

EM-16 ELECTROMAGNETIC SURVEY  
OF THE  
RED CLOUD MINE  
COULTERVILLE, CALIFORNIA

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July 1980

- RED CLOUD MINE-

Geology Report at the request of

"MINING ENTERPRISES"

I INSPECTED THE RED CLOUD GOLD MINE, LOCATED NEAR COULTERVILLE, CA. MARIPOSA COUNTY, EIGHT MILES NORTH EAST OF COULTERVILLE OFF OF DOG-TOWN ROAD ON JUNE 1, 1980.

THE PROPERTY IS ACCESSIBLE THE YEAR AROUND BY A PAVED ROAD WITHIN 3 MILES, THE LATTER BEING A DIRT ROAD WHICH IS IN GOOD CONDITION. THE MINING PROPERTY CONSIST OF 19.5 ACRES OF SLIGHTLY ROLLING LAND WITH GOOD STANDS OF PINE & FIR TIMBER. THE PROPERTY HAS GOOD FACILITIES WITH BUILDINGS AND HAS ELECTRIC POWER. THE GENERAL COMPOSURE OF THE ROCK, OR ORE, CONSISTS OF A HARD BODY OF SLATE, LIMESTONE AND SPOTTY GRANITE WITH GREENSTONE. THE GOLD BEARING ORE CONSIST OF CALSITE VEINS WITH A GREENSTONE CARRYING LIGHT VALUE.

-DESCRIPTION OF EXISTING SHAFT-

THERE IS ONE EXISTING SHAFT 4X6 DECLINE @ 47 DEGREES N-NE 12 DEGREES WITH A A FRAME CONSISTING OF TIMBERS 12" IN DIAMETER BASE, DEBARKED LOGS 60' LONG MOUNTED IN CONCRETE. IT WAS CONSTRUCTED IN 1973 AND TIED TOGETHER WITH BOLTS, WITH A 8" LIFTING SHIVE, WHICH CONSISTS OF A SINGLE DRUM HOST WINCH AND IS POWERED BY A 4 CYLINDER WASHASHA WATER COOLED ENGINE. THE SHAFT IS APP. 110' DEEP. THE SHAFT PRODUCES 1400 GAL OF WATER IN 24 HOURS. GOING DOWN THE SHAFT THE COMPOSER OF ROCK CONSISTS OF A HARSH BODY, HARD BASED SHALE WITH SPOTTY GRANITE. THERE ARE A NUMBER OF FEEDER VEINS OF VERY HIGH VALUE FROM FINGER SIZE TO FIVE INCHES IN WIDTH OF A HARD CALCITE BODY. THESE ARE THE LEAD VEINS ON THE UPPER RUN OF THE ORE BODIES. THESE SMALL VEINS ARE APPARENTLY RUNNING N.E. & S.W. AT APP. 22 DEGREES ANGLE WITH A TENDENCY OF DIPPING TO APP. 60 DEGREES.

-OLD SHAFT-DESCRIPTION OF OLD WORKINGS & BUILDINGS-

THE RED CLOUD MINE HAS A VIVID HISTORY OF APP. EIGHT MILLION DOLLARS TAKEN FROM THE MINE FROM 1883 TO 1894. MILLING OPERATIONS CONSISTED OF A TWENTY FOUR STAMP MILL POWERED BY A STEAM ENGINE. THERE ARE APP. EIGHT TUNNELS LEADING OFF OF THE HALLAGE SHAFT - N.E. & S.W. SOME OF THE TUNNELS BEING APP. 165' IN LENGTH. THE MAIN SHAFT IS CAVED IN DUE TO THE POOR COLLERING JOB AND THE VIBRATION OF THE BATTERY OF TWNTY FOUR STAMPS THAT HAD BEEN MOUNTED NEAR THE EDGE OF THE MAIN SHAFT.

(Cont'd)

RED CLOUD MINE  
CONT'D

THE MAIN SHAFT WHICH FURNISHED THE ENTRY TO THE TUNNELS AT 100' INTERVALS IS BLOCKED & CAVED APP. 70' FROM THE SURFACE CONSISTING OF OLD TIMBERS AND OVER BURDEN OF APP. 28' WHICH STILL HAS THE WATER & AIR PIPE AND RAILS IN THE MAIN TUNNEL.

THE REDCLOUD MINE HAS CONSISTANTLY SHOWN VERY RICH ORE AND AN ATTEMPT IS BEING MADE, AT THIS WRITTING, TO HAVE A EM-16 STUDY MADE IN ORDER TO LOCATE THE MAIN ORE BODIES.

THE MINING PROPERTY HAS ADUQUATE ELECTRIC POWER AND HAS A 2 BEDROOM HOUSE WITH MODERN FACILITIES TOGETHER WITH A DETACHED GARAGE. A ONE BEDROOM CABIN FOR SLEEPING FACILITIES. ONE WORKSHOP APP. 30' X 50' WITH STORAGE BINS FOR MACHINE SHOP WORK. A ONE STAMP MILL FOR ASSAYING FACILITIES. ONE BUILDING APP. 30'X40' USED AS A ASSAYING OFFICE.

-CONCLUSION-

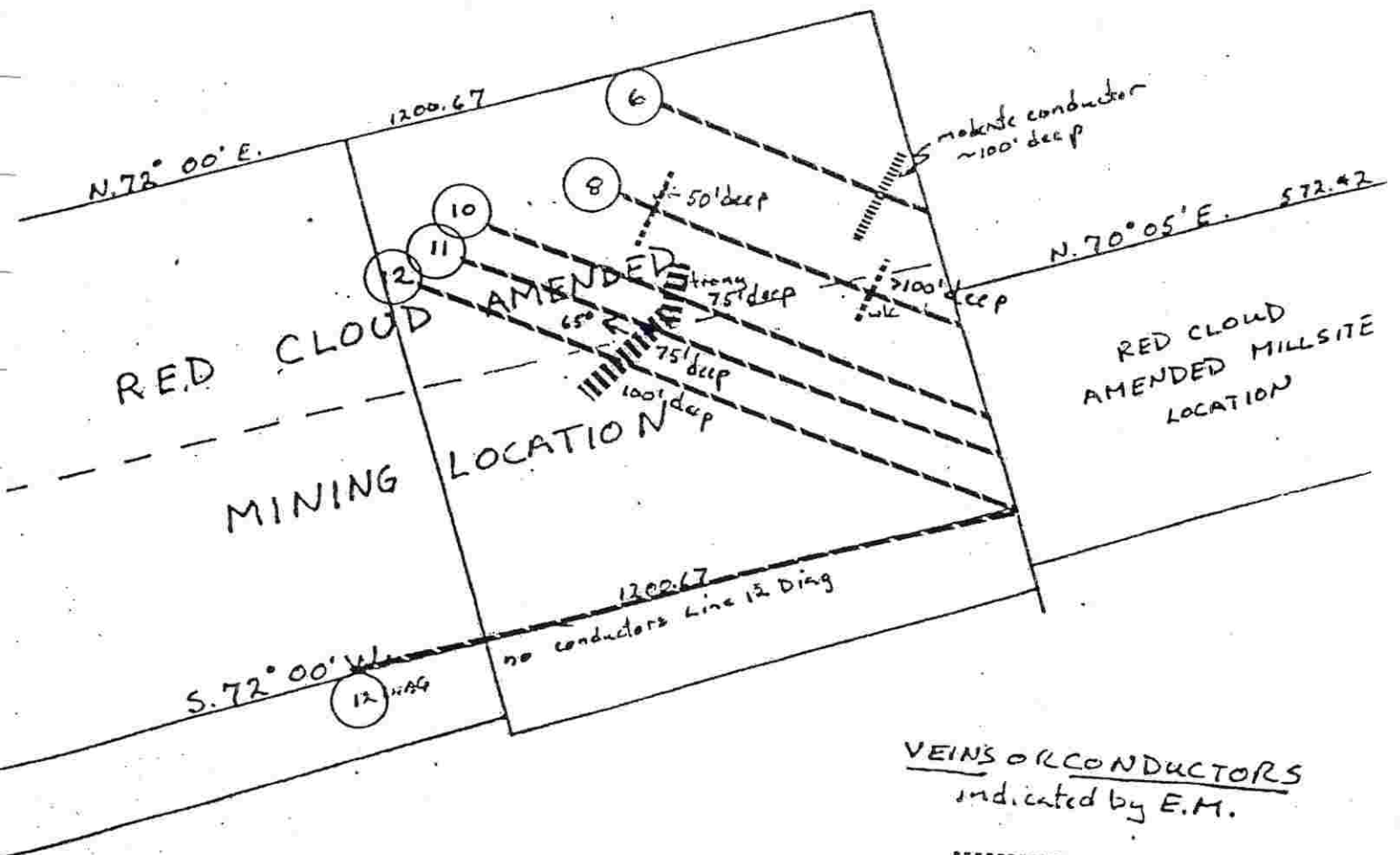
IN MY OPINION, AFTER MY INSPECTION OF THE MINING PROPERTY, TOGETHER WITH CONSIDERING THE PAST HISTORY OF THE MINE, I FEEL CONFIDENT THAT THE RED CLOUD MINE HAS A GOOD VALUE AND POTENTIAL AND FEEL THAT WHEN THE MAIN ORE BODIES ARE LOCATED THAT THE MINE COULD VERY EASILY PROVE TO BE ONE OF THE LARGE GOLD PRODUCERS IN THE STATE. I WOULD RECOMMEND THAT THE EM-16 SURVEY BE CONDUCTED AS SOON AS POSSIBLE AND THAT A GRAPEIC ORE FLOW SHEET BE OBTAINED IN ORDER TO DEFINE AND DETERMINE THE MOST FAVORABLE METHOD OF THE MILLING AND PROCESSING OF THE MINERALIZATION FOR THE HIGHEST RECOVERY VALUE OF THE ORE.

IT IS MY BELIEVE THAT THE RED CLOUD SHOULD BE DEVELOPED AND PUT BACK IN OPERATION AS THE POTENTIAL AND VALUE OF THIS MINE IS EVIDENT.

J.N. LINDSEY  
Operation Mining Consultant  
willmington, Ca.



FIGURE 1-A  
EM-16 SURVEY RESULTS  
ANOMALY LOCATIONS



VEINS OR CONDUCTORS  
indicated by E.M.

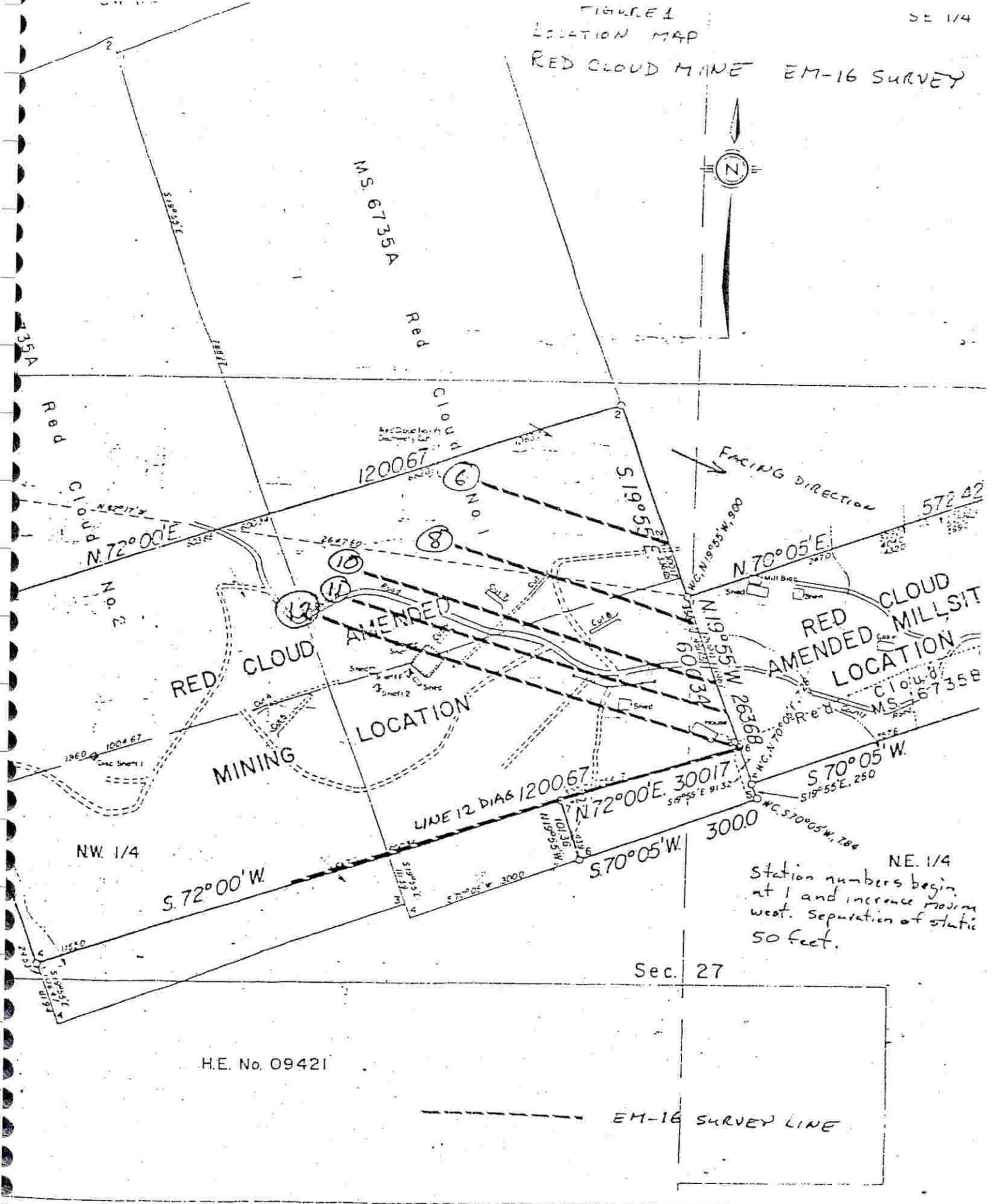
- ..... WEAK
- ||||||| MODERATE
- ||||||| STRONG

Approx Dip shown by arrow  
65° ←

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FIGURE 1  
 LOCATION MAP  
 RED CLOUD MINE EM-16 SURVEY

SE 1/4



Station numbers begin at 1 and increase <sup>maximum</sup> west. Separation of static 50 feet.

Sec. 27

H.E. No. 09421

EM-16 SURVEY LINE

## SUMMARY AND CONCLUSIONS

Six lines of very low frequency electromagnetics (VLF-EM) were surveyed at the Red Cloud Mine Property east of Coulterville, California. The position of these survey lines is shown in the location map, Figure # 1. The instrument used was a Geonics EM-16 receiver utilizing the Jim Creek, Washington VLF transmitter station NPG at a frequency of 18.6 kilohertz. Lines were run magnetic East and West. Readings were taken at 50 foot stations. Numbers on each line began at 1 on the East end edge of the line and increases westerly.

Strong anomalies were located in the vicinity of the caved shaft (East of shaft 6 and Shaft 2). These anomalies continue north to line 6, the furthest north survey line tested. The conductive zone, probably the orebody, does not continue as far southwest as the south edgeline of the Red Cloud (Amended) claim location.

Profiles and interpretation of the survey are discussed.

## DESCRIPTION OF EM-16 METHOD

The EM-16 system is a very low frequency (VLF) electromagnetic receiver useful for detecting conductive zones such as orebodies. In the case of massive sulfides or heavily disseminated orebodies containing metallic minerals we would expect the orebody to respond directly. Veins not containing a fairly large percentage of metallic minerals (such as pyrite, chalcopyrite, galena, etc.) may give an indirect indication of their location may still respond to EM-16 by virtue of being located in a structure such as a fault zone which is more electrically conductive than the surrounding rocks.

While radio frequency EM prospecting is not new (for example, see Eve and Keys, 1956 or Heiland, 1940), it is only fairly recently that easily operated, light, one man units were made commercially available. The Geonics EM-16. These units make use of VLF (very low frequency) radio stations of the U.S. Navy communications network- thus the necessity of a field transmitter is eliminated. Radio-frequency E.M. methods using ground-transportable transmitters were employed in the 1930's and, to a lesser extent, as recently as 1960, for both prospecting and geological mapping. Because of the relatively high frequencies employed, the method suffered from poor penetration and difficulty in discriminating between bodies of different conductivities. In North America the

method was abandoned in favour of low-frequency E.M. for nearly all prospecting applications

In Europe , the use of radio-frequency methods continued underground, for mapping coal-seams and for exploring in the vicinity of base-metal orebodies. The Russians (3) have been successful in applying radio shadow techniques in drill-holes for routine exploration and mapping of sulphide overburden layer; attenuation in most rocks, even at these frequencies, is quite low

Despite these and other activities, radio-frequency methods were not accepted for routine surface or airborne exploration until until Geonics Limited introduced a "passive" instrument working in the VLF range (15-25kHz) in 1964. This instrument in the EM-16. Powerful military radio transmitters situated conveniently around the globe provided the primary E.M. signal.

Successful surveys were carried out with this instrument in 1965. By the end of 1966 the method was in widespread use, and in 1967 several similar systems were introduced or under development. At least two airborne versions were tested in 1968. By 1969 airborne and/or ground instruments were being manufactured by more than five North American firms. Currently the instruments are in a wide variety of propecting applications.

E.M. prospecting methods rely on the measurement of secondary fields generated by conducting bodies in the ground



when subjected to a primary E.M. signal. "Active" methods employ transportable transmitters, generally working in the frequency range 400 to 5,000 Hz. AFMAG is a "passive" method, relying on electrical discharges generated by thunderstorms which produce measurable signals in the 50 to 500 Hz. range.

The VLF method is also "passive", in this case employing the radiation from powerful military radio transmitters as the primary signals. Frequencies and power outputs of these stations are listed below.

<u>Station</u>	<u>Location</u>	<u>Frequency KHZ</u>	<u>Radiated power(kw)</u>
IDO	Rome, Italy	27.2	50
LPZ	Marte Grande, Buenos Aires	23.6	72.1
NSS	Annapolis, Md., USA	19.0	100
PKX	Malabar, Java	18.98	162
ROR	Gorki, U.S.S.R.	17.0	315
UTT	Sainte Assise, Paris, France	20.7	60.8
UMS	Moscow, U.S.S.R.	17.1	200
NAA	Cutler, Maine, U.S.A.	17.8	1000
NBA	Balboa, Canal Zone	24.0	150
NLK/NPG *	Jim Creek, Wash., U.S.A.	18.6	300
NPM	Lualualei, Hawaii U.S.A.	23.4	300
NWC	North West Cape, Australia	15.5	1000
WWVL	Fort Collins, Colo., U.S.A.	20.0	4

\* Used in this survey

The radiation from these transmitters contains both electric and magnetic components and travels in three modes: skywave, spacewave and groundwave. At the large distance we are concerned with, we receive mainly the skywave wave-guided by the ionosphere and earth surface. The magnetic component is the one of main interest to us, as beneath the ground surface it carries the bulk of the signal energy, and it offers certain advantages in practical field measurement.

Basically the radio frequency unit measure the angle of tilt (from the horizontal) or the dip of radio frequency magnetic fields produced by the VLF stations. This magnetic field part of the radio wave is transmitted in a horizontal orientation, but can be modified in at least two ways: by a SECONDARY (S)-Field from a conducting mineral body "excited" by the PRIMARY or P-field transmitted by the VLF station; or by a S-field produced by currents induced in rocks and soils.

Figure 1 illustrates the main features of measuring the effect of a conducting mineral body. It is conventional to plot the "tilt angle profile"-e.g. the angle of tilt of the EM unit when the instrument is aligned parallel to the net field (S+ P). This alignment is checked by obtaining a null in the measuring coil (the vertical or long coil of the unit shown in figure 1(a)). These features are discussed in the operating manuals and case histories, put out by Geonics and Crone (see the references), and need not be pursued further here.

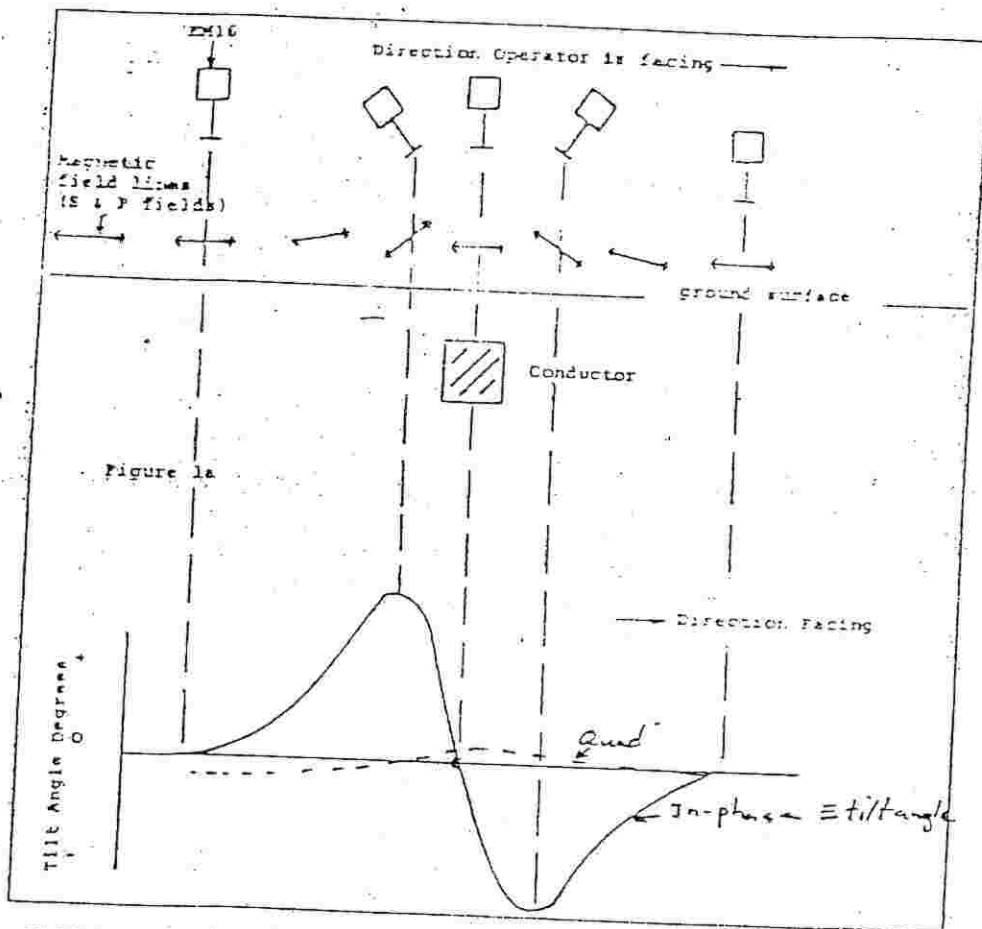


FIGURE 1. Measuring the Effect of a Conductor with a Radio Frequency Unit.

Figure 1(b). Tilt Angle Profile

The radio frequency EM units can be used to prospect for disseminated to massive sulfides but can only be used in areas of light overburden (less than 50 feet if wet, 100 feet or so, if dry). Water filled faults, graphite, etc., can also give rise to "anomalies" as indicated by the EM-16. A discussion of other advantages and disadvantages of these units can be found in the manufacturer's literature and will not be discussed here. These units are enjoying increasing popularity in both geological mapping and prospecting.



RESULTS AND INTERPRETATION  
(Including EM-16 Profiles)

Six lines of EM-16 were completed at the Red Cloud Property. The EM-16 profiles on the next 6 pages summarized the results obtained. On each profile are notes and interpretation; these should be consulted for details.

On each profile, conductor axes, or "anomalies" have been shown. Arrows are used to locate the axis; the size of the arrow is proportional to the inferred strength of the conductor. The In-Phase component of the vertical electromagnetic field is illustrated with a solid line; the Quadrature (or "out of phase") component of the vertical field is shown by the dashed line.

The strongest responses obtained (good conductors) were obtained on lines 12 (near the main working) and 10 (located 100 feet further north). The anomaly on line 11 was weaker than that obtained on either line 12 or line 10.

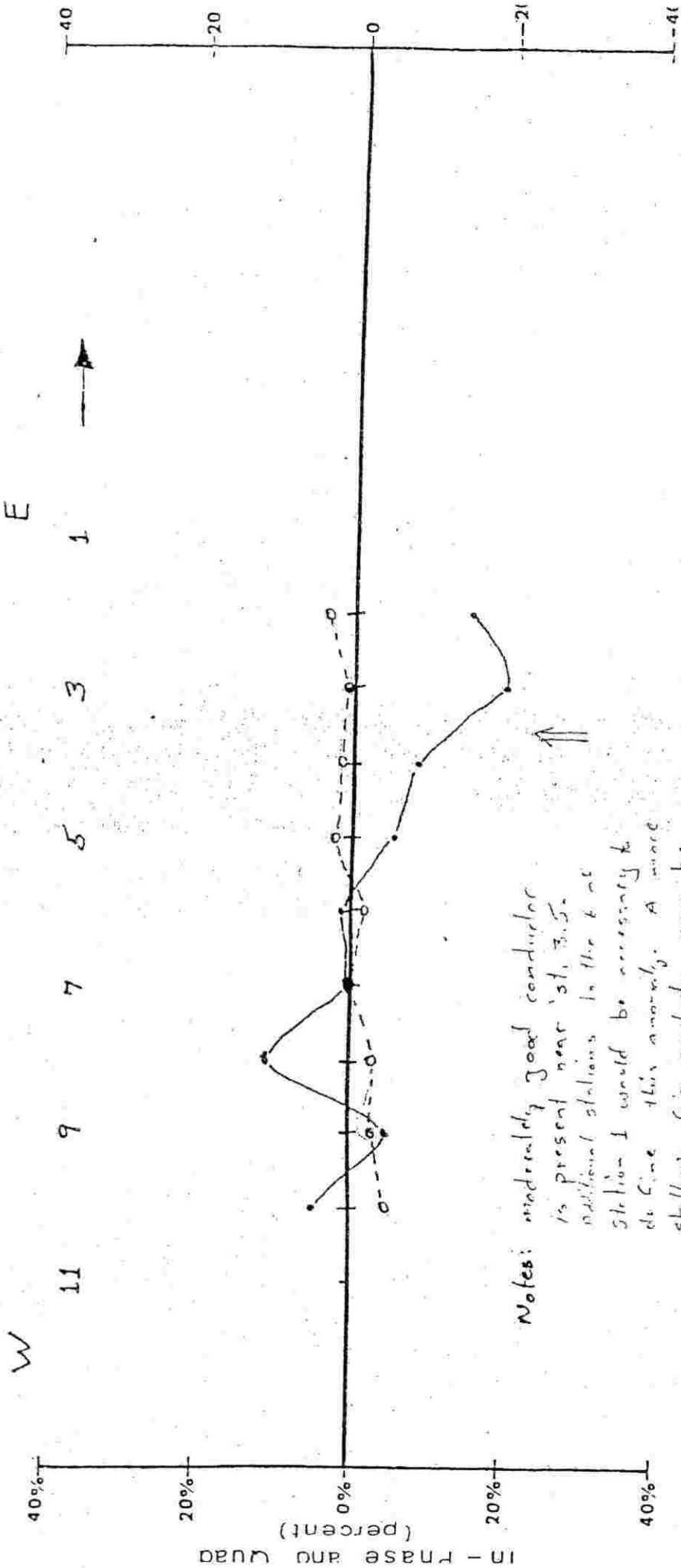
On lines 6 and 8, moderate to weak conductors are present near stations 3.4 and 2.5 respectively. It is probable that these responses are part of the same conductor which occurs near station 10 on line 12. The width of the conductor suggests that the zone may be deeper in this area. The characteristics of the profile of line 8 strongly suggests that two conductors are present in this area.

Line 12 Diagonal begins at station 1 on line 12 and continues S.72°W. along the south side line of the Red Cloud (Amended)

claim. It does not appear that any significant conductors are presented on this line.

Additional lines could be added in the future to the south of line 12 to extend coverage in that area.

# MINING ENTERPRISES EM-16 SURVEY



Notes: remarkably good conductor is present near st. 3.5. additional stations in the line at station 1 would be necessary to define this anomaly. A more shallow fair conductor may be located just west of the survey boundary.

DATE	JUNE 1980
MAP NUMBER	
COUNTY	
STATE	CALIFORNIA
DATA BY	JWMM
DRAWN BY	JWMM

PROPERTY: RED CLOUD  
 LINE: 6

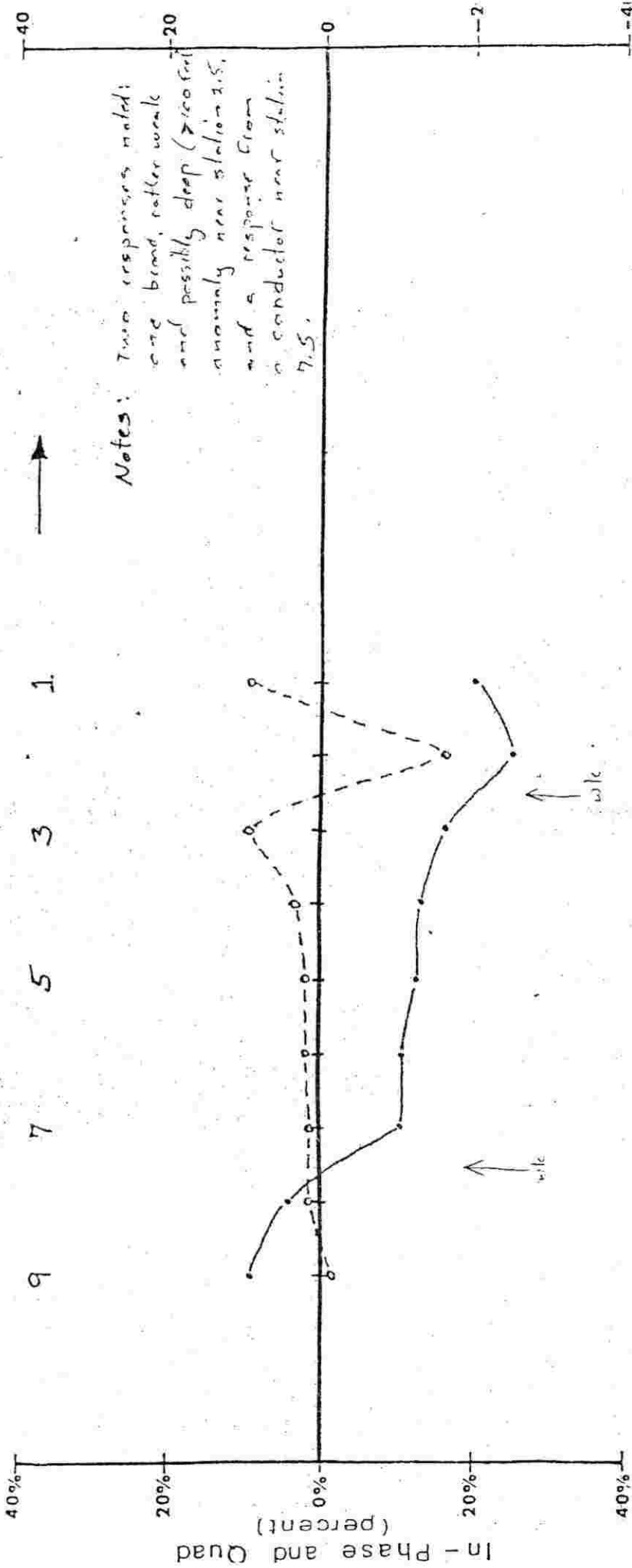
Station: NGP (18.6 KHz)  
 IN - PHASE \_\_\_\_\_  
 QUADRATURE .....

32



# MINING ENTERPRISES EM-16 SURVEY

W 9 7 5 3 1 E →



Station: NGP (18.6 KHz)

IN - PHASE

QUADRATURE

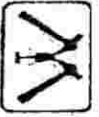
PROPERTY: RED CLOUD

LINE: 8



24

DATE	JUNE 1980
MAP NUMBER	
COUNTY	
STATE	CALIFORNIA
DATA BY	JWM
DRAWN BY	JWM

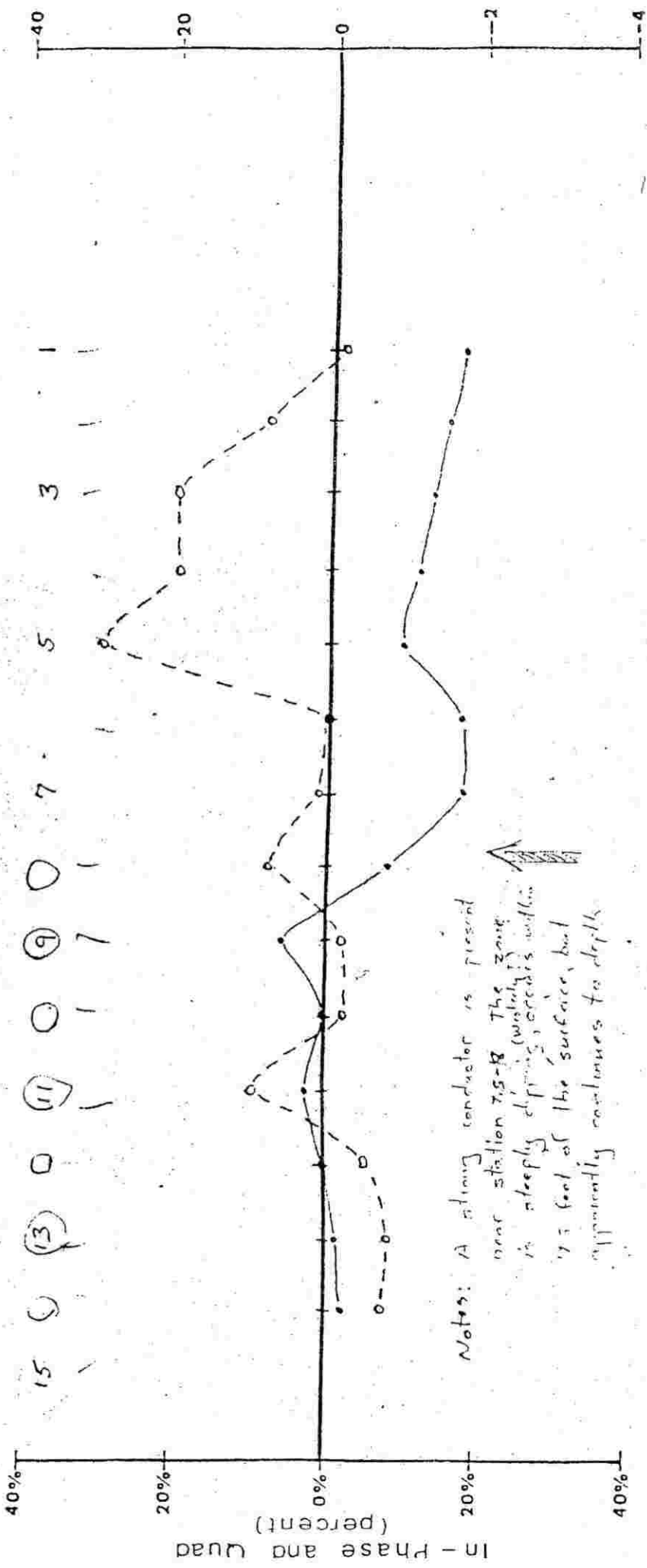


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# MINING ENTERPRISES EM-16 SURVEY

W → E



Station: NGP (18.6 KHz)

IN - PHASE \_\_\_\_\_

QUADRATURE - - - - -

PROPERTY: RED CLOUD

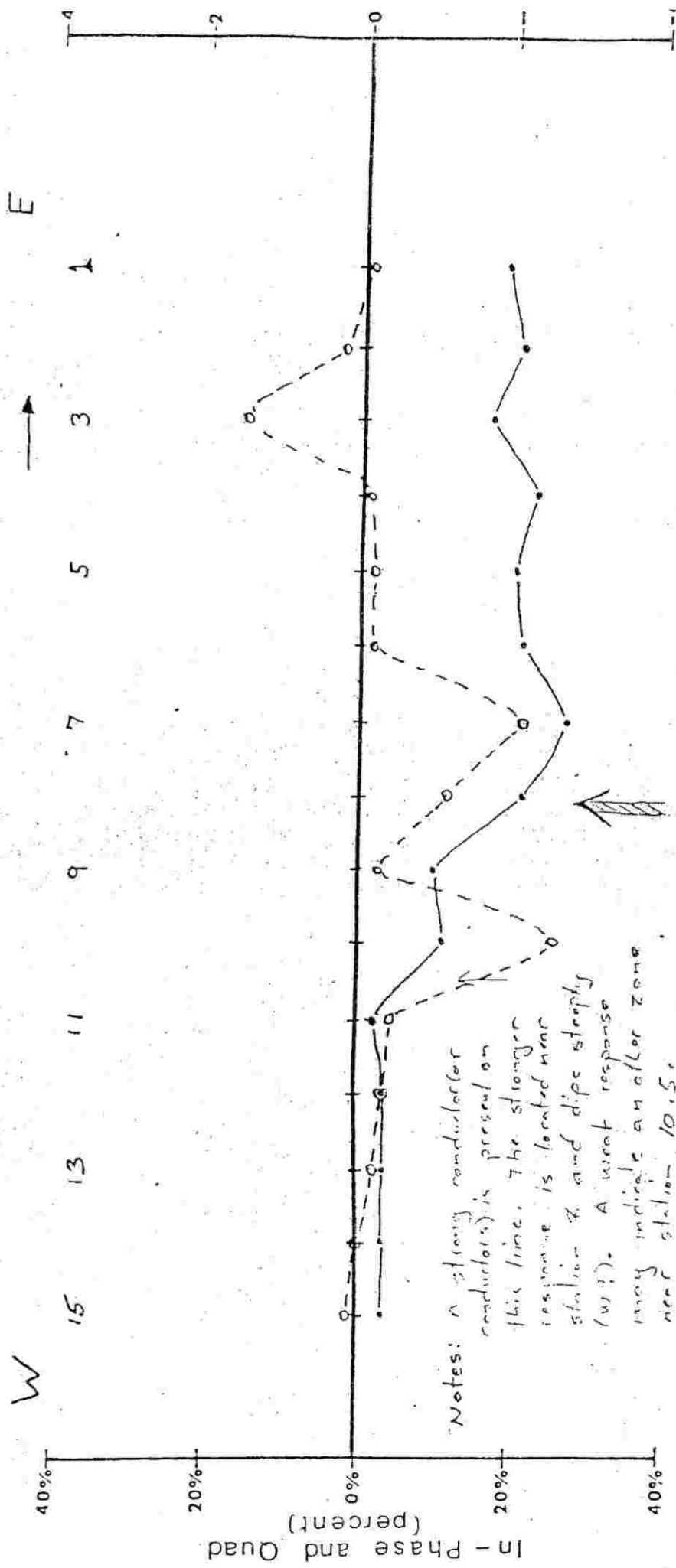
LINE : 10

DATE	JUNE 1980
MAP NUMBER	
COUNTY	
STATE	CALIFORNIA
DATE BY	JWJ
DRAWN BY	JWJ



WHITNEY & WHITNEY, INC.

# MINING ENTERPRISES EM-16 SURVEY



Notes: A strong conductor (conductor) is present on this line. The stronger response is located near station 8 and dips strongly (W?). A weak response may indicate an other zone near station 10.5.

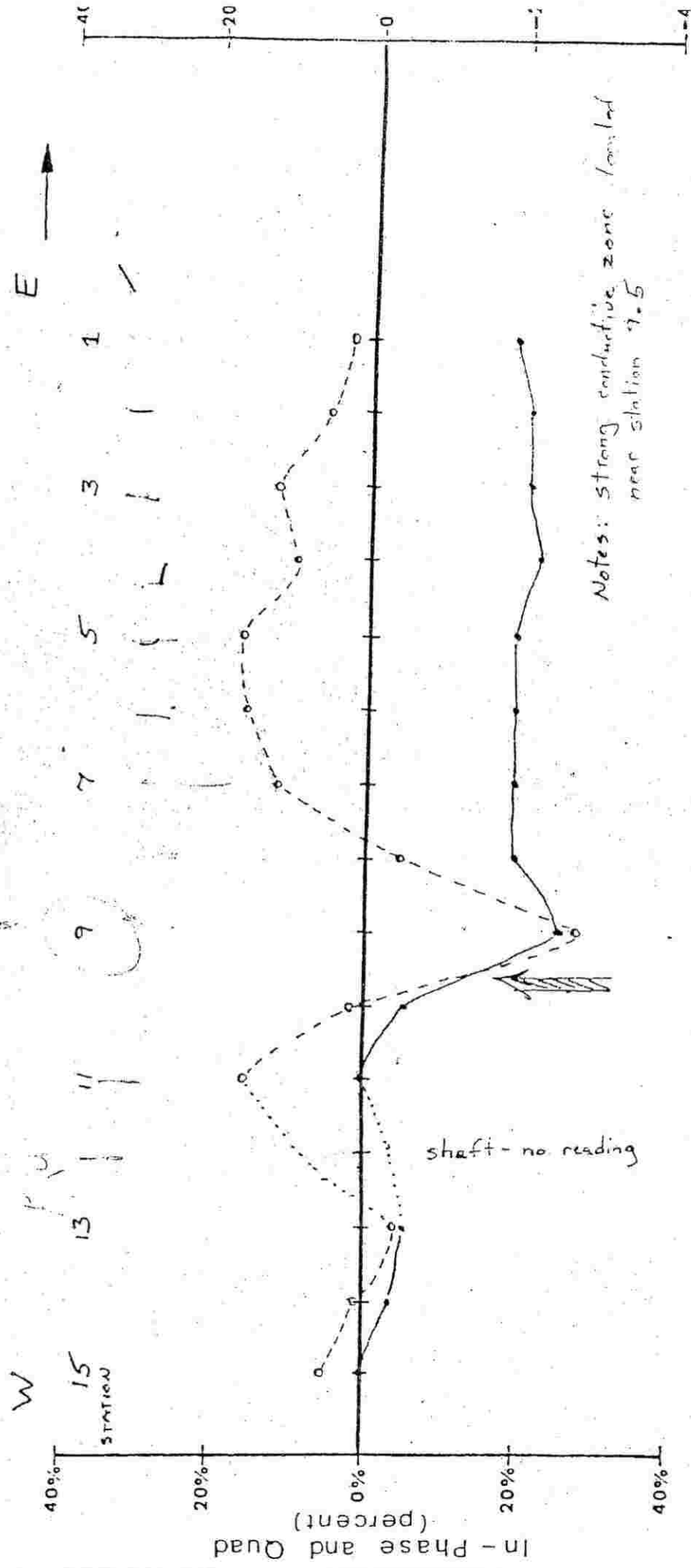
DATE	JUNE 1980
MAP NUMBER	
COUNTY	
STATE	CALIFORNIA
DATA BY	JWM
DRAWN BY	JWM

PROPERTY: RED CLOUD  
 LINE: 11

Station: NGP (18.6 KHz)  
 IN-PHASE \_\_\_\_\_  
 QUADRATURE .....



# MINING ENTERPRISES EM-16 SURVEY



DATE	JUNE 1930
MAP NUMBER	
COUNTY	
STATE	CALIFORNIA
DATA BY	JWMH
DRAWN BY	JWMH

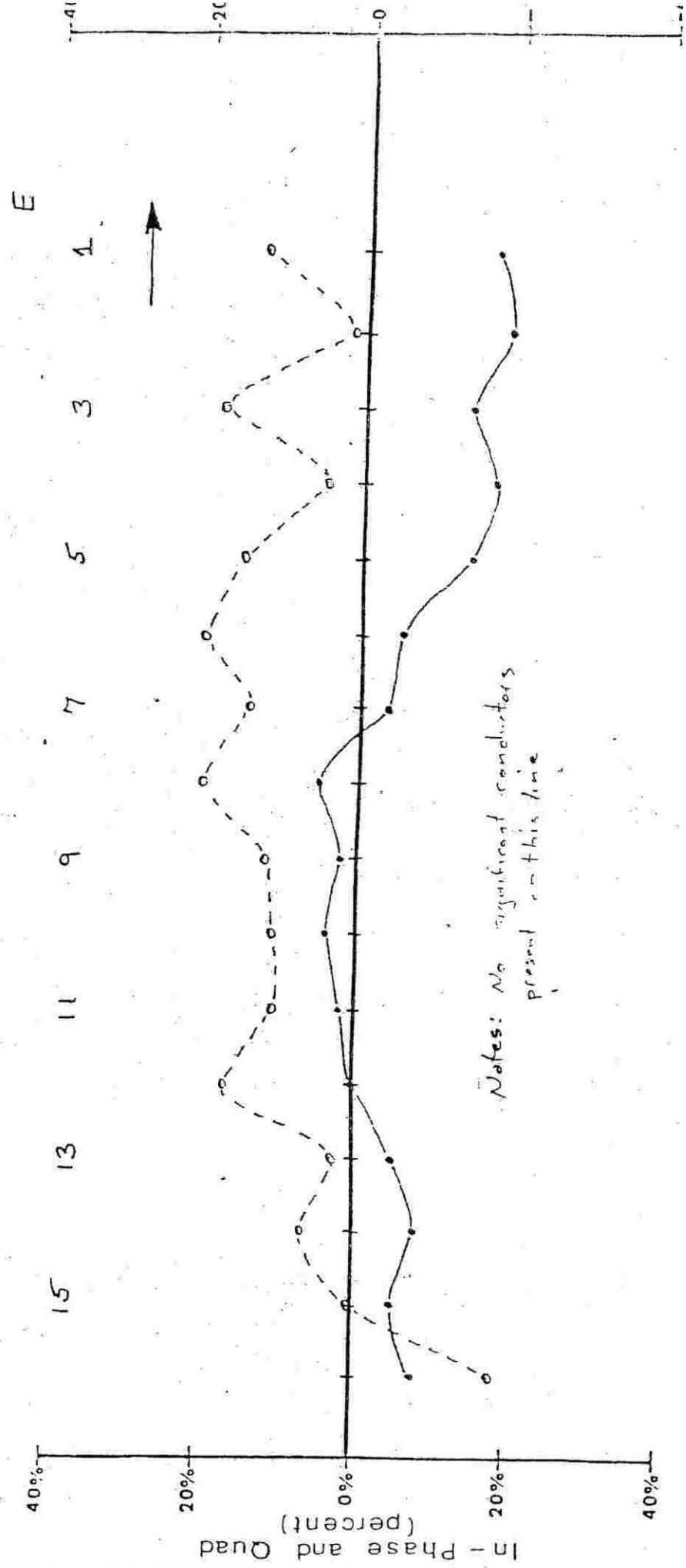
PROPERTY: RED CLOUD  
 LINE: 12

Station: NGP (18.6 KHz)  
 IN - PHASE —————  
 QUADRATURE .....



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# MINING ENTERPRISES EM-16 SURVEY



Notes: No significant conductors  
present on this line

DATE	JUNE 1980
MAP NUMBER	
COUNTY	
STATE	CALIFORNIA
DATA BY	JUDAY
DRAWN BY	JUDAY

PROPERTY: RED CLOUD  
 LINE : LINE 12 DIAG.

Station: NGP (18.6 KHz)  
 IN - PHASE                       
 QUADRATURE                       
 2  
 8



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DATA SHEETS

On the following pages are the actual numerical results obtained for each of the survey lines at the property.

These include necessary data for plotting the profiles discussed in the preceding section.

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EN-16 ELECTROMAGNETIC SURVEY

Project: Red Cloud Mine

Line No: 6

Facing: East

Station: NPG-Seattle, WA  
 FREQ: 18.6KHZ  
 Rx Operator: J.M. Maitte  
 Date: 6/16/80  
 Line Oriented:

Station Spacing 50 f

STATION No.	IN-PHASE (%)	QUADRATURE (%)	SLOPE (%)	IP (%)	IP spacing	ELEV.	ELEV.	NOTES
St. 1			-2					EAST
St. 2	-15	+4	+5					
St. 3	-20	+1	-5					
St. 4	-8	+2	-3					
St. 5	-5	+3	-3					
St. 6	+2	-1	+3					
St. 7	0	0	+5					
St. 8	+12	-2	+20					
St. 9	-4	-2	+15					WEST
St. 10	+6	-4						

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EM-16 ELECTROMAGNETIC SURVEY

Project: Red Cloud Mine

Line No: 8

Pacing: East

Station: NPG-Sealco, WA  
 FREQ: 18.6KHZ  
 Rx Operator: J.W. Mittle  
 Date: 6/16/80  
 Line Oriented:

Station Spacing 50

STATION No.	IN-PHASE (%)	QUADRATURE (%)	SLOPE (%)	IP (%)	IP spacing	ELEV.	ELEV.	NOTES
St. 1	-20	+10	+2					EAST North edge of creek
St. 2	-25	-16	+4					cross creek
St. 3	-16	+10	0					south edge of creek
St. 4	-13	+4	0					
St. 5	-12	+2.5	+18					
St. 6	-10	+2	+5					
St. 7	-10	+2	+10					
St. 8	+5	+2	+10					
St. 9	+10	-1	+14					WEST

MINING ENTERPRISES

EM-16 ELECTROMAGNETIC SURVEY

Project: Red Cloud Mine

Line No: 10

Facing: EAST

Station: NPG-Seattle, W/  
 FREQ: 18.6KHz  
 Rx Operator: J.W. Holt  
 Date: 6/16/80  
 Line Oriented: \_\_\_\_\_

Station Spacing: 50 ft

STATION No.	IN-PHASE (%)	QUADRATURE (%)	SLOPE (%)	IP (%)	IP Spacing	ELEV.	ELEV.	NOTES
St. 1	-18	-2	0					EAST
St. 2	-16	+8	-10					
St. 3	-14	+20	-5					
St. 4	-12	+20	0					
St. 5	-10	+30	+4					in road by chain gate
St. 6	-18	0	+15					in road by chain gate
St. 7	-18	+1	+9					
St. 8	-8	+8	+8					
St. 9	+6	-2	+17					
St. 10	0	-2	+15					
St. 11	+3	+10	-3					
St. 12	0	-5	0					
St. 13	-1	-8	-5					ished to left
St. 14	-2	-7	+8					WEST



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EM-16 ELECTROMAGNETIC SURVEY

Project: Red Cloud Mine  
 Line No: 11  
 Facing: EAST

Station: NPG-Seattle, WA  
 FREQ: 18.6KHZ  
 Rx Operator: J.W. Miller  
 Date: 6/16/80  
 Line Oriented: \_\_\_\_\_

Station Spacing 50 ft

STATION No.	IN-PHASE (%)	QUADRATURE (%)	SLOPE (%)	IP (%)	IP spacing	ELEV.	FLEV.	NOTES
St. 1	-20	-5	+3					EAST
St. 2	-22	=2	-5					
St. 3	-18	+15	-8					
St. 4	-24	-1	0					
St. 5	-21	-2	+1					
St. 6	-22	-2	+6					
St. 7	-28	-22	+15					
St. 8	-22	-12	+10					
St. 9	-10	-2.5	+20					
St. 10	-11	-26	+15					
St. 11	-2	-4	+5					Next to edge of shaft
St. 12	-3	-3	+16					
St. 13	-3	-2	+1					
St. 14	-3	0	-2					continued

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EM-16 ELECTROMAGNETIC SURVEY

Project: Red Cloud Mine

Line No: 11 continued

Pacing: EAST

Station: NPG-Seattl, W.  
 FREQ: 18.6KHZ  
 Rx Operator: J.W. Holt  
 Date: 6-16-80  
 Line Oriented:

Station Spacing 50

STATION No.	IN-PHASE (%)	QUADRATURE (%)	SLOPE (%)	IP (%)	IP Spacing	ELEV.	ELEV.	NOTES
St. 15	-3	+2	-5					WEST

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EM-16 ELECTROMAGNETIC SURVEY

Project: Red Cloud Mine

Line No: 12

Facing: East

Station: NPG-Seault In, WA  
 FREQ: 18.6KHZ  
 Rx Operator: J.W. Heston  
 Date: 6/16/80  
 Line Oriented:

Station Spacing 50 f

STATION No.	IN-PHASE (%)	QUADRATURE (%)	SLOPE (%)	IP (%)	IP Spacing	ELEV.	ELEV.	NOTES
St. 1	-20	+2	0					EAST
St. 2	-22	+5	0					
St. 3	-22	+12	-9					
St. 4	-23	+9.5	-14					
St. 5	-20	+16.5	-8					
St. 6	-20	+16	+4					
St. 7	-20	+12	+20					
St. 8	-20	-4.5	+25					
St. 9	-26	-28	+28					
St. 10	-5	+2	+32					
St. 11	0	+16	0					
St. 12		- SHAFT						
St. 13	-5	-4	+18					
St. 14	-3	+1	0					
	C	+6	-12					WEST

Mining Enterprises

EM-16 ELECTROMAGNETIC SURVEY

Project: Red Cloud Mine  
 Line No: 12  
 Facing: East

Station: NPG-Seattler, W/  
 FREQ: 18.6KHz  
 Rx Operator: J.M. Miller  
 Date: 6/16/80  
 Line Oriented: \_\_\_\_\_

Station Spacing 50

STATION No.	IN-PHASE (%)	QUADRATURE (%)	SLOPE (%)	IP (%)	IP spacing	ELEV.	ELEV.	NOTES
St. 1	-18	+12.5	+10					EAST
St. 2	-20	+1	-15					
St. 3	-15	+18	-10					
St. 4	-18	+4	-15					
St. 5	-15	+15	-18					
St. 6	-6	+20	+4					
St. 7	-4	+14	+5					
St. 8	+5	+20	+6					Pipe with brass cap
St. 9	+2	+12	-4					
St. 10	+4	+11	-3					
St. 11	+2	+11	0					
St. 12	0	+17	-8					
St. 13	-5	+3	-25					
St. 14	-8	+7	-36					

continued

MINING ENTERPRISES

EM-16 ELECTROMAGNETIC SURVEY

Project: Red Cloud Mine  
 Line No: 12-continued  
 Facing: East

Station: HPG-Seattl, WA  
 FREQ: 18.6KHZ  
 Rx Operator: J.W. Motte  
 Date: 6/14/80  
 Line Oriented:

Station Spacing 50 ft

STATION No.	IN-PHASE (%)	QUADRATURE (%)	SLOPE (%)	TP (%)	TP spacing	ELEV.	ELEV.	NOTES
St. 15	-5	0	+45					
St. 16	-8	-18	+5					WEST



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