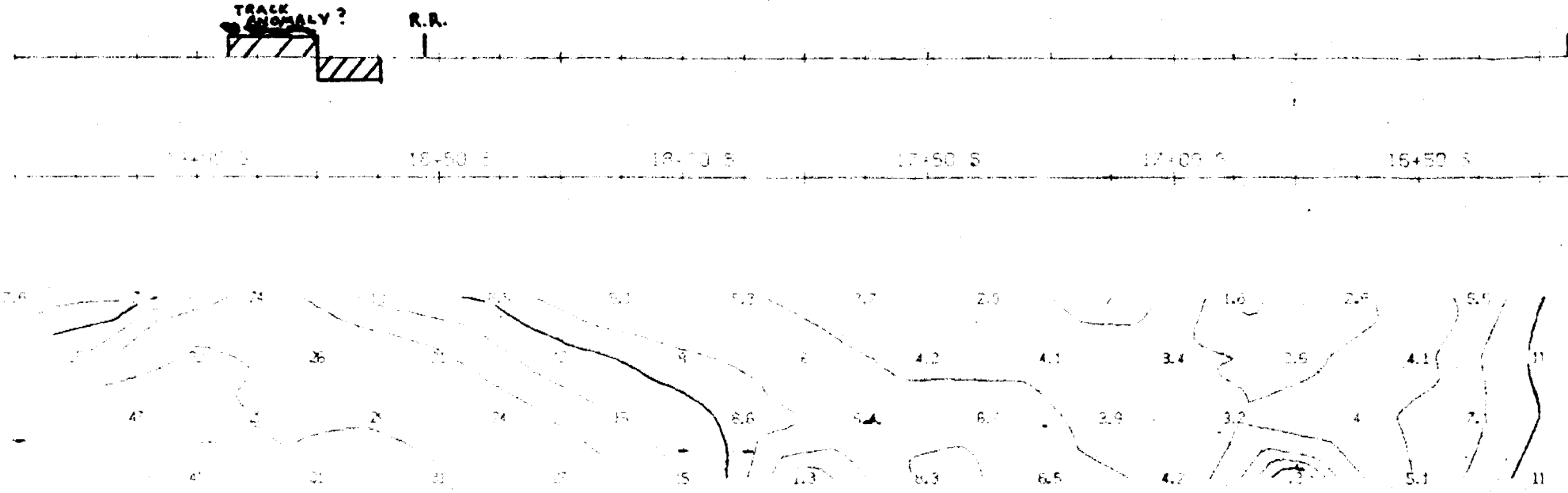
2.13177

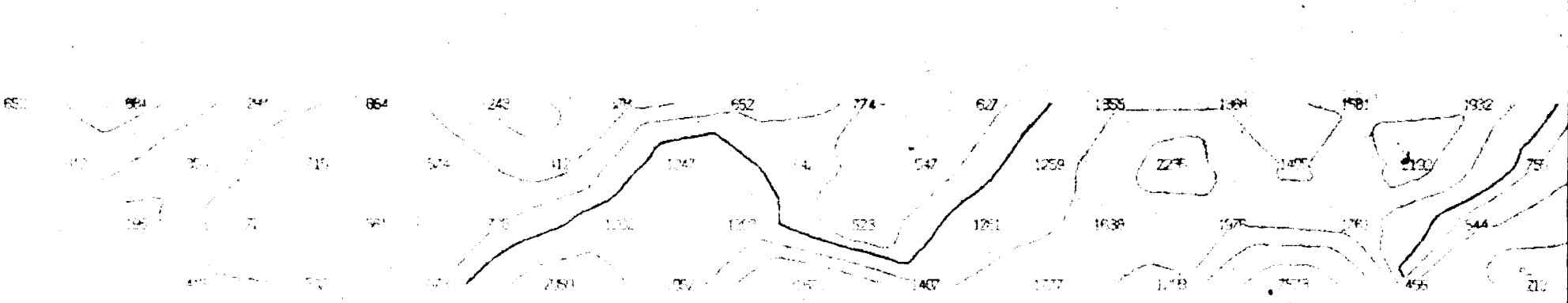
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for GLEN AUDEN RESOURCES

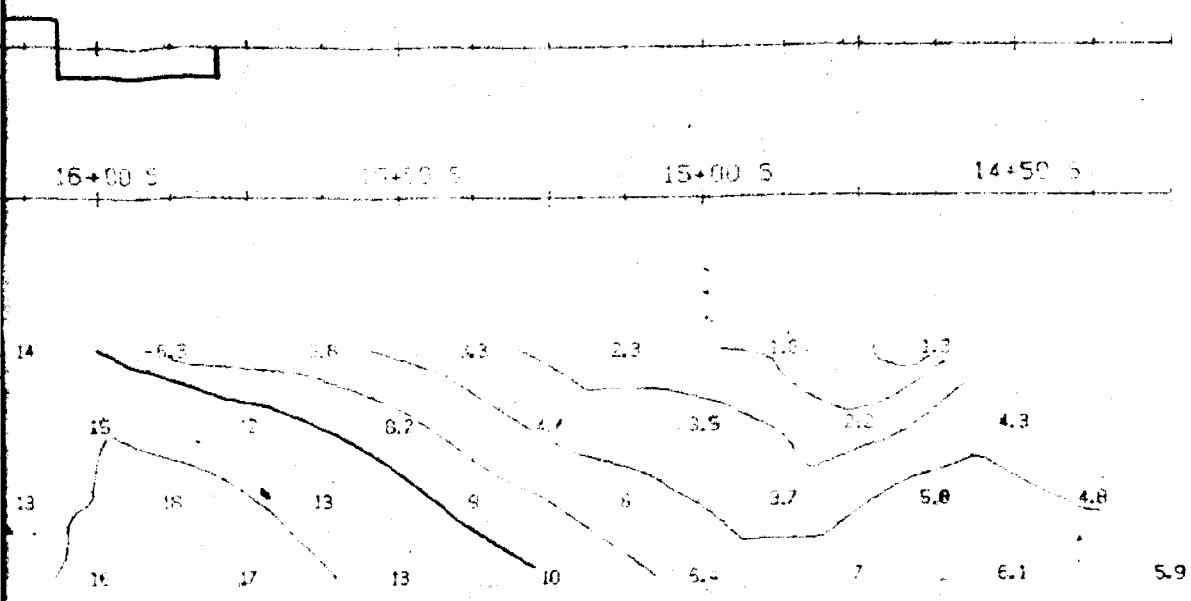
Title
Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: Aug 23,1989	Scale: 1 : 1250
Interp. by: R.L.	Job # M-310

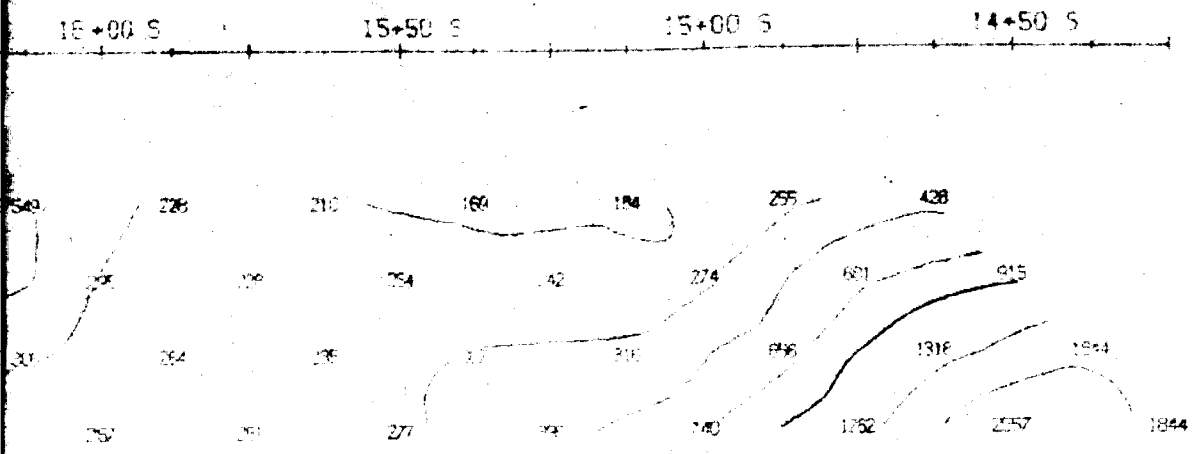

TRACK ANOMALY ?
R.R.
18+50 S
18+00 S
17+50 S
17+00 S
16+50 S
filter
n = 1
n = 2
n = 3
n = 4


18+50 S
18+00 S
17+50 S
17+00 S
16+50 S
filter

INTERPRETATION

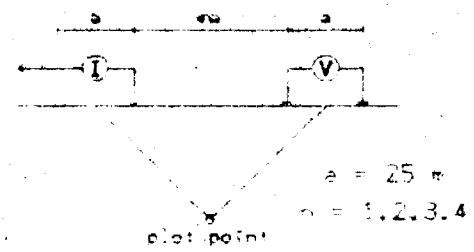


TOPOGRAPHY



7+00W

Pole-Dipole Array



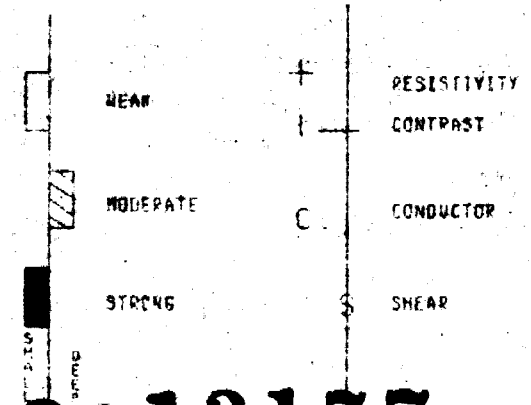
Filtered Profiles

Resistivity ———
Chargeability ———
Metal Factor - - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: B. Malpage

I.P. ANOMALIES



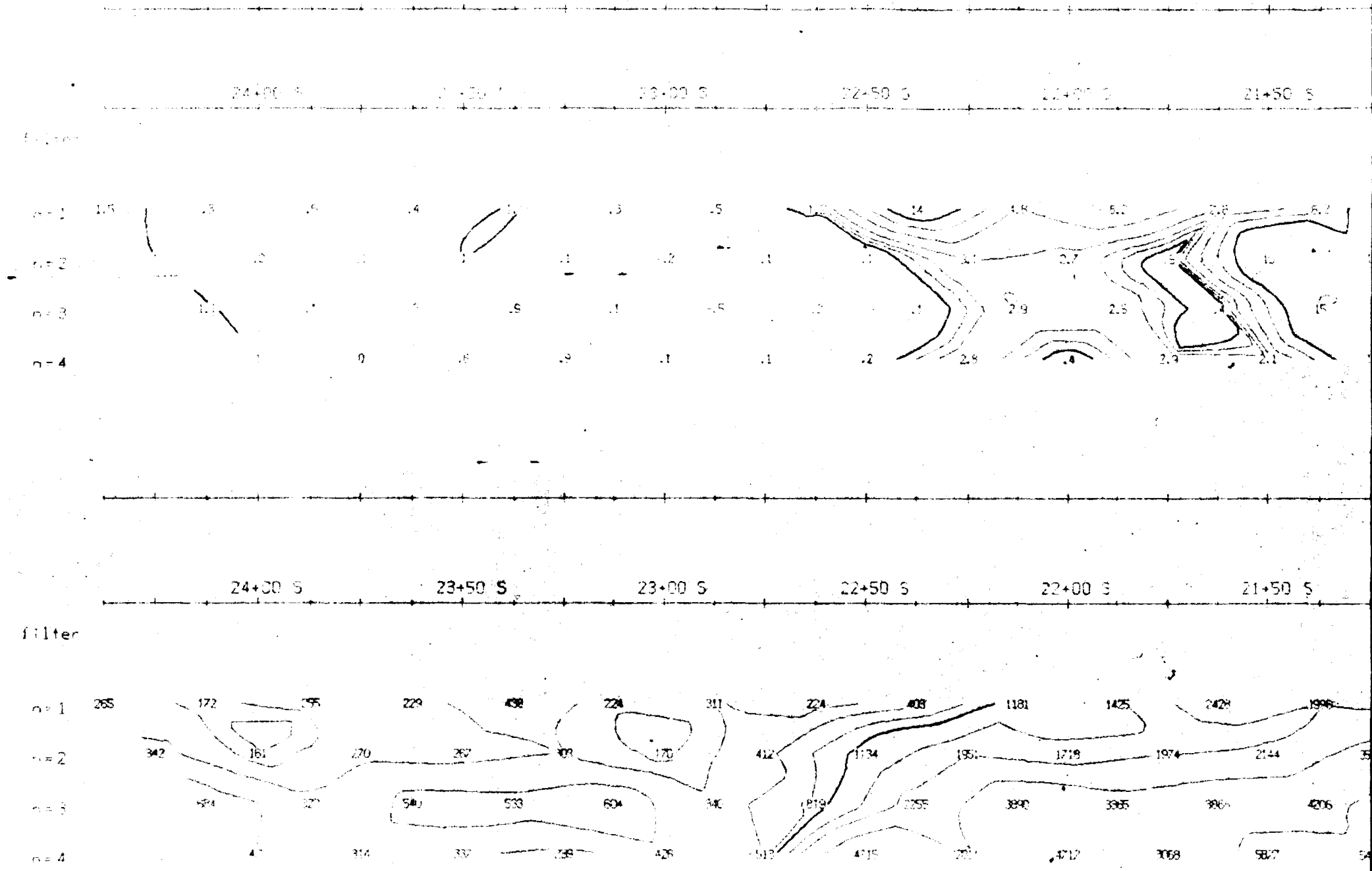
2.13177

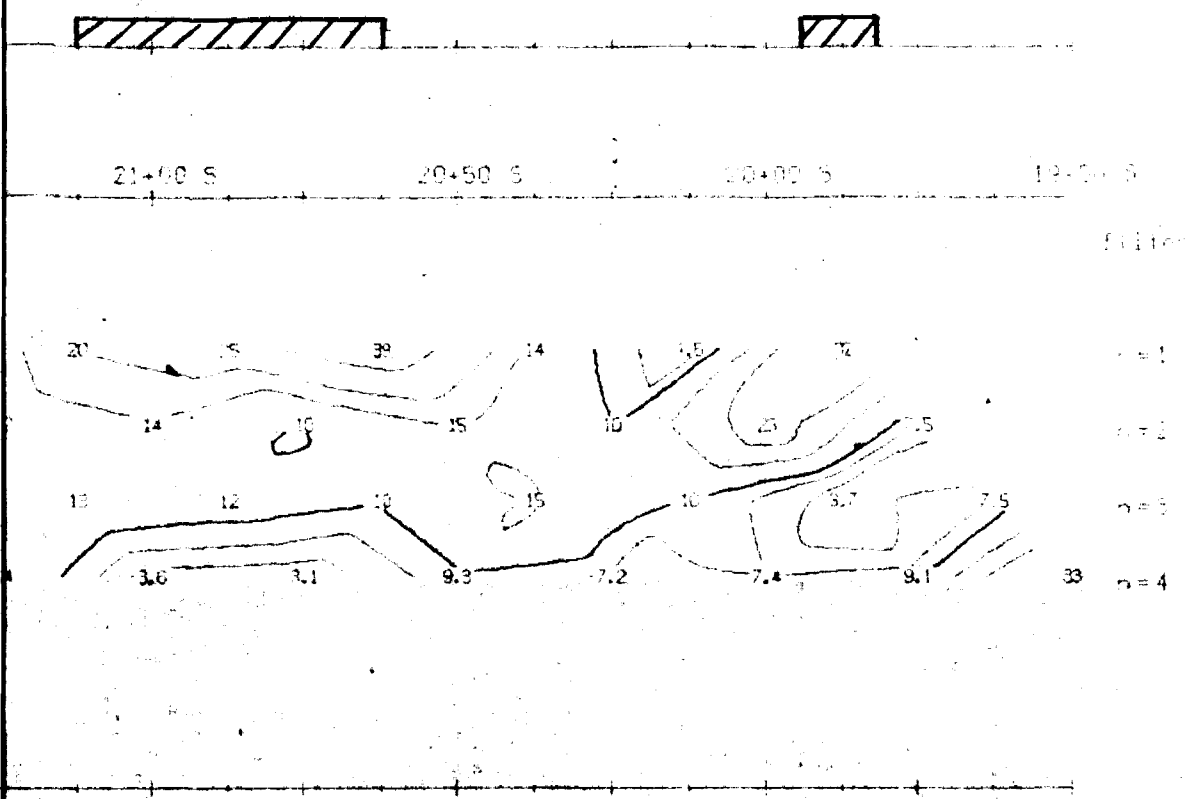
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for GLEN AUDEN RESOURCES

title Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp, Ont.

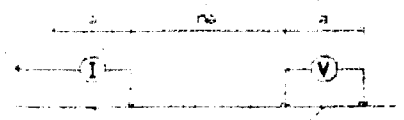
Date: Aug 13, 1983	Scale: 1 : 1250
Interp. by: R.L.	Job # M-810


24+00 S
23+50 S
23+00 S
22+50 S
22+00 S
21+50 S
filter
n = 1
n = 2
n = 3
n = 4



7+00W

Pole-Dipole Array



a = 25 m
n = 1.2.3.4

plot point

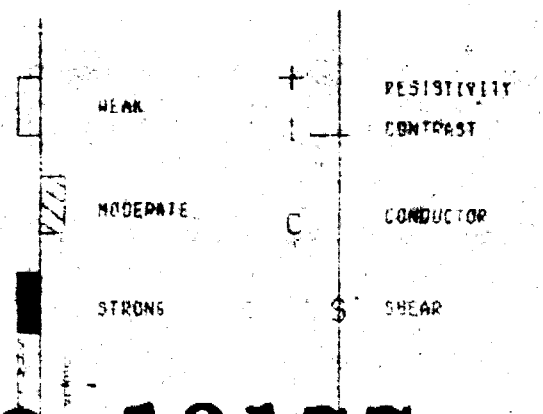
Filtered Profiles

Resistivity ——— —
Chargeability ———
Metal Factor - - - - - -

Logarithmic Contours 1. 1.5. 2. 3. 5. 7.5. 10....

Instrument: IPR-11
Transmitter: Hunter 7.5 KW
Operator: B. Nalpage

I.P. ANOMALIES



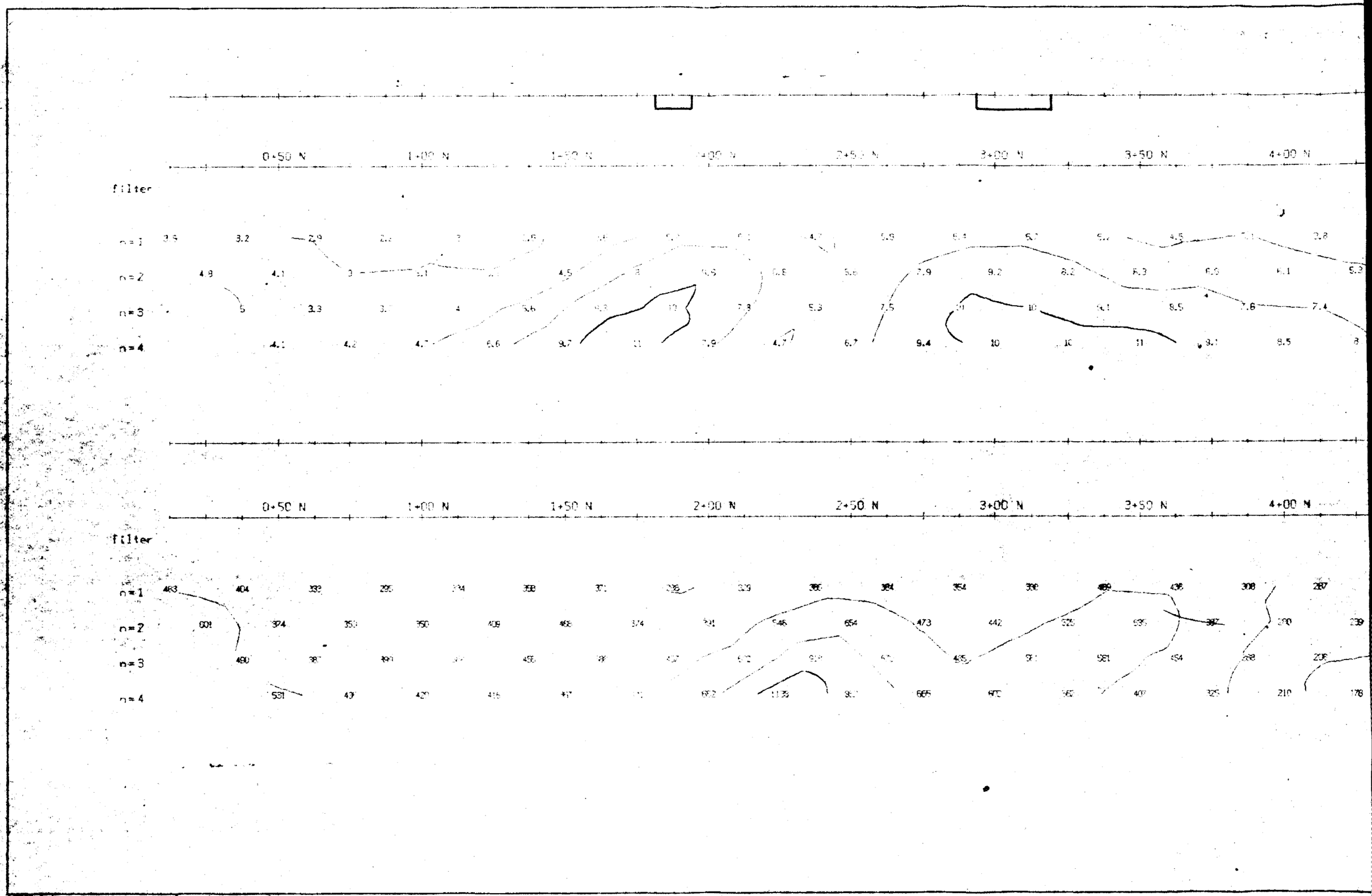
2.13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

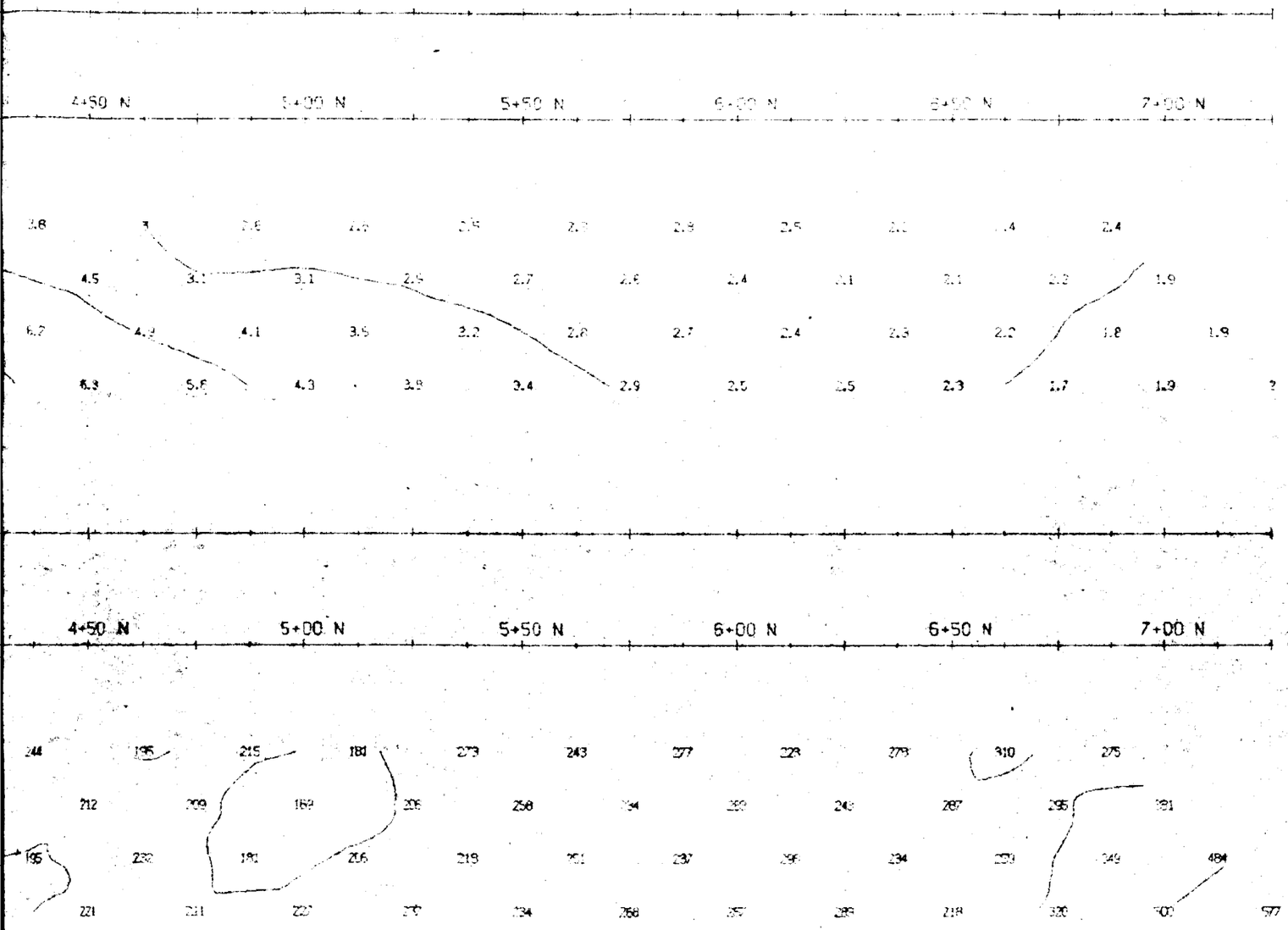
For: GLEN AUDEN RESOURCES

Title: Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: Aug 13, 1980	Scale: 1 : 1250
Interp. by: P.L.	Job # M-310



GEOSOFT (tm) Software for the Earth Sciences. Toronto, Canada



INTERPRETATION

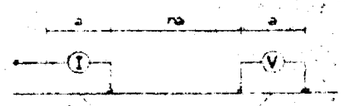
CHARGEABILITY (MSEC)

TOPOGRAPHY

RESISTIVITY (ohm_m)

9+00W

Pole-Dipole Array



a = 25 m
n = 1,2,3,4

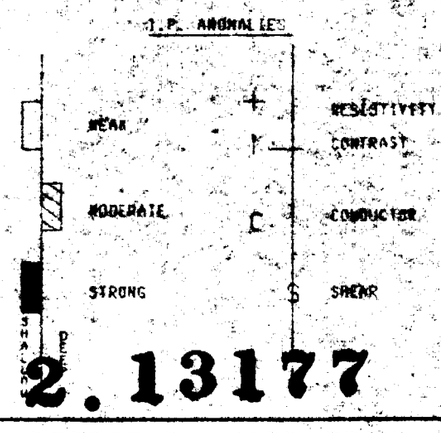
plot point

Filtered Profiles

Resistivity ———
Chargeability ———
Metal Factor - - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: B. Malpage



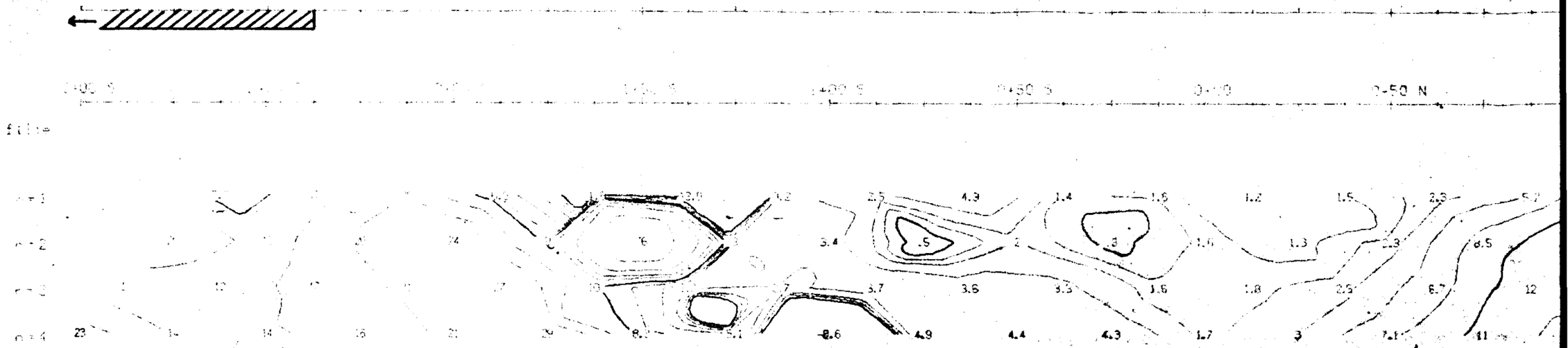
2.13177

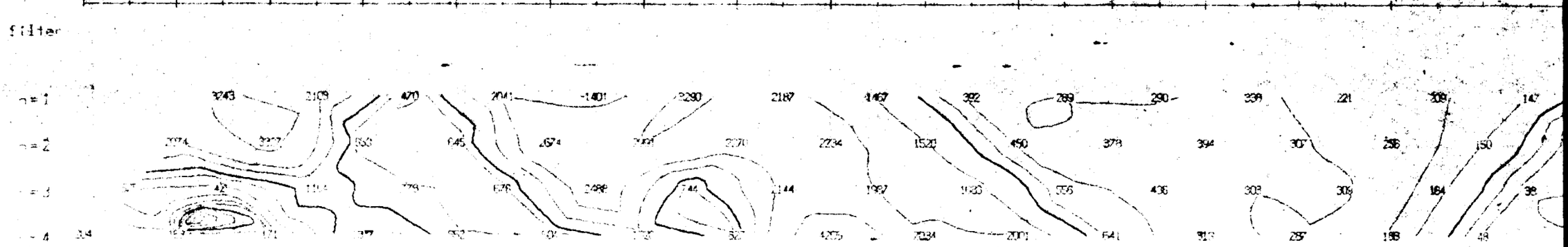
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for: GLEN AUDEN RESOURCES

Title: Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: Aug 23,1989	Scale: 1 : 1250
Interp. by: R.L.	Job # M-310

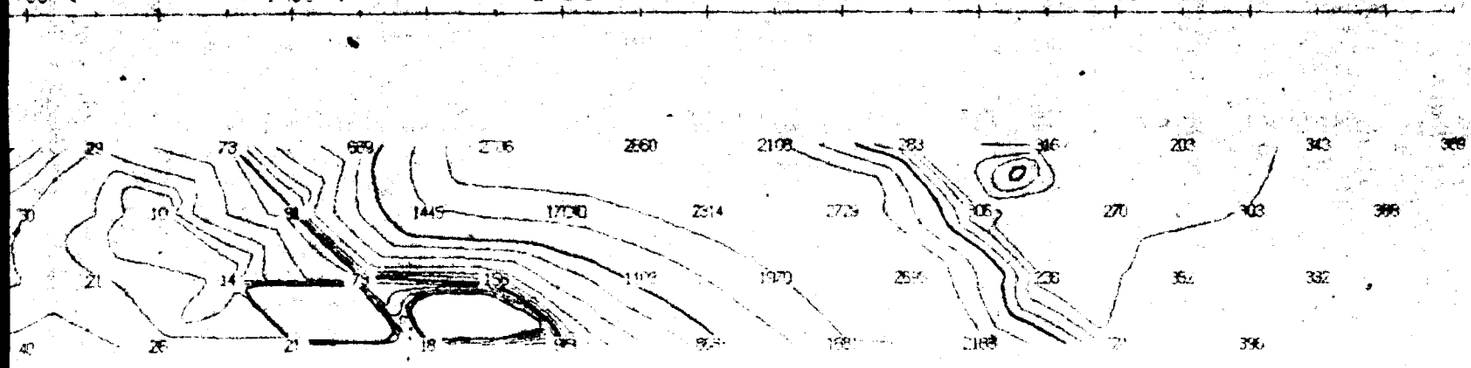




INTERPRETATION

CHARGEABILITY (MSEC)

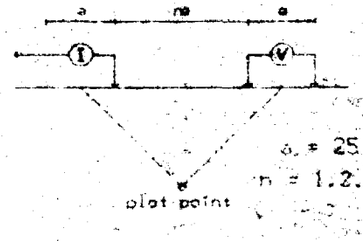
TOPOGRAPHY



RESISTIVITY (ohm-m)

9+00W

Pole-Dipole Array



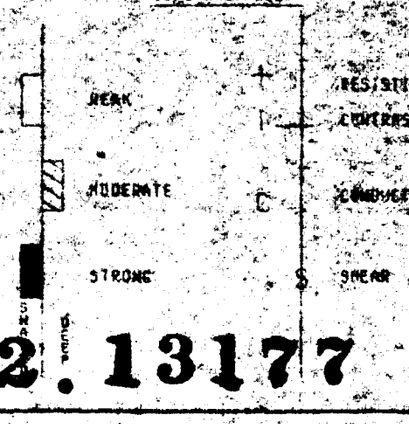
Filtered Profiles

Resistivity
Chargeability
Metal Factor

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10.....

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: B. Walpole

I.P. ANOMALIES



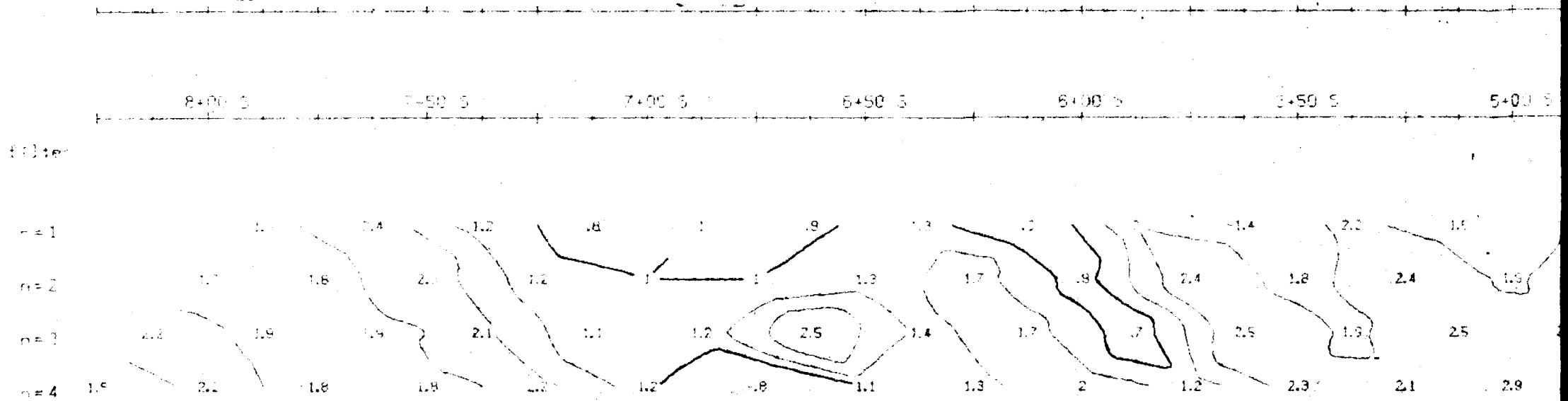
2.13177

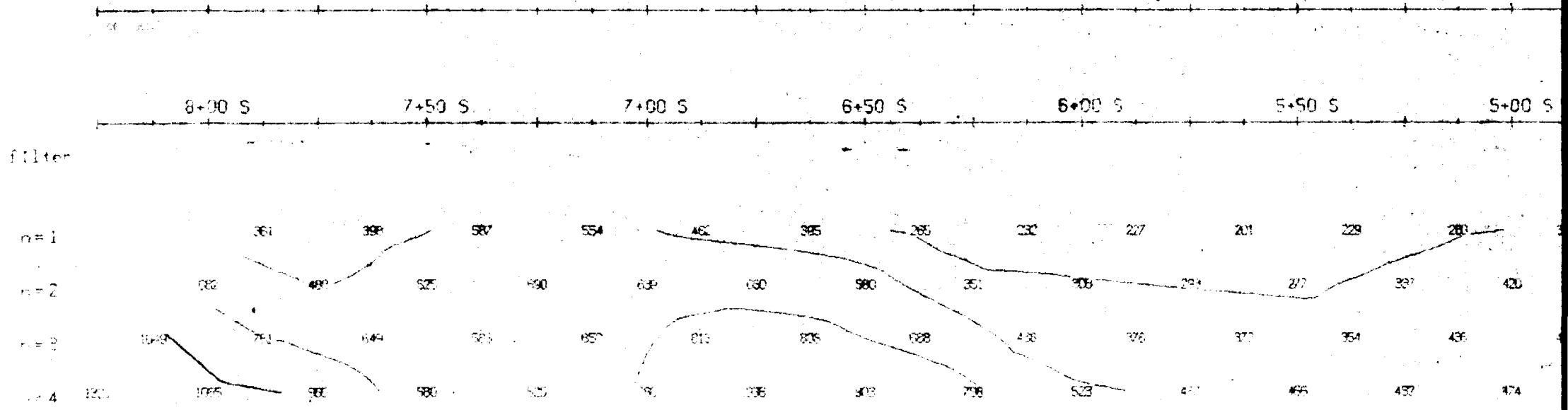
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

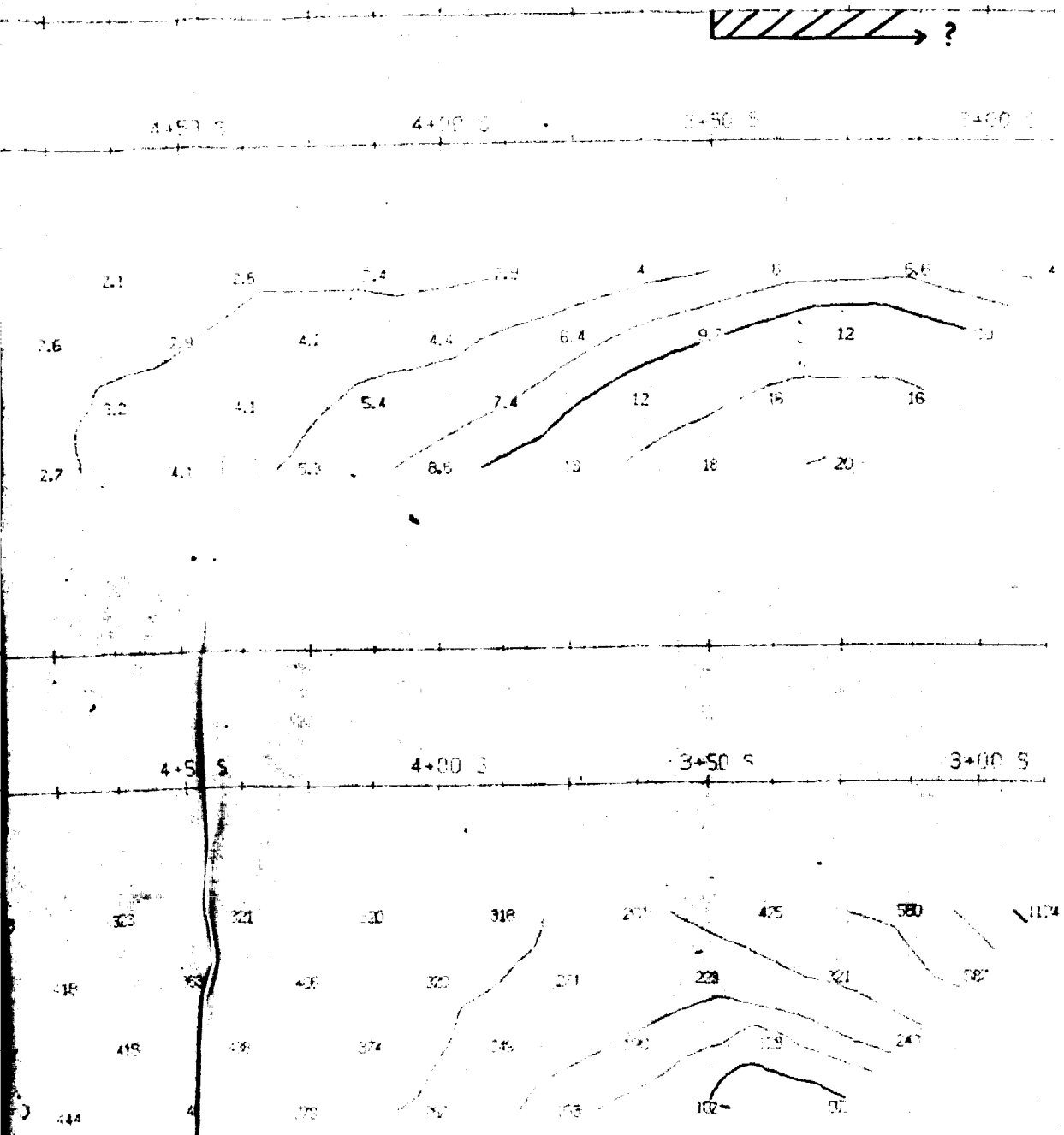
for GLEN AUDEN RESOURCES

Title: Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp, Ont.

Date: Aug 29, 1989	Scale: 1 : 1250
Interp. by: R.L.	Job # M-310



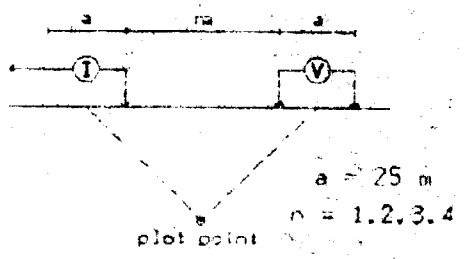




INTERPRETATION

9+00W

Pole-Dipole Array

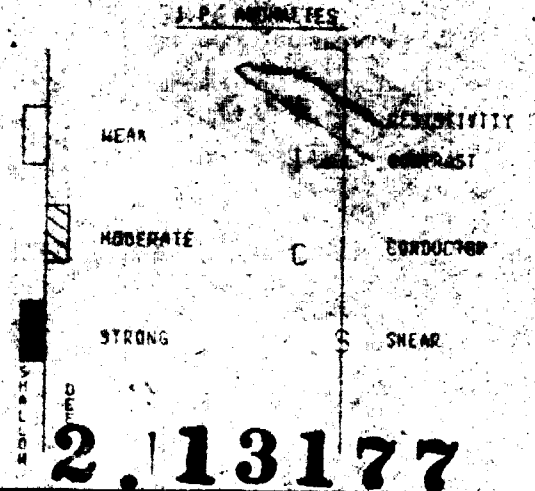


Filtered Profiles

Resistivity ———
Chargeability ———
Metal Factor ———

Logarithmic
Contours 1, 1.5, 2, 3, 5, 7.5, 10...

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: B. Malpage



2.13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for
GLEN AUDEN RESOURCES

Title
Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: Aug 29, 1989	Scale: 1 : 1250
Interp. by: R.L.	Job # M-310

R.R.

18+50 S | 18+00 S | 17+50 S | 17+00 S | 16+50 S

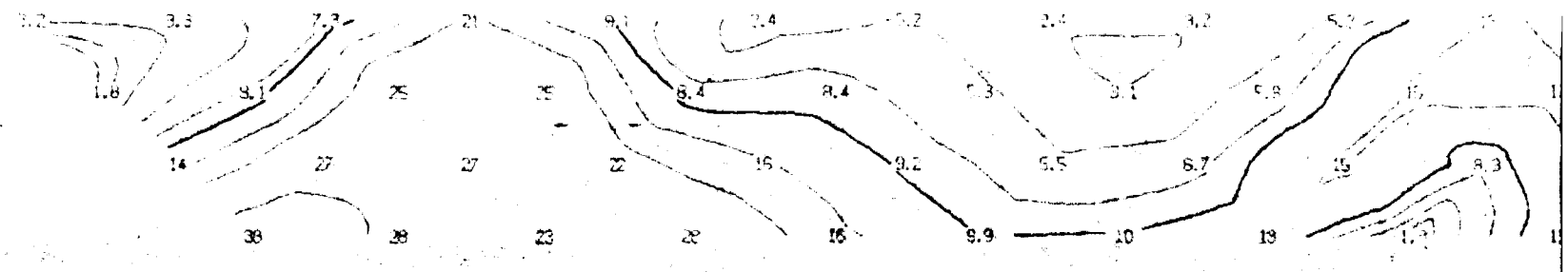
Filter

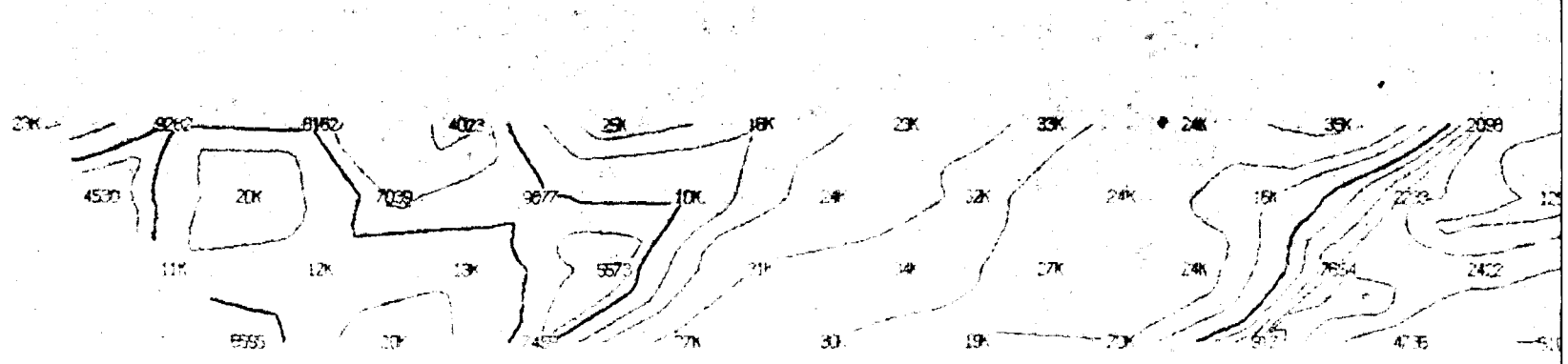
n = 1

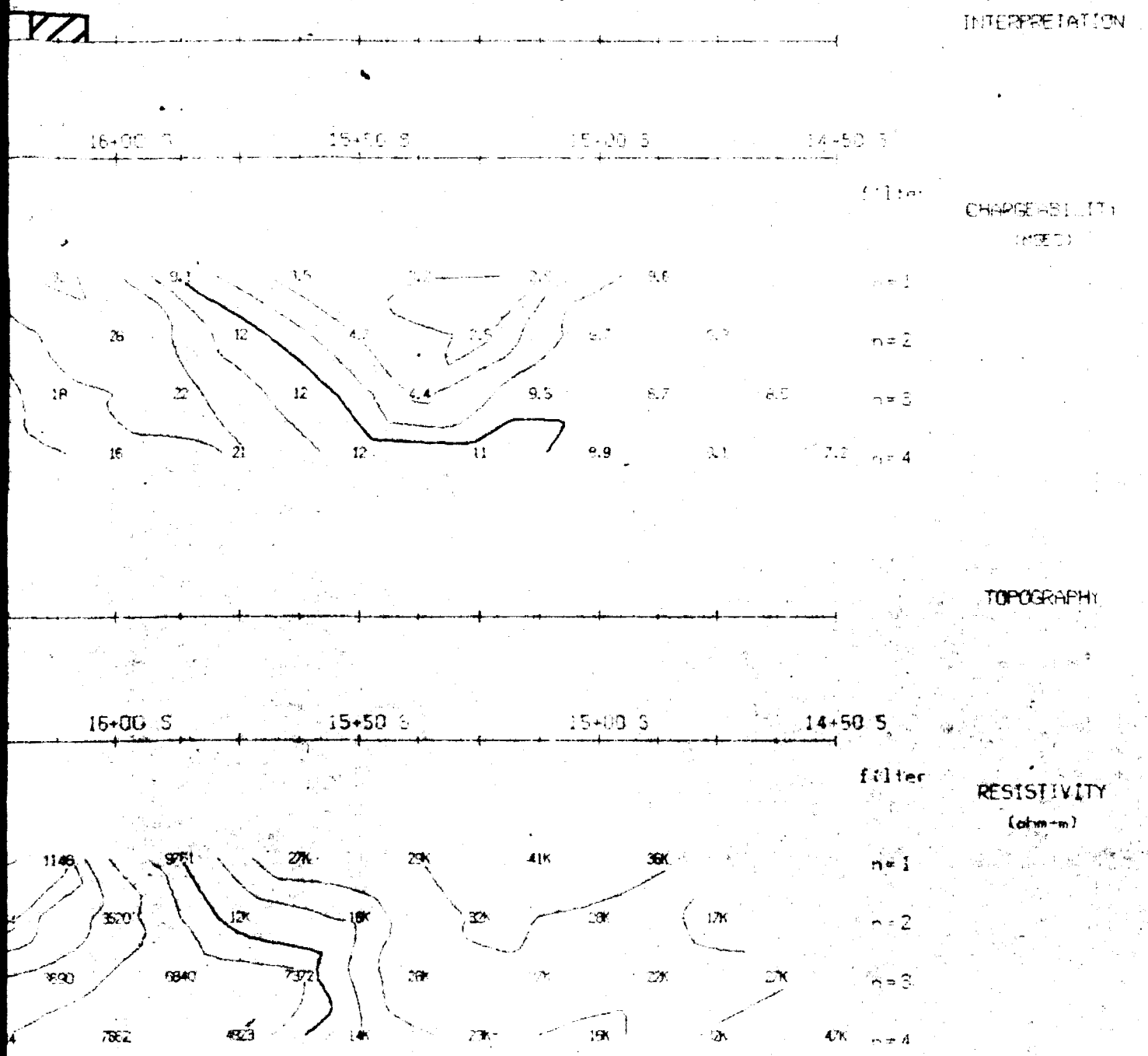
n = 2

n = 3

n = 4

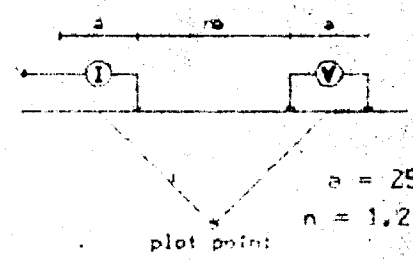






9+00W

Pole-Dipole Array



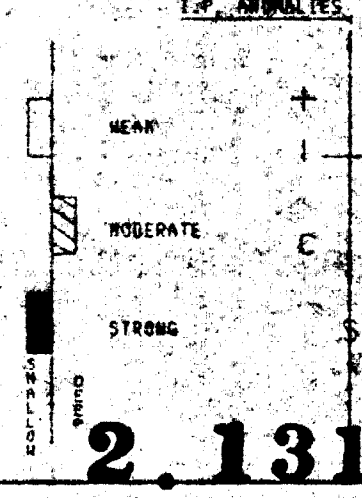
a = 25 m
n = 1,2,3,4

Filtered Profiles

Resistivity ———
Chargeability ———
Metal Factor - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10...

Instrument: Scintrex IPR-11
Transmitter: Scintrex TSQ-3
Operator: T. von Cardinal



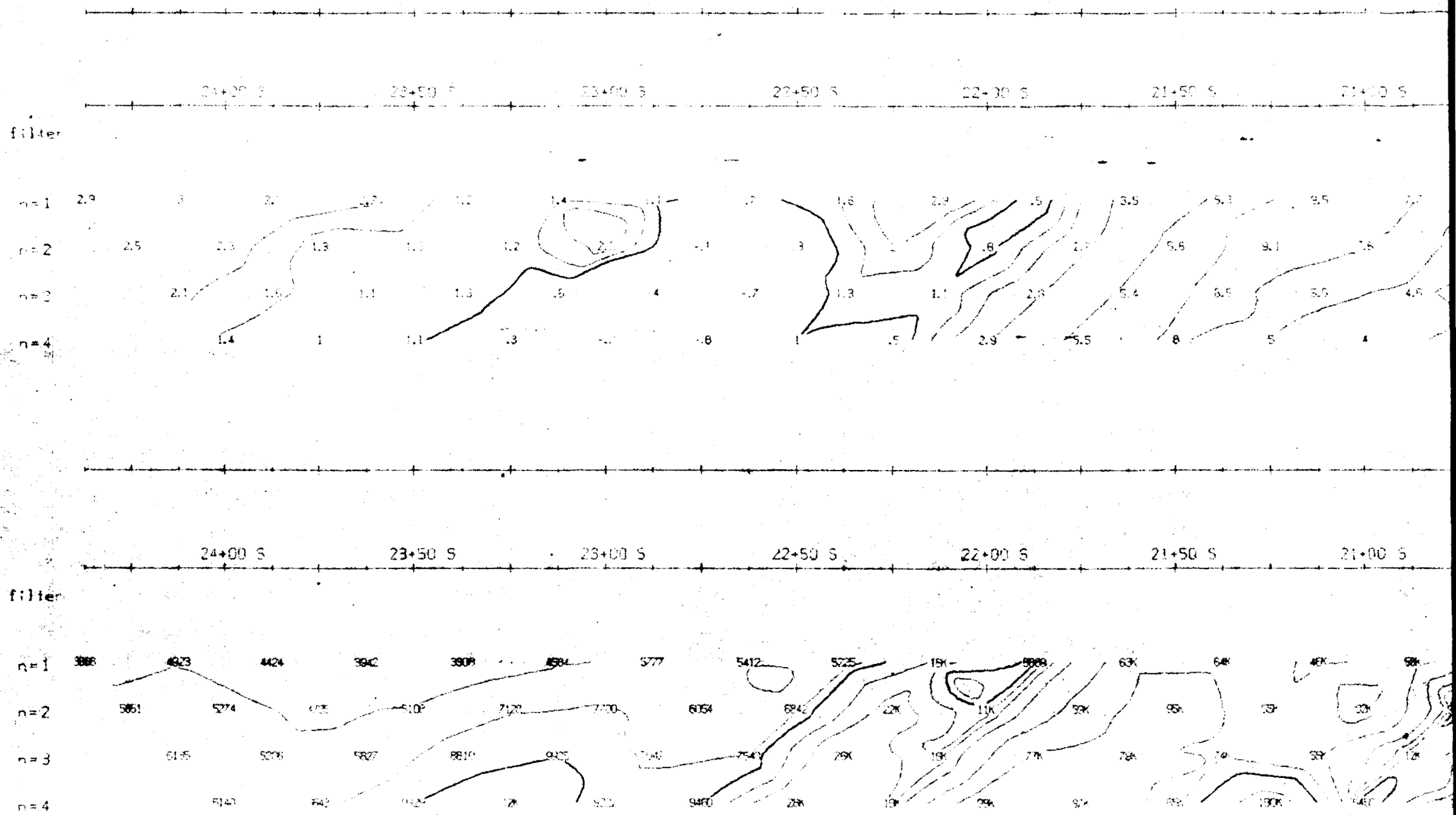
2.13177

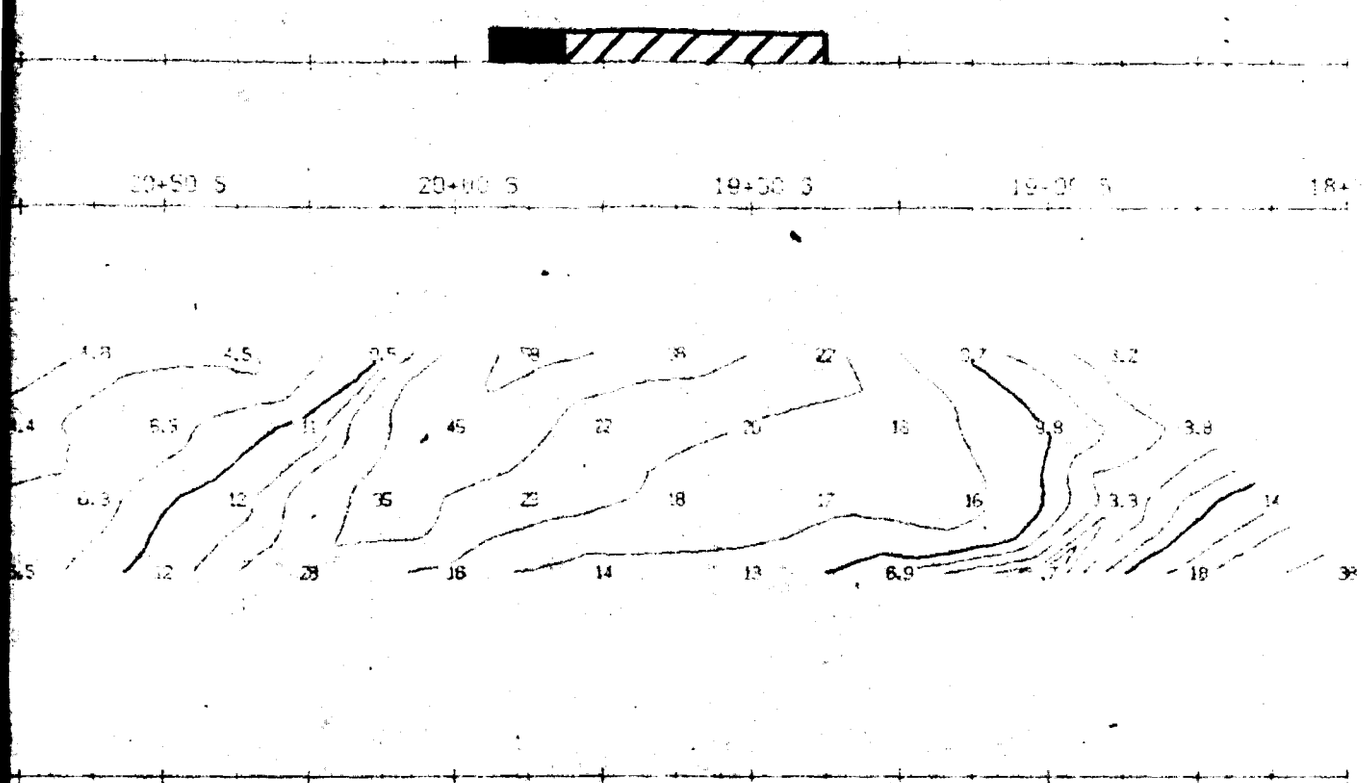
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for GLEN AUDEN RESOURCES LTD.

Title: Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp., Ont.

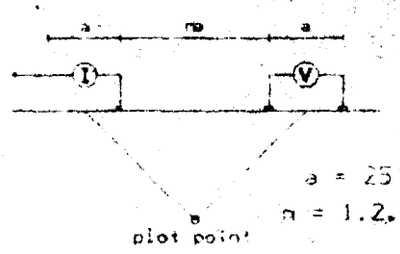
Date: August 11, 1989	Scale: 1 : 1250
Interp. by: P.L.	Job #: M-310





9+00W

Pole-Dipole Array

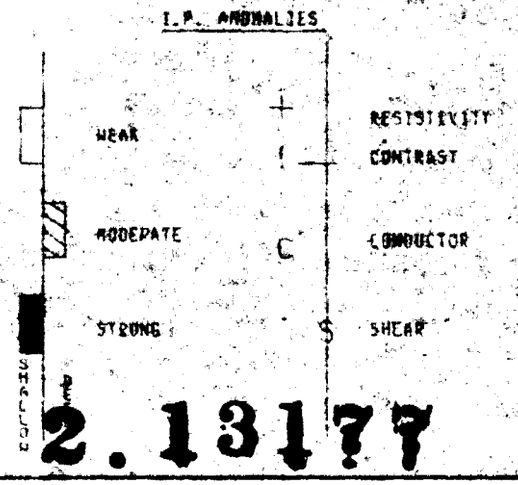


Filtered Profiles

Resistivity
Chargeability
Metal Factor

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: Scintrex IPR-11
Transmitter: Scintrex ISU-3
Operator: T. von Cardinal

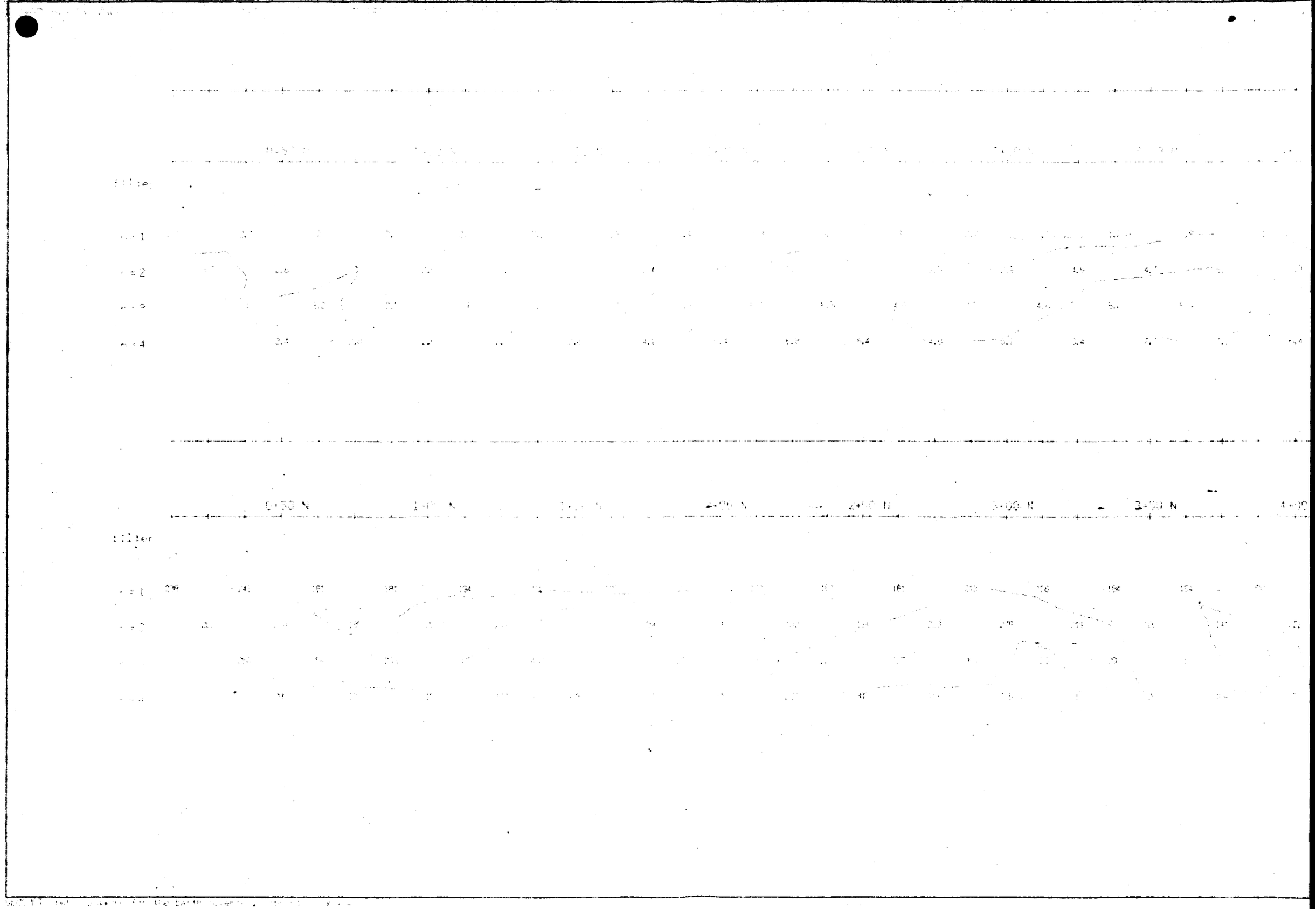


ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

For GLEN AUDEN RESOURCES LTD.

Title: Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp., Ont.

Date: August 11, 1989	Scale: 1 : 1250
Interp. by: R.L.	Job # M-310



11+00W

Pole-Dipole Array

a = 25 m
n = 1, 2, 3, 4, 5, 6

Filtered Profiles

Resistivity
Chargeability
Metal Factor

Logarithmic Contours: 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: B. Malpage

I.P. ANOMALIES

MEAN
MODERATE
STRONG

RESISTIVITY CONTRAST
CONDUCTOR
SHEAR

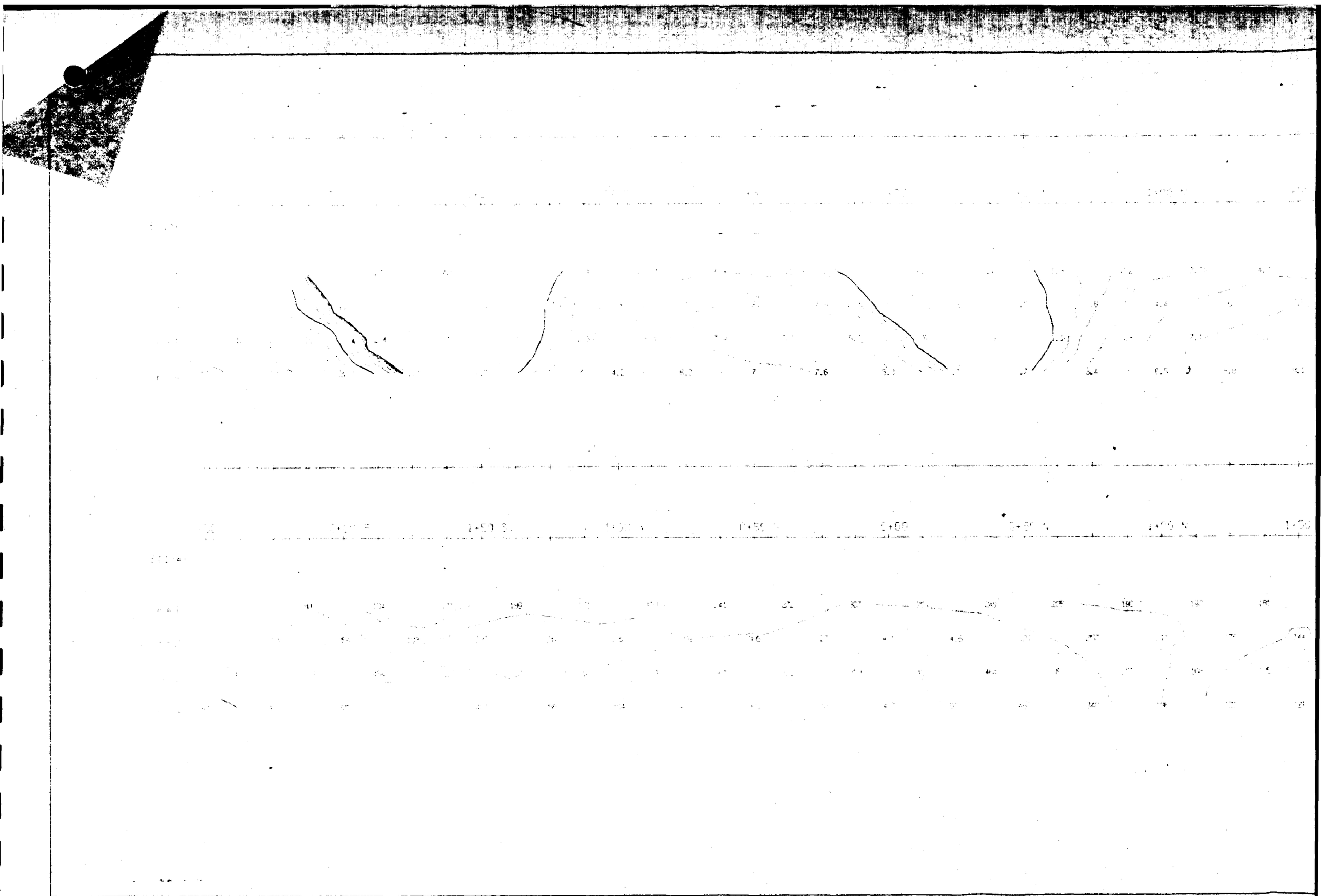
2.13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project

Date: May 25, 1990 | Scale: 1:1250
Drawn by: B.M. | Drg. # M-910



11+00W

Pole Dipole Array

I V

Plotting profile

Pseudosections
Plan map
Metal factor

Logarithmic contours 1. 1.5. 2. 3. 5. 7.5. 10....

Instrument: IRIS-II
Transmitter monitor 2.3 kW
Operator: S. Malouge

I.P. ANOMALIES

WEAK	T	RESISTIVITY CONTRAST
MODERATE	C	CONDUCTOR
STRONG		OVERLAP

2.13177

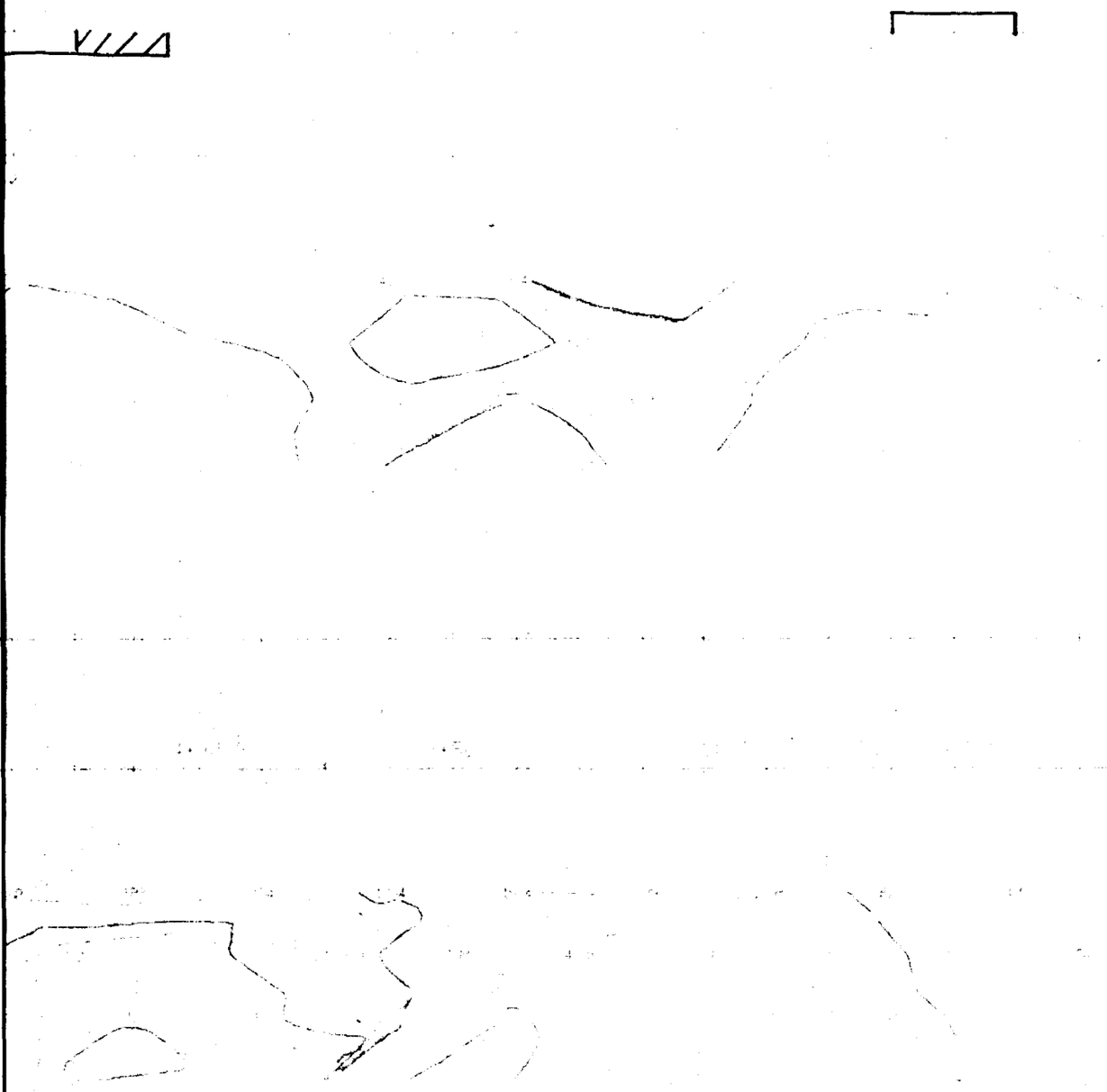
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Kapuskasing, Ont.

Date: Aug 30, 1983	Scale: 1 : 1250
Interp. By: R.I.	Job # M-83-10

11+00W

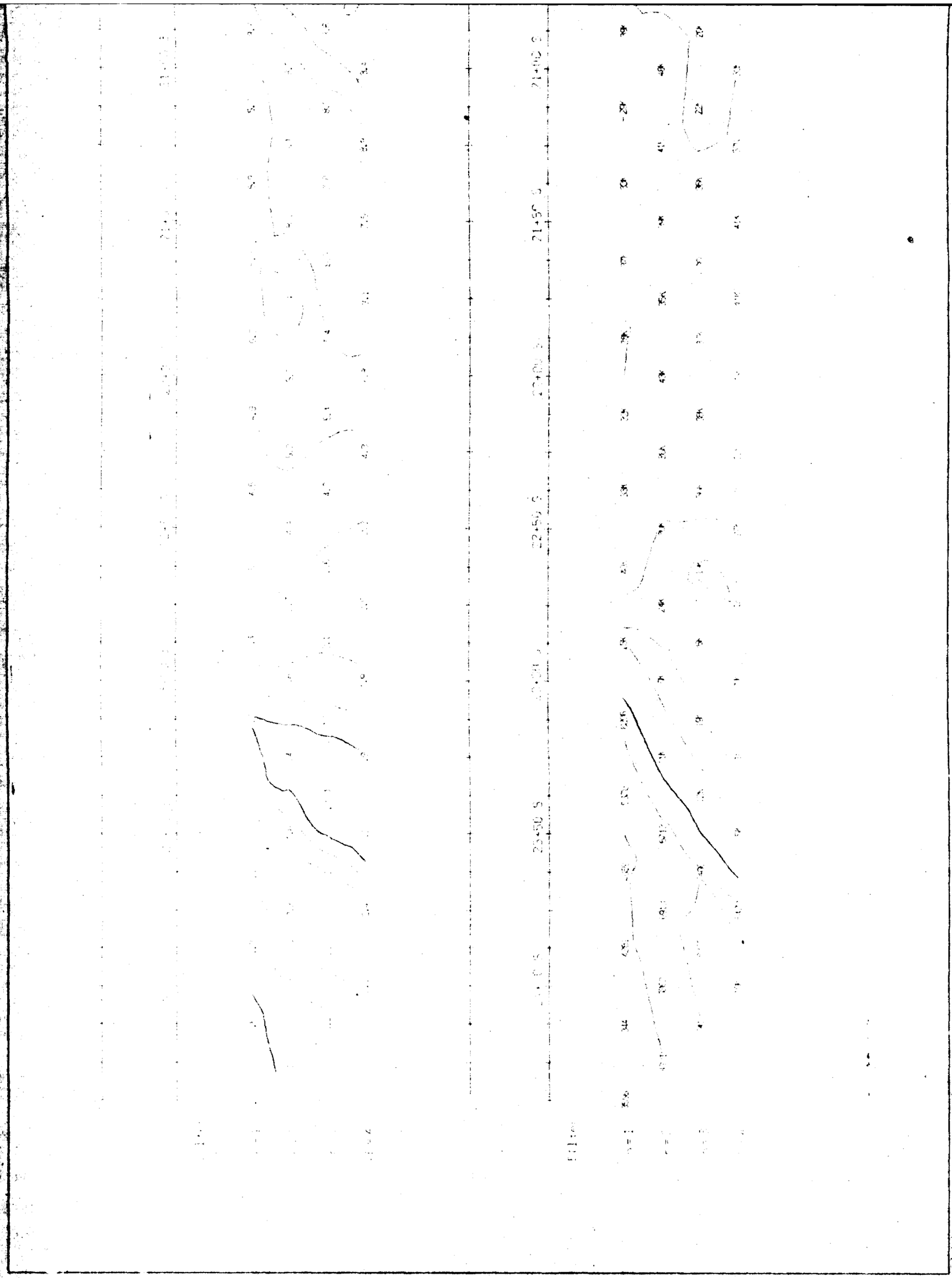


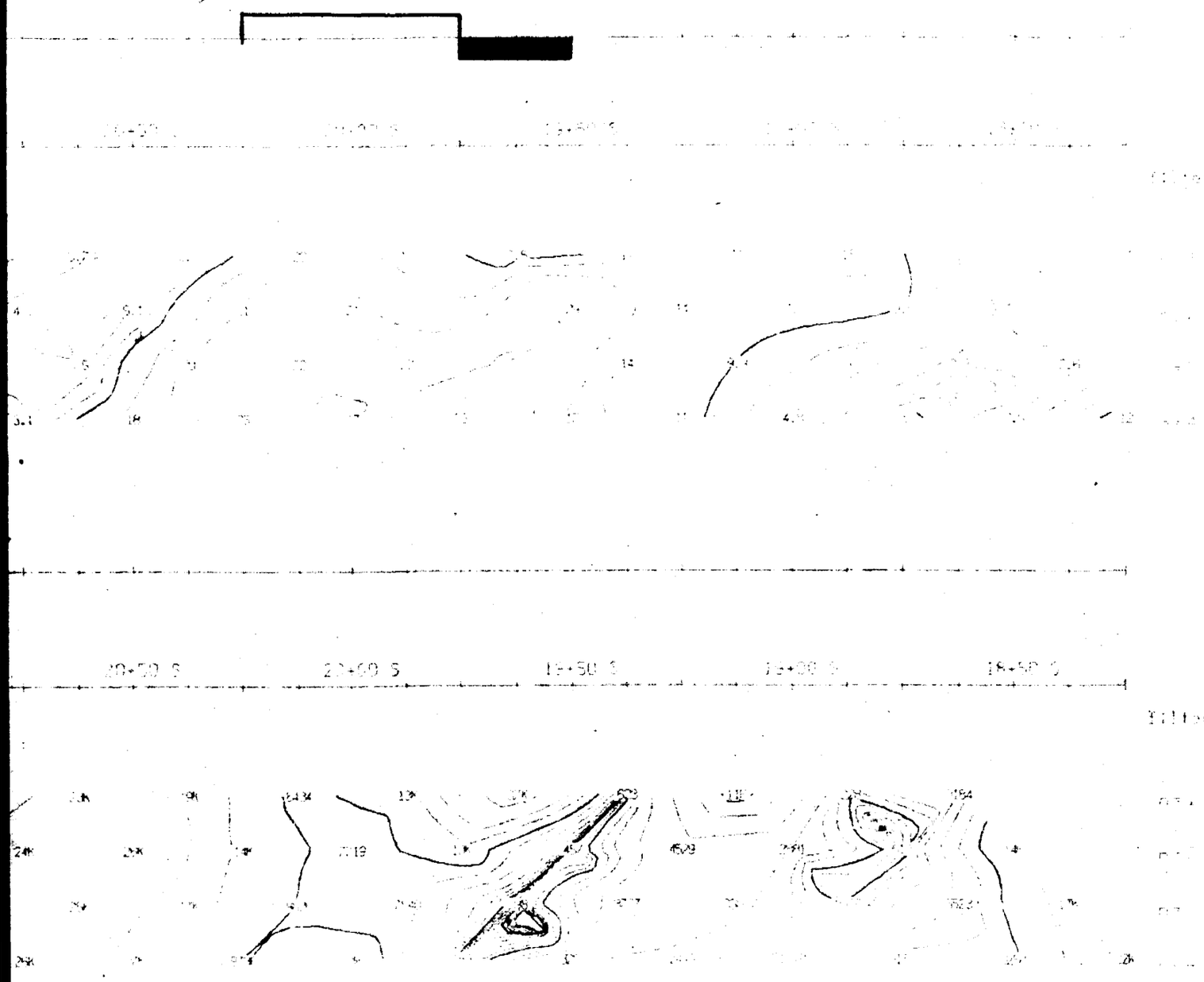
2.13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project





11+00W

Pole-Dipole Array

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: Scintrex IPR-11
Transmitter: Scintrex TSQ-3
Operator: T. von Cardinal

I.P. ANOMALIES

WEAK	+	RESISTIVITY CONTRAST
MODERATE	C	CONDUCTOR
STRONG	S	SHEAR

2.13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES LTD.

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Kelly Lake Area, Ont.

2+50 N

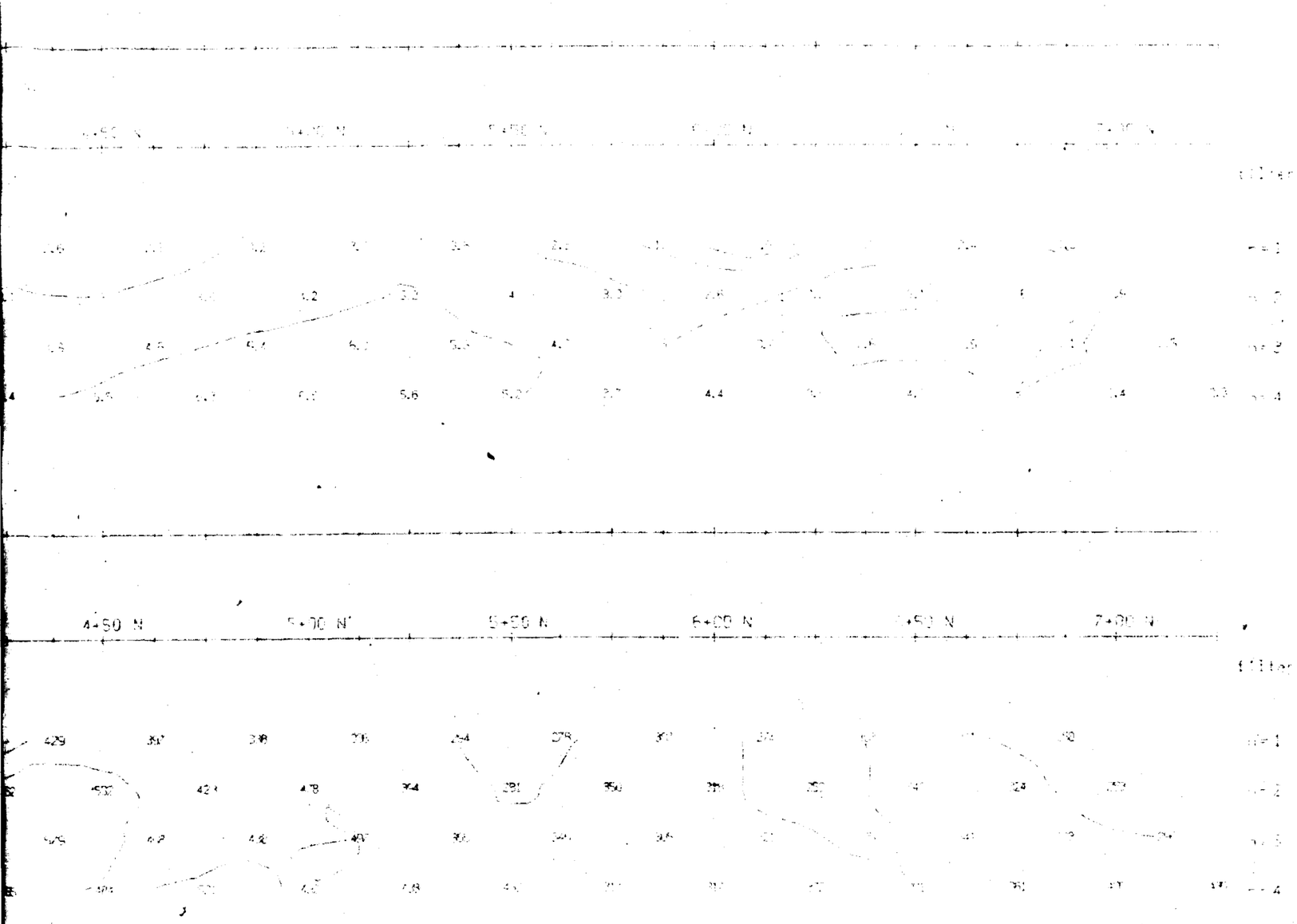
3+00 N

3+50 N

4+00 N

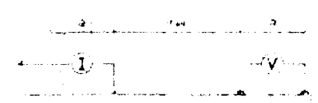
fill

clay



13+00W

Pole-Dipole Array



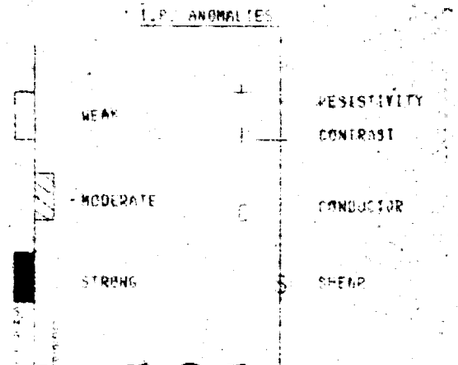
Filtered Profiles

Resistivity ————
Chargeability ————
Metal Factor - - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IPR-11
Transmitter: Hunter 7.5 KW
Operator: R. Valpage

I.P. ANOMALIES



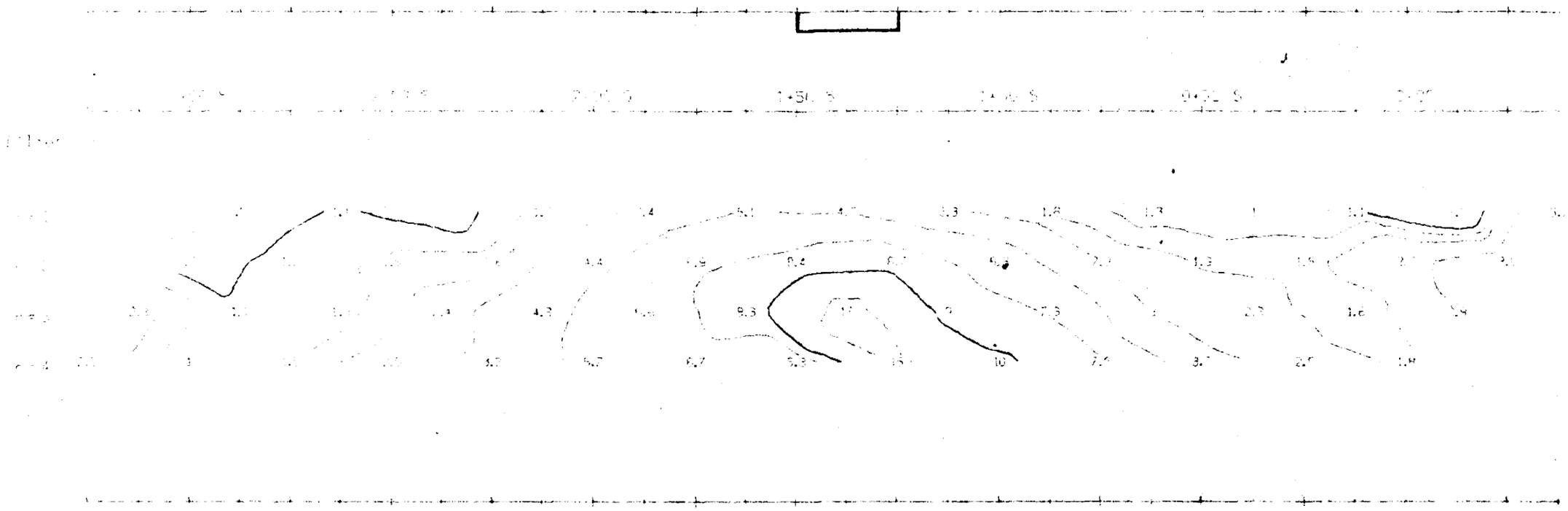
2.18177

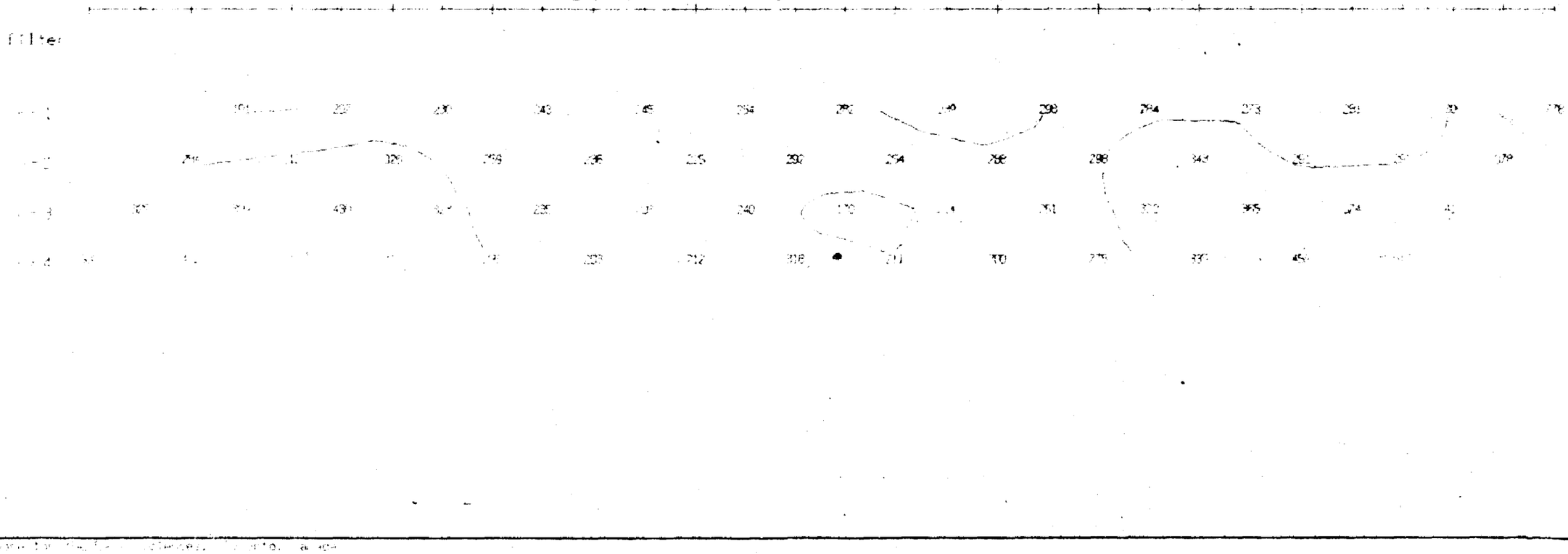
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

For: GLEN AUDEN RESOURCES

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: Aug 2, 1999	Scale: 1 : 1250
Interp. by: R.S.M.	Job # M-810





INTERPRETATION

13+00W

Pole-Dipole Array

Filtered Profiles

Resistivity ——————
Chargeability ——————
Metal Factor ——————

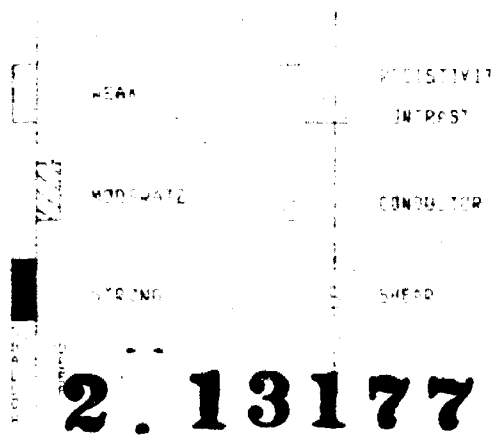
Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10.....

Instrument: IRIS-II

Transmitter: Huntec 2.5 KW

Operator: B. Malange

I.P. ANOMALIES

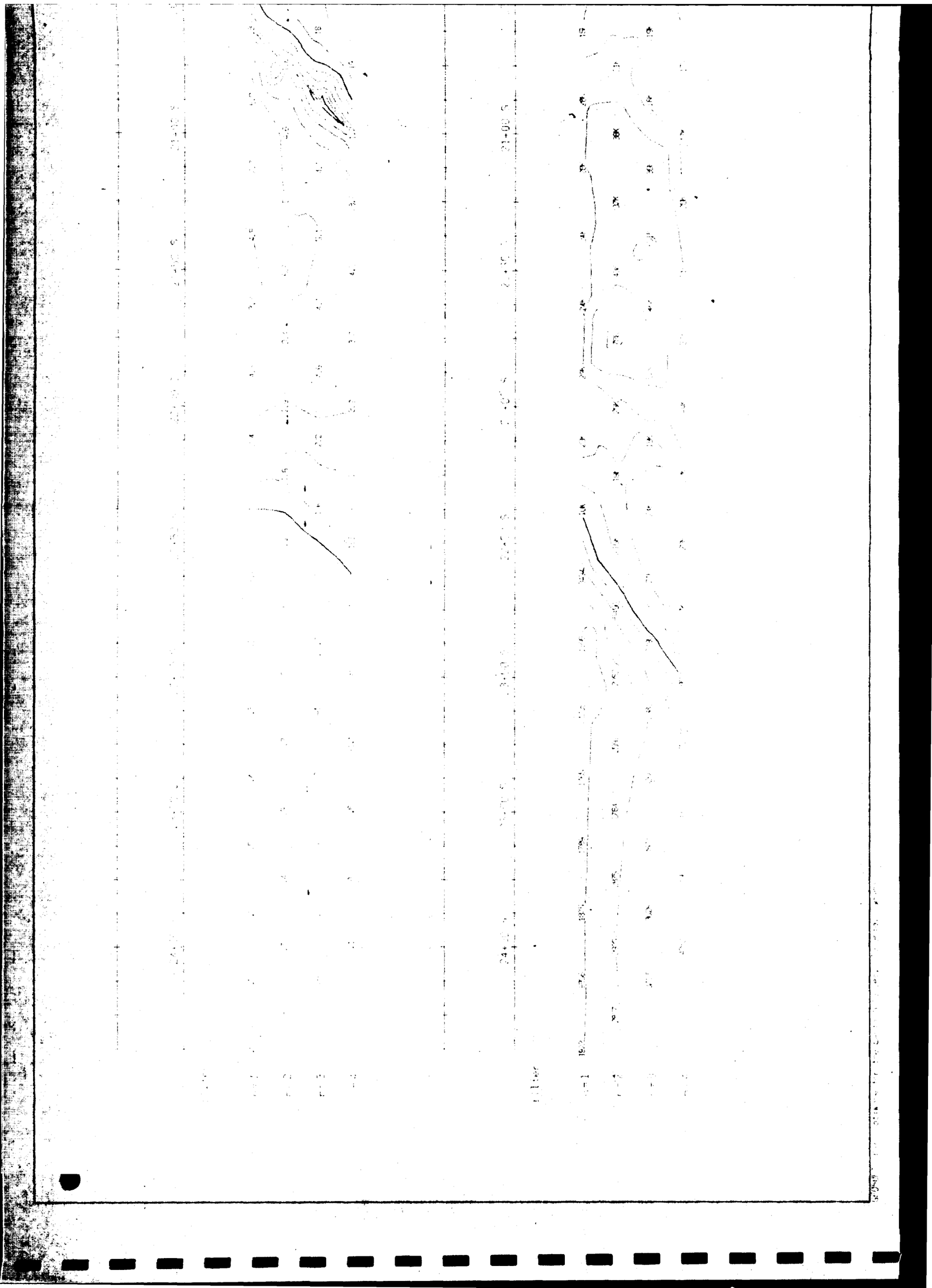


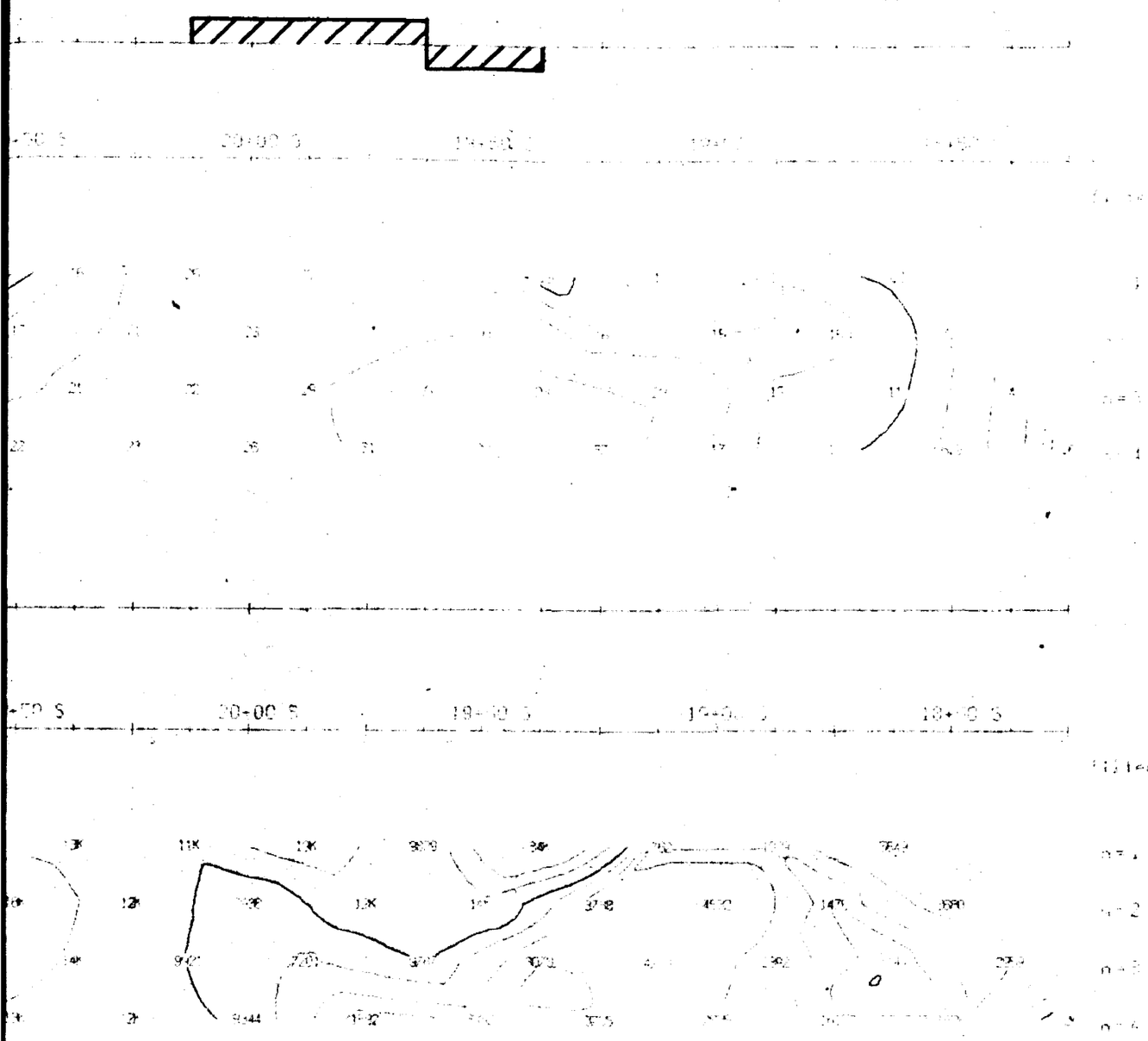
2.13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Kelvin Twp., Ont.





13+00W

Pole-Dipole Array

a = 25 m
n = 1, 2, 3, 4

Plotting Points

Resistivity
Chargeability
Metal Factor

Contours: 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: Scintrex IPR-11
Transmitter: Scintrex TSQ-3
Operator: T. von Cardinal

I.P. ANOMALIES

MEAN — RESISTIVITY CONTRAST
MODERATE — CONDUCTOR
STRONG — SHEAR

2.13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES LTD.

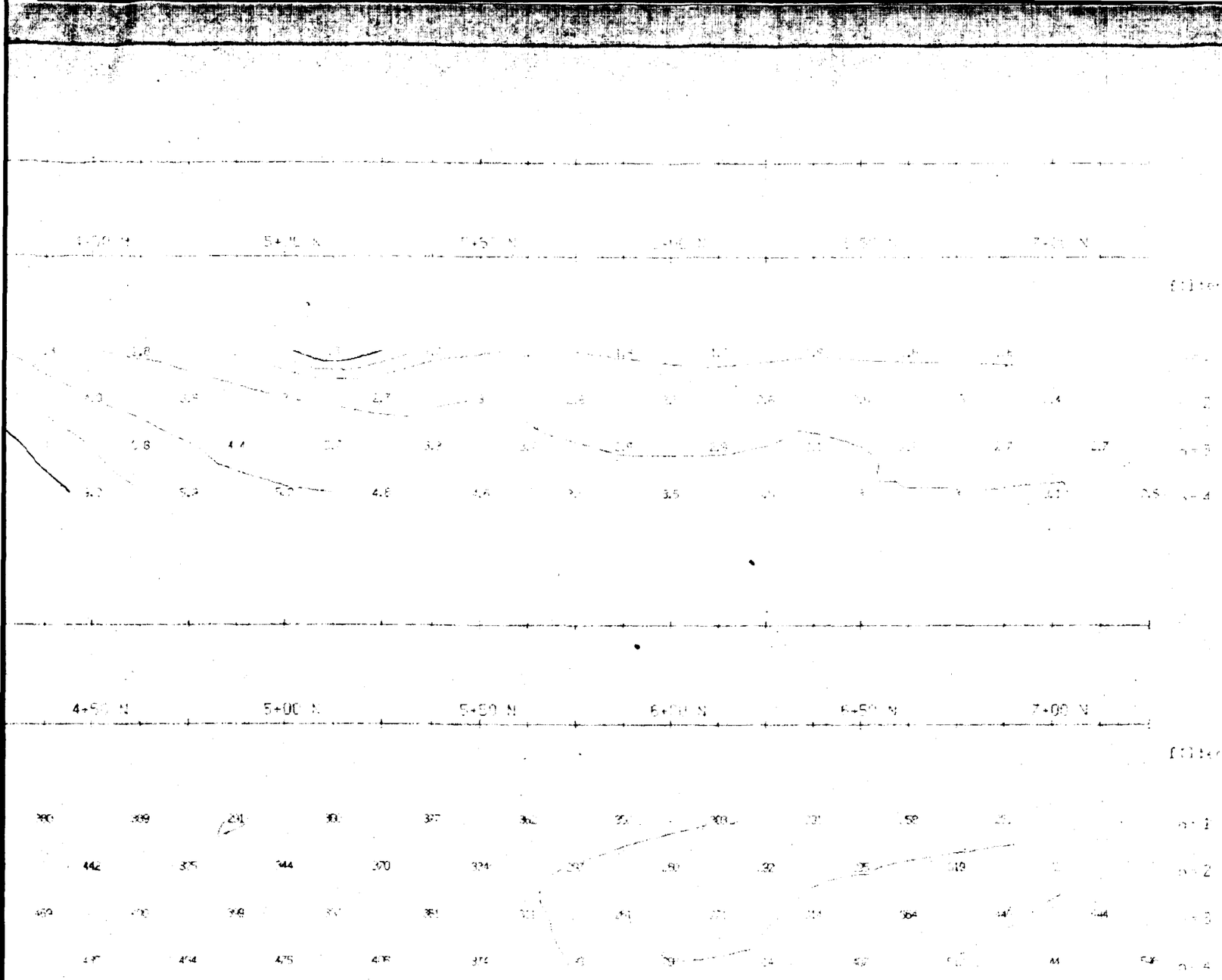
Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp., Ont.

Date: August 9, 1983	Scale: 1:1250
Drawn by: P.L.	Job # M-830

3+00 N

3+50 N

4+00 N



15+00W

Pole-Dipole Array

a = 25 m
n = 1, 2, 3...

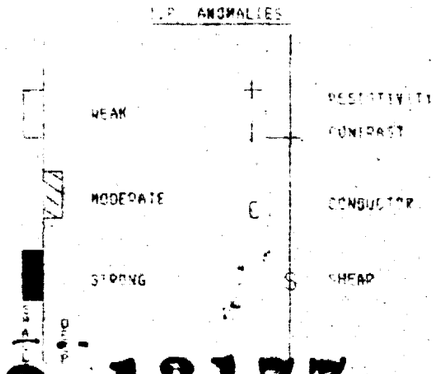
Plotted Profiles

Resistivity ———
Chargeability ———
Metal Factor - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IPR-11
Transmitter: Huntec 7.5 kW
Operator: B. Malpage

I.P. ANOMALIES



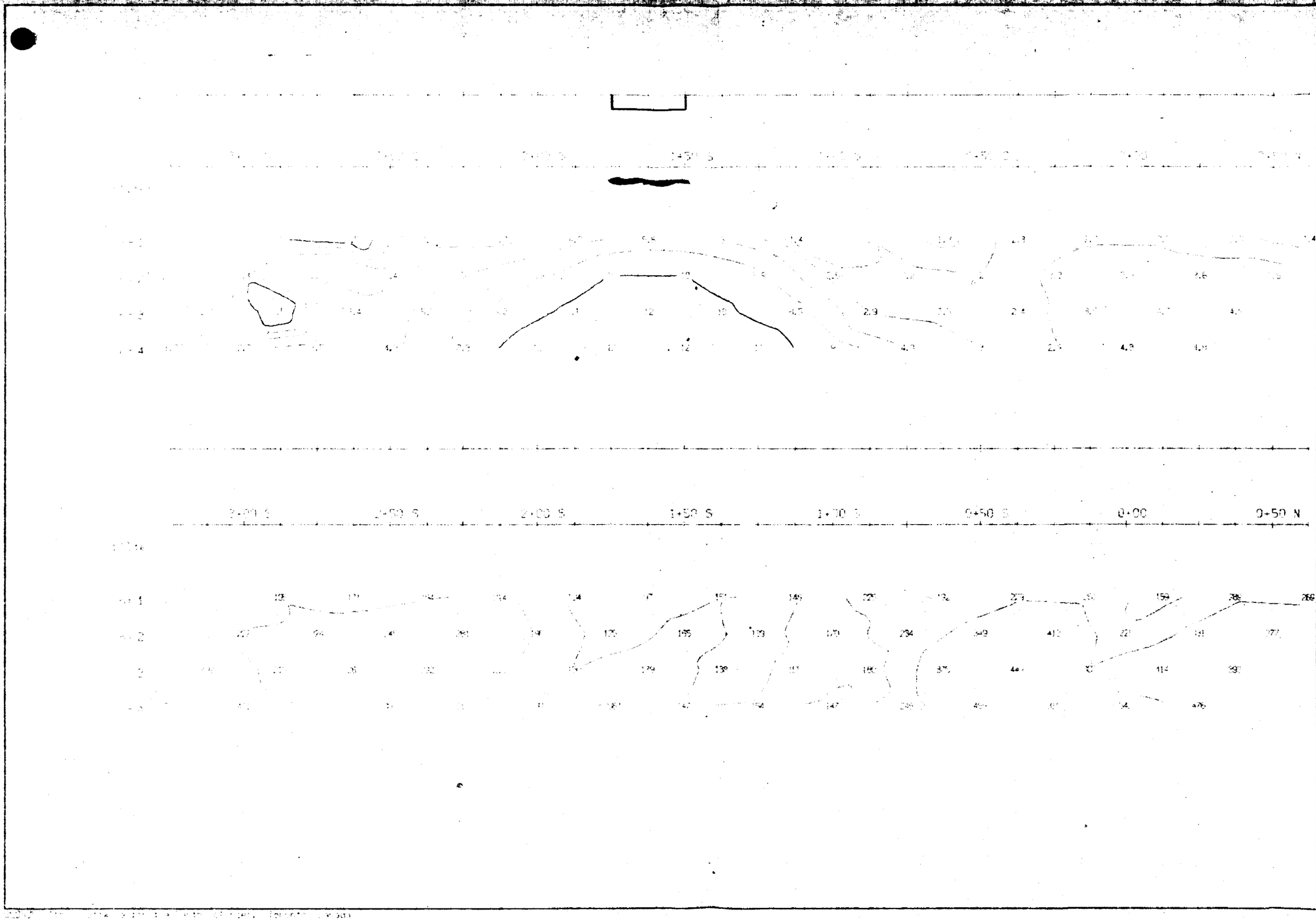
2 13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for
GLEN AUDEN RESOURCES

Title
Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

Date: Aug 25, 1989	Scale: 1 : 1250
Interp. by: R.L.	Job # M-310


3+00 S
2+50 S
2+00 S
1+50 S
1+00 S
0+50 S
0+00
0+50 N

INTERPRETATION

TOPOGRAPHY

RESISTIVITY
(ohm-m)

15+00W

Pole-Dipole Array

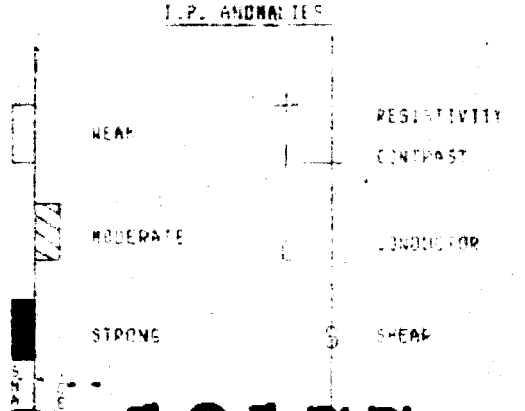
Filtered Profiles

Resistivity
Chargeability
Metal Factor

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IPR-11
Transmitter: Huntec 7.5 KW
Operator: B. Maloage

I.P. ANOMALIES



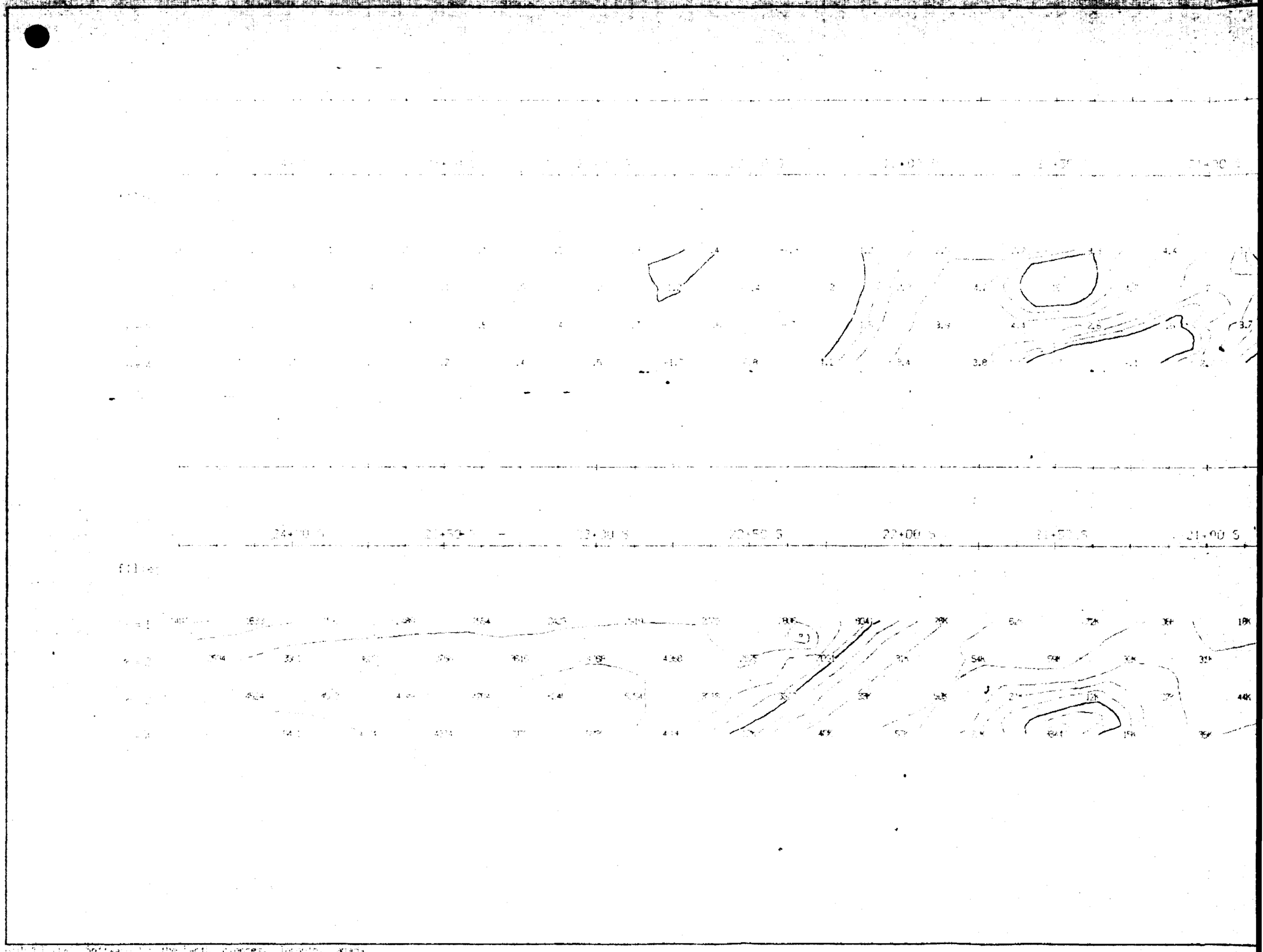
2.13177

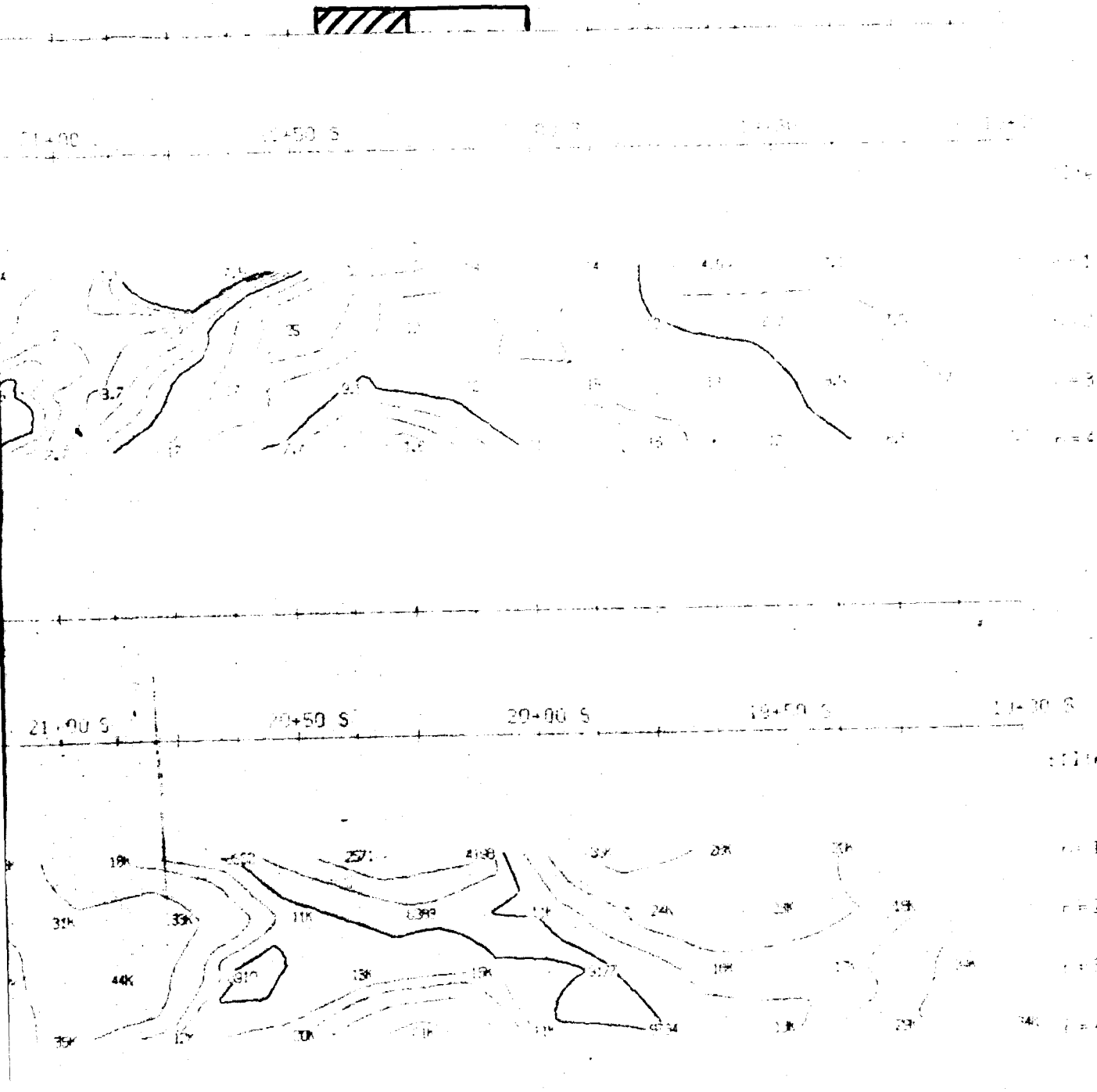
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

For: GLEN AUDEN RESOURCES

Title: Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Kelso Twp., Ont.

Date: Aug 31, 1985	Scale: 1:1000
Interp. by: R.S.	Jan 8 Mar 10


24+00 S
23+50 S
23+00 S
22+50 S
22+00 S
21+50 S
21+00 S
fill



15+00W

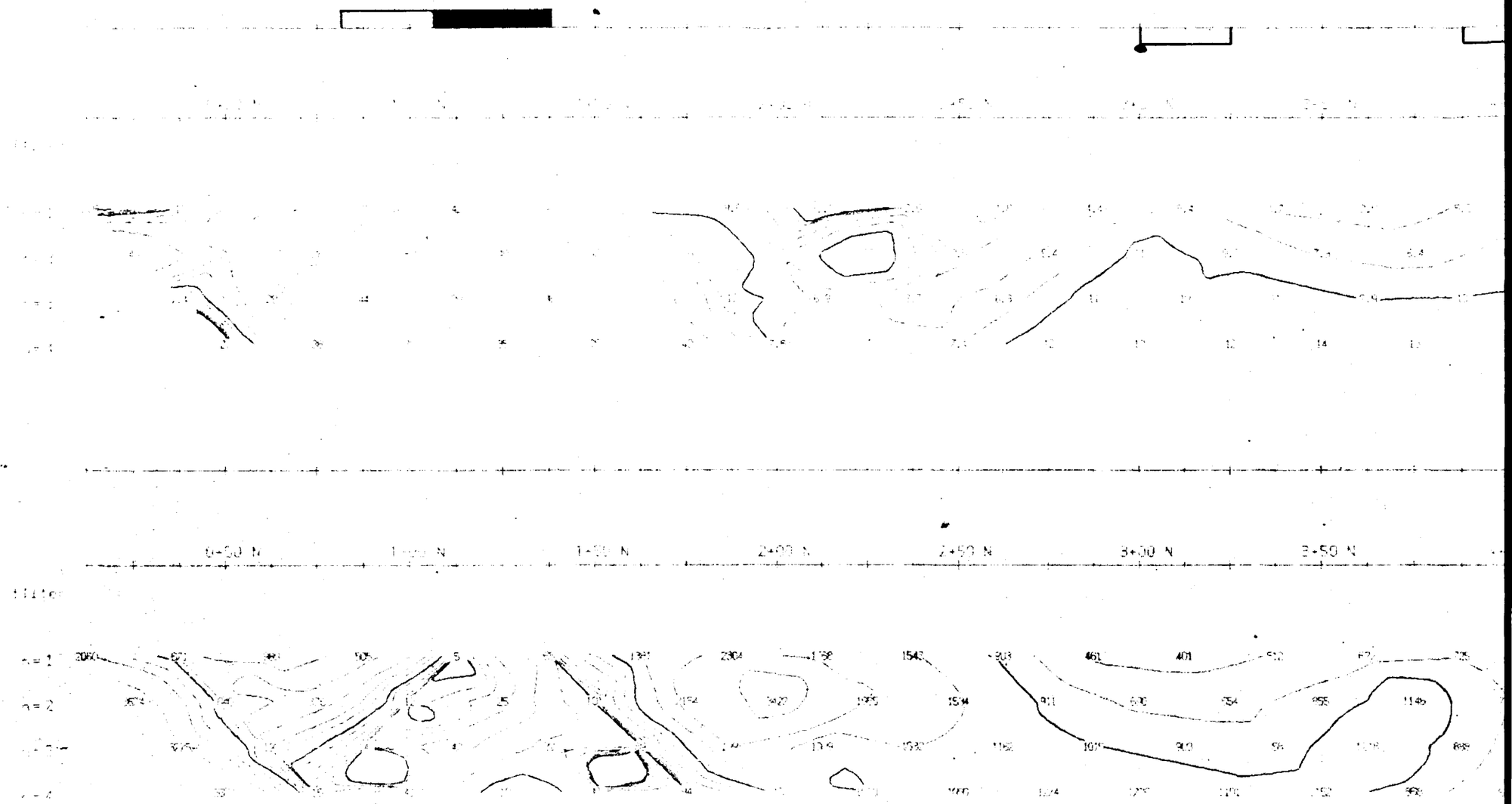
2 13177

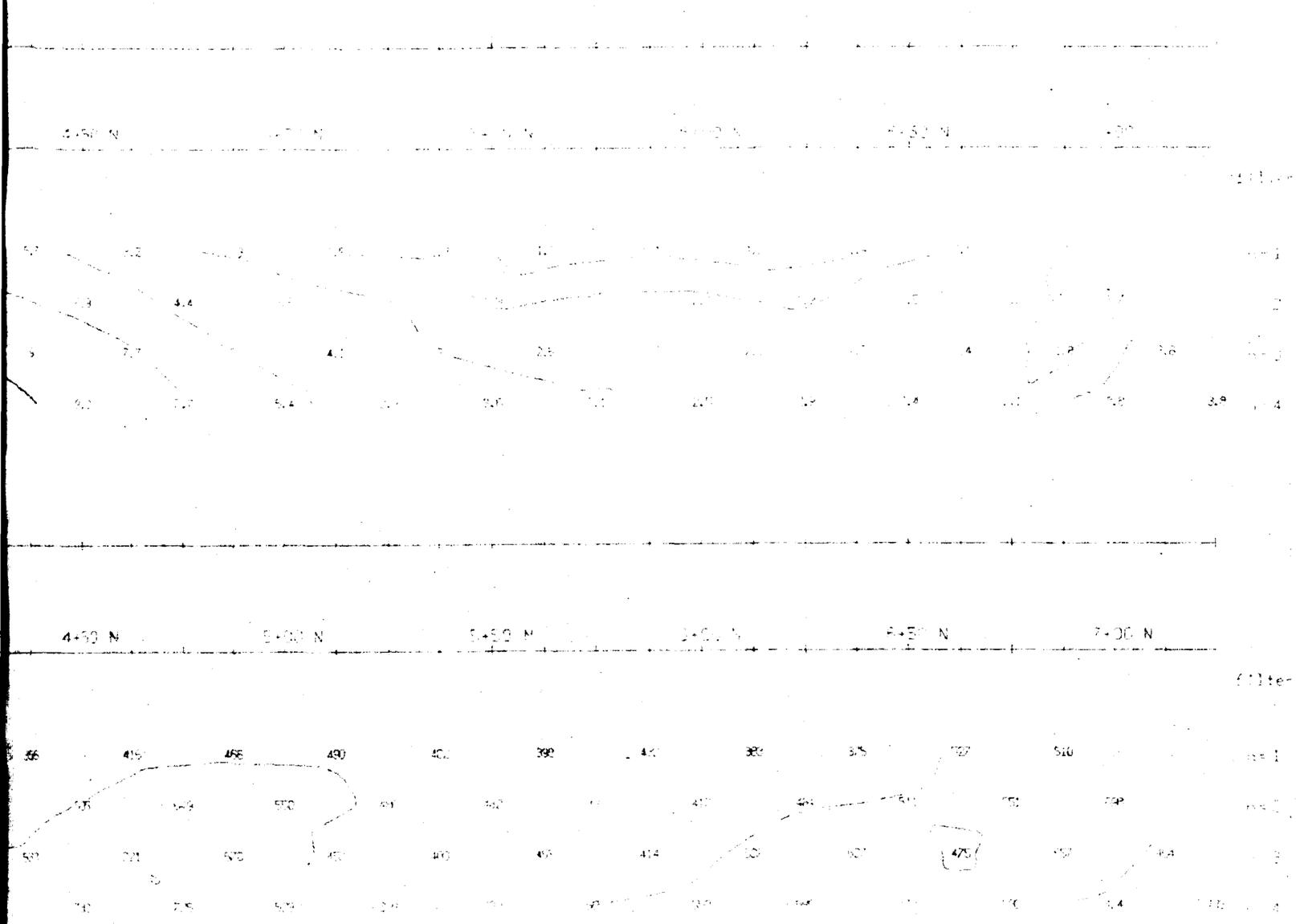
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES LTD.

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Meath Twp., Ont.

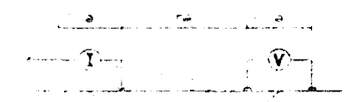
Date: August 9, 1983	Scale: 1" = 125'
Interp. by: P.L.	Job # M-510


0+00 N
0+50 N
1+00 N
1+50 N
2+00 N
2+50 N
3+00 N
3+50 N



17+00W

Pole-Dipole Array



a = 25 m
n = 1,2,3,4

Plotted at Midpoint

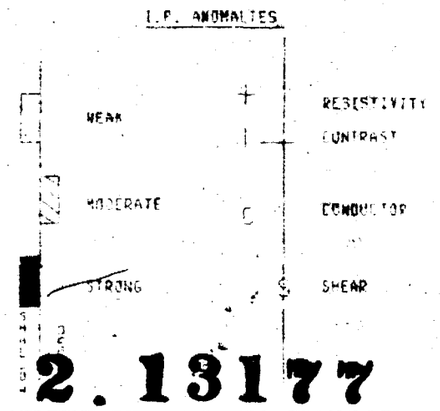
Filtered Profiles.

Resistivity ——————
Chargeability ——————
Metal Factor - - - - - - - -

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IPR-11
Transmitter: Hunter 7.5 KW
Operator: B. Malpage

I.P. ANOMALIES



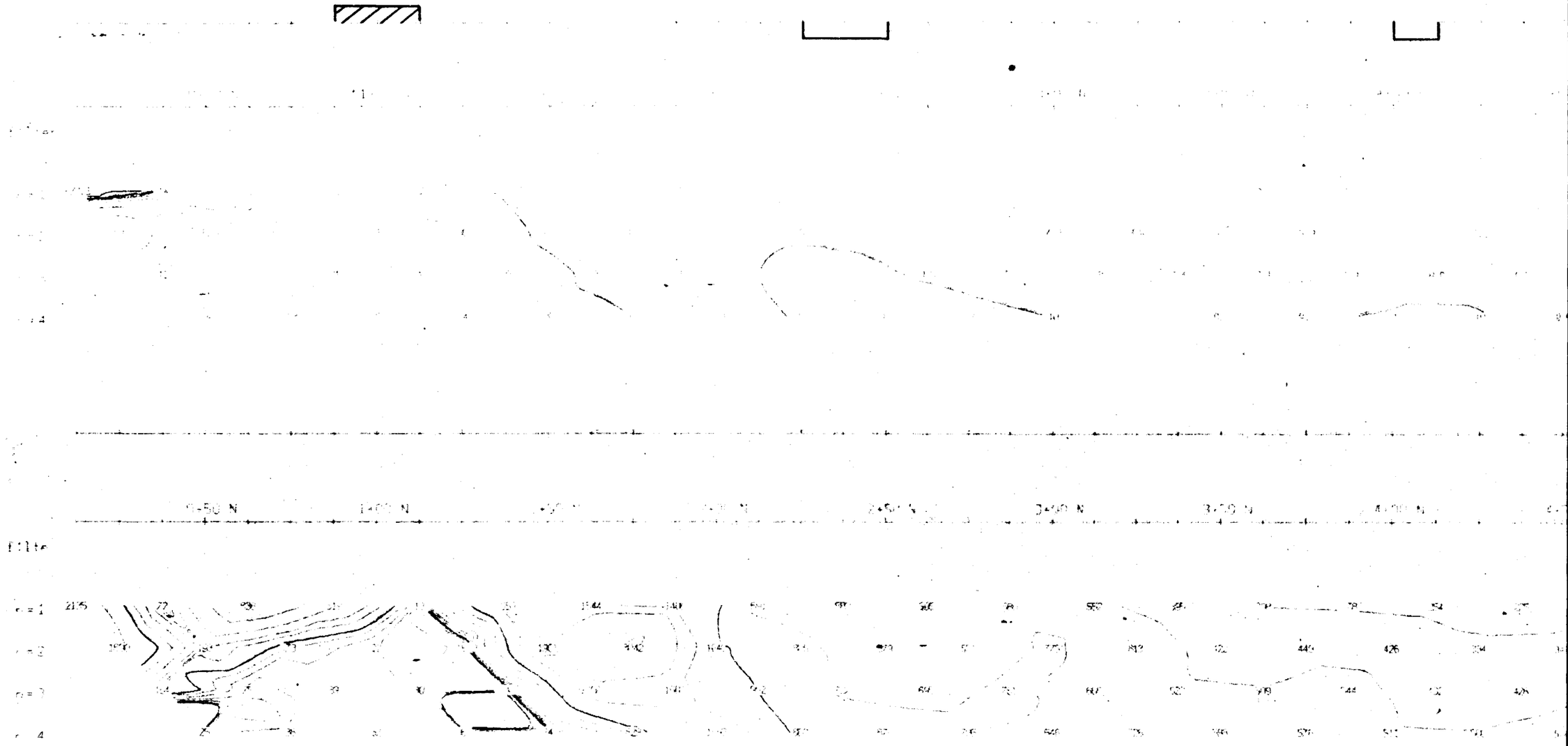
2.13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

For: GLEN AUDEN RESOURCES

Title: Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp. Ont.

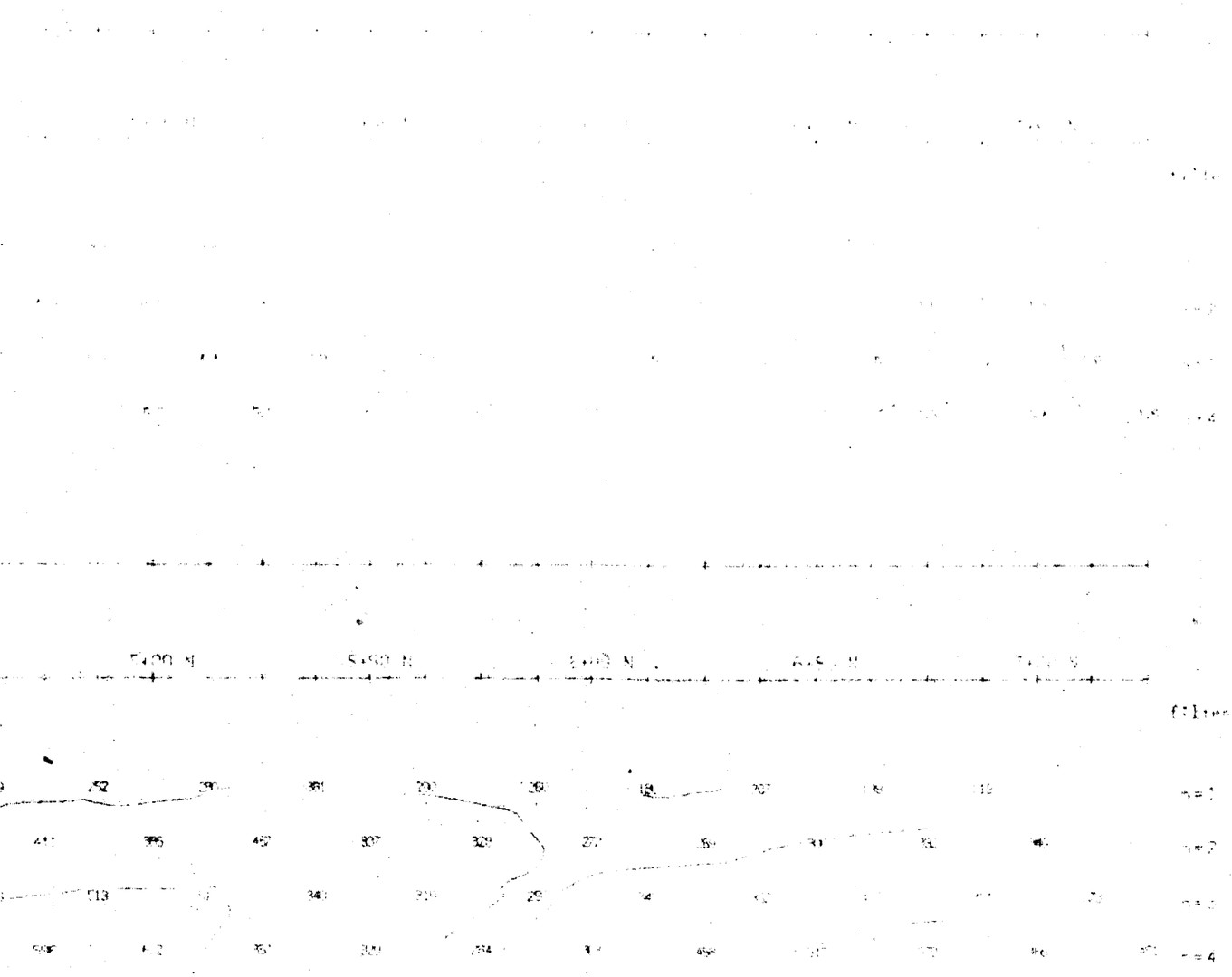
Date: Aug 27, 1989	Scale: 1 : 1250
Interp. by: R.L.	Job # M-810



INTERPRETATION

TYPE OF SURVEY

RESISTIVITY

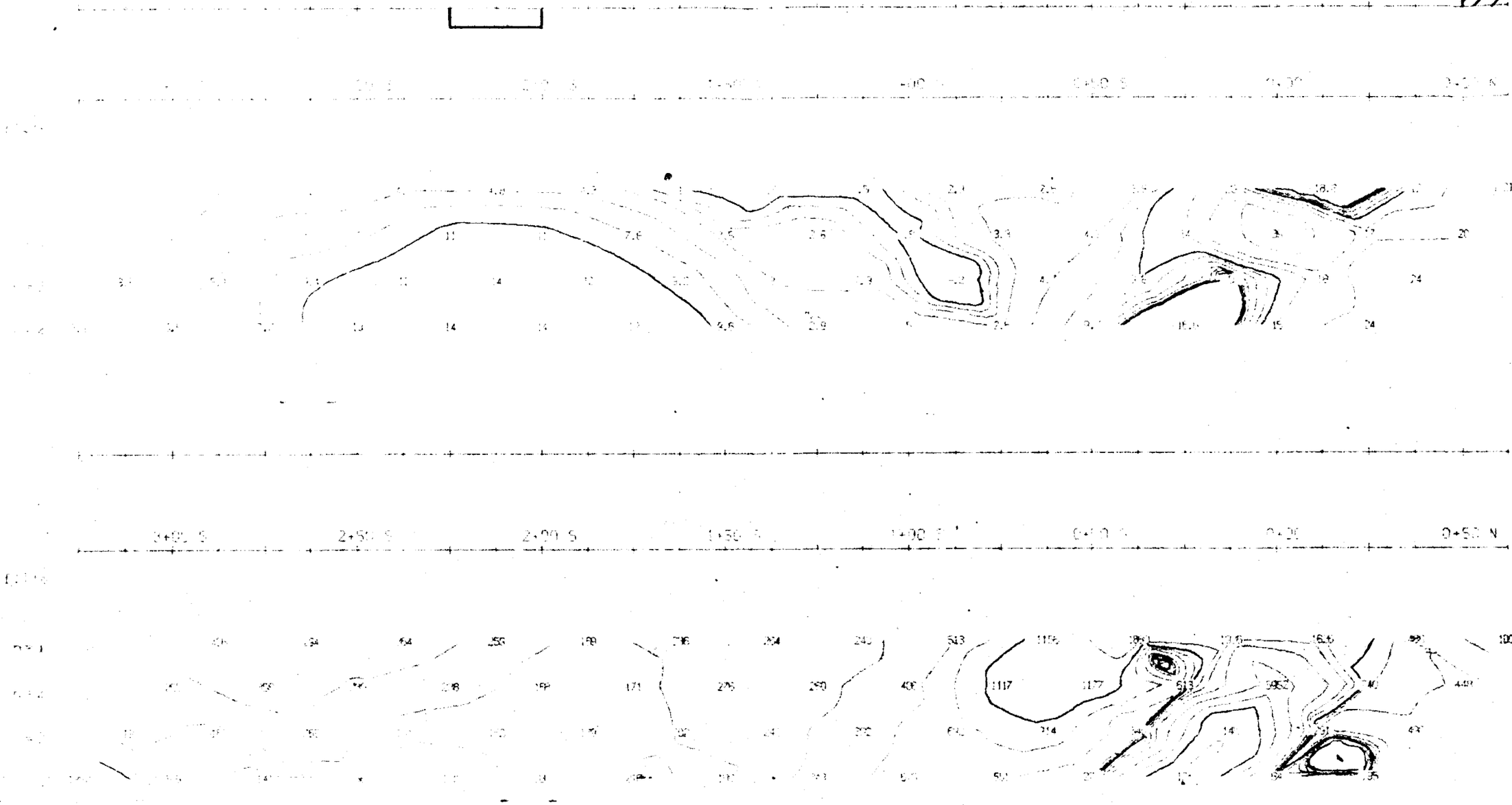


ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

for
GLEN AUDEN RESOURCES

Title
Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Keith Twp, Ont.

Date: Aug 28, 1989	Scale: 1 : 1250
Drawn by: R.L.	Job # M-310


3+50 S
2+50 S
2+00 S
1+50 S
1+00 S
0+50 S
0+00
0+50 N

17+00W

INTERPRETATION

Hole-Dipole Array

filter CHARGEABILITY msec

n=1

n=2

n=3

n=4

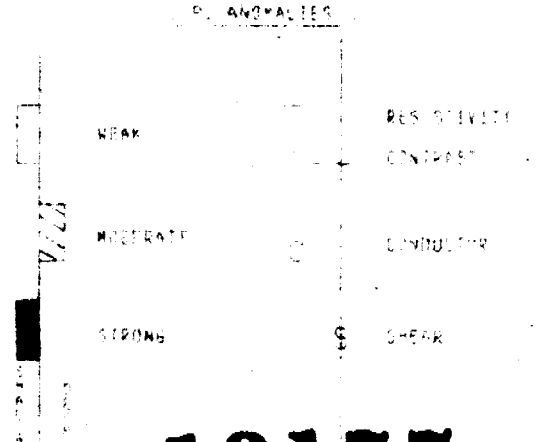
Resistivity
Chargeability
Metal Factor

Logarithmic
Contours 1, 1.5, 2, 3, 5, 7.5, 10....

Instrument: IRIS IP
Transmitter: Huntec 7.5 KW
Operator: S. Malpage

TOPOGRAPHY

P. ANOMALIES



filter RESISTIVITY ohm_m

n=1

n=2

n=3

n=4

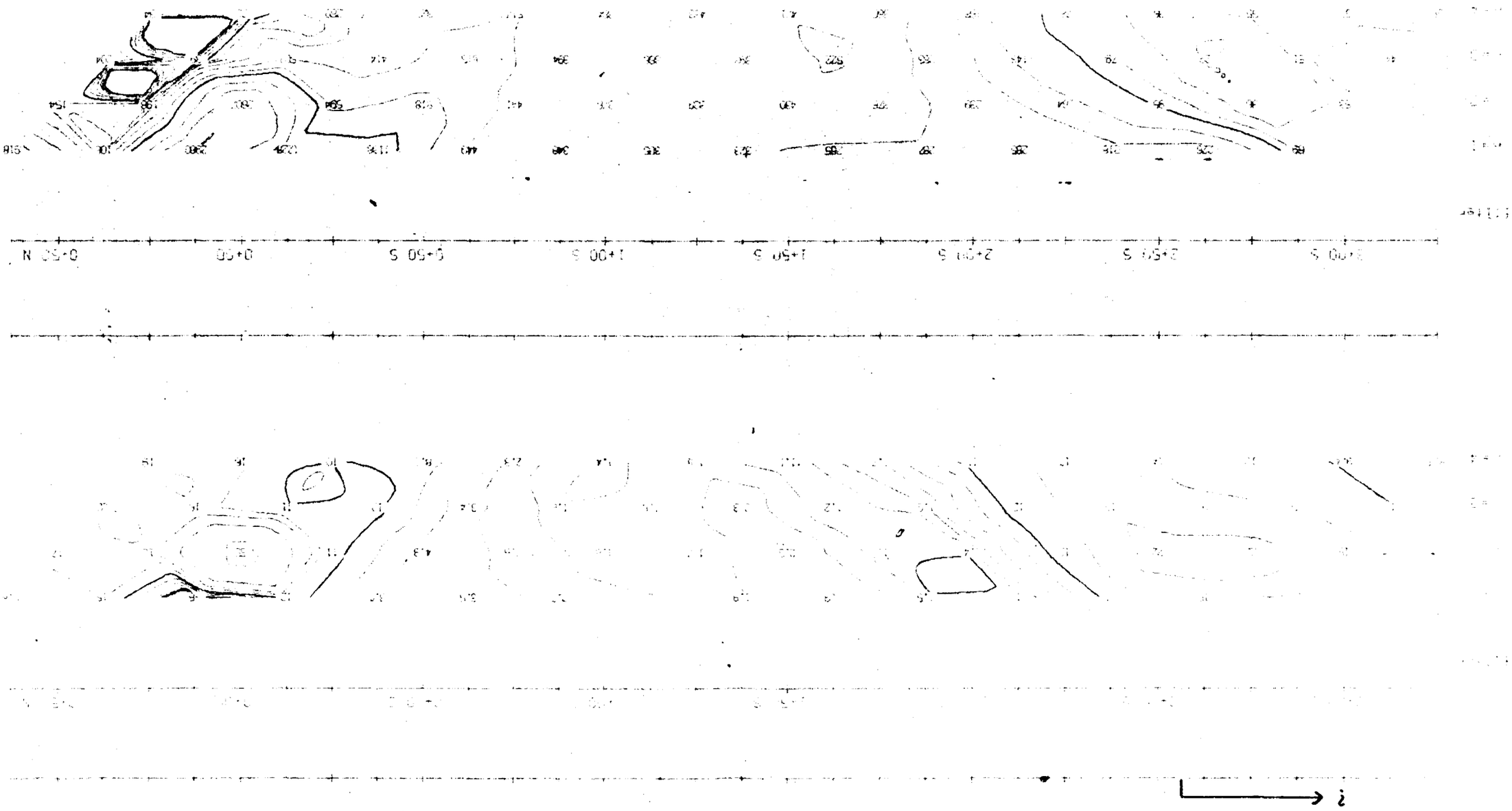
2.13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

For GLEN AJDEN RESOURCES

Title Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Pacific Ltee. Ont.

Date Aug 31, 1988	Field [illegible]
Interp. by [illegible]	Fig. 3

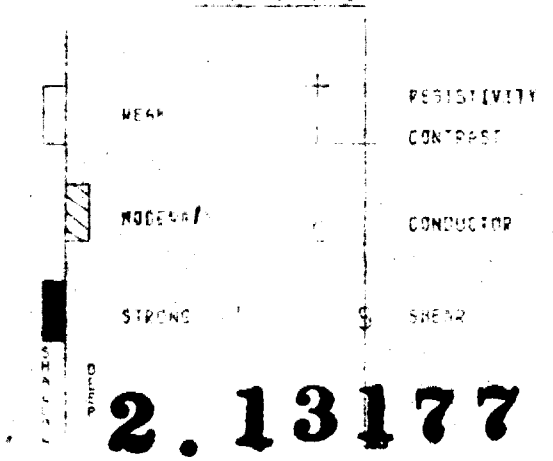


19+00W

Logarithmic Contours 1, 1.5, 2, 3, 5, 7.5, 10...

Instrument: IPR-11
Transmitter: Hunter 7.5 kW
Operator: D. Malpage

I.P. ANOMALIES



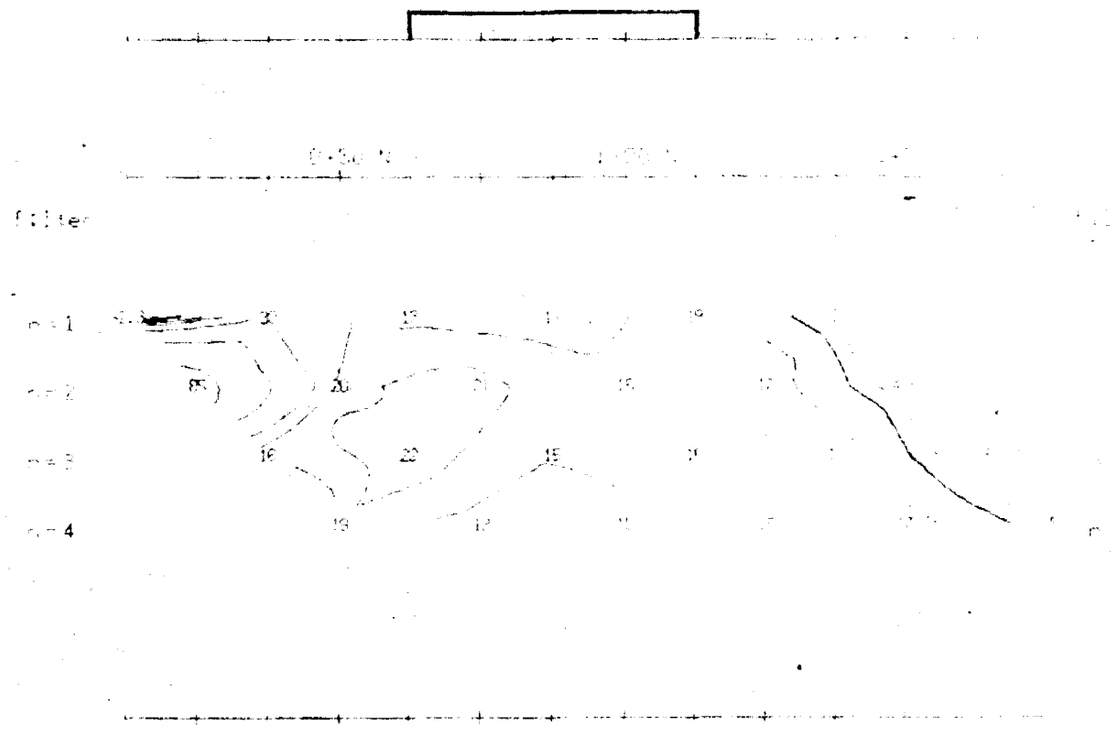
2.13177

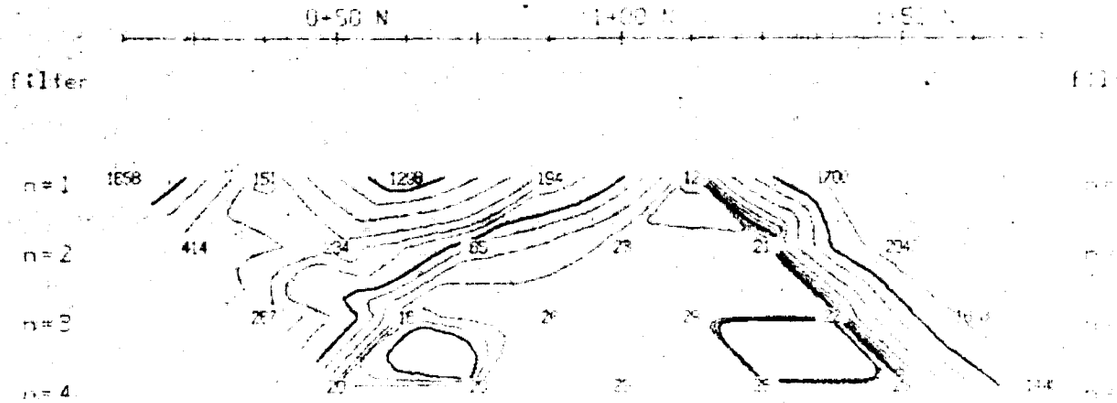
ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project
Kelso Twp. Ont.

Aug 31, 1989	Scale 1 : 1250
Drawn by: P.L.	Job # M-510





GEOSOFT Inc. Software for the Earth Sciences, Toronto, Canada

20+00W

I.P. ANOMALIES

MEAN
MODERATE
STRONG
RESISTIVITY
CONTRAST
CONDUCTOR
SHEAR

2.13177

ROBERT S. MIDDLETON
EXPLORATION SERVICES INC.

GLEN AUDEN RESOURCES

Time Domain
INDUCED POLARIZATION SURVEY
Groundhog River Project

Ontario

Ministry of
Northern Development
and Mines

Ministère du
Développement du Nord
et des Mines

Mining Lands Section
880 Bay Street, 3rd Floor
Toronto, Ontario
M5S 1Z8

Tel: (416) 965-4888

Your File: W9006.60294
Our File: 2.13177

July 24, 1990

Mining Recorder
Ministry of Northern Development & Mines
60 Wilson Avenue
TIMMINS, Ontario
P4N 2S7

Dear Sir/Madam:

Re: Notice of Intent dated June 21, 1990 for Magnetometer Survey submitted on Mining Claims P 1035690 et al in Keith Township.

No assessment work credits will be approved for this report as of the above date.

Please inform the recorded holder of these mining claims and so indicate on your records.

Yours sincerely,

W. R. Cowan
Provincial Manager, Mining Lands
Mines & Minerals Division

JS:zm
Encl:

cc: Mr. W. D. Tieman
Mining & Lands Commissioner
Toronto, Ontario

Resident Geologist
TIMMINS, Ontario

Glen Auden Resources Ltd.
TIMMINS, Ontario

R. S. Middleton Exploration Services
TIMMINS, Ontario

Ministry of Northern Development and Mines

Ontario

Technical Assessment Work Credits

File 2.13177

Date June 21,1990

Mining Recorder's Report of Work No. W9006-60294

Recorded Holder
Glen Auden Resources Ltd

Township or Area
Keith Township

Type of survey and number of Assessment days credit per claim	Mining Claims Assessed
Geophysical	P 1035690-91 1035695-96 1035701 1035703-04 1035713 to 1035715 incl 1035718 1035723 1035725 to 1035727 incl 1035732 to 1035734 incl 1071623-24 1087290 to 1087292 incl
Electromagnetic _____ days	
Magnetometer 0 days	
Radiometric _____ days	
Induced polarization _____ days	
Other _____ days	
Section 77 (19) See "Mining Claims Assessed" column	
Geological _____ days	
Geochemical _____ days	
Man days ☐ Airborne ☐	
Special provision ☐ Ground ☐	
☒ Credits have been reduced because of partial coverage of claims.	
☐ Credits have been reduced because of corrections to work dates and figures of applicant.	

Unless the maps sent back to you are returned with the required information within 30 days no credit will be awarded for this survey

Special credits under section 77 (16) for the following mining claims

No credits have been allowed for the following mining claims

☐ not sufficiently covered by the survey ☐ insufficient technical data filed

The Mining Recorder may reduce the above credits if necessary in order that the total number of approved assessment days recorded on each claim does not exceed the maximum allowed as follows: Geophysical - 80; Geological - 40; Geochemical - 40; Section 77(19) - 60.

Ontario

Ministry of
Northern Development
and Mines

Ministère du
Développement du Nord
et des Mines

Mining Lands Section
880 Bay Street, 3rd Floor
Toronto, Ontario
M5S 1Z8

Tel: (416) 965-4888

Your File: W9006.60295
Our File: 2.13177

July 24, 1990

Mining Recorder
Ministry of Northern Development & Mines
60 Wilson Avenue
TIMMINS, Ontario
P4N 2S7

Dear Sir/Madam:

Re: Notice of Intent dated June 21, 1990 for a Geological Survey submitted on Mining Claims P 1035690 et al in Keith Township.

The assessment work credits, as listed with the above mentioned Notice of Intent, have been approved as of the above date.

Please inform the recorded holder of these mining claims and so indicate on your records.

Yours sincerely,

W. R. Cowan
Provincial Manager, Mining Lands
Mines & Minerals Division

JS:zm
Encl:

cc: Mr. W. D. Tieman
Mining & Lands Commissioner
Toronto, Ontario

Resident Geologist
TIMMINS, Ontario

Glen Auden Resources Ltd.
TIMMINS, Ontario

R. S. Middleton Exploration Services
TIMMINS, Ontario

Ontario Ministry of Northern Development and Mines

Technical Assessment Work Credits

File 2.13177

Date June 21,1990

Mining Recorder's Report of Work No. W9006.60295

Recorded Holder: GLEN AUDEN RESOURCES LTD

Township or Area: KEITH TOWNSHIP

Type of survey and number of Assessment days credit per claim	Mining Claims Assessed
Geophysical	
Electromagnetic ____ days	P 1035690 to 696 incl.
Magnetometer ____ days	1035701 to 704 incl.
Radiometric ____ days	1035713 to 715 incl.
Induced polarization ____ days	1035717-18
Other ____ days	1035723 to 727 incl.
Section 77 (19) See "Mining Claims Assessed" column	1035732 to 734 incl.
Geological 40 days	1035786
Geochemical ____ days	1071623
Man days ☐ Airborne ☐	1087290 to 293 incl.
Special provision ☒ Ground ☒	
☐ Credits have been reduced because of partial coverage of claims.	These credits may be further reduced by the Mining Recorder.
☐ Credits have been reduced because of corrections to work dates and figures of applicant.	

Special credits under section 77 (16) for the following mining claims

20 days geological - P 1035740, 1035785

30 days geological - P 1071624

No credits have been allowed for the following mining claims

☐ not sufficiently covered by the survey ☐ insufficient technical data filed

The Mining Recorder may reduce the above credits if necessary in order that the total number of approved assessment days recorded on each claim does not exceed the maximum allowed as follows: Geophysical - 80; Geological - 40; Geochemical - 40; Section 77(19) - 60.

Ministry of Northern Development and Mines

Ontario

DOCUMENT No. W 9006 • 60293

Mining Act

Report of Work
(Geophysical, Geological and Geochemical Surveys)

Instructions
- Please type or print.
- Refer to Section 77, the Mining Act for assessment work requirements and maximum credits allowed per survey type.
- If number of mining claims traversed exceeds space on this form, attach a list.
- Technical Reports and maps in duplicate should be submitted to Mining Lands Section, Mineral Development and Lands Branch:

Type of Survey(s)	Mining Division	Township or Area
GROUND GEOPHYSICS - INDUCED POLARIZATION	PORCUPINE	KEITH TWP.

Recorded Holder(s)	Prospector's Licence No.
GLEN AUDEN RESOURCES LIMITED 2.13177	T-1915
Address	**Telephone No.**
P.O. BOX 1637 TIMMINS ONT P4N 7W8	(705) 264-4246
Survey Company	
R.S. MIDDLETON EXPLORATION SERVICES INC	
Name and Address of Author (of Geo-Technical Report)	**Date of Survey (from & to)**
J. BURTON & R. LACHAPELLE (ADDRESS AS ABOVE)	14 10 89 (Day / Mo. / Yr.) — 16 10 89 (Day / Mo. / Yr.)

Credits Requested per Each Claim in Columns at right

Special Provisions		Days per Claim
For first survey: Enter 40 days. (This includes line cutting)	Geophysical - Electromagnetic	
	- Magnetometer	
For each additional survey: using the same grid: Enter 20 days (for each)	- Other	
	Geological	
	Geochemical	
Man Days Complete reverse side and enter total(s) here	Geophysical - Electromagnetic	Days per Claim
	- Magnetometer	
	- Other I.P.	20.76
	~~Geological I.P.~~	~~20.76~~
	Geochemical	
Airborne Credits Note: Special provisions credits do not apply to Airborne Surveys.		Days per Claim
	Electromagnetic	
	Magnetometer	
	Other	
Total miles flown over claim(s).		

Mining Claims Traversed (List in numerical sequence)

Mining Claim Prefix	Mining Claim Number	Mining Claim Prefix	Mining Claim Number	Mining Claim Prefix	Mining Claim Number
P	1035690	P	1035704	P	1035732
P	1035691	P	1035713	P	1035733
P	1035692	P	1035714	P	1035734
P	1035693	P	1035715	P	1071624
P	1035694	P	1035717	P	1071623
P	1035695	P	1035718	P	1087290
P	1035696	P	1035723	P	1087291
P	1035701	P	1035725	P	1087292
P	1035702	P	1035726	P	1087293
P	1035703	P	1035727		

RECEIVED
APR 27 1990
MINING LANDS SECTION

RECORDED
MAR 14 1990

Date	Recorded Holder or Agent (Signature)
March 14/90	Cliff David

Total number of mining claims covered by this report of work: 29

Certification Verifying Report of Work

I hereby certify that I have a personal and intimate knowledge of the facts set forth in this Report of Work, having performed the work or witnessed same during and/or after its completion and annexed report is true.

Name and Address of Person Certifying

CLIFF DAUID P.O. BOX 1637 TIMMINS ONT P4N 7W8

Telephone No.	Date	Certified By (Signature)
(705) 264-4246	March 14/90	Cliff David

For Office Use Only

Total Days Cr. Recorded	Date Recorded	Mining Recorder
602.01	MAR. 14 90	S. White Mining Recorder
	Date Approved as Recorded	Provincial Manager, Mining Lands
	June 22/90	

Received Stamp: PORCUPINE MINING DIVISION RECEIVED MAR 14 1990 1:00pm

0582 (89/06)

Assessment Work Breakdown

Man Days are based on eight (8) hour Technical or Line-cutting days. Technical days include work performed by consultants, draftsmen, etc..

Type of Survey

Technical Days				Technical Days Credits		Line-cutting Days		Total Credits		No. of Claims		Days per Claim
86	X	7	=	602	+	0	=	602	÷	29	=	20.76

Type of Survey

Technical Days				Technical Days Credits		Line-cutting Days		Total Credits		No. of Claims		Days per Claim
	X	7	=		+		=		÷		=	

Type of Survey

Technical Days				Technical Days Credits		Line-cutting Days		Total Credits		No. of Claims		Days per Claim
	X	7	=		+		=		÷		=	

Type of Survey

Technical Days				Technical Days Credits		Line-cutting Days		Total Credits		No. of Claims		Days per Claim
	X	7	=		+		=		÷		=	

Ontario

Ministry of Natural Resources

File _____

GEOPHYSICAL – GEOLOGICAL – GEOCHEMICAL TECHNICAL DATA STATEMENT

2.13177

TO BE ATTACHED AS AN APPENDIX TO TECHNICAL REPORT
FACTS SHOWN HERE NEED NOT BE REPEATED IN REPORT
TECHNICAL REPORT MUST CONTAIN INTERPRETATION, CONCLUSIONS ETC.

Type of Survey(s) TOTAL FIELD MAGNETIC

Township or Area KEITH TWP.

Claim Holder(s) GLEN AUDEN RESOURCES LIMITED
C/O R.S. MIDDLETON EXPL. SERV. INC P.O. BOX 1637 TIMMINS

Survey Company R.S. MIDDLETON EXPLORATION SERVICES INC

Author of Report R LACROIX

Address of Author 86 CEDAR ST. SOUTH, TIMMINS

Covering Dates of Survey AUGUST 8 1989 TO SEPTEMBER 7 1989
(linecutting to office)

Total Miles of Line Cut 55 Km

SPECIAL PROVISIONS CREDITS REQUESTED

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

DAYS per claim.

Geophysical
–Electromagnetic _____
–Magnetometer 20
–Radiometric _____
–Other _____
Geological _____
Geochemical _____

AIRBORNE CREDITS (Special provision credits do not apply to airborne surveys)

Magnetometer _____ Electromagnetic _____ Radiometric _____
(enter days per claim)

DATE: JAN 19/90 SIGNATURE: Richard Lacroix
Author of Report or Agent

Res. Geol. _____ Qualifications _____

Previous Surveys

File No.	Type	Date	Claim Holder

MINING CLAIMS TRAVERSED
List numerically

(prefix)	(number)
P 1035690	P 1035725
P 1035691	P 1035726
P 1035695	P 1035727
P 1035696	P 1035732
P 1035701	P 1035733
P 1035703	P 1035734
P 1035704	P 1071623
P 1035713	P 1071624
P 1035714	P 1087290
P 1035715	P 1087291
P 1035718	P 1087292
P 1035723	

If space insufficient, attach list

TOTAL CLAIMS 23

0227 (5/79)

GEOPHYSICAL TECHNICAL DATA

GROUND SURVEYS – If more than one survey, specify data for each type of survey

Number of Stations N/A Number of Readings N/A

Station interval 25m and 12.5m Line spacing 100m

Profile scale N/A

Contour interval 20, 100, 1000 GAMMAS

MAGNETIC

Instrument EDA INSTRUMENTS PPM 350

Accuracy – Scale constant 10 GAMMAS

Diurnal correction method AUTOMATIC

Base Station check-in interval (hours) N/A

Base Station location and value T2 2465S / 13+75W , 58000 GAMMAS

EDA INSTRUMENTS PPM 400

ELECTROMAGNETIC

Instrument

Coil configuration

Coil separation

Accuracy

Method: ☐ Fixed transmitter ☐ Shoot back ☐ In line ☐ Parallel line

Frequency (specify V.L.F. station)

Parameters measured

GRAVITY

Instrument

Scale constant

Corrections made

Base station value and location

Elevation accuracy

RESISTIVITY

Instrument

Method ☐ Time Domain ☐ Frequency Domain

Parameters – On time Frequency

– Off time Range

– Delay time

– Integration time

Power

Electrode array

Electrode spacing

Type of electrode

INDUCED POLARIZATION

Ontario

Ministry of Natural Resources

File _____

GEOPHYSICAL – GEOLOGICAL – GEOCHEMICAL TECHNICAL DATA STATEMENT

2.13177

TO BE ATTACHED AS AN APPENDIX TO TECHNICAL REPORT
FACTS SHOWN HERE NEED NOT BE REPEATED IN REPORT
TECHNICAL REPORT MUST CONTAIN INTERPRETATION, CONCLUSIONS ETC.

Type of Survey(s) INDUCED POLARIZATION

Township or Area KEITH TWP.

Claim Holder(s) GLENAUDEN RESOURCES LIMITED
c/o R.S. MIDDLETON EXPL SERV INC. P.O. BOX 1637 TIMMINS

Survey Company R.S. MIDDLETON EXPL SERVICES INC

Author of Report R. LACHAPELLE

Address of Author 136 CEDAR ST. SOUTH, TIMMINS

Covering Dates of Survey AUGUST 8 1989 TO SEPTEMBER 7, 1989
(linecutting to office)

Total Miles of Line Cut 55 Km

SPECIAL PROVISIONS CREDITS REQUESTED

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

	DAYS per claim.
Geophysical	
–Electromagnetic	
–Magnetometer	
–Radiometric	
–Other I.P.	20.76
Geological	
Geochemical	

AIRBORNE CREDITS (Special provision credits do not apply to airborne surveys)

Magnetometer _____ Electromagnetic _____ Radiometric _____
(enter days per claim)

DATE: JAN 1990 SIGNATURE: Richard Lachapelle
Author of Report or Agent

Res. Geol. _____ Qualifications _____

Previous Surveys

File No.	Type	Date	Claim Holder

MINING CLAIMS TRAVERSED
List numerically

(prefix) (number)

P1035690	P1035732
P1035691	P1035733
P1035692	P1035734
P1035693	P1071623
P1035694	P1071624
P1035695	P1087290
P1035696	P1087291
P1035701	P1087292
P1035702	P1087293
P1035703	
P1035704	
P1035713	
P1035714	
P1035715	
P1035717	
P1035718	
P1035723	
P1035725	
P1035726	
P1035727	

If space insufficient, attach list

TOTAL CLAIMS 29

GEOPHYSICAL TECHNICAL DATA

GROUND SURVEYS – If more than one survey, specify data for each type of survey

Number of Stations N/A Number of Readings N/A

Station interval 25m Line spacing 100m

Profile scale N/A

Contour interval N/A

MAGNETIC

Instrument

Accuracy – Scale constant

Diurnal correction method

Base Station check-in interval (hours)

Base Station location and value

ELECTROMAGNETIC

Instrument

Coil configuration

Coil separation

Accuracy

Method: ☐ Fixed transmitter ☐ Shoot back ☐ In line ☐ Parallel line

Frequency (specify V.L.F. station)

Parameters measured

GRAVITY

Instrument

Scale constant

Corrections made

Base station value and location

Elevation accuracy

INDUCED POLARIZATION RESISTIVITY

Instrument SCINTREX IPR-11

Method ☒ Time Domain ☐ Frequency Domain

Parameters – On time 2sec Frequency

– Off time 2sec Range

– Delay time 450msec

– Integration time 900msec

Power NUNTEC 7.5 KW

Electrode array POLE-DIPOLE

Electrode spacing 25m

Type of electrode STAINLESS STEEL

REFERENCE

AREAS WITHDRAWN FROM DISPOSITION

M.R.O. – MINING RIGHTS ONLY
S.R.O. – SURFACE RIGHTS ONLY
M.+ S. – MINING AND SURFACE RIGHTS

	Description	Order No.	Date	Disposition	File
(1)				S.R.O.	135263
(2)	M.N.R. RES.			S.R.O.	22417
(3)	SEC 36/80		7/2/80	S.R.O.	188543

SAND AND GRAVEL

(1) M.T.C. PIT
(2) M.T.C. PIT 34-15
(3) M.T.C. PIT 34-16
(4) M.T.C. PIT 1085
(5) GRAVEL FILE 177587
(6) M.N.R. PIT 3A-1 (M.O.E. WASTE DISP. SITE)

NOTES

SURVEY LINES SHOWN THUS ———— ARE FOR CONTROL ONLY. CLAIMS CLASSIFIED AS BEING IN UNSUBDIVIDED TERRITORY.— March 7, 1947.
Surveyor General

FLOODING

Flooded areas on Hoodoo & Horwood Lakes and Groundhog R. to contour elev. 1117' L.O. 7746 File: 75166

MUSKEGO TWP.

IVANHOE TWP.

PENHORWOOD TWP.

HORWOOD TWP.

LEGEND

HIGHWAY AND ROUTE No.
OTHER ROADS
TRAILS
SURVEYED LINES:
TOWNSHIPS, BASE LINES, ETC.
LOTS, MINING CLAIMS, PARCELS, ETC.
UNSURVEYED LINES:
LOT LINES
PARCEL BOUNDARY
MINING CLAIMS ETC.
RAILWAY AND RIGHT OF WAY
UTILITY LINES
NON-PERENNIAL STREAM
FLOODING OR FLOODING RIGHTS
SUBDIVISION OR COMPOSITE PLAN
RESERVATIONS
ORIGINAL SHORELINE
MARSH OR MUSKEG
MINES
TRAVERSE MONUMENT

DISPOSITION OF CROWN LANDS

TYPE OF DOCUMENT	SYMBOL
PATENT, SURFACE & MINING RIGHTS	●
" , SURFACE RIGHTS ONLY	◓
" , MINING RIGHTS ONLY	◒
LEASE, SURFACE & MINING RIGHTS	■
" , SURFACE RIGHTS ONLY	▬
" , MINING RIGHTS ONLY	▬
LICENCE OF OCCUPATION	▼
ORDER-IN-COUNCIL	OC
RESERVATION	(R)
CANCELLED	⊗
SAND & GRAVEL	(S)

NOTE: MINING RIGHTS IN PARCELS PATENTED PRIOR TO MAY 6, 1913, VESTED IN ORIGINAL PATENTEE BY THE PUBLIC LANDS ACT, R.S.O. 1970, CHAP. 380, SEC. 63, SUBSEC 1.

SCALE: 1 INCH = 40 CHAINS

FEET 0 1000 2000 4000 6000 8000
METRES 0 200 1000 2000 (1 KM) (2 KM)

TOWNSHIP

KEITH

M.N.R. ADMINISTRATIVE DISTRICT
CHAPLEAU
MINING DIVISION
PORCUPINE
LAND TITLES / REGISTRY DIVISION
SUDBURY

Ministry of Natural Resources — Land Management Branch
Ontario

Date APRIL 1988

Number G-3238

MUSKEGO TWP.

Chevron

Chevron

B.P. Resources

B.H.P. Utah

Unigold Resources

M. Charet

Henry Vitto

George Ross

M. Charet

G. Sanford

M. Charet

Gail Resources
Marshall Minerals

Keith '71' claims

Meunier claims

Groundhog claims

IVANHOE TWP.

PENHORWOOD TWP.

Groundhog River

G. Sanford

Gail Resources
Marshall Minerals

Gail Resources
Marshall Minerals

G. Sanford

G. Sanford

Hoodoo Lake

Groundhog Lake

Armstrong Lake

Horwood

West Marsh

Lake

HORWOOD TWP.

LEGEND

R.S. Middleton property boundary

other property boundaries

22 Meunier claim boundary

2.13177

REVISIONS	ROBERT S. MIDDLETON EXPLORATION SERVICES INC.		
	for GLEN AUDEN RESOURCES LTD.		
	Title KEITH TOWNSHIP PROPERTY LOCATION AND CLAIM MAP Fig. 2		
	Date: Nov. 88	Scale: 1 : 31,640	N.T.S.:
	Drawn: JLB	Approved:	File: M-310

42B01NE0139 2.13177 KEITH

N

Mixed Forest

ppl

adr

low bush

Mixed Forest

pne

spc

pne

1071625

adr

1071626

ppl, bch

ppl

mixed forest

adr

ppl

cdr

cdr

Cottage

Cottage

GROUNDHOG LAKE

LEGEND

TREES

cdr cedar
spc spruce
ppl poplar
bsm balsam
pne pine
mpl maple
adr alder
tmk tamarack
bch birch

creek

swamp

gravel road

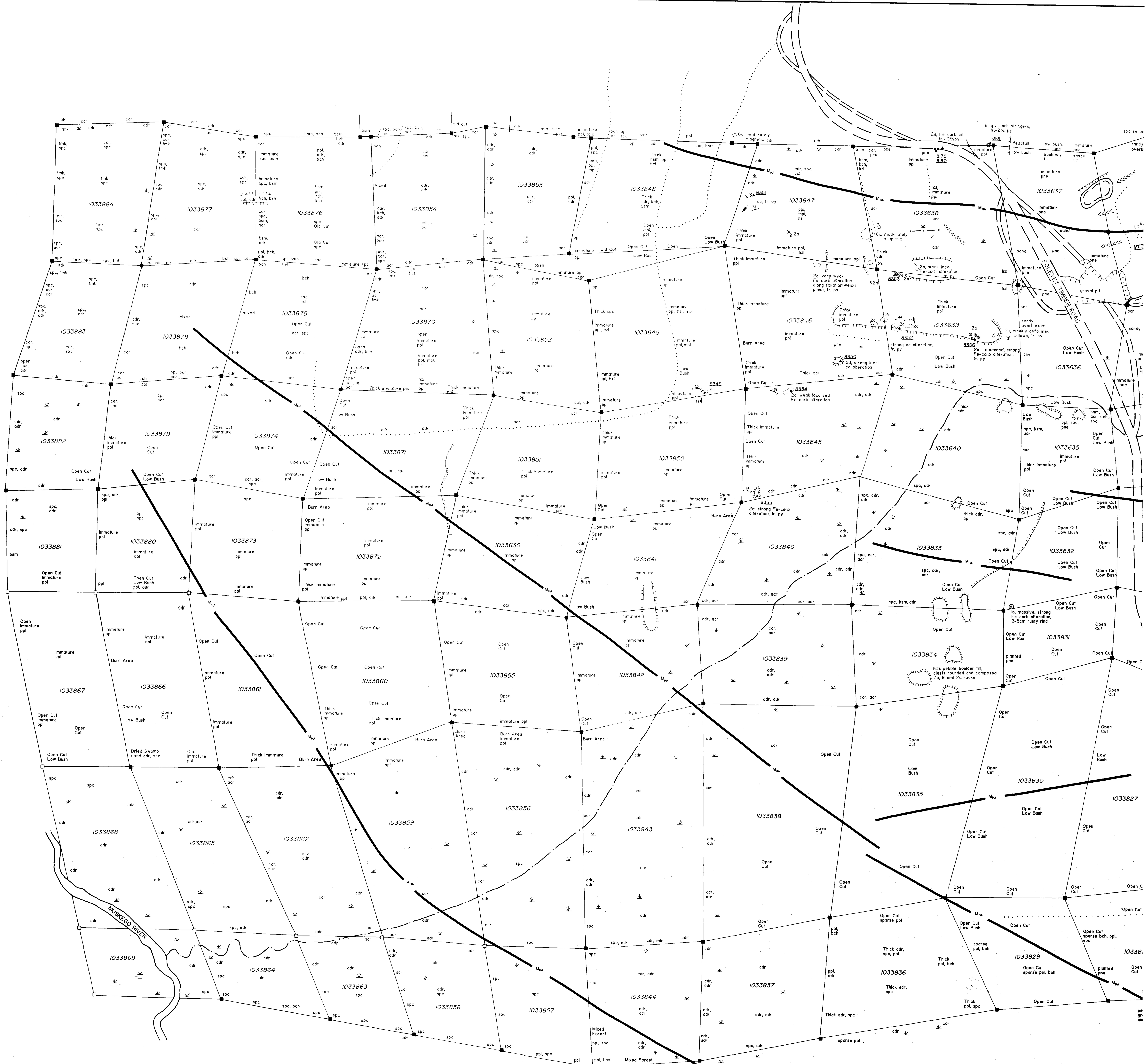
trail

claim post and lines
(assumed post)

REVISIONS	ROBERT S. MIDDLETON EXPLORATION SERVICES INC.		
	for GLEN AUDEN RESOURCES LIMITED		
	Title GROUNDHOG GEOLOGY MAP- SOUTHWEST SHEET 2.13177		
	Date: Nov. 15, 1988	Scale: 1 : 2500	N.T.S.:
	Drawn: M.Z.	Approved:	File: M-310

× Banded chert mag hem boulder rounded to angular 20×15 cm. Strg. magnetic

▼ 5843 Strgly gossanized, recessive bleached boulder, wkly magnetic, dk. grey nod. of chert up to 3cm long



LEGEND

LATE INTRUSIVE ROCKS

6 Proterozoic diabase

7 EARLY FELSIC INTRUSIVE ROCKS

7a granitic rocks
7b quartz-feldspar porphyry

6 EARLY MAFIC AND INTERMEDIATE INTRUSIVE ROCKS

6a gabbro
6b pyroxene-porphyritic rock
6c diorite
6d feldspar porphyry

5 ULTRAMAFIC ROCKS

5a peridotite
5b serpentinized peridotite
5c komatiitic rock
5d carbonatized ultramafic rock

4 SEDIMENTARY ROCKS

4a argillite
4b wacke (siltstone, sandstone)
4c conglomerate
4d chert
4e iron formation
4f graphitic rock

3 FELSIC VOLCANIC ROCKS

3a massive flow or undifferentiated
3b flow breccia
3c porphyritic flow
3d tuff, crystal tuff
3e lapilli tuff

2 INTERMEDIATE VOLCANIC ROCKS

2a massive flow or undifferentiated
2b pillow flow
2c pillow or flow breccia
2d amygdaloidal
2e porphyritic
2f tuff, crystal tuff
2g lapilli tuff
2h agglomerate
2j reworked tuff (tuffacous sedimentary rock)

1 MAFIC VOLCANI

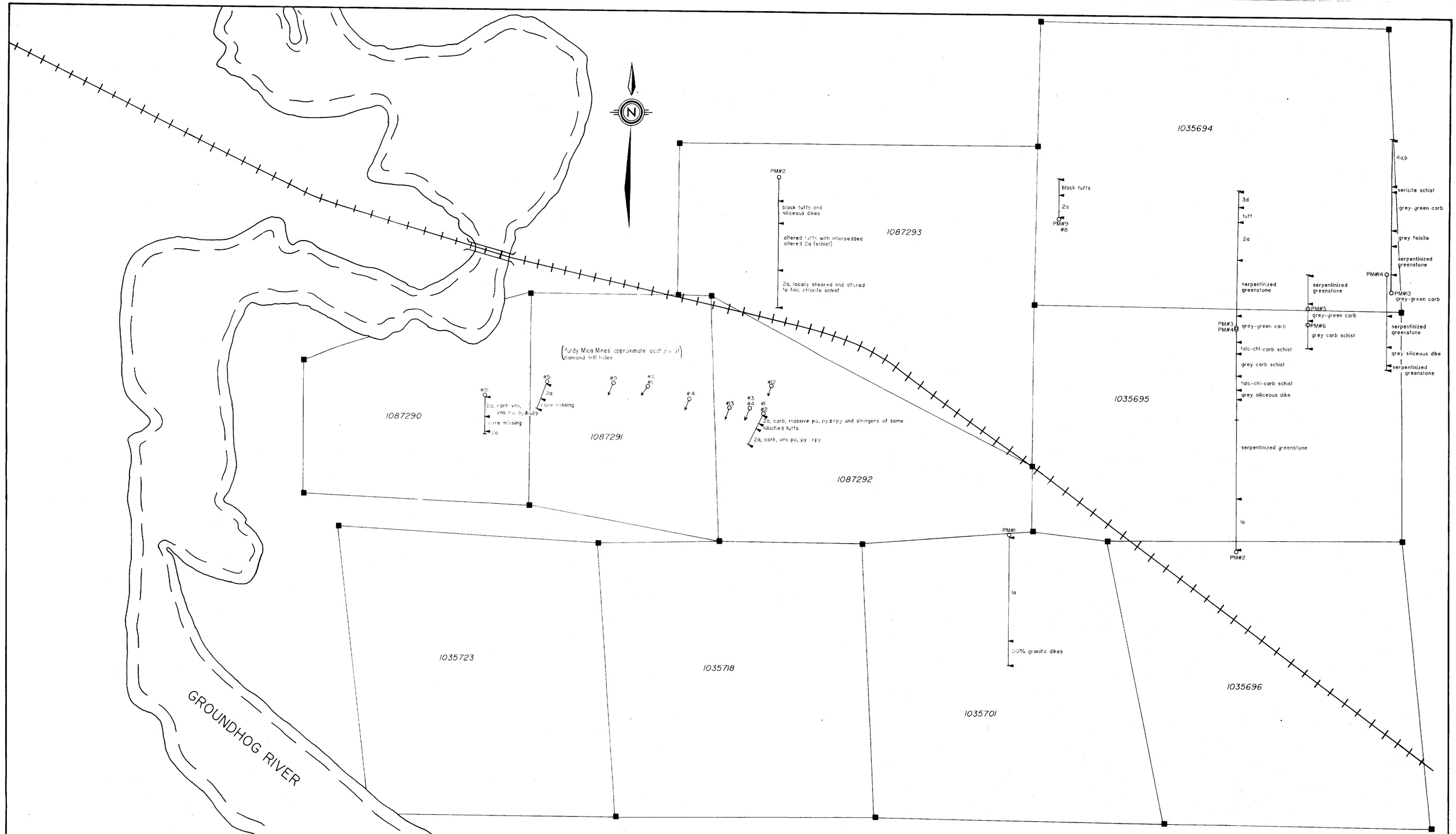
1a massive pillow o
1b pillowed flow
1c pillow or flow br
1d amygdaloidal
1e variolitic
1f porphyritic
1g pyroclastic

qtz quartz
qv quartz vein
silic silicified
carb carbonate
cc calcite
ank ankerite
ep epidote
chl chlorite
pyx pyroxene
feld feldspar
mag magnetite
py pyrite
po pyrrhotite
cpy chalcopyrite

claim post and (assumed post)

sample location number 8336

M_{HA} magnetic high a



LEGEND

LATE INTRUSIVE ROCKS

8 Proterozoic diabase

7 EARLY FELSIC INTRUSIVE ROCKS

7a granitic rocks
7b quartz-feldspar porphyry

6 EARLY MAFIC AND INTERMEDIATE INTRUSIVE ROCKS

6a gabbro
6b pyroxene-porphyry
6c diorite
6d feldspar porphyry

5 ULTRAMAFIC ROCKS

5a peridotite
5b serpentinized peridotite
5c komatiitic
5d carbonatized ultramafic rock

4 SEDIMENTARY ROCKS

4a argillite
4b wacke (siltstone, sandstone)
4c conglomerate
4d chert
4e iron formation
4f graphitic rock

3 FELSIC VOLCANIC ROCKS

3a massive flow or undifferentiated
3b flow breccia
3c porphyritic flow
3d tuff, crystal tuff
3e lapilli tuff

2 INTERMEDIATE VOLCANIC ROCKS

2a massive flow or undifferentiated
2b pillow flow
2c pillow or flow breccia
2d amygdaloidal
2e porphyritic
2f tuff, crystal tuff
2g lapilli tuff
2h agglomerate
2j reworked tuff (tuffaceous)

1 MAFIC VOLCANIC ROCKS

1a massive pillow or undifferentiated
1b pillowed flow
1c pillow or flow breccia
1d amygdaloidal
1e variolitic
1f porphyritic
1g pyroclastic

qtz	quartz
qv	quartz vein
silic	silicified
carb	carbonate
cc	calcite
ank	ankerite
ep	epidote
chl	chlorite
pyx	pyroxene
feld	feldspar
mag	magnetite
py	pyrite
po	pyrrhotite
cpy	chalcopyrite

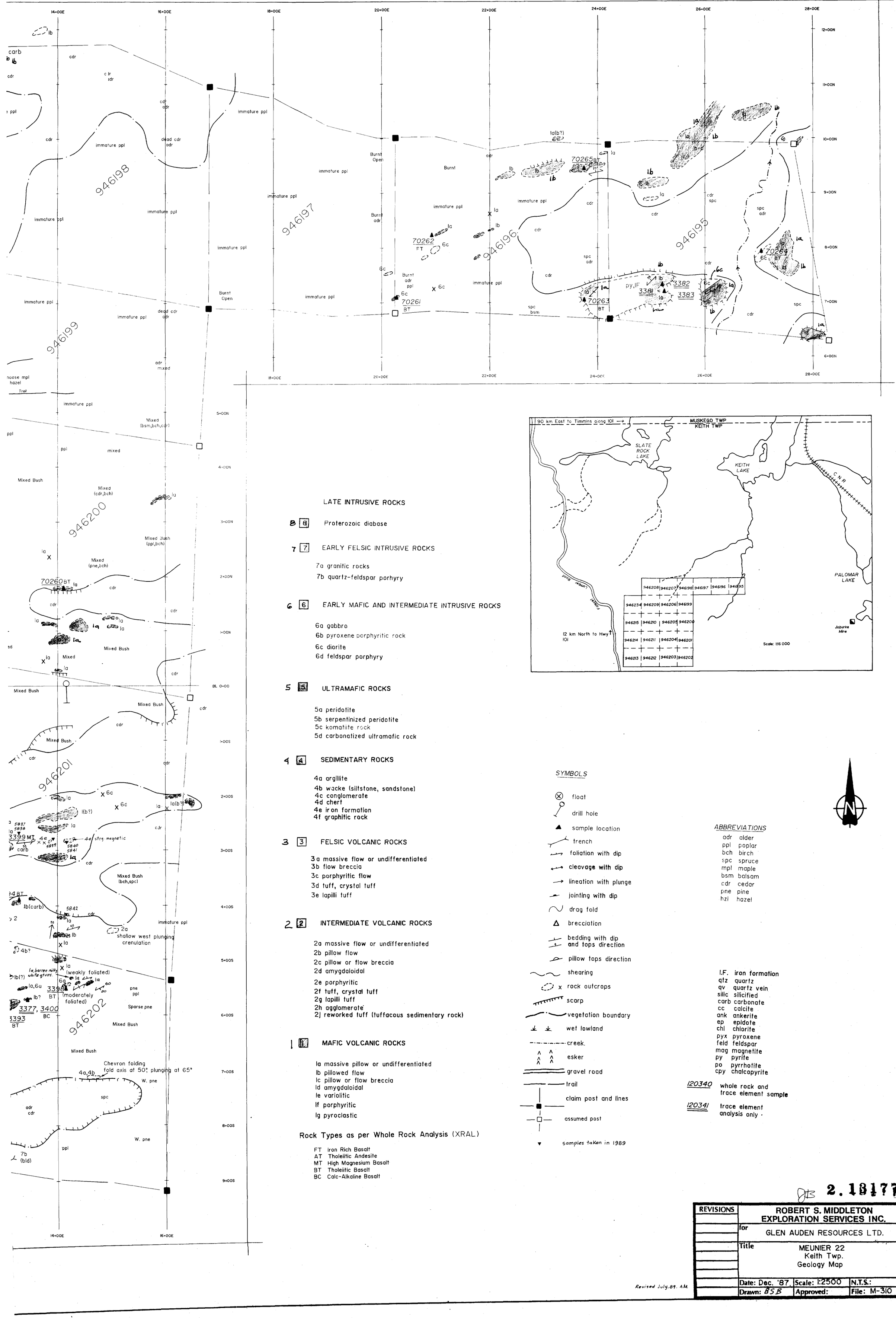
railway tracks
diamond drill hole (depth known)
(depth unknown)
claim post and lines (assumed post)

JB 2.13177

REVISIONS	ROBERT S. MIDDLETON EXPLORATION SERVICES INC.		
	for GLEN AUDEN RESOURCES LIMITED		
	Title GROUNDHOG DRILL HOLE LOCATION MAP		
	Date: Nov. 15, 1988	Scale: 1: 2500	N.T.S.:
	Drawn: M.Z.	Approved:	File: M-310

42B01NE0139 2.13177 KEITH

280



LATE INTRUSIVE ROCKS

8 [8] Proterozoic diabase

7 [7] EARLY FELSIC INTRUSIVE ROCKS

- 7a granitic rocks
- 7b quartz-feldspar porhyry

6 [6] EARLY MAFIC AND INTERMEDIATE INTRUSIVE ROCKS

- 6a gabbro
- 6b pyroxene porphyritic rock
- 6c diorite
- 6d feldspar porphyry

5 [5] ULTRAMAFIC ROCKS

- 5a peridotite
- 5b serpentinized peridotite
- 5c komatiite rock
- 5d carbonatized ultramafic rock

4 [4] SEDIMENTARY ROCKS

- 4a argillite
- 4b wacke (siltstone, sandstone)
- 4c conglomerate
- 4d chert
- 4e iron formation
- 4f graphitic rock

3 [3] FELSIC VOLCANIC ROCKS

- 3a massive flow or undifferentiated
- 3b flow breccia
- 3c porphyritic flow
- 3d tuff, crystal tuff
- 3e lapilli tuff

2 [2] INTERMEDIATE VOLCANIC ROCKS

- 2a massive flow or undifferentiated
- 2b pillow flow
- 2c pillow or flow breccia
- 2d amygdaloidal
- 2e porphyritic
- 2f tuff, crystal tuff
- 2g lapilli tuff
- 2h agglomerate
- 2j reworked tuff (tuffacous sedimentary rock)

1 [1] MAFIC VOLCANIC ROCKS

- 1a massive pillow or undifferentiated
- 1b pillowed flow
- 1c pillow or flow breccia
- 1d amygdaloidal
- 1e variolitic
- 1f porphyritic
- 1g pyroclastic

Rock Types as per Whole Rock Analysis (XRAL)

- FT Iron Rich Basalt
- AT Tholeiitic Andesite
- MT High Magnesium Basalt
- BT Tholeiitic Basalt
- BC Calc-Alkaline Basalt

SYMBOLS

- float
- drill hole
- sample location
- trench
- foliation with dip
- cleavage with dip
- lineation with plunge
- jointing with dip
- drag fold
- brecciation
- bedding with dip and tops direction
- pillow tops direction
- shearing
- x rock outcrops
- scarp
- vegetation boundary
- wet lowland
- creek.
- esker
- gravel road
- trail
- claim post and lines
- assumed post
- ▼ samples taken in 1989

ABBREVIATIONS

adr	alder
ppl	poplar
bch	birch
spc	spruce
mpl	maple
bsm	balsam
cdr	cedar
pne	pine
hzl	hazel

I.F.	iron formation
qtz	quartz
qv	quartz vein
silic	silicified
carb	carbonate
cc	calcite
ank	ankerite
ep	epidote
chl	chlorite
pyx	pyroxene
feld	feldspar
mag	magnetite
py	pyrite
po	pyrrhotite
cpy	chalcopyrite

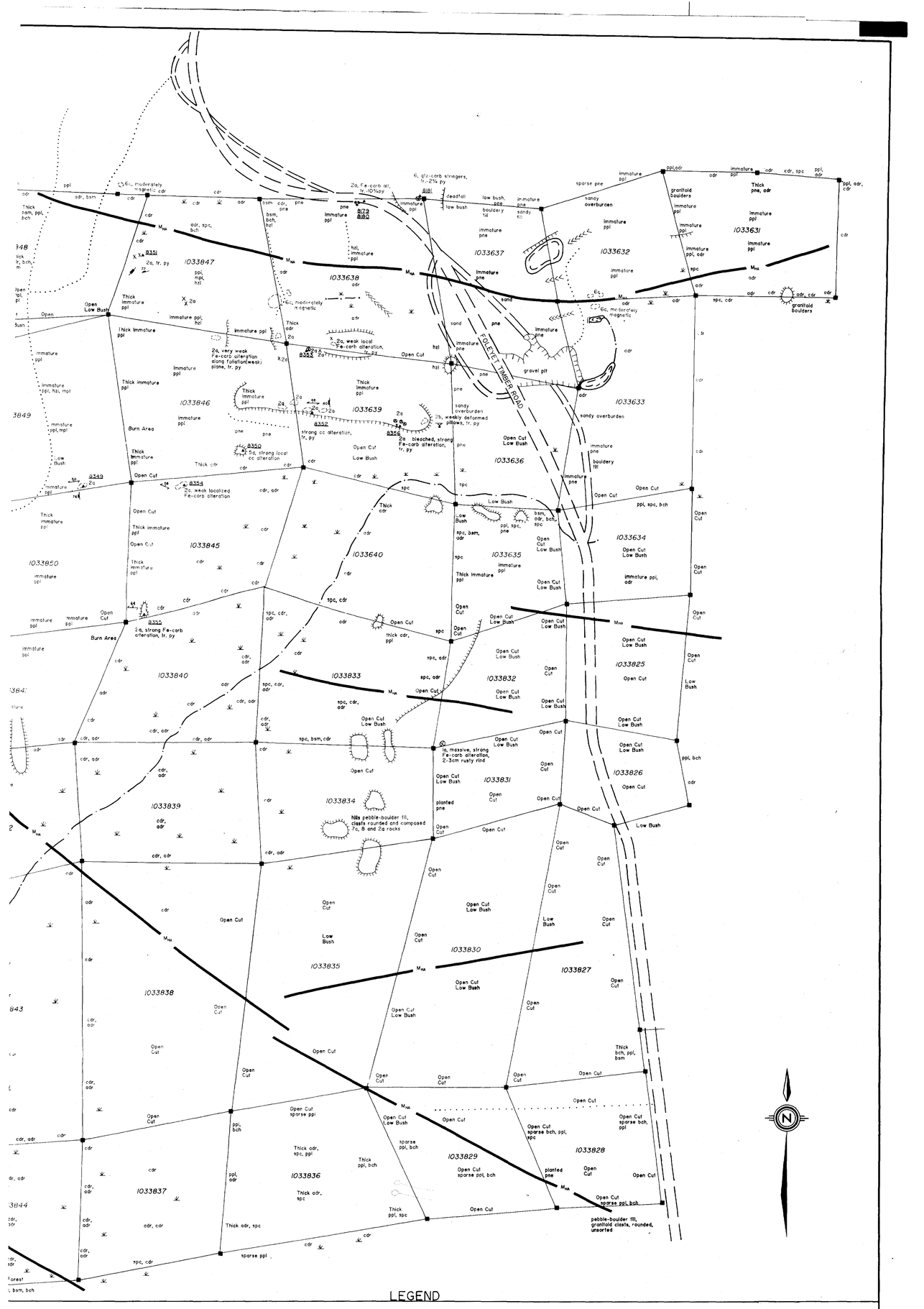
120340 whole rock and trace element sample

120341 trace element analysis only.

Revised July.89. A.M.

2.18177

REVISIONS	ROBERT S. MIDDLETON EXPLORATION SERVICES INC.		
	for GLEN AUDEN RESOURCES LTD.		
	Title MEUNIER 22 Keith Twp. Geology Map		
	Date: Dec. '87	Scale: 1:2500	N.T.S.:
	Drawn: BSB	Approved:	File: M-310



LEGEND

LATE INTRUSIVE ROCKS

8 Proterozoic diabase

7 EARLY FELSIC INTRUSIVE ROCKS

7a granitic rocks
7b quartz-feldspar porphyry

6 EARLY MAFIC AND INTERMEDIATE INTRUSIVE ROCKS

6a gabbro
6b pyroxene-porphyritic rock
6c diorite
6d feldspar porphyry

5 ULTRAMAFIC ROCKS

5a peridotite
5b serpentinized peridotite
5c komatiitic rock
5d carbonatized ultramafic rock

4 SEDIMENTARY ROCKS

4a argillite
4b wacke (siltstone, sandstone)
4c conglomerate
4d chert
4e iron formation
4f graphitic rock

3 FELSIC VOLCANIC ROCKS

3a massive flow or undifferentiated
3b flow breccia
3c porphyritic flow
3d tuff, crystal tuff
3e lapilli tuff

2 INTERMEDIATE VOLCANIC ROCKS

2a massive flow or undifferentiated
2b pillow flow
2c pillow or flow breccia
2d amygdaloidal
2e porphyritic
2f tuff, crystal tuff
2g lapilli tuff
2h agglomerate
2j reworked tuff (tuffaceous sedimentary rock)

1 MAFIC VOLCANIC ROCKS

1a massive pillow or undifferentiated
1b pillowed flow
1c pillow or flow breccia
1d amygdaloidal
1e variolitic
1f porphyritic
1g pyroclastic

TREES

qtz	quartz	cdr	cedar
qv	quartz vein	spc	spruce
silic	silicified	ppl	poplar
carb	carbonate	bsm	balsam
cc	calcite	pne	pine
ank	ankerite	mpl	maple
ep	epidote	adr	alder
chl	chlorite	tmk	tamarack
pyx	pyroxene	bch	birch
feld	feldspar	hzl	hazel
mag	magnetite		
py	pyrite		
po	pyrrhotite		
cpy	chalcopyrite		

claim post and lines (assumed post)

sample location and number (e.g. 8336)

M_{HA} magnetic high anomaly

80 foliation with dip

75 cleavage with dip

lineation with plunge

60 jointing with dip

drag fold

brecciation

60 bedding with dip and tops direction

pillow tops direction

shearing

outcrop, float

scarp

french

pit

shaft

esker

creek

swamp

gravel road

trail

railway tracks

2.13177

REVISIONS	ROBERT S. MIDDLETON EXPLORATION SERVICES INC.
	for GLEN AUDEN RESOURCES LIMITED
	Title KEITH 71 GEOLOGY MAP
	Date: Nov. 15, 1988 | Scale: 1 : 5000 | N.T.S.:
	Drawn: M.Z. | Approved: | File: M-310

1035786
1035732
1035727
1035713
1035690
1035733
1035726
1035714
1035691
1035703
1035734
1035725
1035715
S3523
S3525
S2450
S2452
S2453

LEGEND

LATE INTRUSIVE ROCKS

8 Proterozoic diabase

7 EARLY FELSIC INTRUSIVE ROCKS
- 7a granitic rocks
- 7b quartz-feldspar porphyry

6 EARLY MAFIC AND INTERMEDIATE INTRUSIVE ROCKS
- 6a gabbro
- 6b pyroxene-porphyry
- 6c diorite
- 6d feldspar porphyry

5 ULTRAMAFIC ROCKS
- 5a peridotite
- 5b serpentinized peridotite
- 5c komatiiite
- 5d carbonatized ultramafic rock

4 SEDIMENTARY ROCKS
- 4a argillite
- 4b wacke (siltstone, sandstone)
- 4c conglomerate
- 4d chert
- 4e iron formation
- 4f graphitic rock

3 FELSIC VOLCANIC ROCKS
- 3a massive flow or undifferentiated
- 3b flow breccia
- 3c porphyritic flow
- 3d tuff, crystal tuff
- 3e lapilli tuff

2 INTERMEDIATE VOLCANIC ROCKS
- 2a massive flow or undifferentiated
- 2b pillow flow
- 2c pillow or flow breccia
- 2d amygdaloidal
- 2e porphyritic
- 2f tuff, crystal tuff
- 2g lapilli tuff
- 2h agglomerate
- 2j reworked tuff (tuffaceous)

1 MAFIC VOLCANIC ROCKS
- 1a massive pillow or undifferentiated
- 1b pillowed flow
- 1c pillow or flow breccia
- 1d amygdaloidal
- 1e variolitic
- 1f porphyritic
- 1g pyroclastic

qtz quartz
qv quartz vein
silic siliceous
carb carbonate
cc calcite
ank ankerite
ep epidote
chl chlorite
pyx pyroxene
feld feldspar
mag magnetite
py pyrite
po pyrrhotite
cpy chalcopyrite

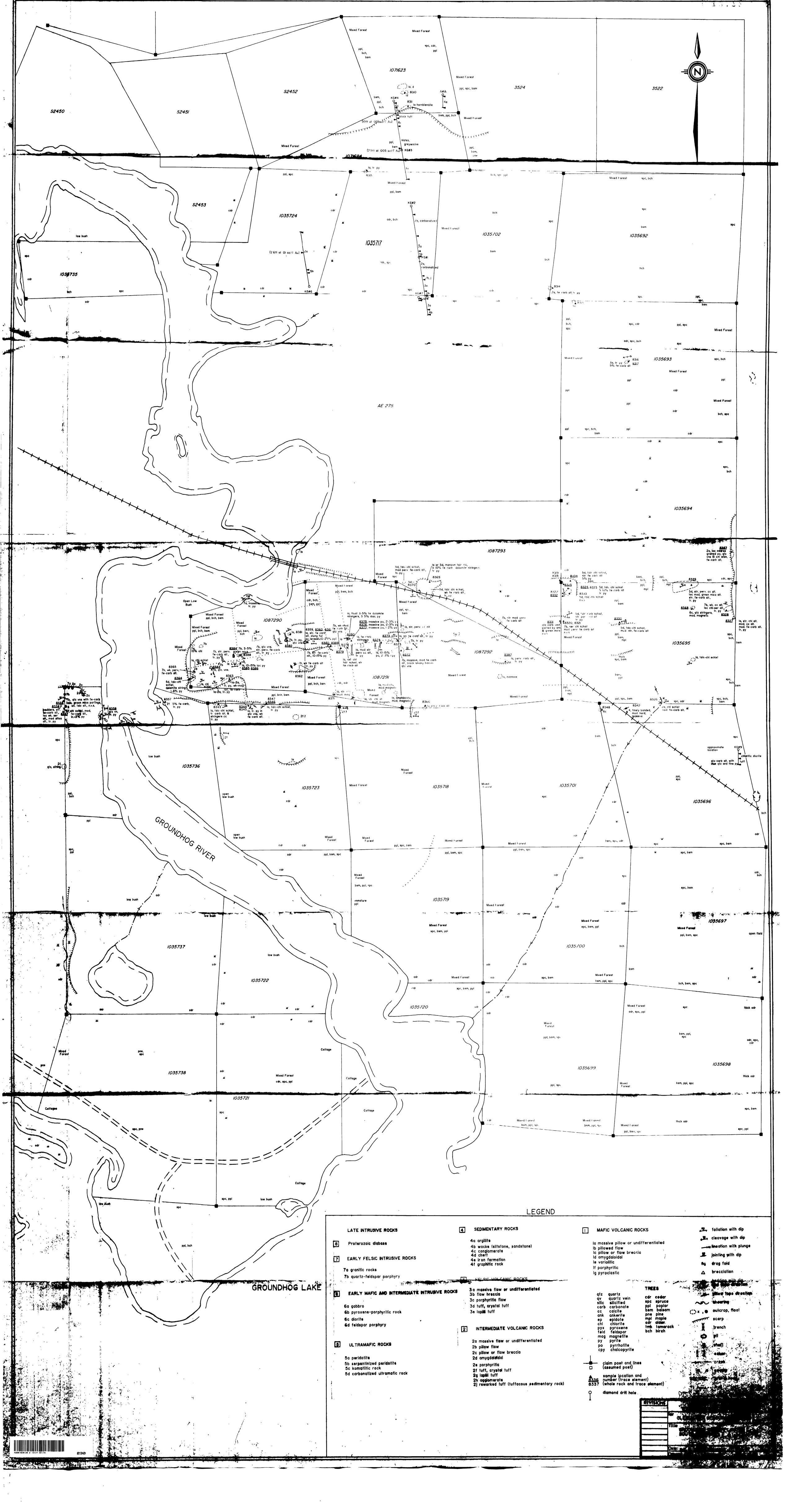
claim post and lines (assumed east)

sample location and number (trace element) (whole rock geochemistry)

diamond drill hole

220


N
GROUNDHOG RIVER
1035686
1035687
1035688
1035689
1035705
1035712
1035728
1035729
1035731
Mixed Forest
bch, bsm, spc
Mixed Forest
bch, spc, bsm
bouldery till
(granitoids)
mixed
cdr, bch, spc
low bush
flood plain
8312
8301
open low bush
thick mixed
spc deadfall
cdr
low bush


52450
52451
52452
52453
3524
3522
1071623
1071624
1035724
1035717
1035735
1035702
1035692
1035693
1035694
1035695
1035696
1035697
1035698
1035699
1035700
1035701
1035718
1035719
1035720
1035722
1035723
1035736
1035737
1035738
1035721
1087290
1087291
1087292
1087293
AE 275
GROUNDHOG RIVER
GROUNDHOG LAKE
Mixed Forest
low bush
open low bush
cottage
LEGEND
LATE INTRUSIVE ROCKS
6 Proterozoic diabase
7 EARLY FELSIC INTRUSIVE ROCKS
7a granitic rocks
7b quartz-feldspar porphyry
8 EARLY MAFIC AND INTERMEDIATE INTRUSIVE ROCKS
8a gabbro
8b pyroxene-porphyritic rock
8c diorite
8d feldspar porphyry
9 ULTRAMAFIC ROCKS
9a peridotite
9b serpentinized peridotite
9c komatiitic rock
9d carbonatized ultramafic rock
4 SEDIMENTARY ROCKS
4a argillite
4b wacke (siltstone, sandstone)
4c conglomerate
4d chert
4e iron formation
4f graphitic rock
3 FELSIC VOLCANIC ROCKS
3a massive flow or undifferentiated
3b flow breccia
3c porphyritic flow
3d tuff, crystal tuff
3e lapilli tuff
2 INTERMEDIATE VOLCANIC ROCKS
2a massive flow or undifferentiated
2b pillow flow
2c pillow or flow breccia
2d amygdaloidal
2e porphyritic
2f tuff, crystal tuff
2g lapilli tuff
2h agglomerate
2i reworked tuff (tuffaceous sedimentary rock)
1 MAFIC VOLCANIC ROCKS
1a massive pillow or undifferentiated
1b pillowed flow
1c pillow or flow breccia
1d amygdaloidal
1e variolitic
1f porphyritic
1g pyroclastic
TREES
qtz quartz
qv quartz vein
silic silicified
carb carbonate
cc calcite
ank ankerite
ep epidote
chl chlorite
pyx pyroxene
feld feldspar
mag magnetite
py pyrite
po pyrrhotite
cpy chalcopyrite
cdr cedar
spc spruce
ppl poplar
bsm balsam
pne pine
mpl maple
adr alder
tmk tamarack
bch birch
claim post and lines (assumed post)
sample location and number (trace element) 8336 8337 (whole rock and trace element)
diamond drill hole
foliation with dip
cleavage with dip
lineation with plunge
jointing with dip
drag fold
brecciation
shear zone with dip
younging direction
shearing
outcrop, float
scarp
trench
pit
shaft
adit
crash
REVISIONS
Title
Date
Drawn
Checked
Approved
232

S2453

1035735

1035724

1035717

1035702

1035692

1035693

1035694

1035695

1035696

1035701

1035718

1035723

1035736

1035737

1087290

1087291

1087292

1087293

1035722

1035719

1035700

1035697

GROUNDHOG RIVER

L 14 W L 13 W L 12 W L 10 W L 9 W

L 15 W L 11 W L 8 W L 7 W L 6 W L 5 W L 4 W L 3 W L 2 W L 1 W L 0

- 700 S
- 800 S
- 900 S
- 1000 S
- 1100 S
- 1200 S
- 1300 S
- 1400 S
- 1500 S
- 1600 S
- 1700 S
- 1800 S
- 1900 S
- 2000 S
- 2100 S
- 2200 S
- 2300 S
- 2400 S

LEGEND

LATE INTRUSIVE ROCKS

8 Proterozoic dykes

7 EARLY FELSIC INTRUSIVE ROCKS

7c granitic rocks
7b quartz-feldspar porphyry

6 EARLY MAFIC AND INTERMEDIATE INTRUSIVE ROCKS

6a gabbro
6b pyroxene-porphyry
6c dacite
6d hornblende porphyry

5 ULTRAMAFIC ROCKS

5a peridotite
5b serpentinized peridotite
5c komatiite
5d carbonatized ultramafic rock

4 SEDIMENTARY ROCKS

4a argillite
4b wacke (siltstone, sandstone)
4c conglomerate
4d chert
4e iron formation
4f graphitic rock

3 FELSIC VOLCANIC ROCKS

3a massive flow or unidifferentiated
3b flow breccia
3c pyroclastic flow
3d tuff, crystal tuff
3e lapilli tuff

2 INTERMEDIATE VOLCANIC ROCKS

2a massive flow or undifferentiated
2b pillow lava
2c pillow or flow breccia
2d pyroclastics
2e pyroclastic
2f tuff, crystal tuff
2g lapilli tuff
2h agglomerate
2i reworked tuff, tuffaceous

1 MAFIC VOLCANIC ROCKS

1a massive pillow or undifferentiated
1b laminated flow
1c pillow or flow breccia
1d amygdaloidal
1e xenolithic
1f porphyritic
1g pyroclastic

TREES

cdr cedar
bsm birch
ppl poplar
spc spruce
mpl maple
asp aspen
tmk tamarack
bch birch

- foliation with dip
- cleavage with dip
- lineation with plunge
- jointing with dip
- drag fold
- breccia vein
- bedding with dip and tops direction
- pillow tops direction
- shearing
- overturned folds
- scarp
- trench
- pit
- shaft
- esker
- creek
- swamp
- gravel road
- trail
- railway tracks

claim post and lines (assumed posts)

sample location and number (those prefixed with B are trace element analyses)

diamond drill hole

REVISIONS

ROBERT S. MIDDLETON EXPLORATION SERVICES INC.

for GLEN AUDEN RESOURCES LTD.

Title:

GROUNDHOG RIVER GEOLOGY MAP

"Groundhog Grid"

Date: JAN 1990 | Scale: 1 : 2500 | N.T.S.:

Drawn: JLB | Approved: | File: M-310

2.13177

1035731 1035728 1035712 1035705 1035689

L 19 W L 18 W L 17 W L 16 W L 15 W L 14 W L 13 W L 12 W L 11 W L 10 W L 9 W L 8 W L 7 W L 6 W L 5 W L 4 W L 3 W L 2 W L 1 W L 0

1035732 1035727 1035713 1035704 1035690

1035733 1035726 1035714 1035703 1035691

1035734 1035725 1035715

1035740

1071623 1071624

S2450 S2451 S2452

3525 3524 3523 3522

R I V E R

G R O U N D H O G

800 N 700 N 600 N 500 N 400 N 300 N 200 N 100 N BL 0/283 N

200S 300S 400S

open swamp

open swamp

head-falls

chert-magnitite

boulders in pit

mass,fgd

4e fgd,str mag

1a fgd, barren

8 mgd,str mag

1a wk fol, wk chl

1a wk chl

a wk chl,tr py

mod chl, lac cc stg,tr py

8339 4e 8340 1a

8335 2a

31408

8333 6a

8310

8311

8315

3140

3145

ppl,spc

ppl,bch

spc,ppl

spc,bch

spc,ald

spc,cdr

cdr,ald

cdr,spc

cdr,bch

bch,spc

bch,ppl

bch,ppl,spc

bsm,spc

ppe,spc