TOTAL Mining Australia Pty. Limited

E.L. 6408 - FENTON PROJECT

ANNUAL REPORT TO THE DEPARTMENT OF MINES AND ENERGY

1989

R/89-6-U

D. W. HARROP
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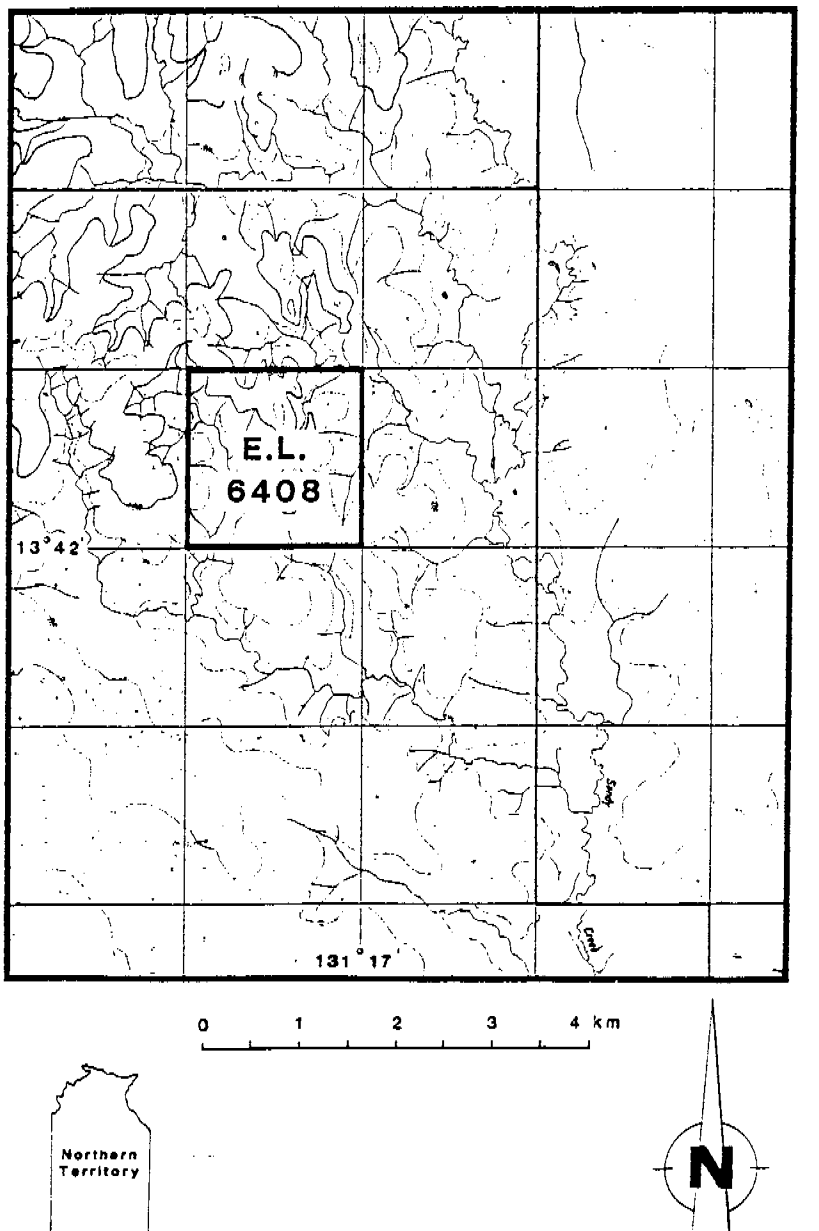
LIST OF PLATES

I. TENEMENT SITUATION

An Exploration Licence of 3.21 sq. kms. was applied for on 16th November, 1988 and was granted on 24th February, 1989. The Exploration Licence was taken to explore for uranium in the Lower Proterozoic Koolpin Formation. The tenement was part of the West Pine Creek Joint Venture between PNC Exploration (Australia) Pty. Ltd. and TOTAL Mining Australia Pty. Limited.



FENTON PROJECT
Tenement Situation

FIG 1.

II. ACCESS

Access to the area is by the Stuart Highway to Hayes Creek then by station roads to the tenement. The tenement is situated on the Douglas Pastoral Station, the manager of which was kept informed about the exploration activities of the company.

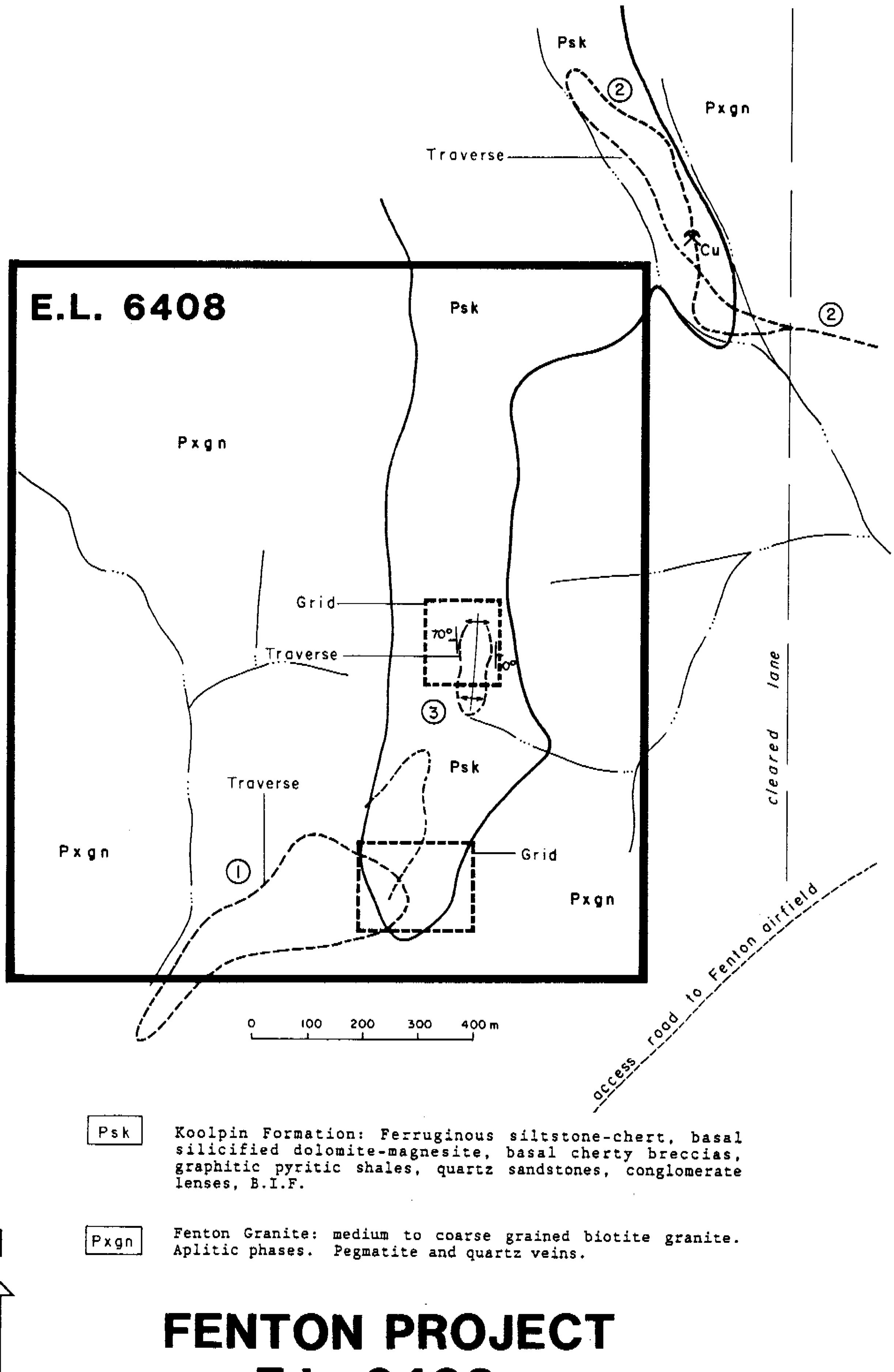
The area is relatively flat, undulating, lightly wooded grassland with minor creeks forming the drainage. The E.L. is used for grazing cattle although there are no fences within the tenement area. The tenement is within the Tipperary 1:100000 map sheet at a coordinate of 13^{o} 42'N, 131^{o} 17'E.

III. REGIONAL GEOLOGY

An inlier of the Lower Proterozoic Koolpin Formation was mapped within a Middle Proterozoic Granite, the Fenton Granite.

Psk Koolpin Formation:	Ferruginous siltstone and chert bands, silicified dolomite-magnesite; basal cherty breccias. Graphitic-pyritic shales. Quartz sandstones, conglomerate lenses and Banded Iron Formation (BIF).
Pxgn Fenton Granite:	Medium to coarse grained biotite granite, aplitic phases. Pegmatite and quartz veins.

The Koolpin here has been the target of sustained gold exploration, however in the licence area itself the outcrop is less than 400 m wide and has, until the latest geological mapping, been overlooked. The inlier has been faulted and folded by the intrusion of the Fenton Granite, resulting in near vertical dips and a series of low topographic ridges caused by the injection of quartz along fault lines. Much of the Koolpin Formation is strongly hematitic at the surface. This is thought to be due to the primary pyrite content of the chlorite and graphite schists that predominate in the Lower Proterozoic lithology. There is also some Banded Iron Formation (BIF), with specular hematite, within the sequence. It is not clear if this unit is the result of the injection of silicon into a strongly pyritic unit such as the graphite schist along the northwest trending fault zones, or whether it is of a primary origin, laid down at the time of the original sedimentation. These units seem to be totally conformable with the surrounding sedimentary units, which implies that they were deposited along with the rest of the sedimentary pile. It must be stated however, that the majority of the faults known at the Fenton Prospect area are strike slip or certainly very close to being strike slip faults. This is probably due to the very strong folding of the Koolpin Formation and the fact that the axis of these folds is also parallel to the strike of the sediments.



Psk — Koolpin Formation: Ferruginous siltstone-chert, basal silicified dolomite-magnesite, basal cherty breccias, graphitic pyritic shales, quartz sandstones, conglomerate lenses, B.I.F.

Pxgn — Fenton Granite: medium to coarse grained biotite granite. Aplitic phases. Pegmatite and quartz veins.

FENTON PROJECT
E.L. 6408

FIG. 2

There are a number of known copper shows in the area around the Fenton Exploration Licence. These are mainly associated with the graphitic units, but are minor in their extent. Minor malachite and cuprite were noted at the surface. It is thought that these copper shows are due to a local increase in the copper content of the otherwise very strongly sulphide rich beds. The predominant sulphide is pyrite which, as already mentioned, has resulted in an abundance of hematite being found at the surface. There is thought to be a minor carbonate content in the sedimentary pile although there has been no positive identification of dolomite beds. There are a number of silica-rich units at the surface which, because of the strong boudinage structure, are thought may be due to thin silicified carbonate beds. This feature and its surface expression has been noted elsewhere in the Pine Creek Geosyncline as being thin beds of carbonate, usually dolomite, at depth. The occurrence of malachite and siderite within the sequence is also indicative of the presence of carbonate horizons, albeit minor ones, in the sequence.

IV. EXPLORATION METHODS AND RESULTS

4.1 GEOLOGY

The E.L. boundaries were transferred onto the Tipperary 1:100,000 sheet from the latitude/longitude data supplied with the N.T. Department of Mines and Energy E.L. approval (See Figure 1). They were then drawn onto the aerial photo overlay using the drainage pattern as a guide (see Figure 2).

Initial ground investigations were designed to confirm both the presence of favourable lithologies within the Licence (i.e. Koolpin Formation) and the previously located radiometric anomalies.

Figure 2 is traced from the aerial photo (Douglas Tipperary, Run 52, 6613). The scale is estimated as being approximately 8 mm = 100 m. Two major lithologies are present: the Fenton Granite and the Koolpin Sediments. Several traverses were made and are described below.

(1) Very poor outcrop overall. Within the sediments there is abundant quartz and ferruginous material as surface rubble. The sedimentary facies are unrecognizable, because of the extreme ferruginous alteration. Area (1), a low ridge, appears to be composed of this facies.

The remaining area of the traverse is Fenton Granite as indicated.

Radiometric anomalies were thought to occur in this area adjacent to some small copper prospects, but were not located.

(2) Traverse two was intended to locate the radiometric anomalies; the indicated copper prospect was assumed to be the one in their vicinity. Long, thick grass made conditions a bit difficult, however the prospect pit was located. Some malachite/cuprite veins occur within quartz-veined ferruginous sediment. The outlined area is a low ridge comprised of steeply dipping, NNW-striking sediments: ferruginous quartzite, siltstone and graphite/carbonaceous shales.

(3) On traverse 3 the facies include a highly variable (and tightly folded) sequence of hematite-rich siltstones (Banded Iron Formation), quartzites, conglomerates, chloritic-micaceous siltstone and graphite-rich shales. Strikes are in the range 330°-340° and steep easterly dips 60°-70° on the east side with steep westerly dips as indicated. Quartz veining and brecciation occur along the central part of the outcrop probably corresponding with the fold axis. No dolomites were observed but there were possible silicified dolomite bands in graphitic schist (traverse 3). West of the ridge outcrop was poor but appears to be hematitic/ sideritic sediments.

After initial prospecting to the north and west, the outcrop zone was traversed by four 100 m spaced lines running due east/west. SPP2, VLF and geology were recorded over 250-300 m. Results are presented on four separate sheets (see Figures 3-6).

4.2 RADIOMETRIC PROSPECTION

Detailed radiometric prospection was carried out over the entire Exploration Licence area. This prospection was using a SPP2 scintillometer, giving a continuous reading of gamma emanation along the chosen traverse. Particular attention was given to the chlorite-rich units of the Koolpin Formation, however the granite, the contact zone and the other Lower Proterozoic units were also prospected in detail.

There was a definite variation in the radiometric signature noted over the various lithologic units:

- The granite was generally radiometrically higher than the enclosed sediments. The average radiometry here was around 110 cps with the maximum reading being around 150 cps. This was surprising as many of the Lower Proterozoic granites are radiometrically very active with an average reading of around 250 cps.

- The Lower Proterozoic units varied widely in there radiometric signature.

- The graphitic units gave the highest readings with an average of around 100 - 130 cps. This is typical of the other strongly graphitic units known elsewhere in the Pine Creek Geosyncline. A maximum reading of 350 cps was noted in the 1989 field season, which was considerably less than the readings gained during the initial prospection of the area prior to applying for the tenement. It is thought that this initial higher reading may have been due to local and intermittent radon emanation or perhaps even a faulty instrument.

- The Banded Iron Formation (BIF) generally was radiometrically low, except where it contained an abundance of graphite. The low radiometry may reflect the degree of silicification and hence its lack of porosity. Iron acts as a scavenger for uranium but when it is tied up in the silica it is unable to come into contact with the uranium moving through the system in the ground water. The average radiometry in the BIF is around 70 - 80 cps.

- The chlorite schist and siltstones were also radiometrically very low. Here the average was around 60 - 70 cps.

Radiometric surveying could be used, as elsewhere in the Pine Creek Geosyncline, to aid in the mapping of the various lithological units. No major anomalies were located during either the prospection or the detailed systematic surveying. One would expect that a significant anomaly in this type of terrain and lithology would be only 3 times the normal background at the surface. One would, however, expect that reading to increase dramatically once a shallow pit had been excavated. At the Fenton Prospect in 1989 the maximum radiometric value was only 350 cps but unfortunately this did not increase dramatically once a pit was opened.

4.3 RADON PROSPECTION

A limited amount of radon prospection was undertaken at the Fenton Prospect in 1989.

Alphacards were placed on a grid 100 x 50 m in the south of the tenement and on a closer grid of 25 x 25 m in the centre of the tenement in an area in which the maximum radiometric anomalism was located in a graphite schist.

The Alphacard method measures alpha radiation emanation derived from the decay of radon gas, which itself is derived from the decay of uranium. This method also discriminates between the presence of radon from uranium and thoron derived from the decay of thorium. At the Fenton Prospect the results of the Alphacard survey were low although they were attributable to radon and not thoron. There was a slight increase in the Alphacard readings over the graphitic units but, compared to other areas investigated in the Pine Creek Geosyncline, they were not of real significance.

The maximum reading gained at the Fenton Prospect in 1989 was only 9 counts per minute.

4.4 VLF SURVEYING

Four traverses were run across the Lower Proterozoic metasediments in the area of the maximum radiometric readings. These traverses gave a strong definition of the graphitic units even when they were totally covered by alluvium and eluvium. This is interesting as the graphite noted in the drill cuttings, although being quite substantial in quantity was predominantly amorphous in nature rather than the highly crystalline form noted along the contact margins with the granite bodies or in the major fault lines. The amorphous graphite is often much less conductive than the crystalline graphite due to the lack of sufficient electrical contact being afforded by the particles.

The VLF survey was conducted using a Geonics EM16 and using both the North West Cape and the Japanese transmitters as the source. Readings were taken every 10 m along each of the traverse lines (see Figures 3-6).

4.5 GEOLOGICAL MAPPING

A detailed geological map was planned however, due to a lack of time at the end of the field season and an early rainfall, this was not achieved . Limited geological traversing did, however, take place whilst the VLF surveying was being carried out. The results of this mapping have been shown on the synthesis plan accompanying this report, as well as on the VLF plots (see Figures 3-6 and Plate 1).

FENTON PROJECT
Traverse 1 Area 3
N.D.T.

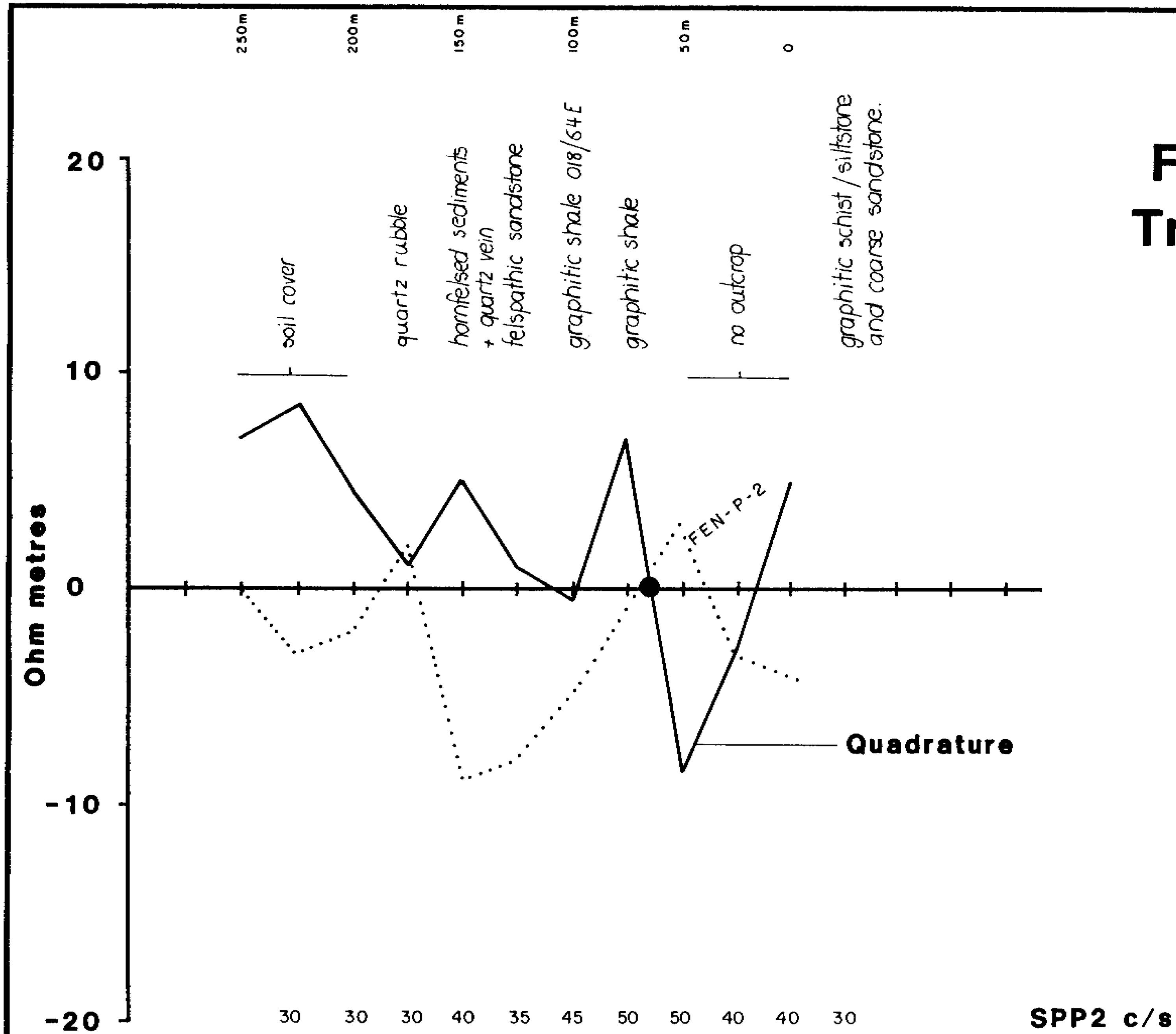


FIG. 3

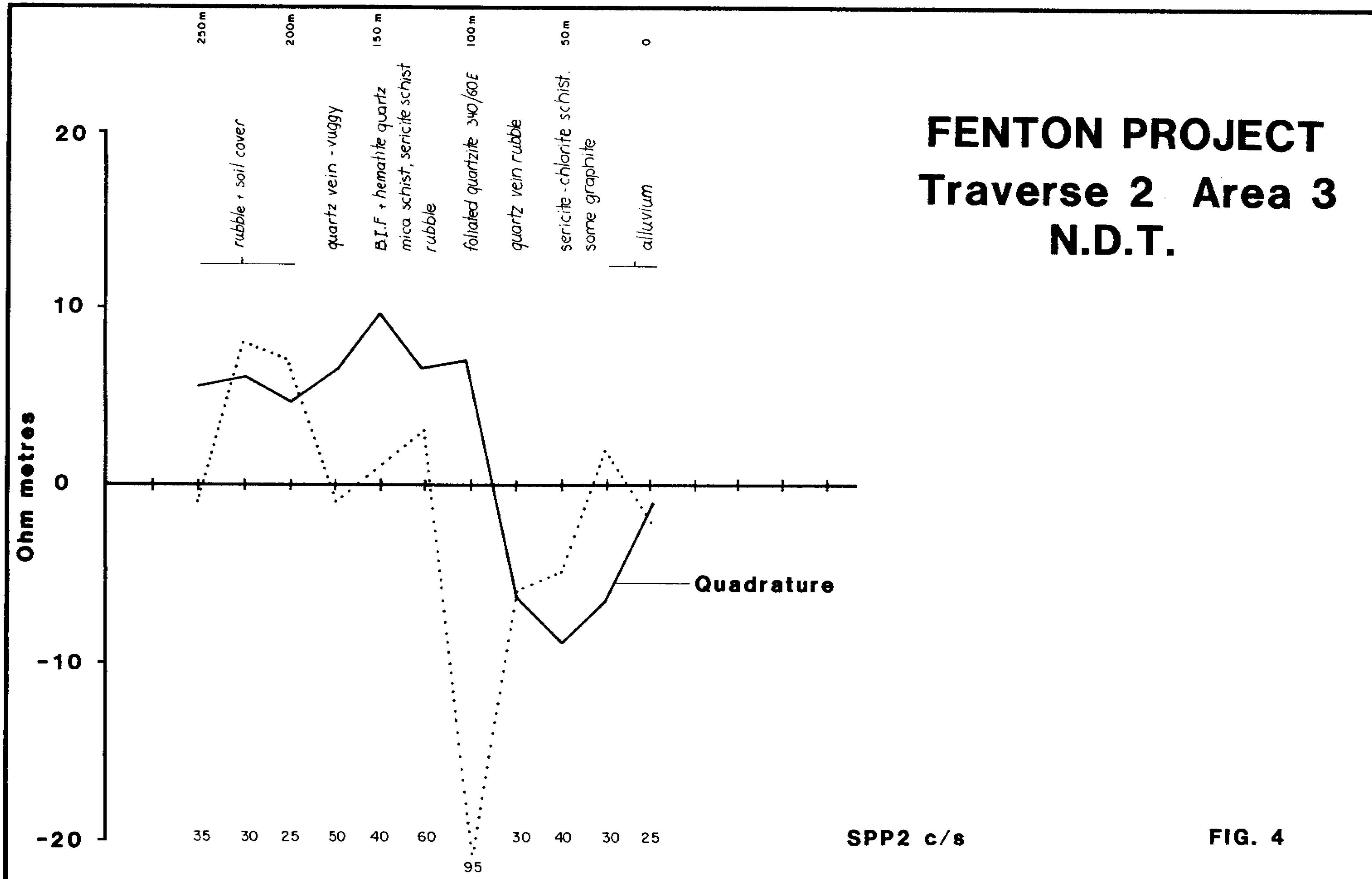

FENTON PROJECT
Traverse 2 Area 3
N.D.T.
250m
200m
150m
100m
50m
0
rubble + soil cover
quartz vein - vuggy
B.I.F + hematite quartz
mica schist, sericite schist
rubble
foliated quartzite 340/60E
quartz vein rubble
sericite - chlorite schist.
some graphite
alluvium
20
10
0
-10
-20
Ohm metres
Quadrature
35
30
25
50
40
60
95
30
40
30
25
SPP2 c/s

FIG. 4

FENTON PROJECT
Traverse 3 Area 3
N.D.T.

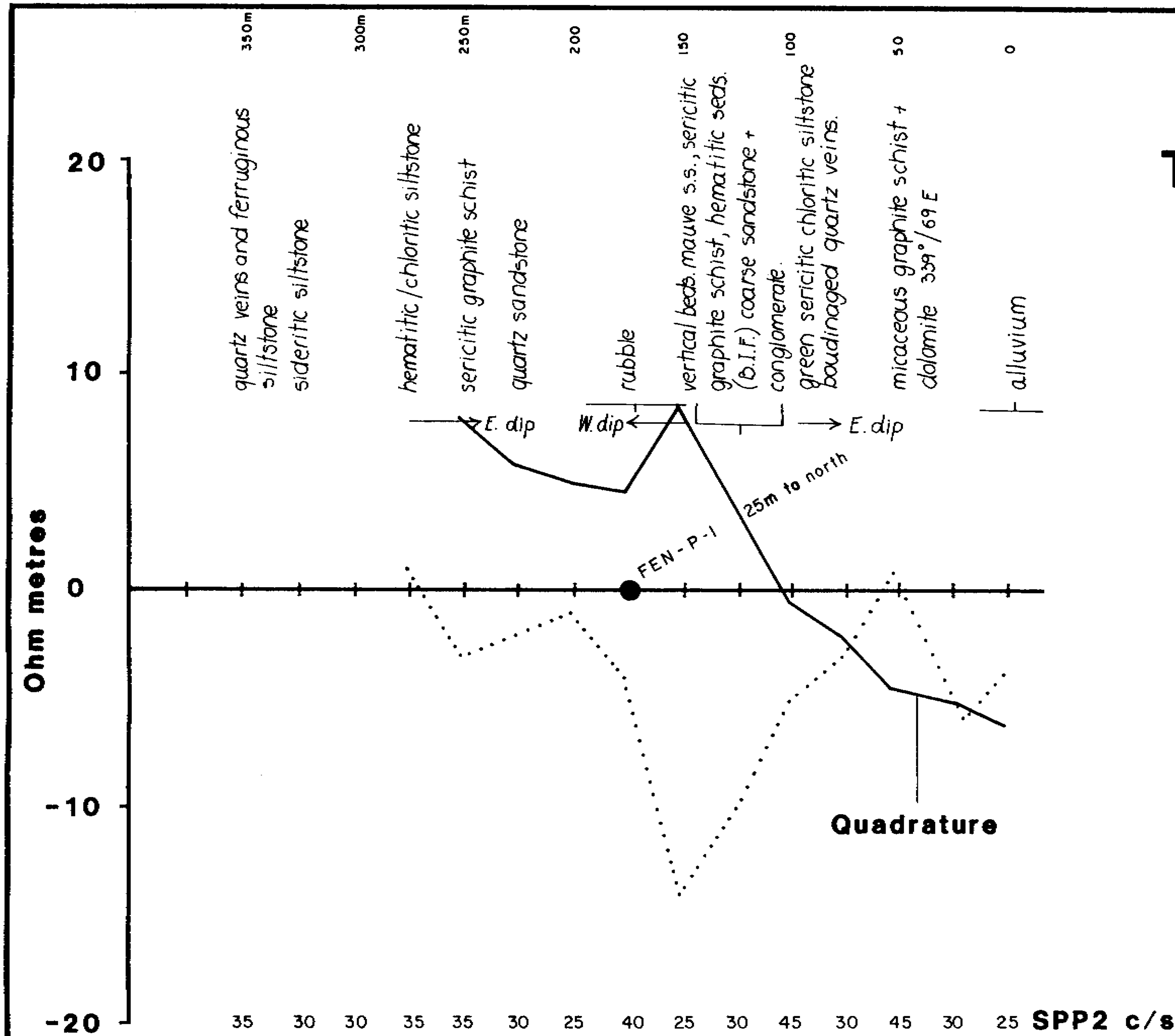


FIG. 5

FENTON PROJECT
Traverse 4 Area 3
Geology & Radiometrics

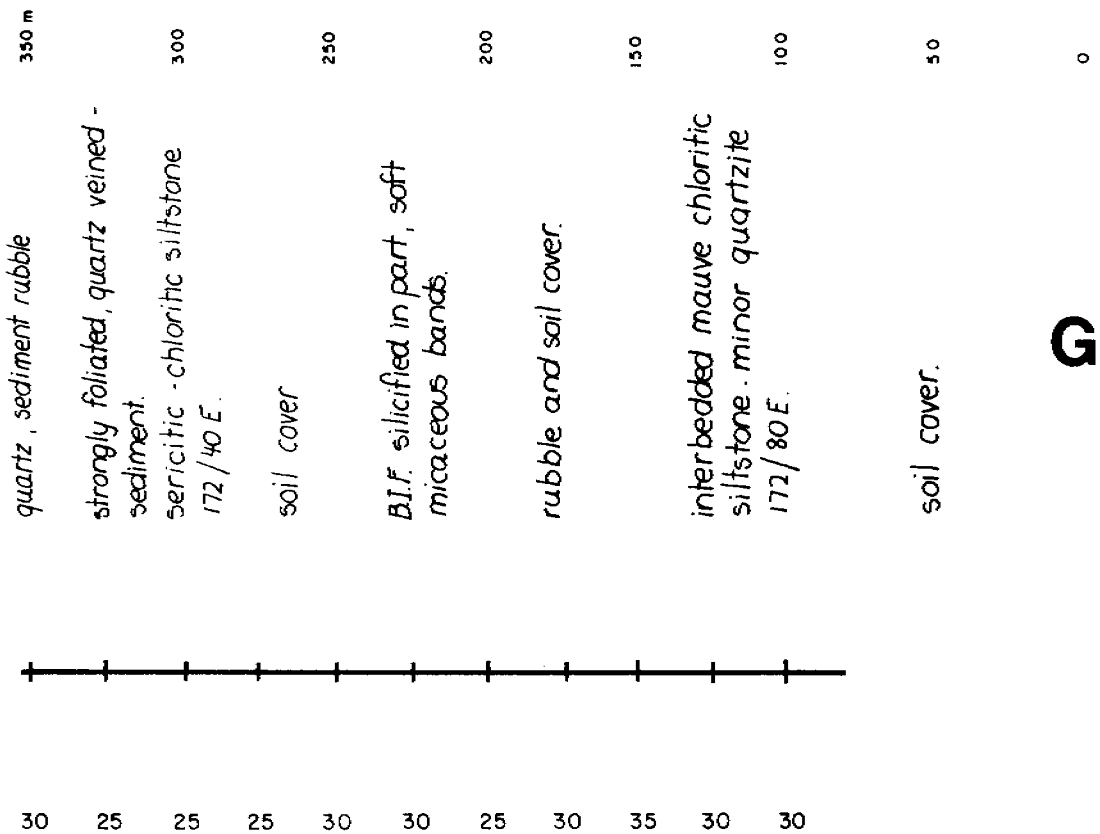


FIG. 6

The main units identified by this limited mapping programme were Banded Iron Formation, hematitic graphite schist, chloritic siltstone/sandstone, quartz veining, and sideritic sandstone.

The drilling of the same section revealed a more complex lithological assemblage much of which was being hidden by alluvium and the effects of the surface weathering.

4.6 PERCUSSION DRILLING

Two percussion holes were drilled at the Fenton Prospect for the following reasons:

1. The inlier of Lower Proterozoic metasediments - Koolpin Formation was very limited in its extent - less than 400 m in width. The sedimentary units were known to be steeply dipping and were therefore thought to have a suitable depth extension, however this was not at all sure, and it was important to determine the volume of the sedimentary pile available to host an ore body before launching into extensive ground surveys.

2. The lithologies present within the Lower Proterozoic metasedimentary pile were not at all well known from the outcrop. Drilling gave a good geological cross-section of the Koolpin Formation in the vicinity of the maximum radiometry known in the area.

These two sites were chosen based on the geology, radiometrics and Alphacard data. FEN-P-1 is located in a small syncline comprising graphite-hematite schist, hematite-chlorite schist and quartz veined, silicified hematite bands. Outcrops in the vicinity of the collar gave surface SPP2 values up to 300 cps. FEN-P-2 was located close to an Alphacard anomaly; green sericitic-chloritic siltstone and adjacent graphite-rich facies outcrop near the hole collar.

FEN-P-1 5658N/4636E 54 m (Plate 2)

Essentially a hematitic sequence intersected: hematitic quartz veined siltstones and quartzites with interbeds of green sericite-chlorite siltstones and hematite bands. Graphite intervals occur at 10 m and 29 m. The hematite-rich beds pass into hematite-chlorite schist at depth, dark green in colour.

The radiometric down-hole log reflects the variable lithology. The first 23 m average 75 cps with one peak of 130 cps at 18 m (hematite-quartzite interval); the hematite/specularite band has a low signature. At 32 m a 150 cps peak occurs within a chlorite schist. Three more peaks, 40 m, 44-45 m and 48 m, are within the chloritic zone.

FEN-P-2 5504N/4754E (Plate 2)

Summary of geology:

0-10 m: Red to greenish (locally) hematitic quartzite/siltstone with quartz veining. Minor chlorite and sericite.

19-26 m: Hematitic-graphitic siltstone/schist.

26-28 m: Black graphite.

28-approx. 36 m: Graphite/hematite schist.

36-40 m: Red clayey mud, no cuttings.

40-48 m: Red hematitic quartzite with quartz veining. Some specularite.

48-53 m: Green-grey and reddish chlorite-hematite schist.

53-60 m: Dark green silicified chloritic siltstone.

The down-hole log contains several peaks over 100 cps: 18 m, at the interface of hematitic quartz and hematitic graphitic siltstone, 120 cps; 29 m, adjacent to a strong graphite bed and graphite-hematite schist, 100 cps; 36 m, red hematitic interval, 100 cps; 38 m, as before; 41 m, contact of red hematitic quartzite; 53 m, chloritic quartzite.

HOLE NO.	COORDINATES	DECLINATION	AZIMUTH	DEPTH (m)
FEN-P-1	4683E/5673N	60^{o}	284^{o}	54
FEN-P-2	4754E/5504N	60^{o}	284^{o}	60
			TOTAL	114

The geological logs were presented along with the radiometric logs at 1:100. Geological cross-sections were drawn and presented at 1:500.

Percussion cuttings were collected every 1 m and laid out on the ground in rows representing ten metres. These piles were then logged by the geologist and, where necessary, samples were collected for analysis. Uranium and thorium analyses were made on selected samples.

4.7 RADIOMETRIC LOGGING

Each hole was logged using a Geometrics T450 logging instrument and a NaI gamma probe. This instrument produces an analogue recording of the gamma radiation emitted from the rocks represented in the hole.

No major anomaly was intersected in either of the drill holes completed in the 1989 programme.

V. CONCLUSIONS

The embayment is large enough to host a sizable uranium orebody, particularly as there are at least 60 m of sediment enclosed by the granite intrusion.

The host rocks are suitable to host a large scale uranium orebody. Graphite and chlorite schist have both been recognized in the sedimentary pile. There is also a large amount of sulphide mineralization particularly associated with the graphite bearing zones. Banded Iron Formation and quartz- filled faults also exist.

The host rocks have been subjected to substantial tectonism. This is shown by the amount and degree of faulting and the intensity of the folding. There appears to have been some tensional tectonism in what would otherwise be described as a compressional regime.

The regional radiometric or Alphacard surveys of the tenement did not reveal enough encouragement to continue exploration of a prospect solely within the Lower Proterozoic metasediment, especially with no Middle Proterozoic unconformity close by.

The tenement consisted of only one subblock comprising only 3.21 sq. kms.

It has been decided by the Joint Venture partners that they will relinquish E.L. 6408 in 1990 to concentrate on the exploration of true unconformity-related orebodies in the Pine Creek Geosyncline.

VI. EXPENDITURE STATEMENT

For period 1st February, 1989 to 31st January, 1990

	$
PURCHASES	330
PERSONNEL	6,884
SUPPLIES AND SERVICES	651
TRANSPORT AND ACCOMMODATION	2,932
GENERAL ADMINISTRATION	379
CONTRACT SERVICES	5,412
TOTAL	16,588

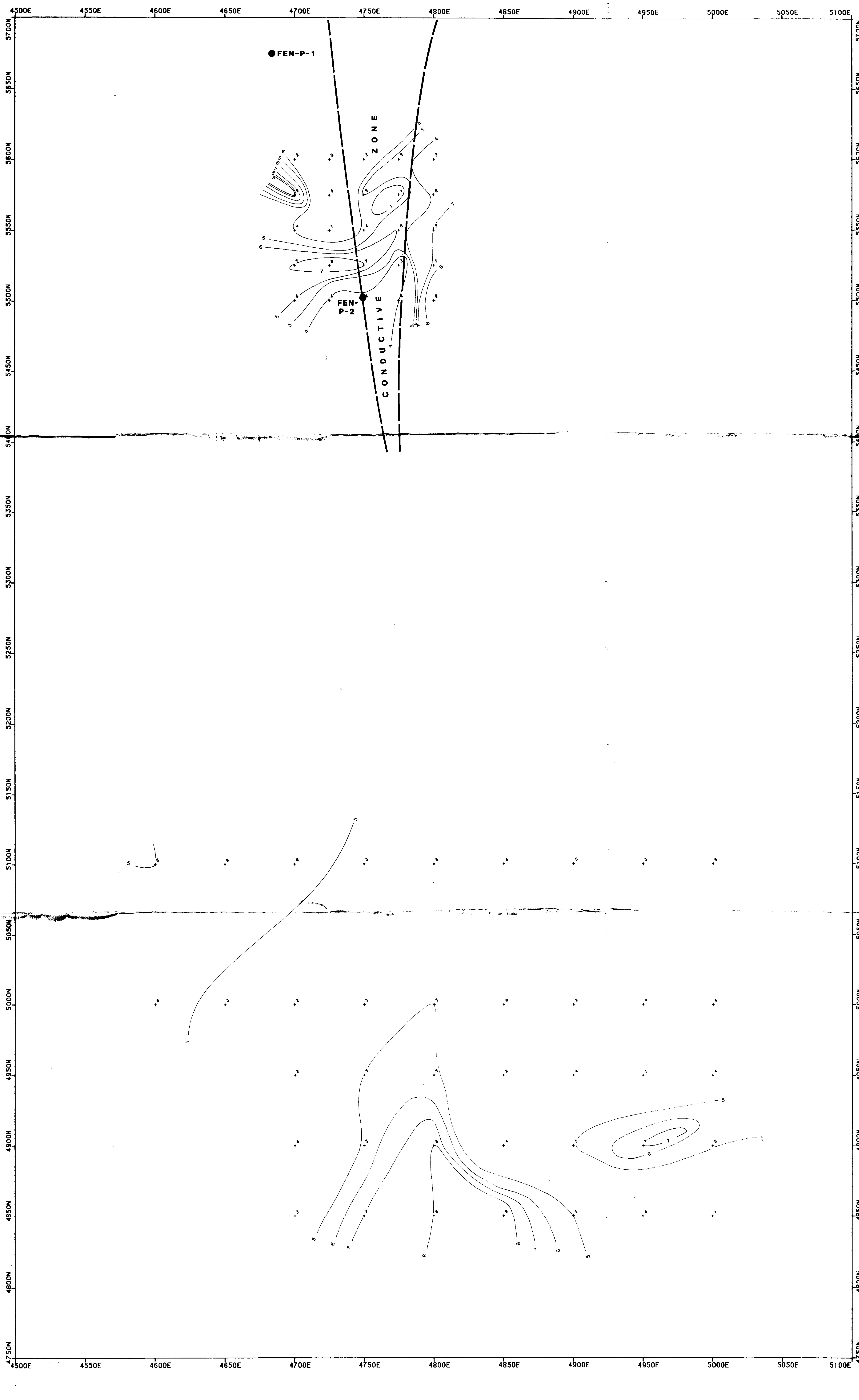
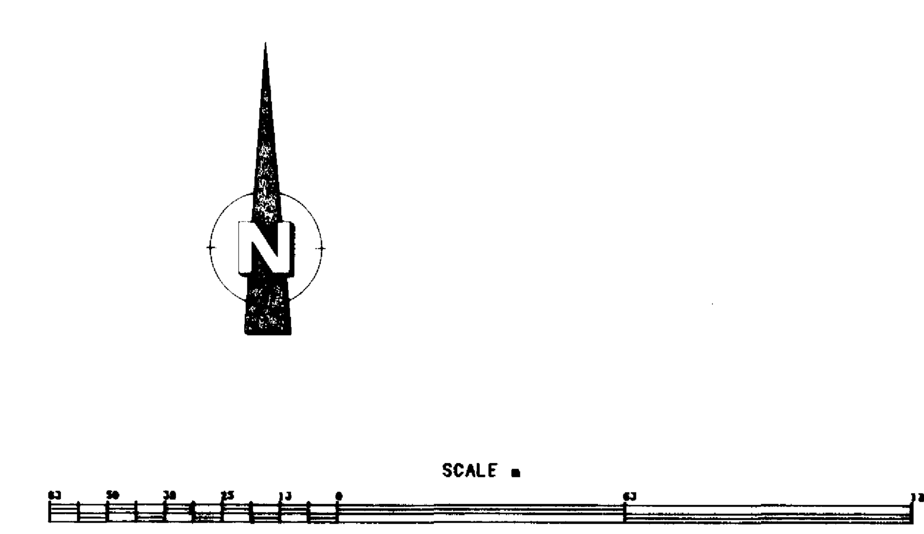


PLATE 1



TOTAL Mining Australia Pty. Limited

FENTON PROJECT - N.T.
E.L. 6408

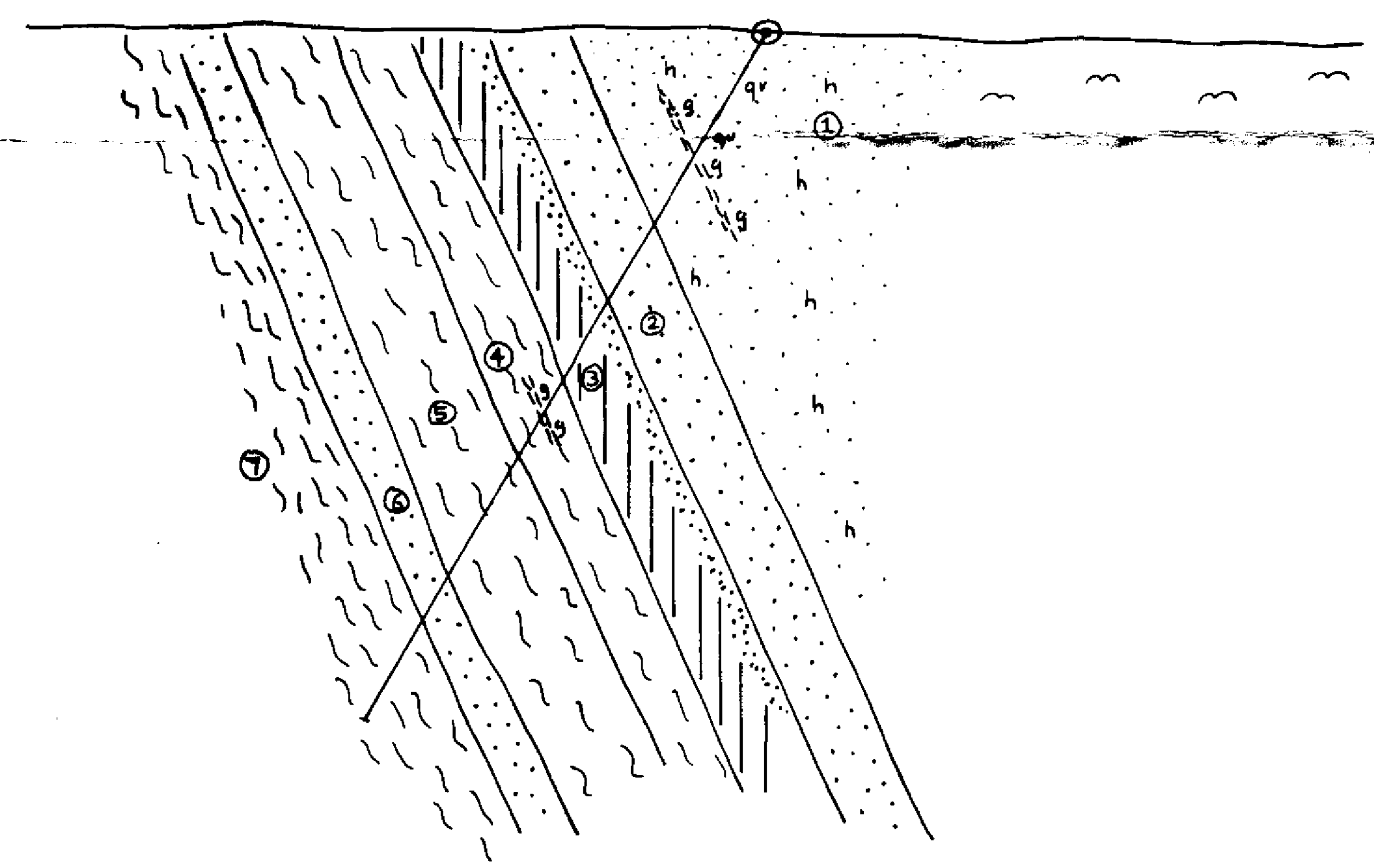
Alphacard Results

REV.	DESCRIPTION	PREP.	DRAWN	CHECKED	DATE
XXX	XXXXXXXXXXXXXXXXXXXX	PM	GR		FEB.90

OFFICE: SYD	SCALE 1/1250	SHEET 1 OF 1	DRG. No 564-001

West **East**

FEN-P-1
(4683E 5673N)

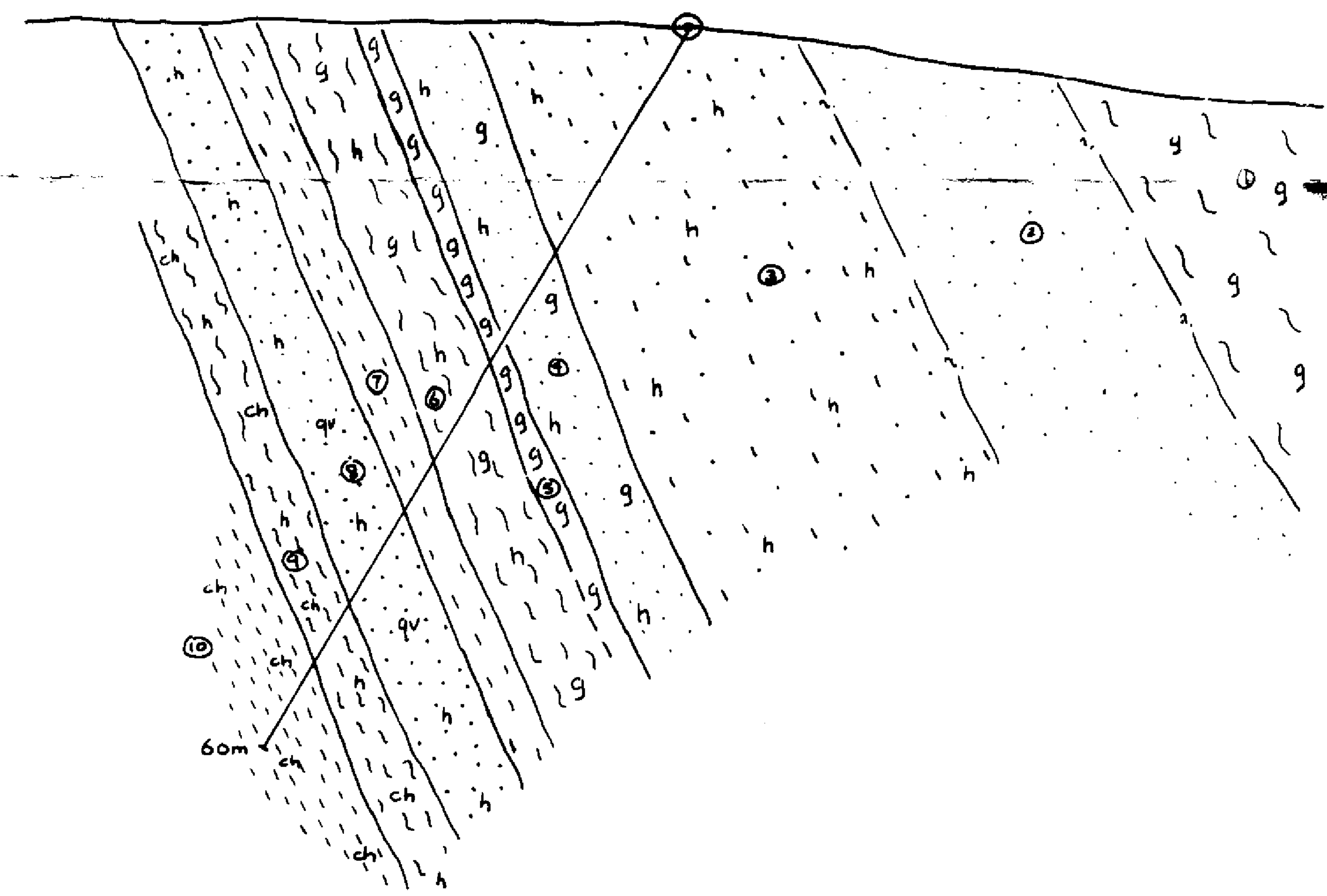


Lower Proterozoic Stratigraphy

Koolpin Formation. Assumed dip 65°E

1. Red hematitic quartzite. Quartz veined. Some siderite. Interbedded graphite
2. Red to green hematitic quartzite. Sericitic + chloritic alteration.
3. Red hematitic quartzite. Quartz veined. Bands of massive hematite and specularite.
4. Dark green hematitic chlorite schist. Minor graphite.
5. Interbedded chlorite schist and hematitic quartzite.
6. Red brown to dark brown hematite-rich meta-siltstone.
7. Dark green chlorite schist.

FEN-P-2
(4754E 5504N)



Lower Proterozoic Stratigraphy

Koolpin Formation. Assumed dip 70°E.

1. Graphite Schist
2. Fine grained felspathic meta sandstone.
3. Hematitic (+ minor chlorite) quartzite - meta siltstone.
4. Hematitic meta siltstone with graphite component.
5. Black graphitic bed.
6. Hematitic graphite schist.
7. Red clay - no cuttings.
8. Red hematitic quartzite; quartz veining. Minor specularite.
9. Greenish grey hematite-chlorite schist.
10. Dark green silicified chloritic meta-siltstone.

PLATE **2**

TOTAL Mining Australia Pty. Limited

FENTON PROJECT - N.T.
E.L. 6408

CROSS SECTIONS FEN-P-1 & FEN-P-2

REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
[redacted]		P M	P M		Dec 89

OFFICE	SCALE 1 : 500	SHEET OF	DRG Nº 564-002