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The Henty Prospect. Geological Appraisal.

G.O. Arnold

February, 1988.

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G.O. Arnold
SENIOR GEOLOGIST

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Cross-section 64000N ✓

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Cross-section 64100N ✓

Cross-section 64150N ✓

Cross-section 64200N ✓

Cross-section 64250N ✓

Cross-section 64300N ✓

Cross-section 64350N ✓

Cross-section 64400N ✓

Cross-section 64450N ✓

Cross-section 64500N ✓

Cross-section 64550N ✓

CONCLUSIONS AND RECOMMENDATIONS

- Mineralization at the Henty prospect is stratigraphically controlled, hosted by the lower Tyndall Group within an overturned sequence dipping sub-parallel to the Henty Fault. The overturned sequence is repeated to the east by a second sub-parallel fault.

- The strong schistosity and brecciation which characterize the Henty Fault are Devonian features, later and unrelated to the mineralization. However, the fault was also active in the Cambrian and has similar associated structures as well as similar timing to the Great Lyell Fault.

- Mineralization at the Henty prospect has great similarities to mineralization at Mount Lyell, including an association with massive silicification resembling that in the Comstock and North Lyell chert bodies. By implication, some hydrothermal activity involved in the Henty mineralization was related to the Henty Fault.

- There is no certain genetic model for the mineralization at the Henty prospect. A syngenetic or early near-syngenetic component is possible, implying the potential importance of stratigraphic level. A fault-related component is likely, implying the potential importance of structures such as the Henty and Great Lyell Faults.

- Intersections with gold grades adequate for underground mining are visually unpredictable and may lack continuity. Some preliminary geostatistics may provide insight into this important question.

1. INTRODUCTION

Two weeks were spend relogging core from the Henty prospect. The assistance of Tony Cartwright, Ray Roberts, and Fergus Fitzgerald is gratefully acknowledged. The object of the work was to gain a geological overview, with particular emphasis on structural controls of mineralisation. The main results are the interpretations on the accompanying cross-sections.

The exploration history and state of knowledge of the prospect at the time of this study are summarized in Cartwright (1986, 1987 a,b).

A second report to discuss the results of a study in progress on the geochemistry of the Henty prospect is planned, to be written in collaboration with S. Gatehouse.

2. SALIENT ASPECTS OF THE GEOLOGICAL SETTING

Mineralization at the Henty prospect is located in the footwall of the Henty Fault, a major structure likely to have been active in the Cambrian as well as the Devonian. Corbett and Lees (1987), as well as a number of earlier reports by Corbett, discuss the tectonic significance of the Henty Fault.

The Mount Read Volcanics are divided into two unlike parts by the Henty Fault. An inter-fault sequence southwest of the Henty prospect together with the Farrell Slates to the northeast represent large fault slivers of sediments partly separating the two segments of the Mount Read Volcanics, but non-correlatable with either. Corbett and Lees visualize juxtaposition along the Henty Fault of separate volcanic arc terranes (the two segments of the Mount Read Volcanics) and an inter-arc basin sequence (the large fault slivers of sediments). This interpretation implies large thrust or wrench fault movements on the Henty Fault, such as characterize plate junctions.

This initial major activation of the Henty Fault is likely to have been in the Cambrian. Corbett and Lees propose a widespread phase of deformation in the Cambrian, particularly evident as complex fault disruption, in contrast to the generally broad, north-south trending, open folding typical of the Devonian deformation. The Great Lyell Fault with proven Cambrian activation trends into the Henty Fault.
Units older than such proposed Cambrian deformation, such as the Tyndall Group and Owen Conglomerate, do not extend across the Henty Fault, whereas Ordovician, Silurian and Devonian sedimentary units are present on both sides of it. Corbett and Lees also cite the presence of mafic-ultramafic rocks and basaltic and gabbroic dykes along the Henty Fault as further evidence of Cambrian activation. Detritus from mafic-ultramafic rocks (particularly chromite) began to shed in the Cambrian in western Tasmania.

Some Devonian activation of the Henty Fault is also likely, as discussed by Berry (1986). Ductile deformation on the fault zone is evident from a strong schistosity, locally mylonitic in intensity. This strong schistosity is transitional to the regional cleavage associated with broad, open, north-south trending, Devonian folding. K/Ar ages on slates adjacent to the fault zone indicate Devonian deformation (Adams et al., 1985).

Several styles of mineralization are associated with major structures in western Tasmania. The classic V.M.S orebodies of the Mt Read Volcanics are all located in general proximity to the Henty, Rosebery, and Great Lyell Faults. However, specifically fault-related mineralization is also suspected on the Henty and Rosebery Faults, as well as mineralization known to be localized on the Great Lyell Fault at Mt Lyell. This fault-related mineralization could have been emplaced in the Devonian when a period of granitoid intrusion and a tectonothermal event is well established. An earlier possibility is a suspected tectonothermal event in the Cambrian (Adams et al., 1985).

3. ROCK TYPES AND STRATIGRAPHY

The unmineralized hanging wall sequence was not studied in any detail - relogging of core was only done a short interval above where drill holes passed into the Henty Fault. The hanging wall sequence consists of fine-grained pink felsic volcanics and fine-grained mafic intervals likely to be dykes.

The fault zone shown on the cross-sections represents an interval where hanging wall and footwall sequences may be intermixed (eg by brecciation or fault imbrication) and exotic rocks may be present. The presence of exotic rocks is indicated by intervals of brecciated and mylonitic black slate. South of the Henty prospect the Henty Fault splays into two. The inter-fault sequence between the splays (interpreted as inter-arc basin facies by Corbett and Lees, 1987) contains abundant black slate and is correlatable with the broken clasts of slate in the fault zone at the prospect.

Before this study was begun, some important aspects of the stratigraphy of the footwall sequence had been recognized. Most of the mineralization was considered to be in the Tyndall Group, overlain by the Newton Creek Sandstone Member of the Owen Conglomerate, with a transitional facies present in the upper part of the Tyndall Group, recognized in some drill holes as the Jukes Breccia.

There are two major problems in attempting to apply more detailed subdivisions. The first of these is the obliteration of primary texture by intense alteration and deformation. Within, for example, rocks affected by intense silicification, primary fragmental textures have completely disappeared. Also, for example, in rocks with mixed silica-sericite-sulphide assemblages overprinted by high strain, the fragmental textures can be quite ambiguous and may reflect primary textures or may have been produced by alteration and deformation.

The other major problem complicating recognition of a local stratigraphy is that the sequence is faulted, not just by the Henty Fault, but by subsidiary faults in the footwall sequence. Evidence for such faulting is present in HP4 (section 64050N) where the drill hole passed stratigraphically up from Tyndall Group into the Newton Creek Sandstone Member then abruptly passed back into Tyndall Group.

Despite these problems, a two-fold subdivision of the mineralized and altered sequence does seem justified. The lower part of the Tyndall Group is exemplified in holes such as HP12 and 12A (section 63950N), whereas the upper part of the Tyndall Group is exemplified in holes such as HFZ5 or in costean exposures above it. In these better examples, there is a striking contrast between the upper and lower Tyndall Group. These two units are discussed in more detail below in sections 3.1 and 3.2.

The Newton Creek Sandstone Member is exposed in the surface costean and intersected in a few drill holes. This unit, which conformably overlies the upper Tyndall Group, consists of white siliciclastic conglomerate and grey-green slate with an hematitic hue.

3.1. Lower Tyndall Group

Much of this unit consists of fragmental textured felsic volcanics likely to be pyroclastics. Also present are intervals with pebbly epiclastic textures suggested by the presence of subrounding in some clasts and intermixing of unlike clast types. Forming another minor component are fine grained 'lava-like' segments of felsic volcanics which could have originated as lava, welded sections in pyroclastic flows, or even as dykes. Characteristically, quartz phenocrysts are present but are not strikingly large or abundant as is the case for much of the upper Tyndall Group. Parts actually lack any quartz phenocrysts.

Carbonate-bearing sections are present, including a few intervals which resemble foliated impure limestone or dolomite.

The ambiguity relating to these rocks is whether the carbonate is a primary component (or nearly primary, as for a diagenetic cement),or whether it has been introduced as part of the facies with pyrite, silica, and sericite. The most likely interpretation at this stage is that primary carbonate formed part of the original sequence, much as it does in the Tyndall Group near Comstock - a similarity previously recognised by A. Cartwright. The proportion of possible massive carbonate is only minor, as indicated on the summary logs on the cross-sections, but substantial sections with epiclastic pebbly textures are also suspected to have had a primary carbonate component. Calcite, ankerite, dolomite, and sideritic-calcite are all referred to in the petrographic descriptions, but much recrystallization and deposition has taken place under metamorphic and hydrothermal conditions, so any primary composition is uncertain.

Virtually all the mineralization is contained within the lower Tyndall Group. As discussed below, *no certain model for the* origin of the mineralization exists. One possibility is that disseminated sulphide and some volumetrically minor lenses of massive sulphide were a primary syngenetic (or near-primary, diagenetic or high-level epigenetic) component of this unit. Another possibility us that a primary carbonate component resulted in preferential replacement by epigenetic sulphides.

3.2. Upper Tyndall Group

This uppermost subdivision of the Tyndall Group is mostly epiclastic, although some coarse fragmental textured sections could be either pyroclastic or epiclastic. Clast and grain sizes show a complete range from conglomerate, through arenite and silt, to pelite and 'ashstone'. Most of the finer sediments are moderately to well sorted. Clasts and grains are almost entirely derived from strongly quartz-phyric felsic volcanics. The abundance of large quartz phenocrysts contrasts with their finer and sparser distribution in the lower Tyndall group, and is a useful guide for identification in strongly altered sections.

Near the top of the upper Tyndall Group are rocks transitional to the Owen Conglomerate. Conglomerate with slightly hematitic clasts and a minor component of foreign siliceous clasts is similar to the Jukes Breccia. Some holes also intersected grey-green slate with an hematitic hue, also characteristic of the Owen Conglomerate, but intercalated with Tyndall Group volcaniclastics. More detailed subdivision of the upper Tyndall Group is likely to be possible; the impression gained in this study is of rapid facies variations.

3.3. Quartz Porphyry

Drill hole HP16 on section 64550N and drill hole HP26 on section 64350N intersected at depth a quartz porphyry body correlated with surface outcrop at the northeast end of the prospect. The contact is interpreted as a fault and is discussed further in Section 4.

The quartz porphyry has a distinctive coarse quartz-phyric texture which can be matched to clasts in the upper Tyndall Group. There is a strong likelihood that this or virtually identical quartz porphyry bodies were exposed as local erosional sources during deposition of the upper Tyndall Group.

An interval of possibly similar quartz porphyry within the lower Tyndall Group was intersected by HFZ12 (section 63500N) and has been correlated with the quartz porphyry to the north. This interval could represent an intrusive.

4. STRUCTURE

The general disposition of structures and stratigraphy is shown in Figure 1. The footwall sequence is overturned, dipping west sub-parallel to the Henty Fault, and apparently repeated to the east across a second sub-parallel fault.

4.1. Schistosity

A strong schistosity is present in both hanging wall and footwall. Limited field work suggests this schistosity extends considerable distances away from the Henty Fault and is transitional to the regional cleavage.

A mylonitic schistosity has been recognised in the relogging shown on the cross-sections. This is particularly developed in the hanging wall above the fault zone and within the hanging wall side of the fault zone. The mylonitic schistosity has been recognized on the basis of more intense foliation, fine metamorphic striping of quartz-rich and mica-rich ribbons, and pronounced flattening and elongation of porphyroclasts, all suggesting high strain. It is possible to argue that these rocks are not true mylonites according to some definitions, but continued use of the term is justified on the basis of past practice and utility. The mylonitic schistosity grades into the more normal strong schistosity farther from the Henty Fault.

A few surface measurements of schistosity and an indication of possible orientations from drill-core data are shown in Figures 4 and 5. The drill core data are from measurements made by A. Cartwright and others. The clustered plots of the intersections of the equal angle projection and the cones of possible orientation of poles to schistosity need to interpreted with circumspection.

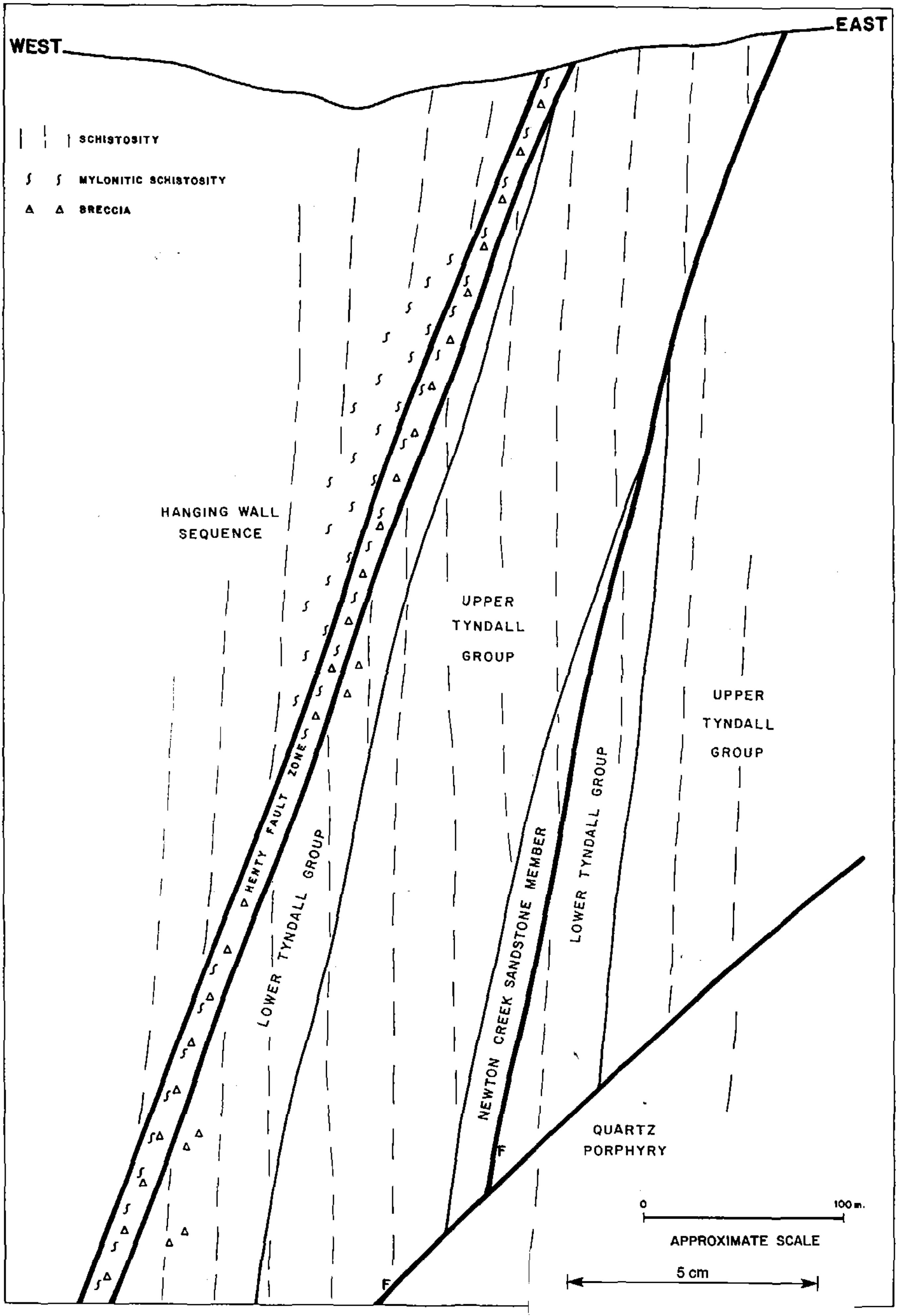


FIGURE 1. ILLUSTRATION OF CROSS-SECTIONAL GEOMETRY OF FAULTS AND STRATIGRAPHY

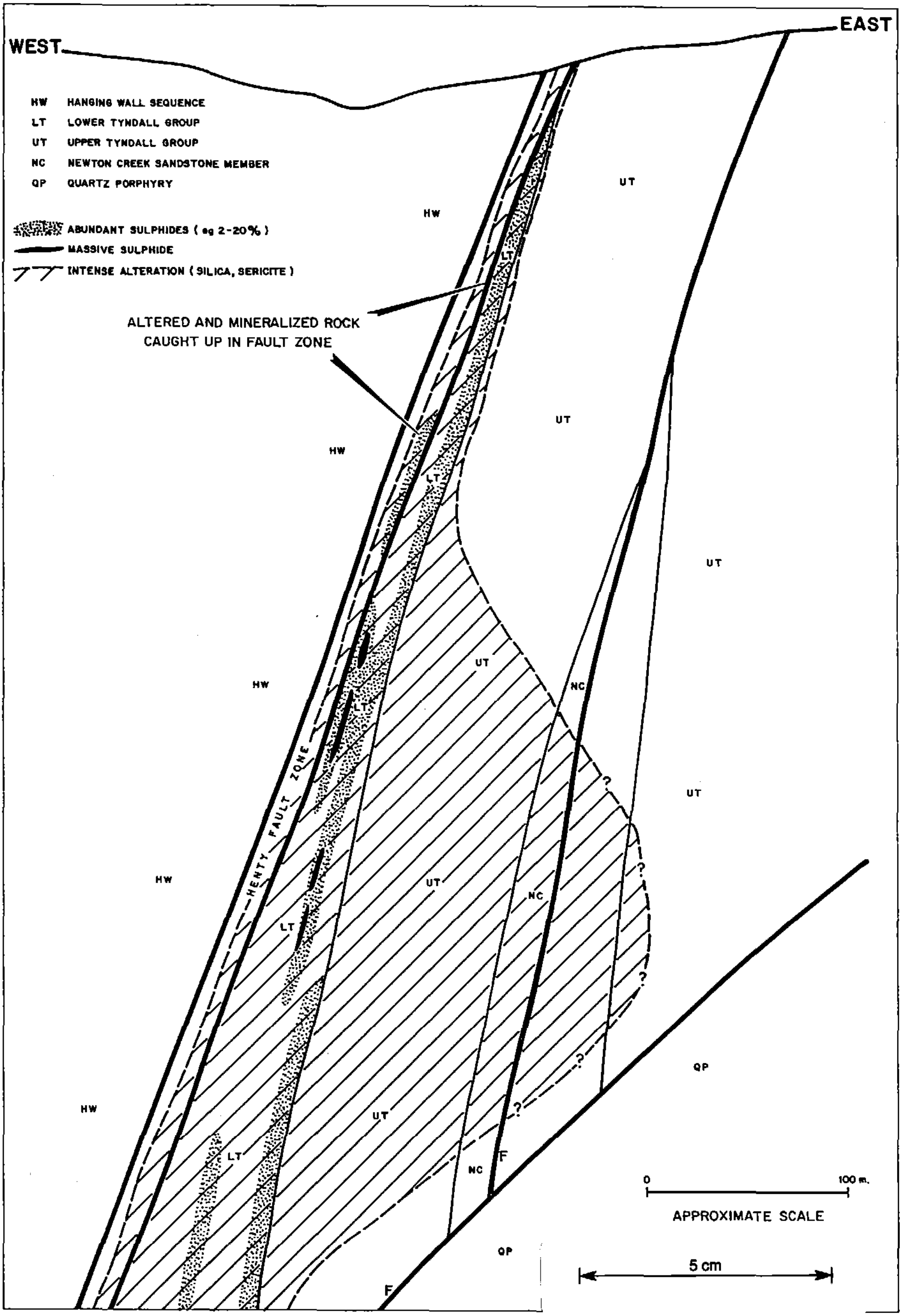


FIGURE 2. ILLUSTRATION OF CROSS-SECTIONAL GEOMETRY OF ALTERATION AND MINERALIZATION

However, the data do suggest that the schistosity in the hanging wall is not parallel to that in the footwall, and neither are parallel to the Henty Fault. The schistosity in the hanging wall is nearest in orientation to that of the fault, though generally somewhat steeper. The mylonitic schistosity near or within the fault zone is likely to be very close to parallel to it, the schistosity bending into parallelism near the fault. The schistosity in the footwall appears to have a more northwesterly trend than the Henty Fault, and a steep dip.

A well developed stretching lineation is evident in the mylonitic schistosity in the hanging wall and its calculated orientation from drill hole data is shown in Figure 6. This orientation (a steep southeast plunge) is in fair agreement with observations of Berry (1986) from the Henty Fault zone at Tullah.

Berry also recorded the presence of horizontal kinkfolds and kinkbands progressively rotated towards the extension direction. A fine crenulation of the schistosity surface perpendicular to the extension direction is evident in much core from zones of mylonitic schistosity, and may represent examples of such deformation. However many of the kinkfolds evident in surface exposures do not accord with this model, and may be later superimpositions associated with the brecciation. Regardless of origin, kinkfolds are commonly present within zones of mylonitic schistosity.

4.2 Brecciation

Mylonitic hanging wall and less strongly foliated footwall sequence are brecciated, particularly within the half of the fault zone nearest the footwall, but similar brecciation also extends into the footwall sequence some distance from the Henty Fault. The brecciation post-dates the development of schistosity.

While some brittle-ductile shear zones may have schistosity and brecciation more-or-less contemporaneously developed, a more likely model for the Henty prospect is that brecciation and some of the kinkfolding is the result of a late phase of brittle deformation superimposed on earlier ductile strain features.

4.3. Definition of the fault zone on the Henty Fault

The Henty Fault often cannot be identified as an exact depth within a drill hole intersection, so most commonly a zone has been identified on the basis of fault-related aspects such as brecciation or the presence of mylonitic schistosity. Neither of these is entirely satisfactory as mylonitic schistosity extends a considerable distance into the hanging wall in some holes, with very transitional contacts, and, similarly, the brecciation extends irregularly into the footwall.

The fault zone shown on the accompanying cross-sections has been chosen as the minimum interval of uncertainty: the upper contact is placed where the hanging wall sequence can no longer be identified in reasonable continuity, and the lower contact similarly. In some cases a contact between mylonitic rocks probably belonging to the hanging wall, and mineralized or silicified rock, probably belonging to the footwall, could be more precisely defined, but the presence of exotic clasts of black slate indicates that mixing has occurred, and a minimum zone of uncertainty is preferable.

In a typical intersection passing from hanging wall into footwall, the schistosity becomes irregularly stronger, then mylonitic, and the primary rock type becomes difficult to identify. Kinkfolds are often present in the mylonitic zone, and brecciation increases downwards in it. Exotic black slate intervals are commonly present in the brecciated and mylonitic zone. Less schistose but strongly brecciated intervals of silicified and mineralized footwall then appear, sometimes before the intervals of black slate, and progressively become dominant. The brecciation then decreases irregularly as the hole passes into continuous footwall sequence.

4.4. Repetition of sequence in the footwall across a fault sub-parallel to the Henty Fault.

The interpretation of the fault repetition of the footwall sequence as illustrated in Figure 1 is necessarily more uncertain than interpretation of structure and stratigraphy nearer the Henty Fault, because only a few drill holes have penetrated a sufficient distance into the footwall to provide information.

Fundamental to this interpretation are intersections of Newton Creek Sandstone Member in HP6 (section 64350N), HP4 (section 64050N), and HFZ5 and the costean above (section 63900N). The presence of this unit in simple sequence above the upper Tyndall group is at odds with intersections of Tyndall Group where the overlying unit could be expected, for example in HP26 (section 64350N), and HP7 (section 6400N). The key intersection, though, is in HP4 (section 64050N) where the hole passed downwards through upper Tyndall group, then into Newton Creek Sandstone Member, then back into Tyndall Group. Additionally, a repetition of the upper and lower Tyndall Group is interpreted in HP7 (section 6400N) and HP8 (section 64150N).

4.5. Possible fault along the contact of the Quartz Porhpyry at the northeast end of the prospect.

The interpreted fault along the quartz porphyry contact or depth in HP16 (section 64550N) and HP26 (section 64350N) is also shown on Figure 1, at depth on the eastern side. This possible fault has been shown as the Great Lyell Fault on the cross-sectional interpretations of A. Cartwright, and matches the interpreted position of the Great Lyell Fault shown on the map of Corbett (1984).

However, any fault movement on this contact is likely to be normal rather than reverse, and reverse sense of movement characterizes the Great Lyell Fault where it is known farther south. On the cross-sections accompanying this report, the interpretation of a planar faulted contact of the quartz porphyry is retained, but the notion that it represents the Great Lyell Fault is abandoned. More probably, the Great Lyell Fault joins the east branch of the Henty Fault to the south of the Henty prospect either by simple splay or a more complex transfer geometry. Normal movement along the faulted contact of the quartz porphyry may explain (in part) how steep, overturned basal Owen Conglomerate is present in the prospect area, while the same stratigraphic interval is present to the east on the Gooseneck, flat dipping, apparently undisturbed, and topographically higher.

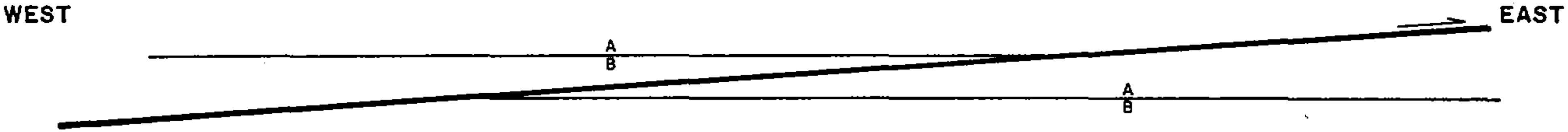
4.6. Comments on interpretation of structures in the Henty prospect.

The geometry shown in Figure 1, of two fault slices dipping sub-parallel to the Henty Fault, with overturned repeated stratigraphy, implies some unusual combination of movements. The presence of the same stratigraphic interval to the east and up slope on the Gooseneck makes the problem even more difficult.

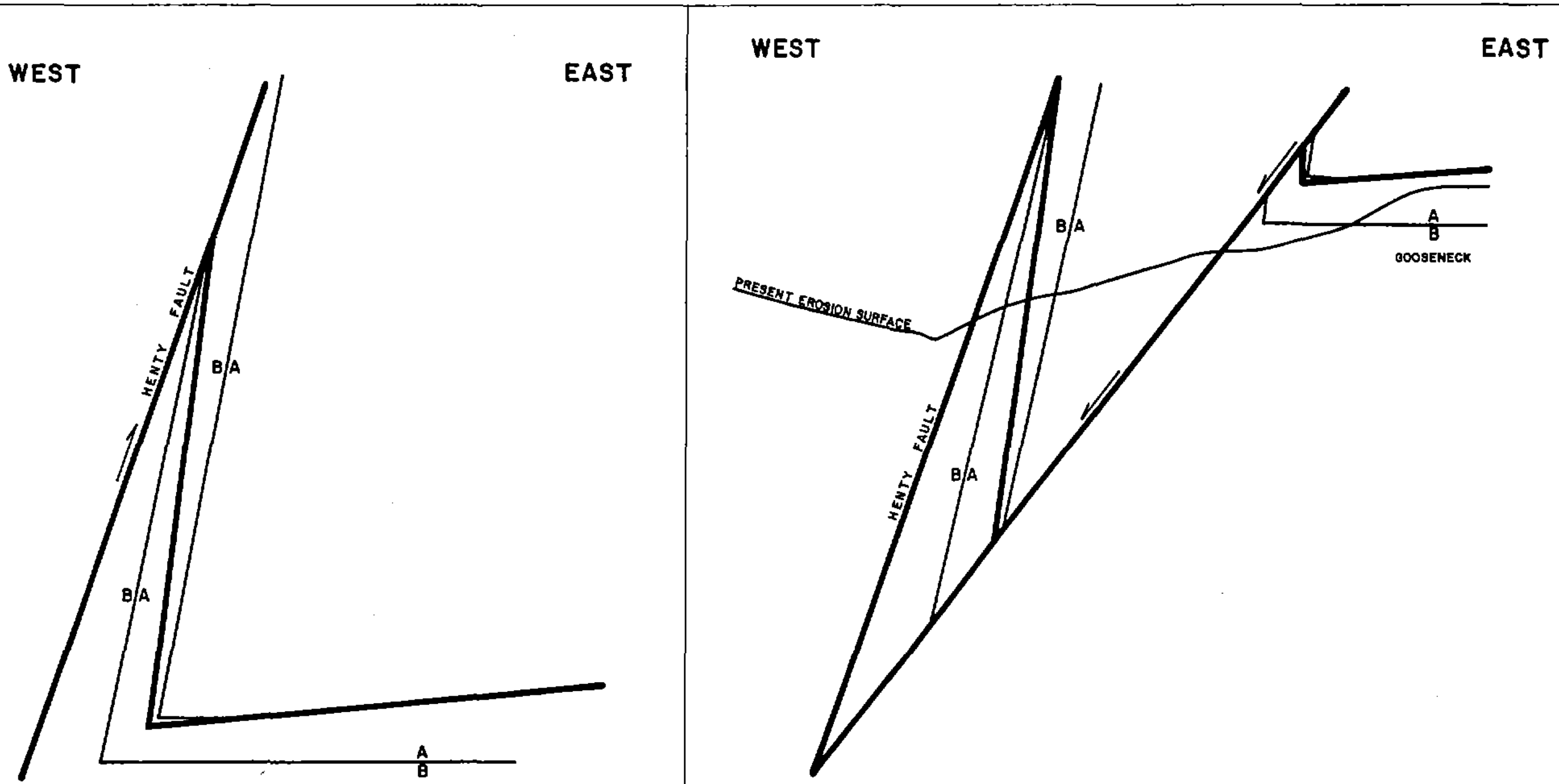
There is no unique solution to this geometry from the data to hand in terms of sequence and styles of deformation. Some possible sequences of faulting which could result in the known geometry are shown in Figure 3.

While there has been ductile strain at the fault zone during development of the schistosity, there is no geometric or textural evidence which demands interpretation of this deformation as the earliest or the most significant.

The data shown in Figure 4 suggest that the schistosity may be steeper and more northwesterly trending than the stratigraphy which is sub-parallel to the Henty Fault.



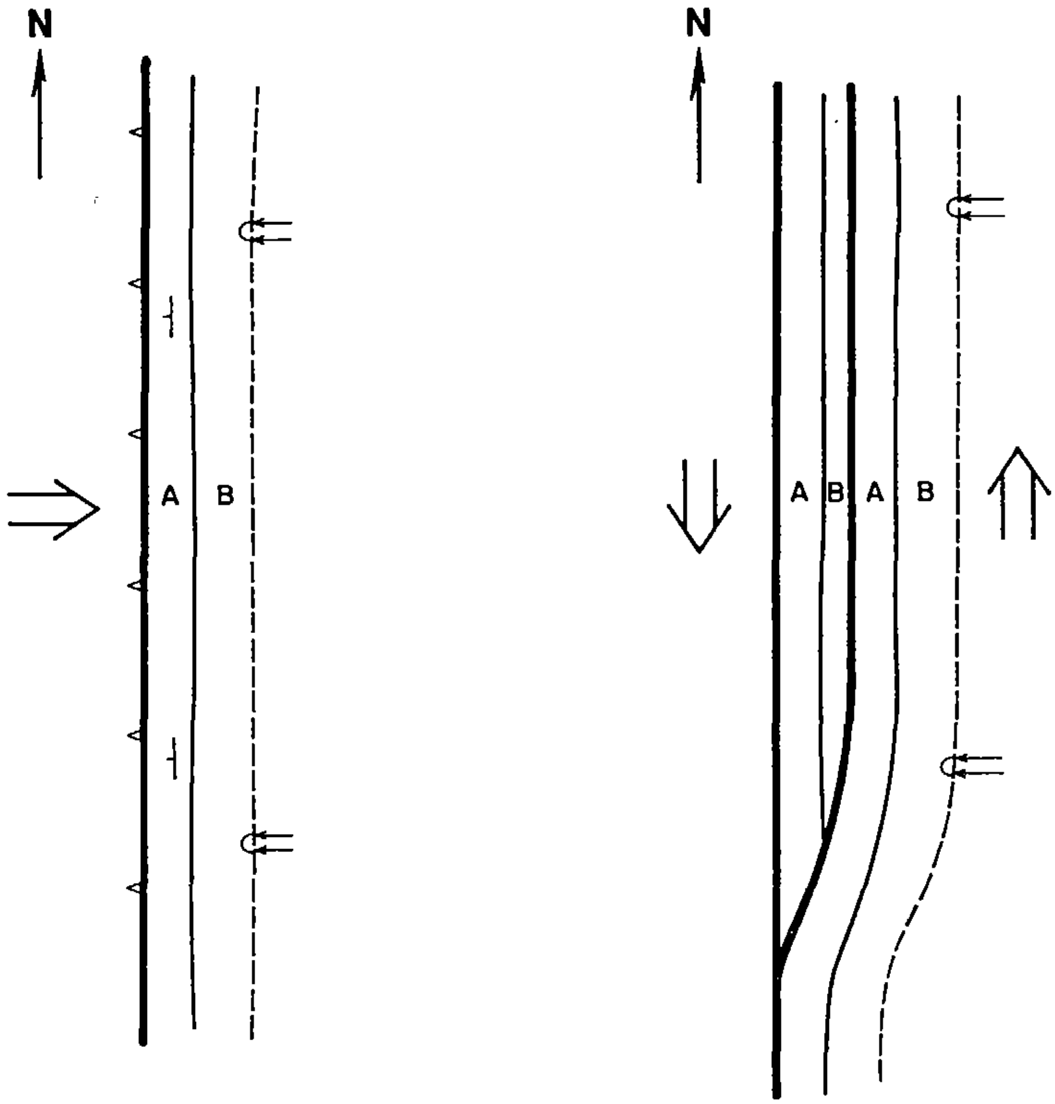
1. SECTION - LOW ANGLE THRUST REPETITION



2. SECTION - OVERTURNING OF REPEATED SEQUENCE ADJACENT TO HENTY FAULT

3. SECTION - DOWN FAULTING BETWEEN GOOSENECK AND MINERALIZED REPEATED SEQUENCE ADJACENT TO HENTY FAULT

FIGURE 3a. POSSIBLE SEQUENCE OF FAULTING IN FOOTWALL OF HENTY FAULT (SCHEMATIC)



1. PLAN - REVERSE FAULTING GIVING A FOOTWALL SYNCLINE WITH OVERTURNED LIMB

2. PLAN - REPETITION OF OVERTURNED LIMB BY WRENCH FAULTING

FIGURE 3b. ALTERNATIVE SEQUENCE TO GIVE GEOMETRY SHOWN IN FIGURE 3a (2)

This geometry implies that the overturning and repetition of stratigraphy in the footwall occurred prior to schistosity development. Similarly, the regional geology discussed in Section 2 indicates that the most significant deformation occurred in the Cambrian and was overprinted by Devonian deformation which produced the schistosity.

This situation is strikingly similar to the geology associated with the Great Lyell Fault at Mt Lyell. There, reverse faulting with a west over east configuration produced footwall folds with overturned western limbs. Fault repetition has produced structures like the Tharsis Ridge with an overturned west dipping sequence imbricated with older volcanics. There, too, the Devonian schistosity has overprinted the earlier faulting, and locally high strain 'mylonitic' schistosity is present at the earlier-faulted contact.

One important difference at the Henty prospect is that substantial movement may have occurred on the Henty Fault in the Devonian. The extension direction (Figure 6) should indicate the direction of relative movement during the ductile phase. The significance of the overprinting brittle faulting is uncertain, though it may correlate with the phase of sinistral wrench faulting identified by Berry (1986) from the Henty Fault near Tullah.

5. ALTERATION AND MINERALIZATION

The most significant observation to emerge from the relogging is that the mineralization at the Henty prospect is stratabound, contained almost entirely within the lower Tyndall Group. Mineralization appears to predate schistosity development and though there may be a genetic link with the Henty Fault, there is no detailed control of the distribution of mineralization by fault-related structures. No single specific genetic model can be identified for the Henty prospect mineralization. However, the mineralization does have remarkable similarities to mineralization at Mt Lyell: similar processes can be inferred, and interpretation is afflicted by similar ambiguities.

Figure 2 summarizes the overall geometry of alteration and mineralization, and its relationship to structures and stratigraphy.

5.1 Details of alteration and mineralization in the lower Tyndall Group.

Pyrite and base metal sulphides (chalcopyrite, galena, and sphalerite, principally) are present mainly as disseminations within fragmental textured volcanics, particularly concentrated where pebbly epiclastic textures are suspected. Locally, sulphides are concentrated into lenses of massive sulphide. In other places, veining seems to have been a characteristic of the mineralization: vein-like concentrations of quartz, carbonate, and sericite, bearing patchy coarse sulphides. Sulphidic veinlets also cross-cut silicified host rock in places. The best gold mineralization is broadly associated with areas of high sulphide concentration but is not readily identified from an association with any of the styles described above. In some cases, strong gold mineralization is present in massive sulphide lenses (but not invariably), in other cases within strong disseminated sulphide concentration (but not invariably), and in other cases within areas of veining as described above (but also not invariably).

Alteration associated with the mineralization consists of silicification and sericitization. Carbonate is also commonly abundant, though the proportions of primary versus secondary carbonate are uncertain. The distributions of silica and sericite are irregular and possibly host-rock controlled. Clasts are commonly silicified and matrix commonly sericitized in fragmental textured volcanics. In other cases, massive silicification replaces entire lenses of host rock.

Carbonate concentrations are broadly associated with concentrations of sulphide. There is a strong hint on some cross-sections that carbonate intervals are at similar stratigraphic positions to lenses of massive sulphide. Many concentrations of disseminated sulphide also have abundant carbonate in the matrix of the host rock. Carbonate and quartz gangue are typically present as a component of the massive sulphide lenses.

Less volumetricaly significant, but also present in scattered localities within mineralized and altered lower Tyndall Group, are fluorite and fuchsite.

Sulphides are not umformly distributed throughout the mineralized unit, but appear to be concentrated in zones which are stratigraphically controlled to some extent, though by no means ideally uniform or predictable. The zones of abundant sulphides shown on the cross-sections are a notional interpretation of how the sulphides are concentrated, but are not reliable in detail.

Mineralization and alteration are overprinted by deformation associated with the schistosity. While it is not possible to be absolutely certain that sulphides were not introduced early in this deformation phase, the simplest and most likely interpretation is that mineralization and alteration were formed prior to the Devonian schistosity. However, some local 'remobilization' is evident, and syntectonic quartz and carbonate veins are present though not abundant, and sulphides are a component of such veins which cross-cut concentrations of earlier sulphides. Minor syntectonic fluorite is also present in veins cross-cutting rocks with an earlier fluorite component.

A number of petrographic studies have been made of the mineralized and altered rocks. Many of the thin sections were re-examined briefly as part of this study. Overprinting deformation and metamorphism have obscured textures related to emplacement of the mineralization. The various parageneses and theories of origins suggested by these petrographic studies need to be viewed with caution, though a general pattern is indicated of replacive sulphides, sericite, and silica, and veining by quartz and carbonate with variable proportions of sulphides and sericite. Relict-colloform, nodular, and framboidal textures have been identified in some massive pyrite aggregates. Minor tetrahedrite - tennantite, bismuth - bismuthinite, native silver, and proustite - pyrargyrite have all been identified as minor phases, together with native gold.

5.2 Details of alteration and mineralization in the upper Tyndall Group.

The upper Tyndall Group is intensely altered in places, mostly silicified, but contains only minor amounts of sulphide mineralization. The silicification in this unit is often remarkably intense, replacing the original rock type by cherty silica, with progressive ghosting out of primary textures until only quartz phenocrysts survive from the original rock.

Some thin sections of rocks previously identified as silicified have proven to be of fine cherty masses of secondary albite. An unknown proportion of such albitisation is likely to be present in alteration nominally described as silicification.

The silicificatiom in the upper Tyndall Group extends outwards throughout the entire thickness of the unit in some drillholes, but is less extensively developed in others. A systematic pattern to this variable development is suspected: silicification is interpreted to be concentrated in a nodal zone where it extends the full width of the unit. Above and below this nodal zone, the outer boundary of the silicification tails back to near the contact between the lower and upper Tyndall Group. An illustration of this geometry is shown in Figure 2. This nodal zone of silicification in the upper Tyndall Group appears to plunge south, and is present near the surface at the northern end of the prospect.

Most of the discussion above about alteration and mineralization in the upper and lower Tyndall Group refers to the sequence nearest the fault which has been systematically drilled. The repeated sequence farther east is only poorly known. However, at least some similar alteration and mineralization is present in this repeated sequence, although possibly weaker.

5.3 Details of alteration and mineralization in other units.

No examples of altered or mineralized Newton Creek Sandstone Member have so far been intersected in drilling, but some transitional facies rocks in the upper Tyndall Group (Jukes Breccia and hematitic-hued grey-green slate) are certainly silicified.

Quartz porphyry at the northeast end of the prospect has been strongly sericite altered and weakly silicified in part of the intersection in HP6 (section 64550N).

The hanging wall sequence is affected by chlorite-carbonate-sericite alteration. This alteration is not feldspar destructive in contrast to the much stronger alteration in the footwall. However, minor examples of silicification can be found in the hanging wall, and the locally developed mylonitic schistosity could reflect the presence of a zone of intense sericitic alteration. Most of the alteration in the hanging wall is likely to have formed during Devonian regional metamorphism. The hanging wall adjacent to the mineralization is also likely to have moved during and after the Devonian schistosity-producing deformation, and so by corollary, after the mineralization was emplaced in the footwall sequence.

The fault zone (as defined in the previous section on structure) contains brecciated, altered, and mineralized rocks, particularly on the side adjacent to the footwall. This zone appears to have truncated the mineralized sequence. No late phases of mineralization and alteration concentrated in the fault zone are evident, with the exception of fuchsite which is particularly strongly developed there. The presence of mafic-ultramatic rocks along strike on the northwest splay of the Henty Fault suggest a likely source of Cr for the fuchsite, perhaps from similar bodies at depth.

While these relationships should logically be important in constraining possible genetic models for the mineralization, most are unfortunately associated with a degree of ambiguity.

5.4 Similarities to Mt Lyell mineralization

Mineralization at the Henty prospect is remarkably similar to that at Mt Lyell. The Great Lyell Fault and Henty Fault were probably active at a similar time in the Cambrian, and are associated with similar subsidiary structures. In both cases there is a spatial association of mineralization with these faults. At Mt Lyell at least, there is firm evidence for hydrothermal activity after the faulting, localized along it.

The general appearance of the mineralization is similar to that at Mt Lyell. For example the general association of disseminated sulphides and lesser massive sulphide lenses irregularly concentrated in zones sub-parallel to stratigraphy can be seen at West Lyell. Competent siliceous boudins can be seen in the costean at the Henty prospect, reminiscent of the 'silica-heads' in the Crown 3 open-cut, though much smaller. The mix of base-metals is similar to that in the Tasman Crown workings at Comstock. At both the Henty prospect and Mt Lyell, the textural relationships of alteration and mineralization to the schistosity are identical. The alteration assemblages are also the same.

Particularly striking is the similarity between the barren siliceous alteration in the upper Tyndall Group at the Henty prospect and silicification in the Comstock chert. At Comstock, some of the mineralization and alteration could be within the same interval of Tyndall Group as that at the Henty prospect, perhaps an explanation for the great similarities between the two.

Silicification in the Comstock chert (and by implication in the stratigraphic hanging wall at the Henty prospect) must surely have the same significance as the silicification in the North Lyell chert which extends across the Great Lyell Fault into the younger Owen Conglomerate. At least part of the mineralization and alteration at the Henty prospect should be fault-related, according to this logic.

The geology of the Henty prospect also has implications for Comstock, and a review of the Comstock geology may prove rewarding in this context. For example, projections of the carbonate-bearing stratigraphy in the Tyndall group into the altered zone may be of interest. The silicification could also have a similar stratabound plunge rather than a vertical geometry.

5.5 Possible Genetic models

There seem to be three main possibilities for the genesis of mineralization at the Henty prospect.

The first possibility is that the mineralization is entirely unrelated to the Henty Fault. Much of the mineralization is probably replacive rather than truly syngenetic, but such problems have never concerned proponents of the V.M.S. model for Mt Lyell. Some similarities exist between the Henty prospect and the deposits at Que River, Hellyer, and Rosebery. For example, carbonate alteration and/or primary carbonates are recorded at the stratigraphic level of mineralization at Rosebery. Framboidal and colloform textures have been identified in the massive sulphide lenses at the Henty prospect, which closely resemble syngenetic sulphidic horizons. Hanging wall alteration of silica, albite, and fuchsite is recorded at Hellyer. No simple system of base metal zoning is apparent at the Henty prospect, however.

The second possibility is that mineralization is partly unrelated to the Henty Fault (e.g. an early phase of sulphide mineralization) and partly related (e.g. by an overprinting phase, perhaps gold bearing, perhaps responsible for the silicification in the upper Tyndall Group). This model is essentially the same as that suggested for mineralization at Mt Lyell (Arnold, 1985).

The third possibility is that the mineralization is entirely fault-related, with no syngenetic or nearly-syngenetic precursor. The stratigraphic control of mineralization could be the result of preferential replacement of host rock, for example of carbonate-bearing epiclastics and limestone.

None of these possibilities can be rigorously excluded at this stage. From an exploration point of view, multiple working hypotheses should be kept in mind. Faults like the Great Lyell Fault and Henty Fault are an obvious focus of interest, as are stratigraphic equivalents of the host rock sequence at the Henty prospect.

Of the three possibilities, I favour the second (two-stage) model as most likely and the third (entirely fault-related) model as the next most likely.

5.6 Implications for reserve estimations and grade control

More geological detail is required than is presently available in computerized form, particularly in terms of stratigraphy, alteration, and mineralization. Some suggestions for a logging format are appended.

There is a strong likelihood that stratigraphy will be the main control for correlation between mineralized intersections and projection of grade. Subsidiary orientations may be parallel to the southward plunge of the node of silicification in the stratigraphic hanging wall, and perhaps at a different scale, parallel to the extension direction associated with the schistosity.

Reasonably systematic distributions seem to be present in terms of sulphide concentrations, base metal assays, and even gold grades at low levels. However gold grades at the levels required for underground mining are visually unpredictable and possibly quite erratic. While a reasonable proportion of the drill holes have encouraging gold intersections, there is, at present, doubt about continuity of these intersections. Some geostatistics, even at this preliminary stage, may provide insight into this important question.

6. REFERENCES

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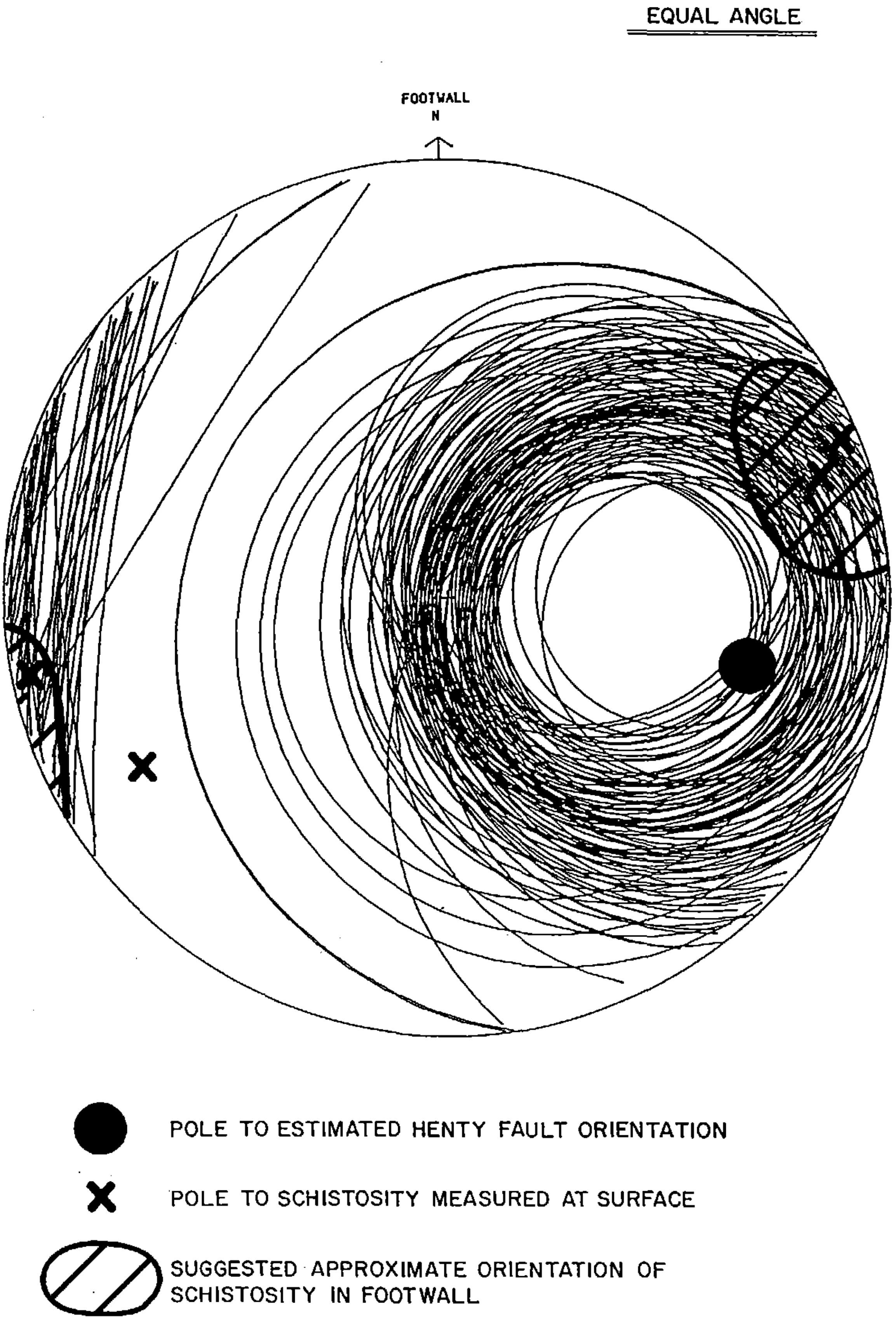


FIGURE 4. CLUSTERED PLOTS OF POSSIBLE ORIENTATIONS OF POLES TO SCHISTOSITY MEASURED FROM DRILL CORE INTERSECTIONS OF THE FOOTWALL SEQUENCES

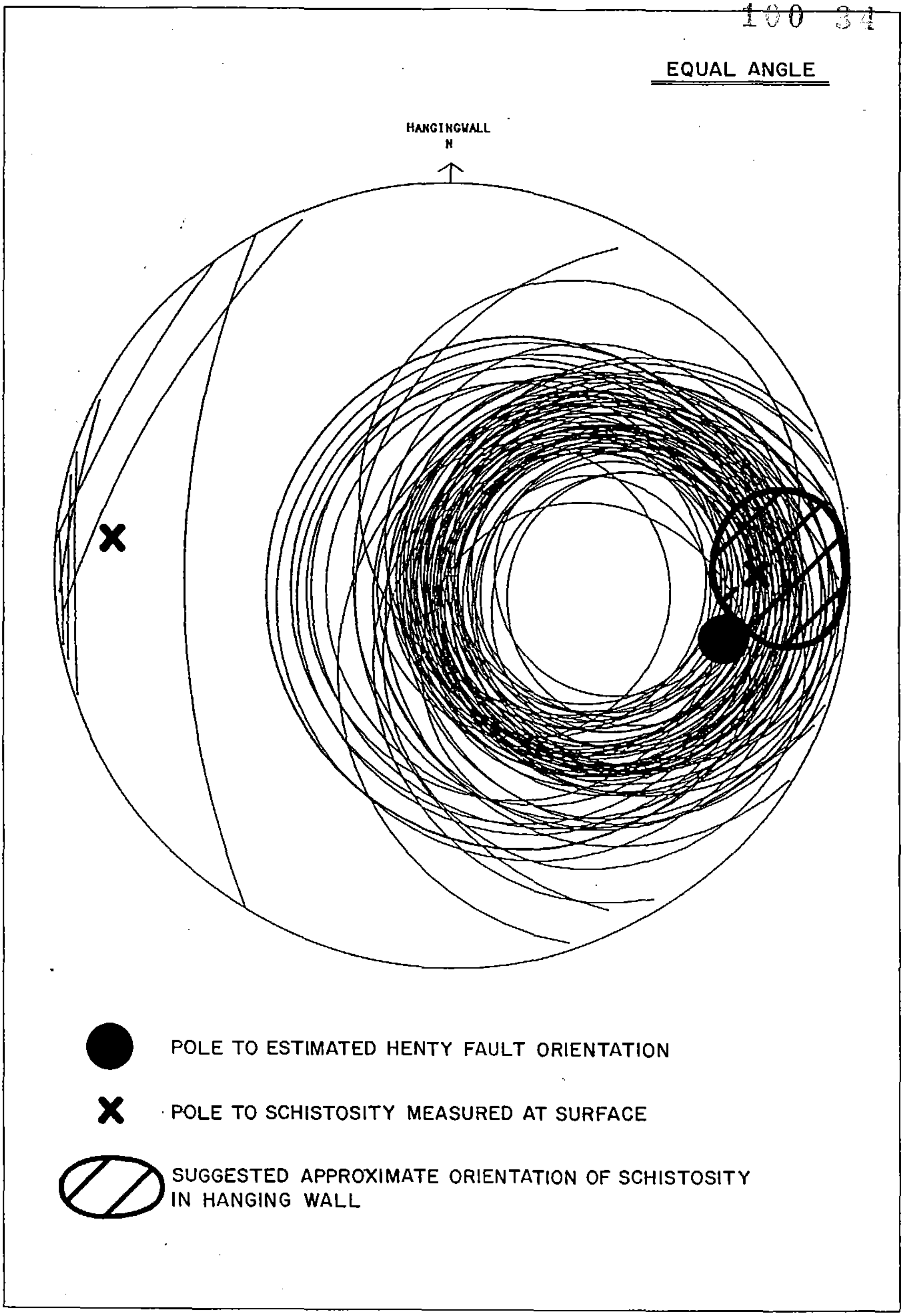


FIGURE 5. CLUSTERED PLOTS OF POSSIBLE ORIENTATIONS OF POLES TO SCHISTOSITY MEASURED FROM DRILL CORE INTERSECTIONS OF THE HANGING WALL SEQUENCE

ROCK UNIT:
LOCATION: HENTY PROSPECT, TASMANIA
DATE:

MEASURED BY:
EQUAL AREA ☑
EQUAL ANGLE ☐

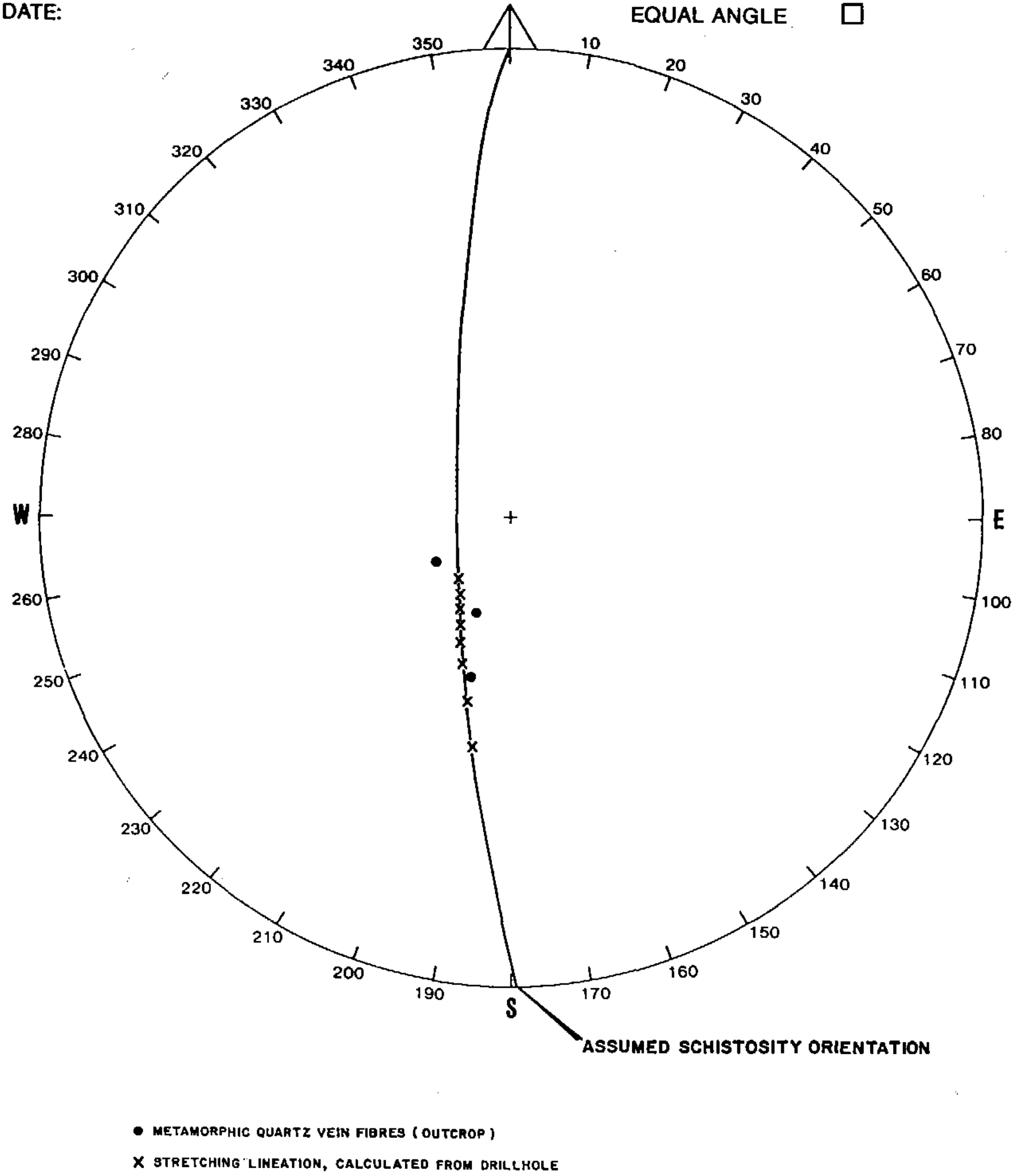


FIGURE 6. DATA INDICATING EXTENSION DIRECTION IN SCHISTOSITY-RELATED DEFORMATION

STRUCTURAL INFORMATION			ALTERATION AND MINERALIZATION ASSEMBLAGES
MASSIVE TO WEAKLY SCHISTOSE			REGIONAL CHLORITE-SERICITE-CARBONATE ALTERATION. FELDSPARS NORMALLY STABLE. TRACE PYRITE MAY BE PRESENT
STRONGLY SCHISTOSE	— —	R	FELDSPAR DESTRUCTIVE SERICITE ALTERATION
INTENSELY SCHISTOSE, MYLONITIC	~ ~	S	SILICIFICATION
BRECCIA	△ △	P	PYRITE ± CHALCOPYRITE ± GALENA ± SPHALERITE
		C	EARLY CARBONATE VEINING
		C'	SYNTECTONIC CARBONATE VEINING
		Q	EARLY QUARTZ VEINING
		Q'	SYNTECTONIC QUARTZ VEINING

ALTERATION AND MINERALIZATION

⊘	INTENSE SILICIFICATION IN UPPER TYNDALL GROUP, INTENSE SILICIFICATION AND/OR SERICITIZATION IN LOWER TYNDALL GROUP
▓	ABUNDANT PYRITE (± Cu, Pb, Zn SULPHIDES), DISSEMINATED ± MASSIVE
⋰	WEAK DISSEMINATED PYRITE (± Cu, Pb, Zn SULPHIDES)
F ━	FAULT
⁓	GEOLOGICAL CONTACT
ʃ ʃ ʃ	MYLONITE ZONE
△ △ △	BRECCIA

ROCK TYPES

HW	HANGING WALL SEQUENCE. PINK FELSIC VOLCANICS, SPARSELY TO NON-QUARTZ-PHYRIC, AND MAFIC DYKES
F	FAULT ROCKS. BRECCIA, MYLONITE AND COHERENT BLOCKS OF HANGING WALL SEQUENCE, FOOTWALL SEQUENCE, AND EXOTIC BLACK SLATE
LT	LOWER TYNDALL GROUP. QUARTZ-PHYRIC AND NON-QUARTZ-PHYRIC FELSIC PYROCLASTICS AND EPICLASTICS
e	PEBBLY EPICLASTIC TEXTURES PRESENT
lst	SIGNIFICANT CARBONATE PRESENT, POSSIBLY PRIMARY
l	FINE-GRAINED FELDSPAR-PHYRIC ? LAVA
UT	UPPER TYNDALL GROUP. DOMINATED BY EPICLASTICS WITH A COARSELY AND ABUNDANTLY QUARTZ-PHYRIC COMPONENT
c	COARSE FRAGMENTAL TO PEBBLY TEXTURES PRESENT
m	MEDIUM-GRAINED (SANDY) EPICLASTIC
f	FINE-GRAINED (SILTY) EPICLASTIC
vf	VERY FINE-GRAINED, SLATE OR ASHSTONE
NC	NEWTON CREEK SANDSTONE MEMBER OF THE OWEN CONGLOMERATE. COARSE SILICICLASTIC CONGLOMERATE, SANDSTONE, AND INTERBEDDED BLACK TO GREEN GREY, SOMEWHAT HEMATITIC SLATE
QP	QUARTZ PORPHYRY, POSSIBLY INTRUSIVE. CRACKLE BRECCIA TEXTURES OFTEN PRESENT

ROCK TYPES

☰	HANGING WALL SEQUENCE
△ △ △	FAULT ROCKS
LT	LOWER TYNDALL GROUP
▧	UPPER TYNDALL GROUP
- - -	NEWTON CREEK SANDSTONE MEMBER OF THE OWEN CONGLOMERATE
∧ ∧ ∧	QUARTZ PORPHYRY

FIGURE 7. LEGEND FOR CROSS-SECTIONS

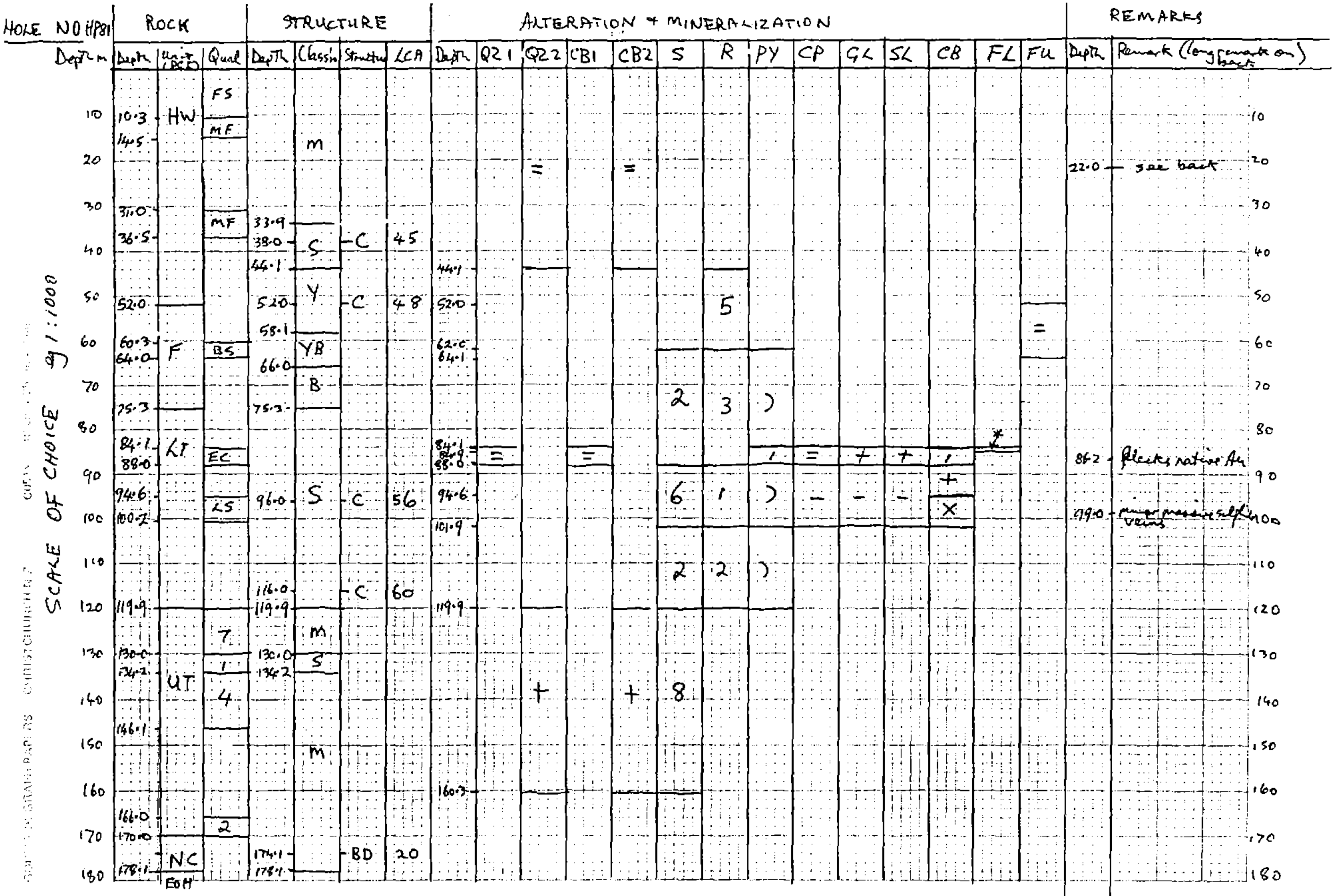
Appendix

Logging Format suggestions

Now that the Henty project is in an advanced stage, there would be advantages in using a graphic log system from which the data could be readily transferred to Geolog. An imaginary drill hole has been logged in the suggested format, and the same data shown on Geoforms ready for entry to the computer. Many variations and additions are possible. Transfer from the graphic log could be done by a technician after limited instruction.

HOLE NO HP81

SCALE OF CHOICE eg 1:1000



22.0 — see back

86.2 — flecks native Au

99.0 — minor massive sulf veins

GRAPHIC LOG DESIGNED FOR CONVERTIBILITY TO GEOLOG

Notes

Rock	Unit	symbols as on cross-sections	
	Qual	FS	felsic
		MF	mafic
		BS	black slate
		EC	epiclastic
		LS	limey
		nos	S-scale on geoform

Structure Class'n	M	massive
	S	schistose
	Y	mylonitic
	B	brecciated

(can combine B with either M, S, or Y)

Structure (measured)	C	cleavage
	BD	bedding

Alteration and Mineralization

Headings	QZ1	early quartz vein
	QZ2	syntectonic quartz vein
	CB1	early carbonate vein
	CB2	syntectonic carbonate vein
	S	silicification
	R	sericitization
	PY	pyrite
	CP	chalcopyrite
	GL	galena
	SL	sphalerite
	CB	disseminated carbonate
	FL	fluorite
	FU	fuchsite

Gradings of alt'n + min'n — G-scale on geoform

L M N O P Q
6 7 8

✓39-42 S-SCALE
B up to .008, C up to .016 → 1
D up to .03, E up to .06 → 2
F up to .12, G up to .25 → 3
R up to .5 m, S up to 1 m → 9
T up to 2 m, U up to 4 m → X
V up to 8 m
W grt than 8 m

T-SCALE ✓& L 48
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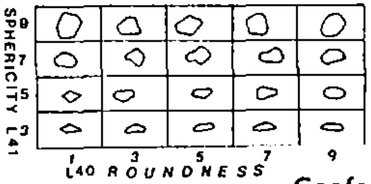
3 7 up to 5 m
8 up to 20 m
9 grt than 20 m
4 5 up to .5 m



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Geolog System

Geoform

S = Alpha S 0 = Zero 1 = One 2 = Two 7 = Seven Ø = Alpha O I or i = Alpha I Z = Alpha Z

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I	P R J							

Identity Data · Survey Data · Upper Tier Geodata · Lower Tier Geodata · Graphic

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/	0000	4410			D			=	=	
/	4410	5200			D					5
R	2200	2201	REMARK FROM BACK PAGE OF GRAPHIC LOG							
/	5200	7530	F		P					
/	6030	6400	BS		R					
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/	5810	6600		YB	D					

✓39-42 GRAIN SIZE & CHARACTERISTICS

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1	FINE SILT	C	[illegible]
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2	COARSE SILT	E	[illegible]
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3	FINE SAND	G	[illegible]
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4	COARSE SAND	I	[illegible]
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5	GRANULE	K	[illegible]
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7	LARGE PEBBLE	O	[illegible]
8	SMALL COBBLE	P	[illegible]
8	LARGE COBBLE	Q	[illegible]
9	SMALL BOULDER	R	[illegible]
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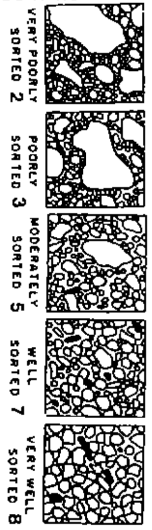

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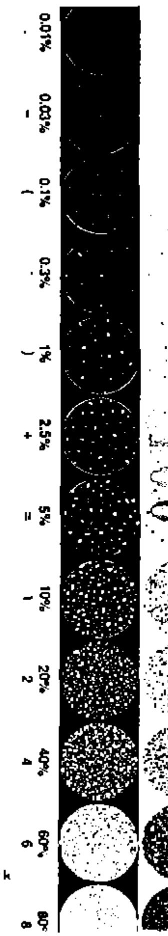

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C Closed; framework supported

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4 5 S - SCALE C up to .016 E up to .06 G up to .25 S up to 1 m U up to 4 m W grt than 8 m
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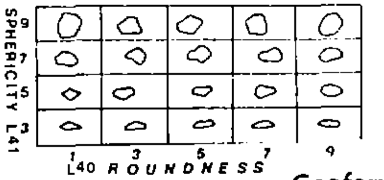
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International Geosystems Corporation **Geolog System** **Geoform**

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R	9900	9901	MINOR MASSIVE SULPHIDE VEINS														

/ 39·42 GRAIN SIZE & CHARACTERISTICS

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	FINE SILT	C
2	MEDIUM SILT	D
	COARSE SILT	E
3	V.FINE SAND	F
	FINE SAND	G
4	MEDIUM SAND	H
	COARSE SAND	I
5	GRIT	J
	GRANULE	K
6	V.SMALL PEBBLE	L
	SMALL PEBBLE	M
7	MEDIUM PEBBLE	N
	LARGE PEBBLE	O
8	SMALL COBBLE	P
	LARGE COBBLE	Q
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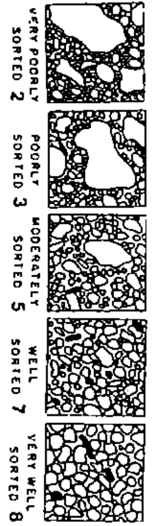

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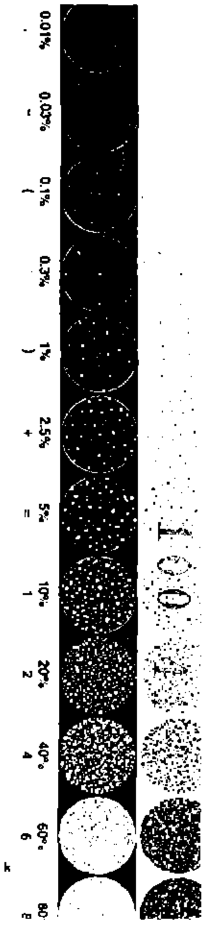

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6 — 7 — B

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C up to .016 E up to .06 G up to .25 S up to 1 m U up to 4 m W grt than 8 m

2 — 3 — 4 — 5

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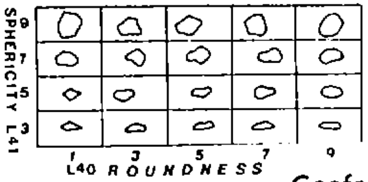

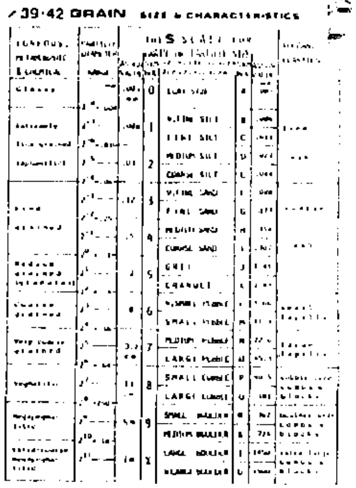

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Geoform

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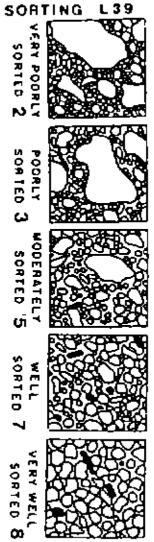

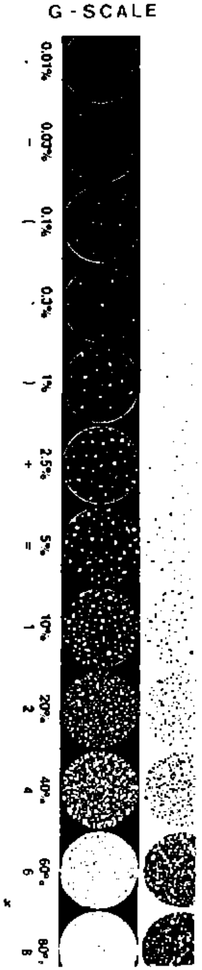

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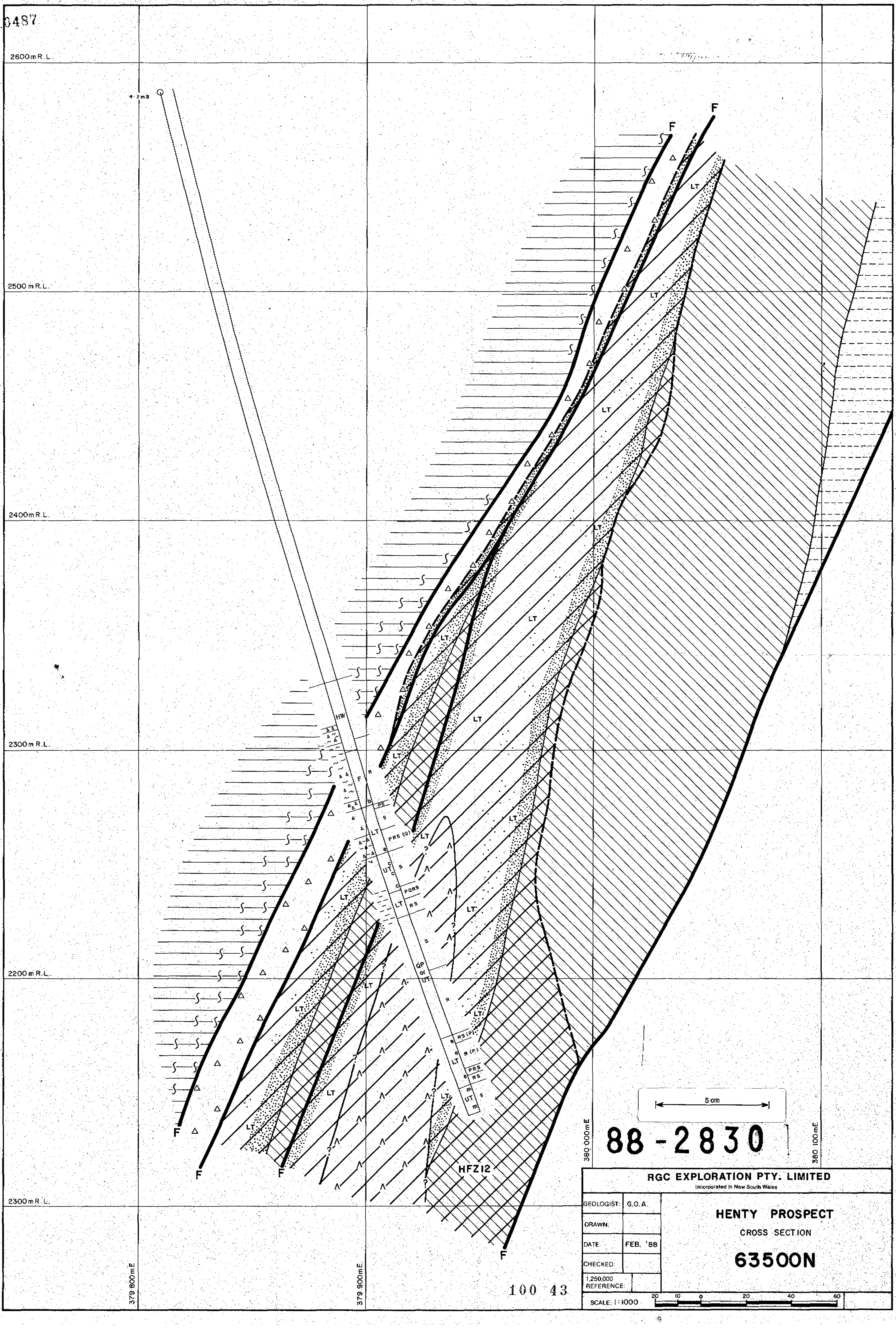

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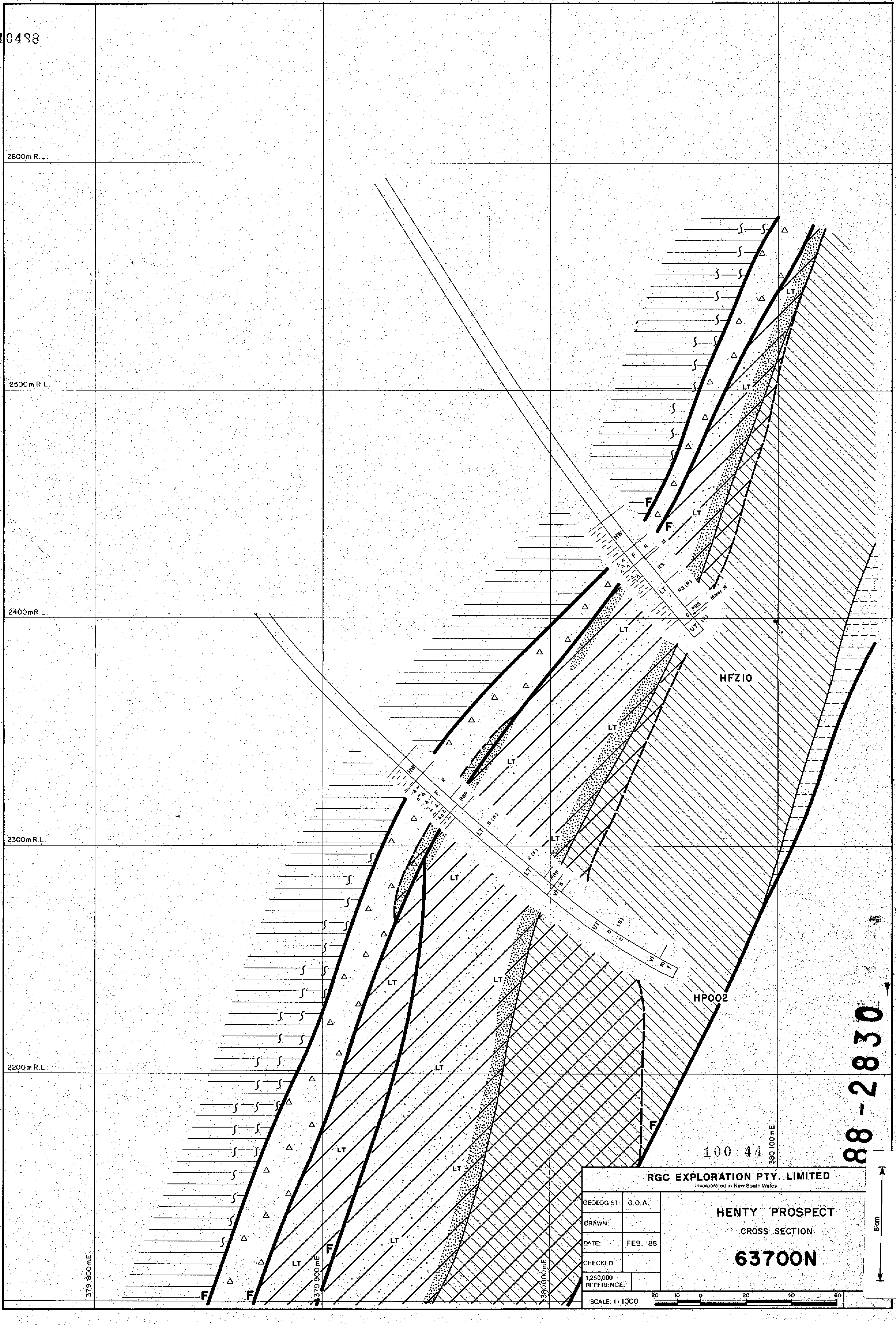

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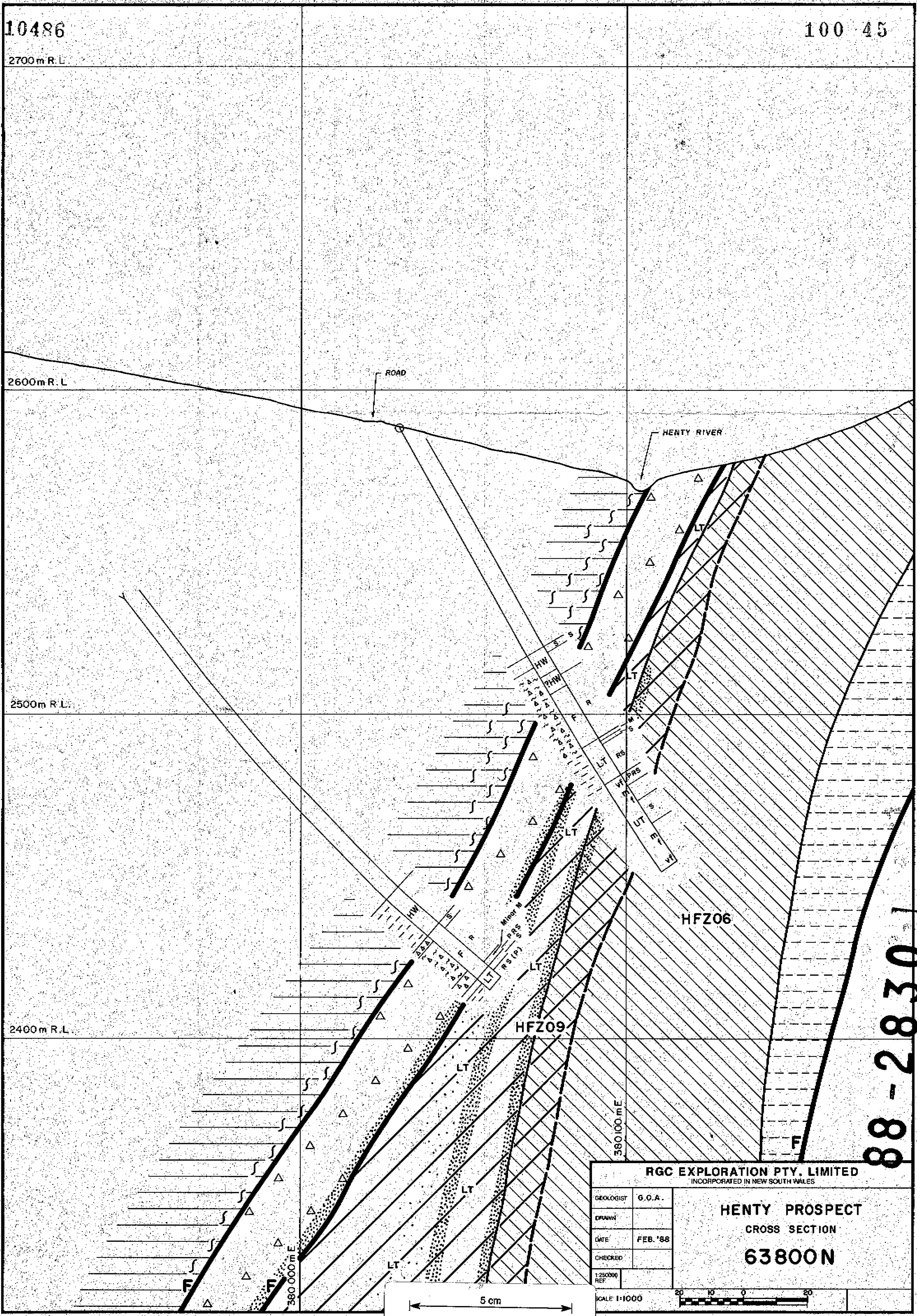

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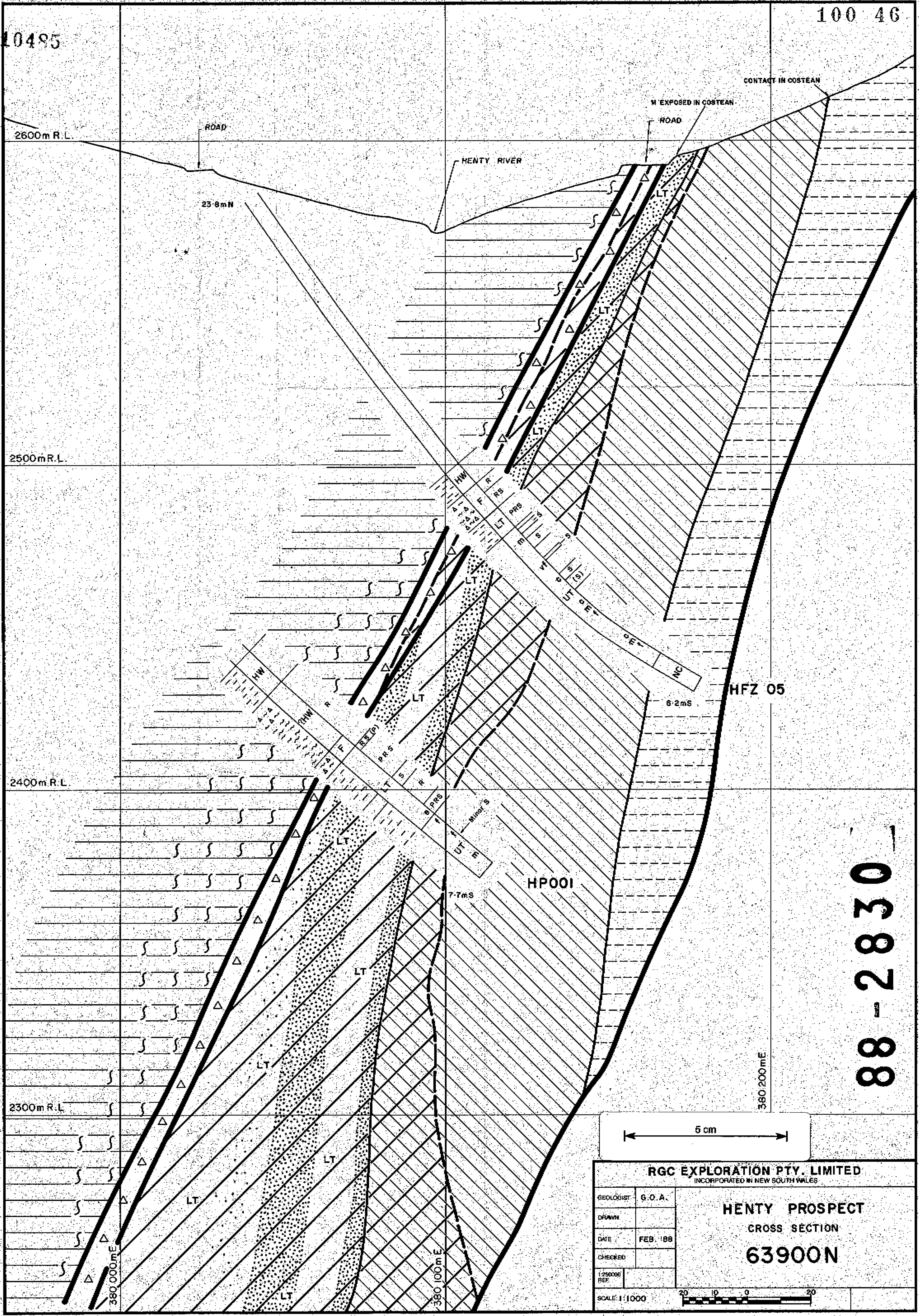

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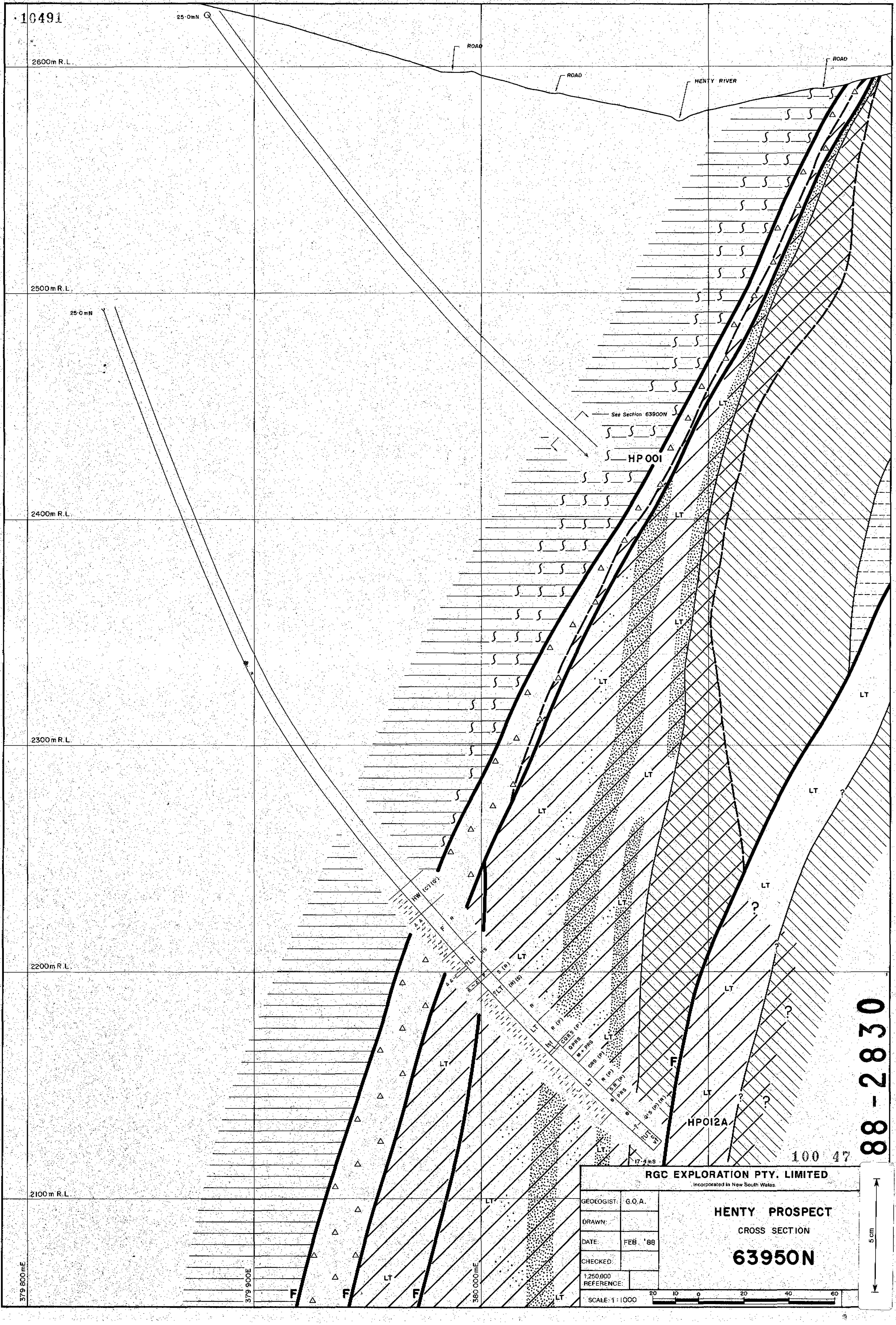

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RGC EXPLORATION PTY. LIMITED
Incorporated in New South Wales

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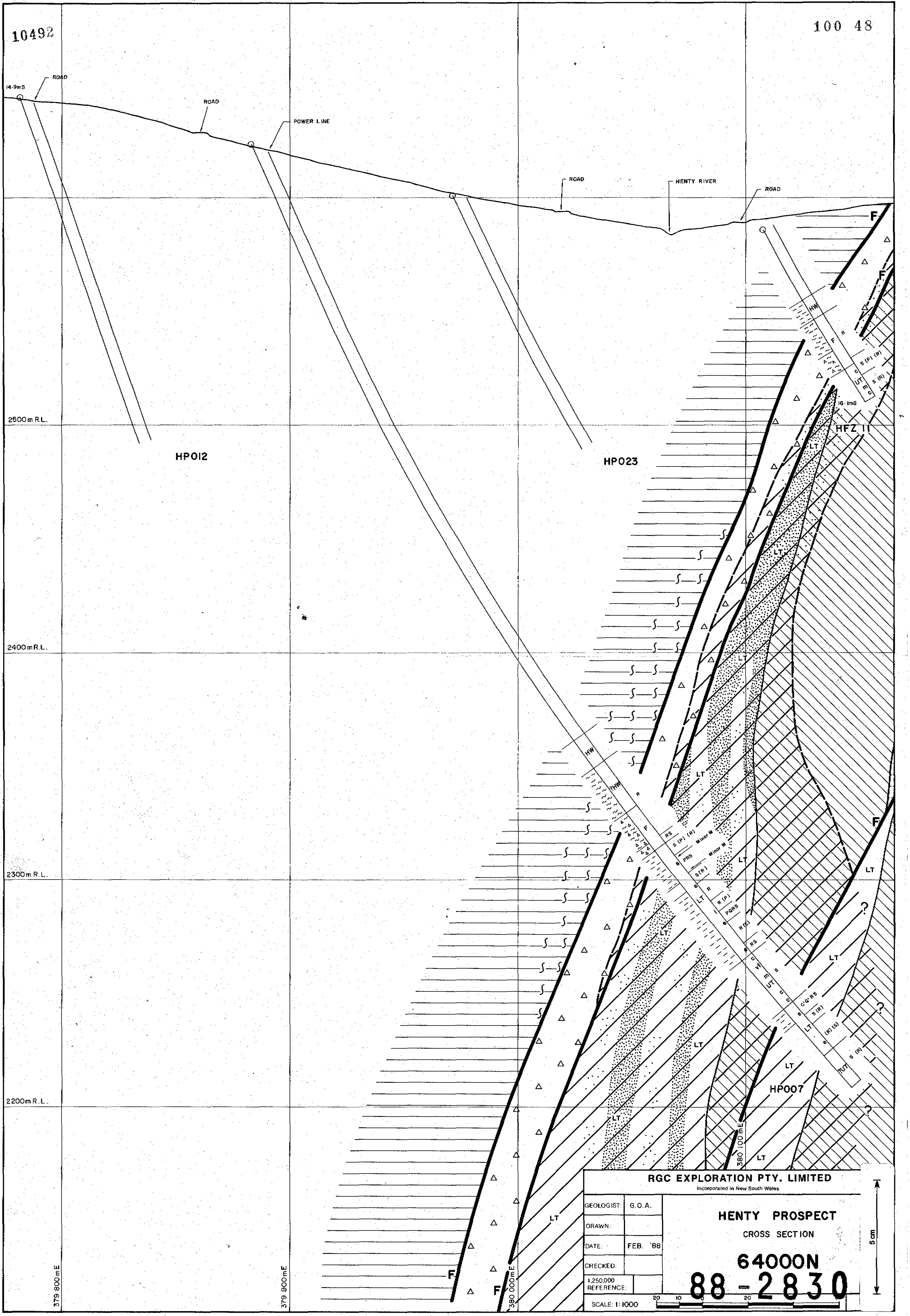
63950N

SCALE: 1 : 1000

20 10 0 20 40 60

5 cm



RGC EXPLORATION PTY. LIMITED
Incorporated in New South Wales

GEOLOGIST:	G.O.A.
DRAWN:	
DATE:	FEB. '88
CHECKED:	
1,250,000 REFERENCE:	

SCALE: 1:1000

20 10 0 20

HENTY PROSPECT
CROSS SECTION

64000N

88 - 2830

5 cm

10490

100 49

RGC EXPLORATION PTY. LIMITED
INCORPORATED IN NEW SOUTH WALES

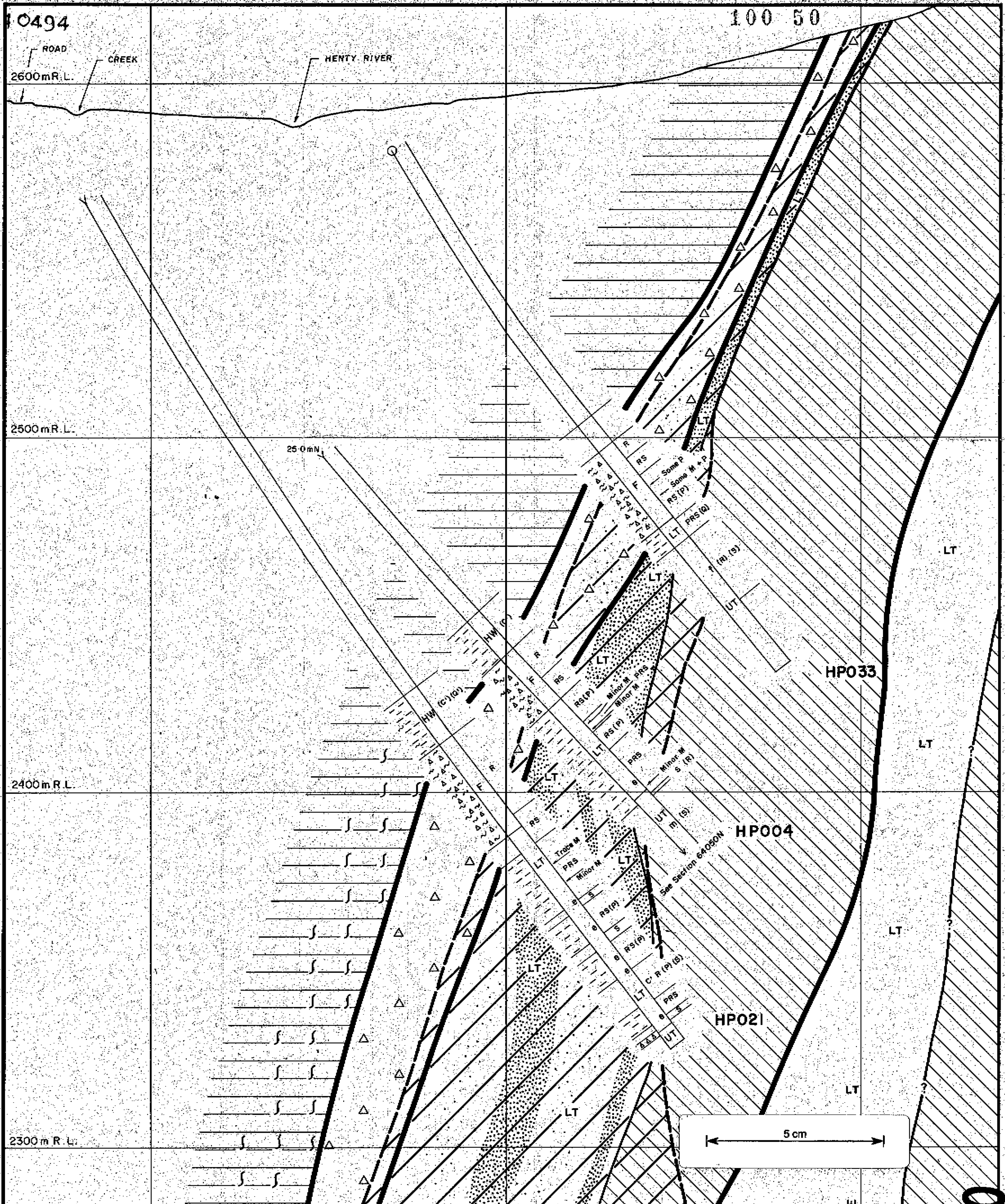
GEOLOGIST G.O.A.
DRAWN
DATE FEB. '88
CHECKED
1:250000 REF
SCALE 1:1000

HENTY PROSPECT
CROSS SECTION
64050N

88-2830

10494

100 50



RGC EXPLORATION PTY. LIMITED
INCORPORATED IN NEW SOUTH WALES

GEOLOGIST	G.O.A.
DRAWN	
DATE	FEB. '88
CHECKED	
1:250000 REF	
SCALE 1:1000	

HENTY PROSPECT
CROSS SECTION
64100N

20 10 0 20

88-2830

10489

88-2830

RGC EXPLORATION PTY. LIMITED

GEOLOGIST	G.O.A.
DRAWN	
DATE	FEB. '88
CHECKED	
1:250000 REF.	

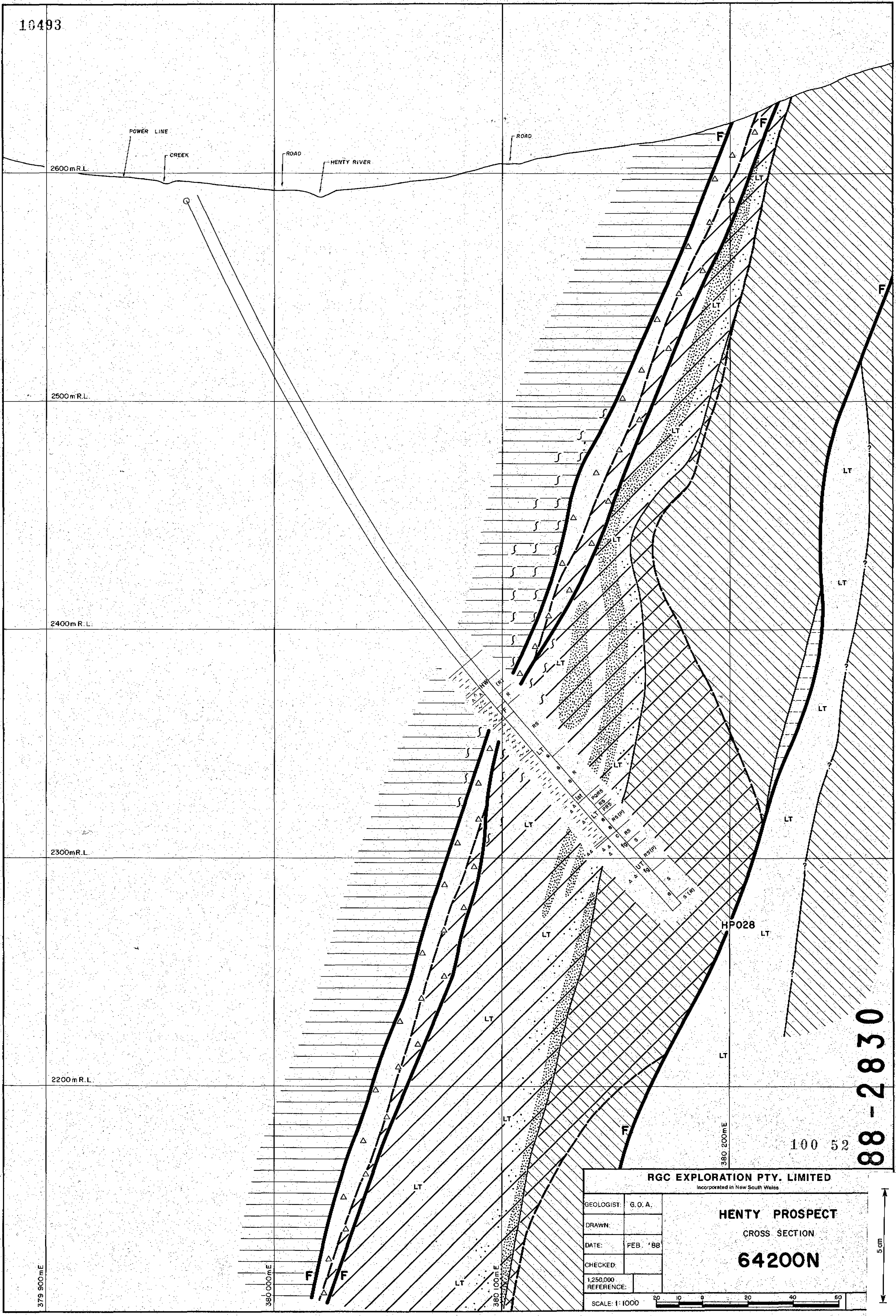
HENTY PROSPECT

CROSS SECTION

64150N

SCALE: 1:1000

10493



88-2830

100 52

RGC EXPLORATION PTY. LIMITED
Incorporated in New South Wales

GEOLOGIST:	G.O.A.
DRAWN:	
DATE:	FEB. '88
CHECKED:	
1,250,000 REFERENCE:	

HENTY PROSPECT

CROSS SECTION

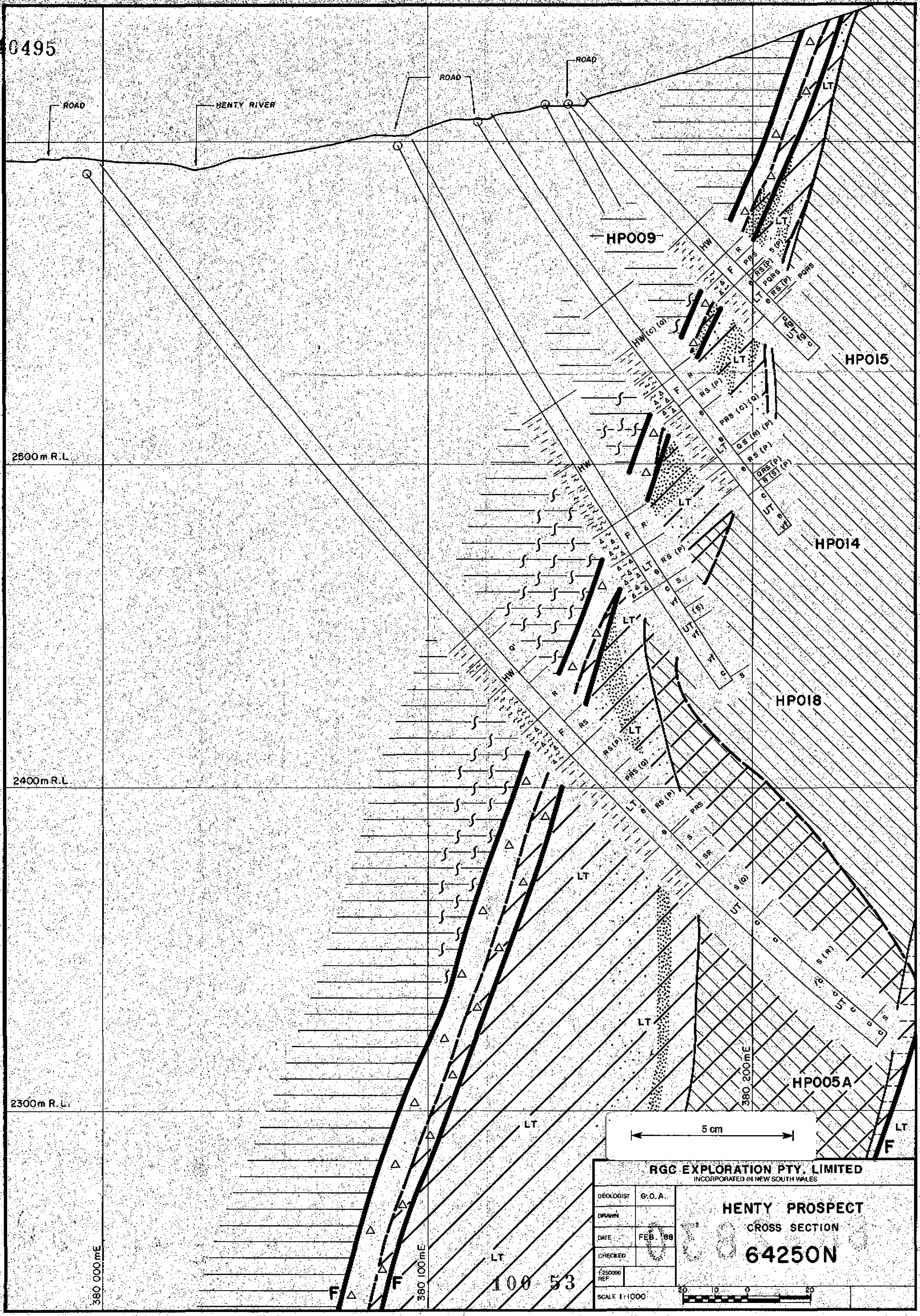
64200N

SCALE: 1:1000

20 10 0 20 40 60

5 cm

10495



RGC EXPLORATION PTY. LIMITED
INCORPORATED IN NEW SOUTH WALES

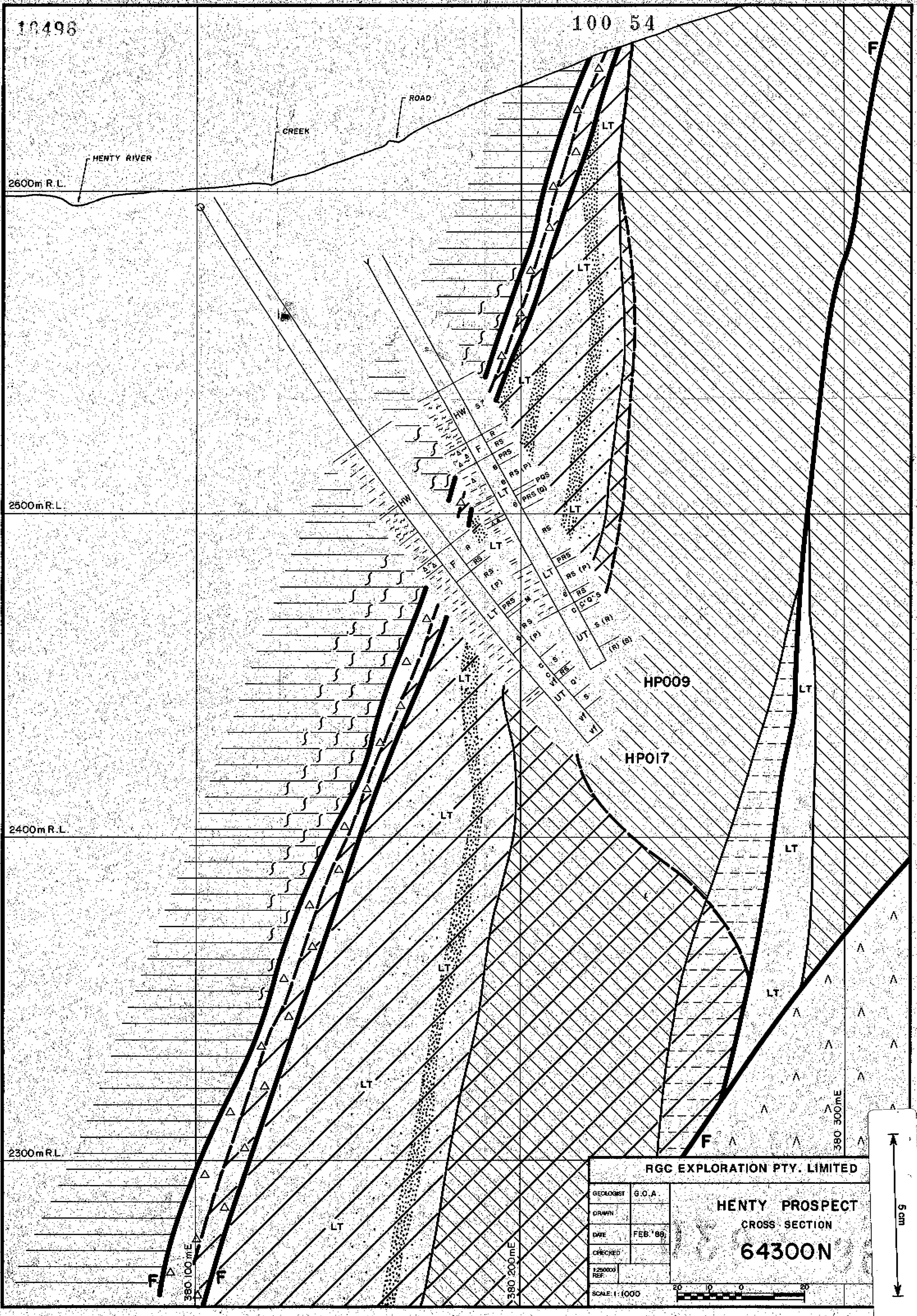
GEOLOGIST	G.O.A.
DRAWN	
DATE	FEB. '88
CHECKED	
1:250000 REF	

HENTY PROSPECT
CROSS SECTION
64250N

SCALE 1:1000 20 10 0 20

100 53

10496



RGC EXPLORATION PTY. LIMITED

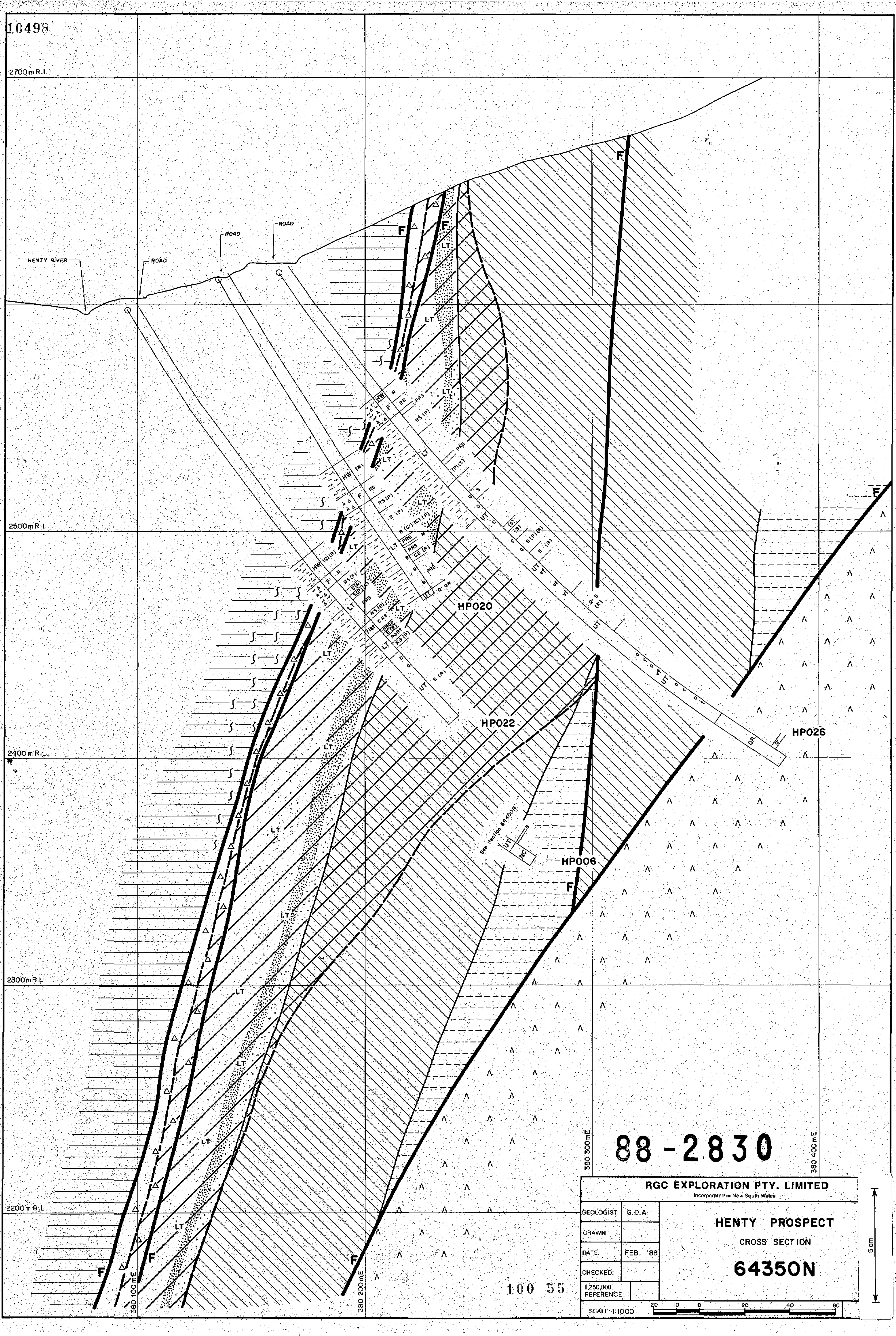
GEOLOGIST	G.O.A.
DRAWN	
DATE	FEB. '89
CHECKED	
1:250000 REF.	

HENTY PROSPECT
CROSS SECTION
64300N

SCALE: 1:1000

20 10 0 20

10498



88-2830

RGC EXPLORATION PTY. LIMITED
Incorporated in New South Wales

GEOLOGIST:	G.O.A.
DRAWN:	
DATE:	FEB. '88
CHECKED:	
1,250,000 REFERENCE:	

HENTY PROSPECT

CROSS SECTION

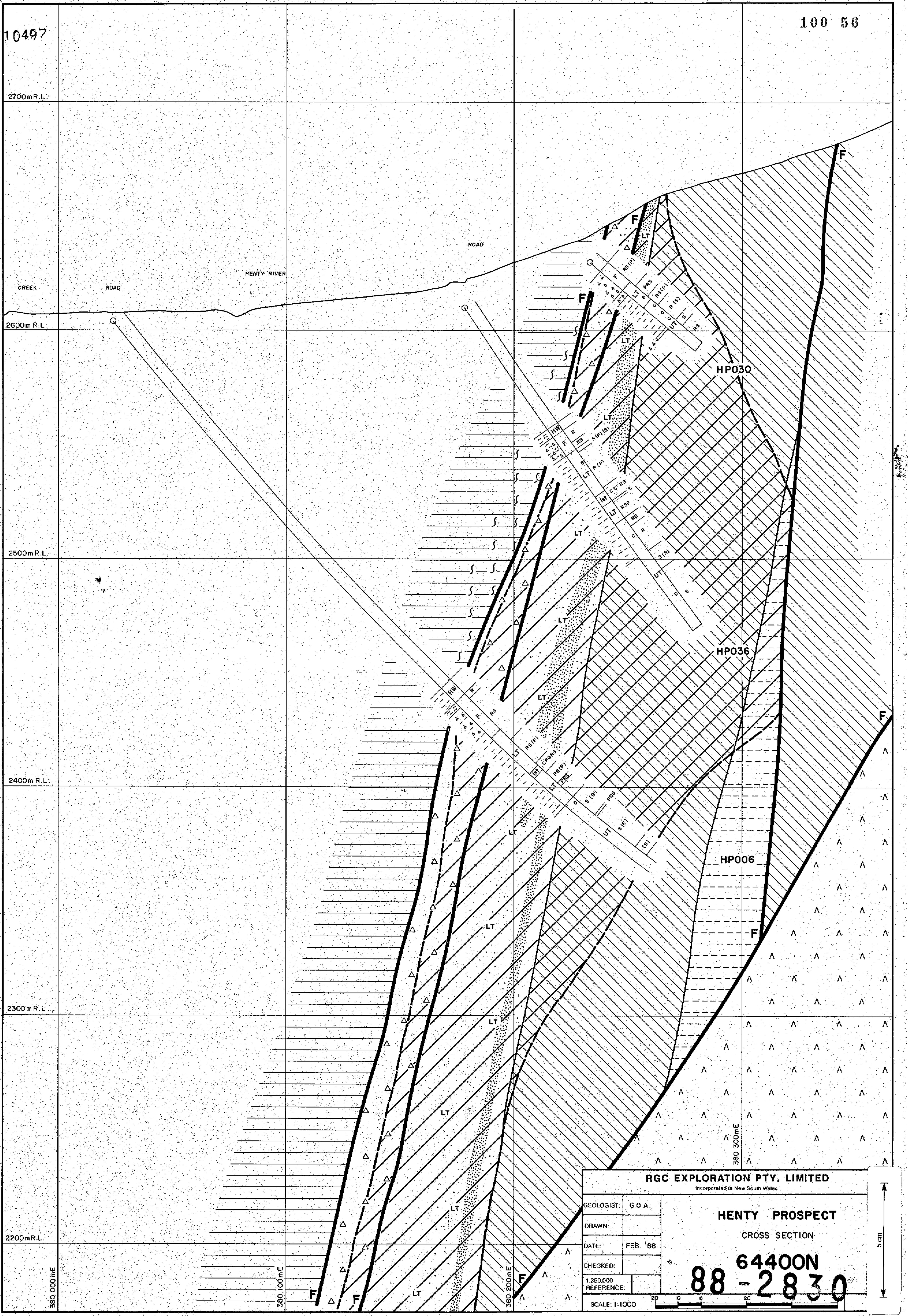
6435ON

SCALE: 1:1000 20 10 0 20 40 60

100 55

10497

100 56



RGC EXPLORATION PTY. LIMITED
Incorporated in New South Wales

GEOLOGIST:	G.O.A.
DRAWN:	
DATE:	FEB. '88
CHECKED:	
1:250,000 REFERENCE:	

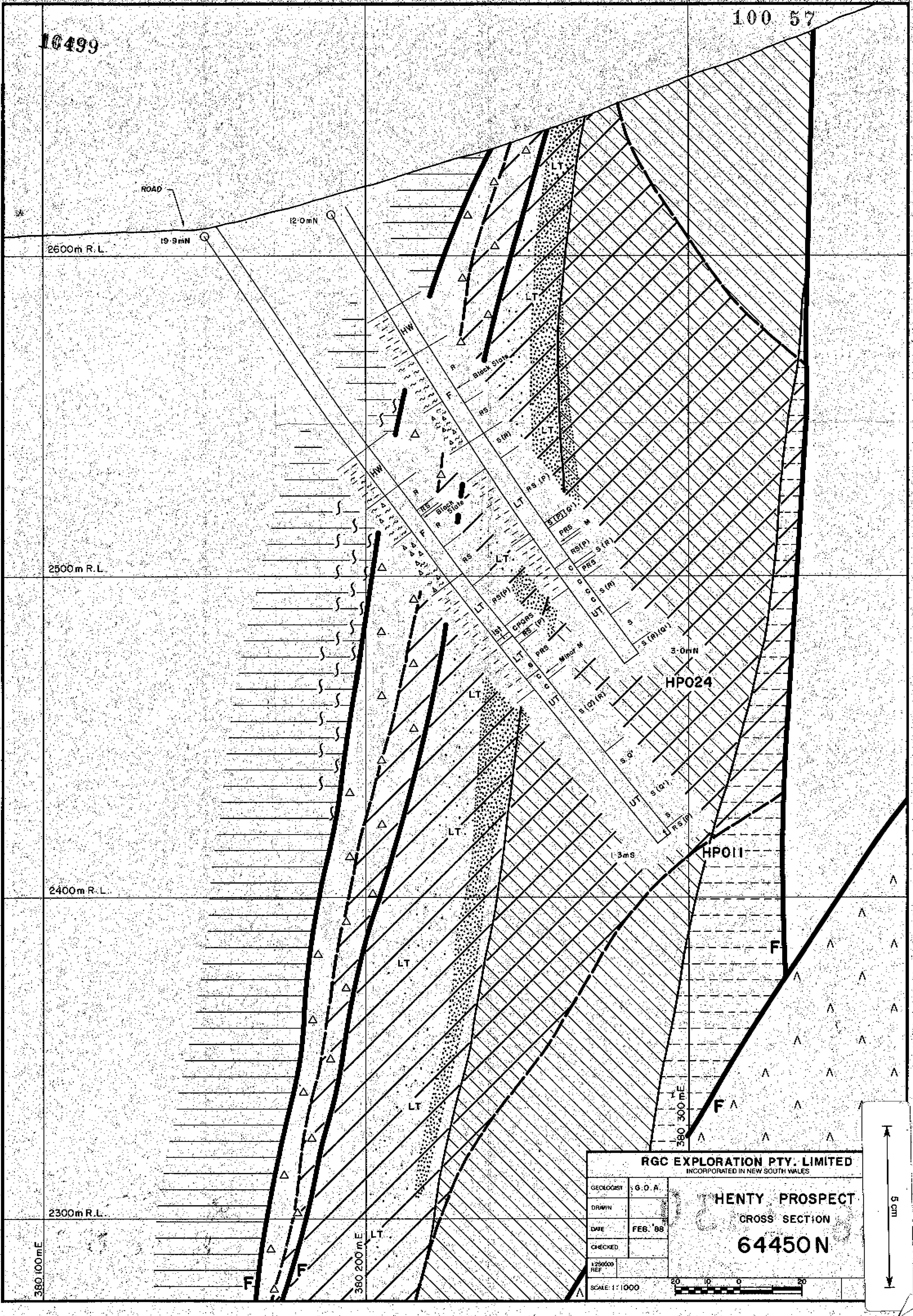
HENTY PROSPECT
CROSS SECTION
64400N

88-2830

SCALE: 1:1000

10499

100 57

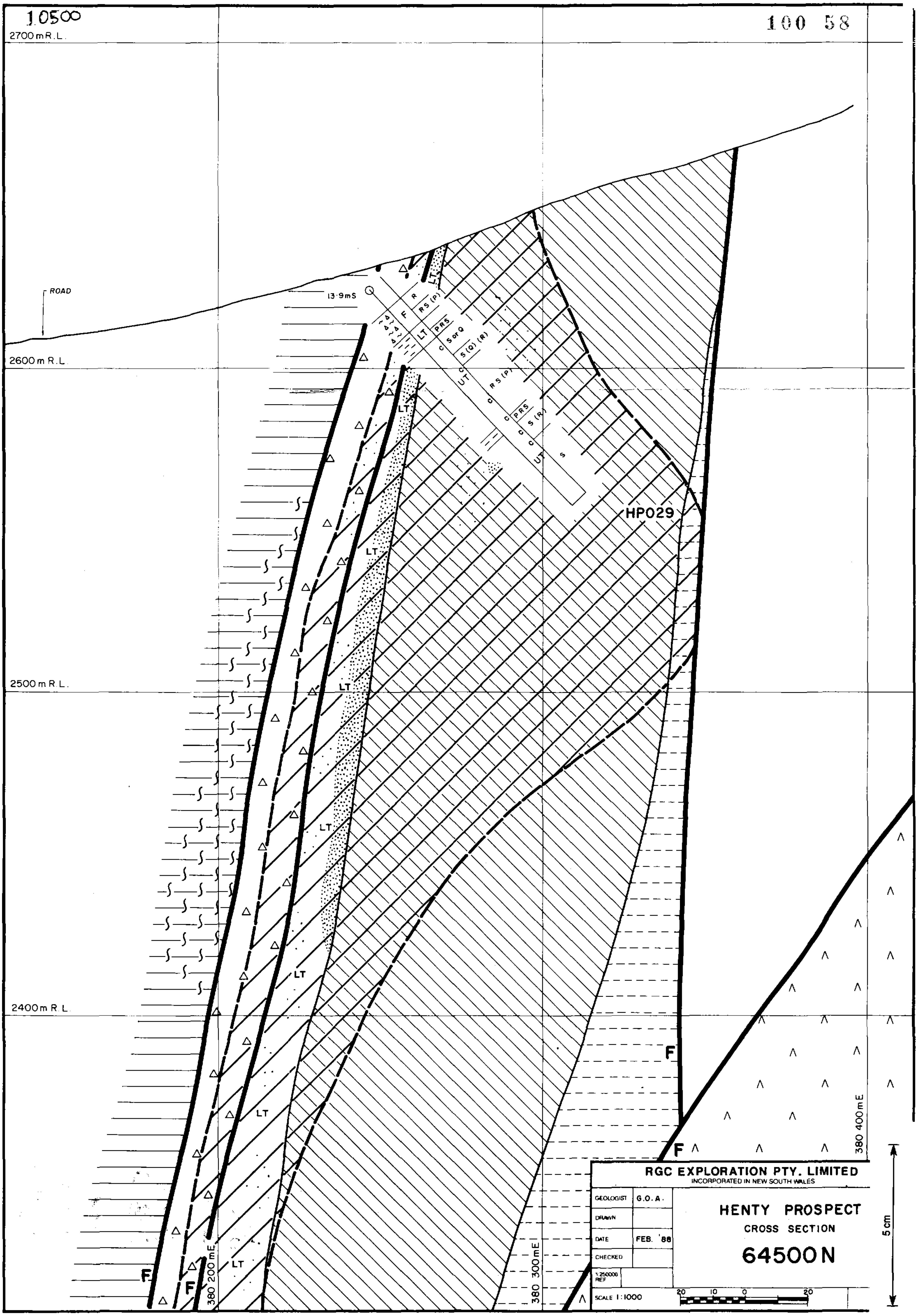


RGC EXPLORATION PTY. LIMITED
INCORPORATED IN NEW SOUTH WALES

GEOLOGIST	G.O.A.
DRAWN	
DATE	FEB. '88
CHECKED	
1:250000 REF	
SCALE 1:1000	

HENTY PROSPECT
CROSS SECTION
64450N

10500



RGC EXPLORATION PTY. LIMITED

INCORPORATED IN NEW SOUTH WALES

GEOLOGIST	G.O.A.
DRAWN	
DATE	FEB. '88
CHECKED	
1:250000 REF	

HENTY PROSPECT

CROSS SECTION

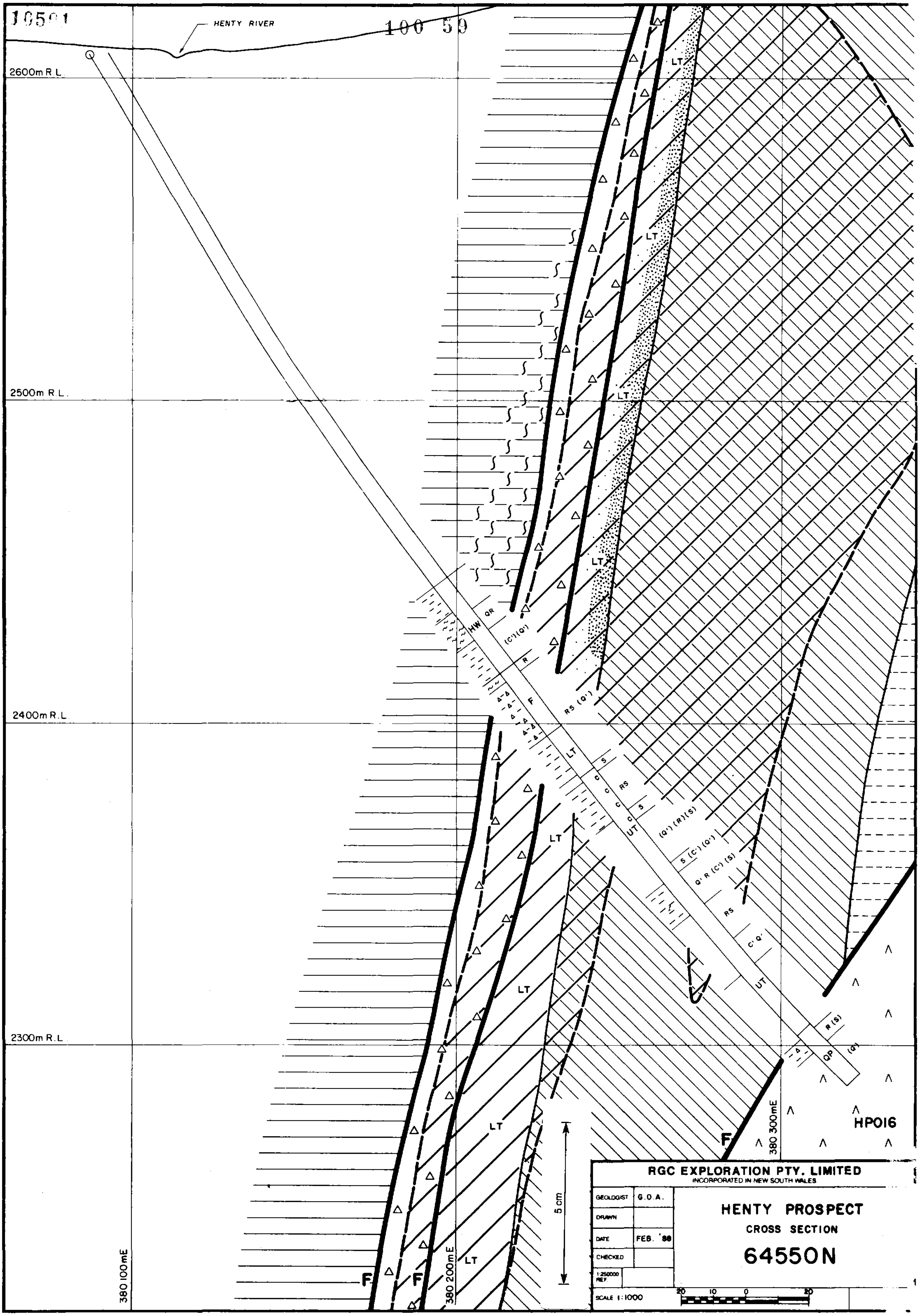
64500N

SCALE 1:1000

20 10 0 20

10591

100 59



RGC EXPLORATION PTY. LIMITED
INCORPORATED IN NEW SOUTH WALES

GEOLOGIST G.O.A.
DRAWN
DATE FEB. '88
CHECKED
1:250000 REF.

HENTY PROSPECT
CROSS SECTION
64550N

SCALE 1:1000

20 10 0 20