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MINERAL EXPLORATION AND ENGINEERING CONSULTANTS

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A REPORT ON GEOPHYSICAL WELL-LOGS

FOR OIL-SHALE, TASMANIA

for

GENERAL GEOLOGICAL SERVICES

by

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SUMMARY

Mitre Geophysics undertook the responsibility for the production and interpretation of the geophysical well-logging which formed part of an exploration program for oil-shale carried out by General Geological Services on behalf of Petro-Quest Pty. Ltd.

The area explored was covered by four EL's (EL's 17/79, 18/79, 19/79 and 21/79) located in northern and north-western Tasmania. Oil-shale (tasmanites) has been known in the area since the 19th century and it occurs in the Lower Permian above a Permian-Carboniferous tillite. A total of forty one holes was drilled of which twenty seven were logged. Four more holes were drilled for coal near Preolenna to the west of EL 17/79; two of these were logged and the results are included in this report (but not summarised). The holes were logged for single point resistance, self potential, gamma and density using a SIE T450 hand operated logger. Ten holes were later relogged for density plus hole diameter (with an electrically operated T450). A few holes show small discrepancies between the electric and nuclear logs. These have mostly occurred early in the project, where a slightly different datum was used for a second logging of the hole (the density log was not available at the beginning of the project).

The bulk of this report is a detailed description of the responses of the various logs in each hole. This makes rather tedious reading and a summary of the results from each area is given here. It is emphasised that only the holes geophysically logged are discussed here and holes not logged may have intersected oil-shale, although no significant intersections were made.

Hellyer:

H01 - H15: Holes H02 and H03 were not drilled, H04 and H07 collapsed before they could be logged; thus eleven holes were logged. Tasmanites was recognised in two holes, H13 and H15. These were detected by the density log which showed two zones at 15 and 16m. in H13 and one at 8.3m. in H15, all less than half a metre thick. However similar

responses were recognised in the density logs from several other holes. These are indicated in Table 1 and discussed below.

H01 shows up to ten zones of interest, whereas other holes have usually shown a maximum of two or three. There is no caliper log to show the hole diameter, but since the density tool has stuck in this hole on more than one occasion, diameter changes are likely. H01 has very questionable potential zones.

H02 and H03 were not drilled, H04 collapsed before it was logged.

H05 drilled 25.75m. (total depth) of basalt.

H06. Three major density responses at 7, 11 and 13.5m., up to 1m. wide, occur with lesser zones at 8.7, 10 and 16.3m. A caliper log confirms that they are not responses to changes in hole diameter. The zones would appear to be too high in the sequence since the hole was continued to 87m. without reaching basement. These zones are above the cored section of the hole.

H07 was bulldozed over during road repairs before logging was attempted.

H08 reached basement (tillite) at 30m. The density log extended to 27m. without detecting any possible oil-shale zones. Since the hole was cored from 26.5m. to 35.6m. (in sandstones and tillite), it may be considered devoid of interest.

H09 intersected basement (tillite) at 56.3m. The hole was cored from 9.2 to 56.3m. and although no tasmanites was recorded, the density log has defined zones of interest at 7 and 15.7m. The caliper log confirms the interest. The responses are less than half a metre thick and suggest only low concentrations of tasmanites. A re-examination of the core from 12 to 18m. is recommended.

H10 intersected basement at 49.2m. The density log extended to 47m. The intervening distance was part of the cored section (45 to 50.5m.). No prospective zones were detected.

H11 reached a basaltic basement at 37.5m.; presumably a sill, and hence the possibility of Permian sediments continuing below the basalt. The density log extended to 34.3m. A zone of apparently lower density at 16.5m. probably correlates with a response on the electric logs at 17.3m. (incorrect zeroing of one of the probes); the less resistive, and positive SP responses are more likely to indicate a zone of increased permeability than oil-shale, however the grab samples around 17m. could be re-examined.

H12, the deepest hole in the project, had not intersected basement at 75.6m. Two minor responses at 63 and 64m. and an even weaker one at 37.6m. are the only possible zones of interest. At best, only low concentrations of tasmanites are indicated.

H13. Tasmanites was recognised in the core at 15 and 17m. The density log shows a strong response at 15m., with a weaker one at 16m. Both zones are less than half a metre thick.

H14 was cored for its total length of 21.5m. in shale (1m.) and then mudstone. The density log shows a large response over the last two metres of the log from 16 to 18m. It is unlikely that such a large response could be due to tasmanites which has gone unnoticed in the core and it probably is due to wash out at the end of the casing which ran to 17.5m. In the absence of a caliper log, the zone is considered to be 'of interest', particularly since the hole may correlate with H15 in which tasmanites was recognised. Thus re-examination of the core is recommended.

H15. Tasmanites was observed in the core between 8 and 9m. A strong density response was recorded at 8.3m. with a weaker one at 9.3m. These zones correlate well with those in H13.

The observed tasmanites (in H13 and H15) and those more confidently predicted from the density logs (H06, H09, H14) all come from holes drilled in the Oonah area, the only area on the Burnie 1 mile geological sheet (which covers all holes except H10) where oil-shale is indicated. All zones were less than 1m. thick.

Latrobe:

L01 - L08: L02, L05 and L07 collapsed before they could be logged. Thus five holes were logged; three in the north eastern part of the EL and two in the south western area. Tasmanites was not observed in any hole, however from the logging, one hole is considered prospective and two others, possibly so (see Table 3).

L01. After 3m. of alluvium and sandy siltstone, this hole entered metamorphics.

L02 collapsed before it was logged.

L03. A broad low density zone was logged from 10 to 14m., however the deflection is not 'typical' of oil-shale intersections. Two deeper zones (at 22.5 and 26.2m.) are considered more likely to represent oil-shale. The hole was not cored over these intervals, and it is recommended that the grab samples from 10m. to 30m. be re-examined.

L04. The density log shows a zone of low density at 18.7m., however it is given a very low emphasis for reasons given in the full description of this hole.

L05 collapsed before it was logged.

L06. Only the top 7m. were logged with the density tool. The cored section extended from 16 to 37.8m. 5.4m. of the 9m. 'gap' was prospective mudstone. Explanatory notes to the Sheffield 1 mile geological map state that oil-shale had been found near Beulah (i.e. near this hole), however this hole did not reach basement.

L07 collapsed before it was logged.

L08. This hole was terminated at 30.24m. owing to drilling problems. The density log extended to 16m., at 15.7m. there is a pronounced zone of apparent low density (a caliper log was not run) which is consistent with the response from oil-shale. However drilling difficulties may have caused local washouts (with the removed material blocking the hole lower down). Since density logs in other holes have revealed zones of interest in open-hole sections, the interval from the end of the density log to the end of the hole (16m. to 30.2m.) may be considered to be inadequate [illegible]

Golden Valley:

G01 - G13: G01, G02, G05, G10A, G11 and G13 all collapsed before being logged and G06 was considered too shallow to log. Thus seven holes were logged. All 'G' holes were drilled in the top one third of the EL. Tasmanites was observed in G07 and two other holes, G03 and G04 were considered to have intersected zones of potential interest (see Table 4). The statement made at the beginning of the summary is repeated here: this report makes no statement on holes not geophysically logged and thus the absence of half the Golden Valley holes in this discussion does not imply that none intersected oil-shale.

G01 and G02 collapsed before they were logged.

G03. This hole reached basement at 33.7m. and the density log extended to within one metre of the end of hole at 42m. Three zones of lower density were defined: the uppermost at 7.5m. assisted by an increase in hole diameter. This was the only zone not in the cored section. The other two zones are at 22.5 and 32.5m. There appears to be a mismatch of about 2m. between the geophysical and geological logs (the latter shallower); it is therefore recommended that the core be re-examined from say 20m. to 33m. and the grab samples from 4 to 9m.

G04 covered 56.7m. of prospective Quamby mudstone without reaching basement. Two zones of potential interest were defined by the density log which extended to 43.6m. (coring was from 46m. to end of hole). The shallower zone is at 9m. where the caliper log shows a large wash out, however since an oil-shale band may also be less competent, this zone is still considered prospective. A smaller deflection on the density log occurred at 17.7m.

G05 collapsed before it was logged.

G06 was considered too shallow to log (about 3m ?)

G07 covered 60.7m. of prospective mudstone without reaching basement. Tasmanites was observed in the core at about 50m. The density log extended to nearly 57m. and two clear zones of lower density were defined

at 46.5m. and again at 48m. (The electric logs also responded to these zones, resistive with a large negative SP).

G08. The density covered all but the last two metres of the hole which extended to 49.3m. without reaching basement. No prospective zones were defined.

G09. The density log extended to within 4m. of the end of hole at 42.7m. (cored from 2.1m.; basement was not reached). No zones of interest were detected.

G10 reached basement at 15.7m. A strong response was obtained in the density log at 10.7m., however for reasons discussed in the full description of the hole, these are not considered prospective.

G10A and G11 collapsed before they were logged.

G12 reached basement at 51.4m. and was cored from 14 to 51.9m. The density log extended to 36.7m. and shows a strong response at 19m. in sandstone. There were corresponding resistance and SP responses but their character suggests that the responses may be due to a local change in hole diameter.

Beaconsfield:

B01 - B06: B03, B05C and B06 collapsed before they were logged; B04 was not drilled. Thus four holes were logged. None of these intercepted tasmanites, but one is considered prospective and one questionably prospective from the logging (see Table 5).

B01. The density log extended to the full depth of the hole (53.4m., basement not reached). Very minor zones of slightly lower density were defined with one strong deflection at 8m. This latter is thought to be due to a wash out (no caliper log). The very minor zones are the weakest density deflections recorded on this project and could not indicate any worthwhile concentrations of oil-shale.

B02 was drilled to 50m. where it intersected a conglomerate (cored from 50 to 54.5m.). The density log extended to 47m. A thin but pronounced zone of lower density was defined at 24.3m. (there was no caliper run). A re-examination of the grab samples is recommended over an interval of say 6m. centred on 24m. A much weaker deflection was defined at 39m. at the end of the gradual change from mudstone to sandstone.

B03 collapsed before it was logged.

B04 was not drilled.

B05A extended to 38.5m. and was cored from 1.5m. to end of hole. The density log extended to 24.3m. and shows considerable variation, however these do not have the character of oil-shale zones and are thought to be due to changes in hole diameter.

B05B was drilled through mostly sandstone to 20.2m. The density log extended to 19.3m; variations in the log are not thought to be due to oil-shale but may reflect changes in hole diameter.

B05C and B06 collapsed before they were logged.

The density logging has defined several zones of lower density in holes from all four EL's. The close relationship between response and oil-shales where they have been observed in the core, suggests that these zones contain concentrations of tasmanites. However it is not suggested that economic concentrations may occur. The recommendations for re-examination of the core or grab samples are to confirm the predictions of the density logs. The necessity for running a caliper log with the density log is evident.

This project discovered a disappointingly small amount of oil-shale, however this follows the trend set by other explorers for oil-shale in northern Tasmania; Endeavour Resources and A.A.R. Ltd., have both recently announced that their reserves were not economic. However the exploration to date has not excluded the possibility of (more elusive) oil-shale deposits in Tasmania.

INTRODUCTION

A drilling Program was undertaken by General Geological Services for Petro-Quest P/L in north-western and northern Tasmania as part of an exploration program for oil-shale. The holes were drilled during the early part of 1981 and were logged with electrical and nuclear probes. This report presents the results of that logging and an interpretation.

Tasmanian oil-shales are unusual, being marine rather than fresh-water deposits (oil-shales of marine origin are called tasmanites). Yen and Chilingarian (1976) give the following description: "Tasmanian tasmanite is a fine-grained arenaceous mudstone containing innumerable discrete yellow discs of biological origin." They continue, it

> "occurs in the north-west of the island over a relatively restricted area fairly close to the existing coast. Insignificant patches of tasmanite have been reported at other isolated places in northern Tasmania, as well as on the mainland of Australia. The Tasmanian oil-shale beds occur in numerous isolated areas separated by later faulting and diabase intrusions. The tasmanite seam is interbedded with other rocks of the Permian system and occurs as two main bands separated by a layer of mudstone up to two feet in thickness. The nature of this mudstone is similar to the inorganic matrix of tasmanite, but contains insignificant organic matter. The composite seam has a fairly uniform thickness of ca 5ft. and shows no thinning out at the edges. It appears that the sea floor did not shelve up at the coast, but the contour changed abruptly at the land margin. In places, tasmanite is replaced by coal as if a low-lying, coal-forming swamp ran right down to the shore line. Unlike the deposits of torbanite elsewhere in Australia, coal does not occur above or below the tasmanite, but is found laterally adjacent to it. It seems that tasmanite was formed in very shallow seas at, or near to, the Permian coastline and that a spore-containing coal was contemporaneously formed in low swampy lands in the same basin surrounded by hills composed of schist, slate and conglomerate."

Yen and Chilingarian describe tasmanite kerogen as "discs with creased and sculptured surfaces, or rather as just visible, amber-coloured, discrete, flattened sacs." They quote Johnson (1877) who wrote "the discs are welded together like grains of meal in an oat cake. The discs resemble diminutive flattened flabby gooseberry skins rent or fractured on one side as by sporadic emission of contents." Samples from the Hellyer area examined by this author, both from cores and from outcrop, contained amber or darker coloured discs of pin-head size or slightly

larger, along bedding planes of a mudstone. Examination of the relevant geological sheets and explanatory reports shows that the oil-shale often occurs close to (and above) tillite at the base of the Permian.

Petro-Quest hold four exploration licences for oil-shale (and coal) in Tasmania (Figure 1). They are:

(1) EL 17/79 of 894 sq. kms. Drill holes in this area have been designated 'H' for Hellyer, the Hellyer River being a major river within the EL.

(2) EL 18/79 of 529 sq. kms. This EL is in two separate areas; EL 4/74 (held by Endeavour Resources Ltd.) lying between the two parts. Drill holes within this EL have been designated 'L' for Latrobe, a large town on the edge of the EL.

(3) EL 19/79 of 1272 sq. kms. Drill holes in this area have been designated 'G' for Golden Valley, a village in the northern section of the EL.

(4) EL 21/79 of 741 sq. kms. Drill holes in this area have been designated 'B' for Beaconsfield, a town in the north west of the EL. 'B' logs in this report have been titled (in error) 'Bacala Area'. Bacala is a railway siding in the north east of the EL.

The description of the holes logged is given area by area in the above order. Not all holes were logged (usually because the hole caved in after the casing was withdrawn), and in many holes, not all probes logged the entire drilled depth of the hole.

Four holes were drilled near Preolenna for coal in a separate project to the west of EL 17/79. Two of these holes were geophysically logged and the results have been included in this report after the Hellyer section.

GEOPHYSICAL METHODS

The logging was carried out using a SIE T450 logger. Physical properties logged were (single-point) resistance and self potential (logged simultaneously), natural gamma and, later, density. Later still, a few holes were logged for hole diameter (caliper log) and density was re-logged for these holes. For the caliper and associated density logging, an electrically-driven winch was used, but all other logs were run with a hand-powered winch. On both units, a ratemeter showed the logging rate in metres/min., however the latter system was quite erratic, especially when compared with the virtually constant speed of the electric model. The T450 uses a 2-pen, 10cm. wide, chart recorder.

The single-point resistance probe measures the resistance between the electrode at the end of the cable and an electrode close to the equipment. This probe shows qualitative changes in resistance down-hole. (However, for this project, the actual value of resistance was recorded, to act as a check on operation and to optimise the logs.) Single-point resistance probes are usually used where the true resistivity is not required; they give good definition of lithological boundaries, and the apparent resistivity always increases or decreases with the true resistivity (which is not always the case with multiple-electrode arrays). Usually, in a given sequence, sandier horizons will be more resistive, while shaley horizons (with a higher clay content) will be less resistive.

Similarly, the self-potential (SP) log shows a qualitative change in voltage between the same two electrodes used for the resistance logging (but for the same reasons as the resistance logging, absolute values of SP were recorded). The voltages measured by the SP log mostly arise from electrochemical potentials at the contacts between the drilling mud and the formation waters. Sandstones (permeable rocks) will cause a more negative potential; shales a more positive one. Thus the SP log is also a good indicator of lithological boundaries.

The gamma probe employs a small scintillometer to record the levels of (natural) gamma radiation down-hole (usually about equal contributions

of uranium, thorium and potassium). Typically, the gamma probe will show an increased response in shales and a decrease in sandstones and limestones. Thus the gamma log will often correlate with the SP log. However in areas of low activity, the statistical variations may be as large as the lithological changes. Gamma probes may be used in cased as well as in dry holes.

The density probe is actually a transmitted gamma log. A source of gamma rays (caesium 137 in this case) is placed at the bottom of the probe which contains a scintillometer. The higher the formation density, the lower the number of gamma rays reaching the detector (a bowspring is used to press the tool against the wall). To give actual densities, the instrument must be calibrated for source intensity, detector sensitivity, mud density and particularly, hole diamter. The equipment used for this project was not calibrated by the supplier (SIE), however an approximate calibration may be done by measuring the densities of uniform sequences of rocks. This was not considered necessary here, given the reconnaissance nature of the project. In evaluation programs the density tool is often used, since a relationship can usually be found between density and yield of the oil-shale (e.g. Colorado, U.S.A., Tixier and Alger, 1970).

It can be seen from many of the logs shown here that density is not a good discriminator of lithological types. However the density log is a direct, but non-unique, discriminator of oil-shale. That is, oil-shale will, with other less dense beds, appear on the log as a zone of increased gamma counts. Thus the density log has been the most useful tool for this project. Unfortunately the density tool was not available until late in the drilling project, when several holes had caved in, preventing logging. (Several holes caved in as soon as the casing was removed, precluding any logging. Subsequent projects have run the nuclear logs (gamma and density) down the rods at the completion of the hole. For electric logging, a few metres of casing in the overburden is usually sufficient to keep the hole open.)

As mentioned above, density logs are sensitive to hole diameter; a local 'wash-out' will appear as a less-dense zone. To remove this ambiguity,

a caliper log is run, which measures (continuously) the hole diameter. Regretably this tool was not available until the end of the project and so only a few holes were caliper logged (immediately after re-logging them with the density probe).

The T450 logging system allowed calibration of the resistance and SP by switches on the recorder which placed standard resistors and voltages across the inputs. Natural gamma and density logs were checked by a weak radioactive source. The caliper log was calibrated using a standard 80mm. inside diameter tube.

Geophysical well logs are essential for open-hole drilling and are useful for correlation and confirmation in cored holes. Further, the density log may be used to define prospective zones for oil-shale; and, in an evaluation program, to determine the likely yield.

WELL LOG DESCRIPTIONS

The results of each log have been traced on to one sheet for each hole. In many cases the drafted log is a composite of more than one run. At some holes, logs of differing scales were run and these have been differentiated by using a solid line for the more sensitive scale and a dotted line for the coarser scale.

The logs are discussed area by area, starting from the north west.

Hellyer:

Nearly all of the Hellyer EL is situated within the area covered by the Burnie 1 mile series geology sheet, and all holes, except one (H10), are within the area. The map indicates that the oil-shale occurs at the base of the Permian 'Inglis Siltstone' (a mudstone with fossiliferous siltstone at top), above the Permian-Carboniferous 'Wynyard Tillite'. Near Oonah, where many of the holes were placed, three outcrops of oil-shale are indicated. The explanatory notes for the Burnie sheet (Gee, 1977) state "Small deposits of Tasmanites oil-shale occur near Oonah (643227). Henderson (1944) described the occurrence as being too small and of too low a yield to be of economic importance". More specifically, Gee (1977, p. 47) states

"The transition from Wynyard Tillite to Inglis Siltstone is rapid ... in a marked change of environment over about 5m. ... Lenticular beds of Tasmanite Oil Shale up to 0.6m. thick occur in silty mudstone from 6 to 20m. above the base of the siltstone. Tasmanites is dispersed through adjacent beds over approximately one metre".

The Hellyer holes are numbered from 01 to 15: holes H02 and H03 were not drilled and H04 and H07 collapsed before logging was attempted. Table 1 gives a list of the coverage of the various logs as well as noting the total depth and geology of the drilled section. Also noted is whether the density log shows zone(s) prospective for oil-shale (absence of a 'P' may be because the density log did not extend the whole length of the log), and whether the geological log recorded oil-shale (tasmanites) and/or basement (usually a tillite). Figure 1 shows the location of all holes drilled at a scale of 1:500,000.

H01 (TD 43.24m.)

This hole was sited within the Inglis Siltstone, but apparently did not reach its base. Resistance, SP, natural gamma and density were logged: the first three to just over 35m., and density to just under 30m. The geological log shows mudstone grading to siltstone down the hole. The electric logs show little deflection: the resistance log suggests minor variations in sandiness from 25 - 30m., although the SP is in poor agreement. The SP log has a generally characterless but sloping line; this gradual increase to the positive side of the log is due to thermal gradients down the hole. The gamma log shows only minor fluctuations. The density log in contrast shows considerable variation. The log was repeated down to 8m. (and the original log shifted to the left). The agreement is generally good, but unfortunately no caliper log was run in this hole; so it is not possible to judge to what extent the density log variations are due to changes in hole diameter (the bit diameter was changed from 4½ inches to 3⅞ inches at 21m: the density log shows the decrease in diameter at 20m). The rather rapid variations, of the order of 1m. or less, suggest a lithological cause and thus the density log may be indicating thin, less-dense bands within the top fifteen metres of the hole, with two thicker bands at 25 and 27m. Inspection of hole H15 where tasmanites was found shows that the responses on the

log for H01 are not dissimilar. However, to restate the above, more definite statements cannot be made without a caliper log. This hole was not logged by caliper (and relogged with density) since the density probe had stuck badly during the original logging of the hole and it was decided not to risk this tool again (regulations in all states demand that radioactive sources have to be retrieved).

H05 (TD 25.75m.)

This hole was presumably placed on the edge of the (indicated) basalt to allow as great a thickness as possible of Inglis siltstone to be intersected, however the hole was abandoned after nearly 26m. of basalt. The logging results are therefore of little relevance. Nevertheless the logs are examined here for comparison with responses from other holes. All logs (except caliper) were carried out to a depth of about 17m. Despite a good grounding for the earth electrode, resistance was in excess of 1000 ohms, which suggests a fairly fresh rock. The rapid excursions at 13.3m. and 14.3m. with corresponding deflections in the SP log indicate narrow joints or fractures. The sharp decrease in resistance above 5.5m., again with a corresponding shift in the SP log, suggests a change from fresh to weathered rock. This is supported by the density log which shows a decrease in density above 5.5m. (however a wider drilling bit was used above 6m.). The natural gamma ray activity is very low, less than 10 cps.

H06 (TD 56.98m.)

This hole was drilled in the Oonah area, near the known occurrences of oil-shale. All logs, including caliper, were run in this hole. SP and density were repeated. The electric and gamma logs went within 1.5m. of the hole's total depth of 57m., the density and caliper to within 6m. The repeated density log (solid line) shows that the later density probe (owned by GGS) has better shielding, giving a lower background count of direct gamma rays. The hole diameter according to the caliper log is 175mm. (6.89 ins.) which is quite different to the 98mm. (3.88 ins.) stated in the geologist's log. The caliper shows a clean hole, which was apparently not reamed out. It seems likely that the caliper log was incorrectly calibrated and that it shows the true variations in hole diameter, but with a 75mm. (3 ins.) bias.

There are two zones within this hole which have caused responses in all four logs. The zones are at 20.5m. and 24.5m. The zones are thin (less than .5m.), resistive, dense and have a low gamma ray activity (cherty bands?). Similar but less well developed responses occur at 46m. and 48.3m.

Of more interest are a series of narrow bands of lower density above 20m. The caliper log shows only minor variations, perhaps enough to confirm a weaker rock type, coincident with the density lows on the logs. Major bands occur at 7m. (about 1m. wide), 11m. (about .3m. wide) and 13.5m. (about .8m. wide); lesser zones occur at 8.7, 10 and 16.3m. From the description of Gee (1977), such bands are too high in the sequence to be oil-shales, however such density lows, with no changes on the other logs, are not inconsistent with bands of oil-shale. A further deflection at 46.3m. may also be included in the zones of possible interest.

Casing is recorded as being to a depth of 3m., however the caliper log clearly shows it to a depth of 2m., suggesting that a different reference level was used. The SP log shows the drift that was noted in H01, and again a thermal gradient down the hole is the suspected cause.

H08 (TD 35.59m.)

All logs except caliper were run in this hole: electric and gamma to within half a metre of the end of hole, but density short some 8.5m. This hole is about 2km. south east of H06 and as estimated from the 1:50,000 scale map, with 20m. contours, it is collared about 40m. lower than H06 (at approx. 440m. asl). No section of this hole is directly correlatable with any part of H06 but the logs are similar in character. The narrow zones are again evident in this log, more numerous and probably thinner (the geological log records an increased amount of siltstone in this region).

The gamma log shows a slight increase coincident with the shale at 26m., but shows no significant decrease within the 3m. of sandstone below this. The contact with the tillite is not evident on either the resistance

or gamma logs (the density log did not extend this far), however the SP does show a change from the 'shale-line' to a 'sand-line' over a 5m. interval.

The density log shows two distinct zones; a change at 12m. (lower density above, higher below), which is coincident with a change in bit size. There is no evidence of the narrow, less-dense bands of H06.

H09 (TD 56.31m.)

All logs were run in this hole, including caliper: all started less than a metre from the bottom of the hole, except for the density log at about 1.5m. However the water table was down to about 31m. (above which electrical logs cannot be used). The gamma log was repeated and the discrepancies illustrate the magnitude of the statistical scatter.

H09 is among the Oonah group of holes, about half a km. north of H06, and, like H08, about 40m. lower. Tasmanites outcrops in a pit 100 to 200m. east of H09, and less than 10 or 20m. (?) below the collar height.

The resistance log shows large deflections at 36.3m. and 51m., the former with a corresponding SP response. The gamma log shows only minor changes, proved real where the repeated log is in agreement, however none are of sufficient size to warrant comment. The zone at 36.5m. has a small corresponding drop in density indicated. Thus these thin, resistive zones may be similar in character to those observed in H06 and H08, but here they are relatively less dense.

The density was relogged, with the caliper tool, about two months after the initial logging. The sudden apparent change in density at about 23m. is due to the water table (the first density logged shows a similar deflection, but at about 31m., the water table level indicated on the electric logs).

There are two minor zones of decreased density; one at 7m., the other at 15.7m. Both zones are less than half a metre thick and while they do not indicate high concentrations of oil-shale, they are zones of

The SP log again shows drift suggesting temperature variations in the bore hole column of fluid.

H10 (TD 50.47m.)

H10 is about 3km. south of Oonah. With an estimated altitude of 500m. asl, this hole is some tens of metres higher than those at Oonah.

All properties were logged on this hole, and all extended to depths between 46 and 47m. This hole has passed through a wider range of rock types than those described above and at least one of the logs has responded to each lithological change.

Both the density and gamma logs show increases below the alluvium (large excursions in the density log signify variations within the overburden). The peat layer at 21m. is characterised by decreases in both the density and level of gamma ray activity. Their responses suggest a thickness of 1.5 to 2m. and at a slightly shallower depth than indicated on the geological log.

The resistance and SP logs suggest that the clay (22m. to 35.6m.) is uniform only from 27m., there being minor variations in the electric and gamma logs above this level. The contact between the clay and siltstone is reflected on all logs (and at the same level as the geological log) - the gamma and density logs both showing a marked increase. None of the logs extended to the contact with the tillite (the granite indicated on the log has a thickness of 14cm., and is presumably a boulder within the tillite).

Apart from the peat (?), the density log shows no zones of lower density which may be of potential interest.

H11 (TD 37.81m.)

H11 is about 3km. south west of Oonah, with an estimated collar height of 480m. asl. The electric and gamma logs extend to 37m., and the density log to 34.4m.

All logs show little change, reflecting the uniform mudstone sequence with variable percentages of siltstone. There are minor exceptions in the electric logs; the most notable being at 17.5m. where there is a less than 1m. thick conductive zone.

The gamma log shows mainly statistical fluctuations below the water table (9m.), but above this it shows variable clay content in the near-surface mudstone and in the weathered zone. The density shows a count decrease going below the water table and a further decrease at the change in drill bit size at 14m. (recorded on the geological log at 15m.).

The basalt at the bottom of the hole was not reached by any of the logs, however the decrease in the gamma count at the end of the log may be an indication of the less radioactive formation.

The density log shows a less-dense zone, less than 1m. thick, at about 16.5m ; the deflection is, however, only slight.

H12 (TD 75.55m.)

This hole is 3km. (approx.) west of Oonah, and is the deepest hole in the oil-shale project (all other holes being less than 60m.). The electric logs went to the end of the hole, the density to about 1m. short and the gamma log 1m. over (!). The SP curve has been drafted up from two logs.

The geological log shows a series of mudstones with two shaley patches at 4 to 12m. and 23 to 27m.; the geophysical logs reflect this uniformity, showing little change. The electric logs show two sharp, narrow deflections, about 5m. apart, near the 50m. mark. These sandier zones are slightly denser and have a lower gamma activity. These zones are similar to two markers on the electric logs of H06 about 4.5m. apart near 23m. and thus a tentative correlation can be made between these two holes which are approximately the same height above sea level. However the less-dense zones which occur above these markers in H06 are not in evidence in H12.

The gamma has responded to variations in shale content near the surface,

but shows little other change, apart from the two zones described above. The step in density at 26m. agrees with the change in bit size, recorded in the geological log at 26.9m. Two minor variations in the density log at 63 and 64m., and an even smaller one at 37.6m. are the only possible zones of interest. Unfortunately a caliper log is not available to confirm that these zones are of a lower density.

H13 (TD 46.07m.)

This hole is among the 'Oonah holes', being about ½km. from H06. All properties were logged; the electric logs to 44.2m., the gamma to 43.3m., one density to 43m., a repeat run to 40m., and the caliper to 43m.

The geological log shows a monotonous sequence of mudstones throughout the hole, with the exception of about 1m. of shale near the surface. The gamma log, which might be expected to respond to the shale, shows an increased count about 1m. shallower. Further down the hole there are similar mismatches between aligned responses on the gamma and density logs and responses on the electric logs. These features occur between 20 and 30m., and are similar to those noted in holes H06 and H12. That is, thin (∿20cm.) resistive and dense bands with a strong SP response and with a lower gamma ray activity. On the electric logs, these bands occur at 21.2m., 24.3m., 25.7m., 27m. Similar electrical responses occur below this, but they do not have the associated nuclear log responses. At 38.7m., the electric logs show a contact zone, with a sandier zone below (higher resistance and a more negative SP). The gamma log also defines the contact (at about 38m.), and a slightly lower activity reinforces the interpretation of a sandier zone.

However it is in the density log that most interest occurs, since tasmanites was recognised in the core at 15m. and 17m. The density log shows a narrow (about .5m.) band of (much) less dense rock at 15m. and a second, poorer band at 16m.; the response at 17m. is within the background level. The higher band is also very resistive (given the .7m. mismatch between these logs). The later density probe (run with the caliper log) shows a more sensitive response to changes in formational density than the earlier probe with its higher background count level. The caliper log shows a remarkably uniform hole diameter below about 5m., confirming that the variations in the density log are due to changes in

The mismatch of about .7m. between the electric and nuclear logs suggests that one of the sets of logs was incorrectly zeroed at the drill-hole collar. The top section of the SP log was repeated due to thermally-caused drift. The lack of repetition suggests that there was still a considerable amount of electrochemical activity in the hole.

H14 (TD 21.45m.)

This hole is in the Oonah area; it was abandoned at 21.5m. due to drilling problems. The hole was dry and only gamma and density were logged.

The gamma log shows an atypical narrow band of markedly decreased radioactivity at 7m. The corresponding density deflection shows it to be more dense. The hole was cored and no different lithology was noted. Presumably the geophysical logs have responded to a sandier, more compact layer within the mudstone.

At 15.5m. the density logs show a strong increase in counts; this may be due to wash out at the end of the casing, but the possibility of tasmanites cannot be discounted. A dense, low gamma zone at 5.5m. in drill hole H15 occurs above tasmanites and although in H14 this zone is more marked and further from the density decrease, the similarities with H15 suggest that the two holes may be correlatable, and that therefore the density decrease is due to a concentration of tasmanites (unfortunately the altitude of H14 is not known).

H15 (TD 39.33m.)

All properties were logged in this hole; electric and gamma logs to 36.5m., the two density logs to 29 and 36.8m., and the caliper to 29.5m.

Tasmanites was observed in the core between 8 and 9m. The density log shows a strong response at 8.3m., with a weaker one below. The stronger zone has a corresponding resistance response and this band of tasmanites clearly correlates with that defined in drill hole H13. Also correlatable are the narrow, resistive and dense bands of low gamma activity that occur at 18m., 21m. and 27.8m. in H15.

Matching the electric logs of H13 and H15 with the resistive tasmanites responses opposite each other (there are also characteristic 'lobes' on both logs), it can be seen that there is not an exact correspondence between the narrow zones mentioned above, but the resistive layer below 39m. in H13 closely agrees with a similar response below 29.5m. in H15 (unlike H14, there is no SP response to this zone).

H13 and H15 are about .5km. apart and it appears that the band of tasmanites, the narrow dense, resistive zones and the sandier layer within the mudstone may all be correlated from one hole to the other. The difference in depths below the surface being 8 to 10m., i.e. 10m. on H15 correlates approximately with 20m. on H13.

Preolenna:

Four holes were drilled outside the western boundary of EL 17/79 into the Preolenna Coal Measures. A summary is given in Table 2.

The holes were placed on the south-western end of Coal Mine road, south of Preolenna. They were collared on the Flowerdale Sandstone which lies above the Preolenna Coal Measures (sandstone with carbonaceous shale and coal seams) which in turn lies above the Inglis Siltstone. The Burnie 1 mile geology sheet shows (abandoned) coal mines in the Coal Measures which outcrops on the north west side of the Jessie River Gorge. Gee (1977) states that there are four seams within the Coal Measures, ranging in thickness from 0.2 - 0.6m.

P01 (TD 29.57m.)

Electric and nuclear logs were run in this hole; the former extended to 28m., the latter to about 27.8m. The geological log shows sandstone throughout with some carbonaceous "wisps and blobs" (the hole was cored from 5m. to the bottom). However the geophysical record is rather at odds with this homogeneous sequence. In particular the density log shows several (apparently) less-dense zones. These may, of course, be merely a reflection of changes in hole diameter, but the responses are strongly developed. The zone from 16 to 17m. has a corresponding strong gamma response and the electric logs show the zone to be conductive with a positive SP response. Although coal generally shows an increase in resistivity, some coal bands are relatively less resistive and hence this zone could be interpreted as a coal response; certainly it should be checked for possible core loss. The apparent less-dense zone at 11.5m. has no corresponding gamma or electric response, but the zone is narrow and the response strong; again the core should be re-examined at this point.

The general character of the gamma log suggests that there is considerable variation in the shaleyness of the sandstone. And this is generally corroborated by correlations with the resistance and SP logs (although deflections in the latter are less well developed).

P02 (TD 48.42m.)

This hole caved in and the electric and gamma logs extend to only 21.5m. The density was logged later and only went to 11.3m. The water table at 12m. means that the electric logs cover only 9.5m. The appearance of these short sections suggests a similar situation to P01, that is variations of shaleyness within the sandstone. The changes in the density log are ascribed to hole wash out (at 2m.) and to a change in drill bit size (at 7m., recorded on the geological log as being at 8m.). Unfortunately the density log did not extend far enough to determine whether any of the apparent less-dense zones recorded in P01 occur in this hole.

Latrobe:

The 'Latrobe' EL, EL 18/79, is covered by the Devonport, Sheffield and Frankford 1 mile series geology maps. A total of 8 holes was drilled in the two areas that make up the EL, however only 5 were logged (see Table 3).

Tasmanite oil-shale was intersected in several old bores sunk (many for oil or coal) near the Mersey River, south of Devonport. Burns (1964, Figure 21) shows the distribution of the bores in the area that intersected oil-shale. Most of the area with known oil-shale is held by Endeavour Resources Ltd. in EL 4/74 which is between the two sections of Petro-Quest's EL 18/79. However the north west corner of the southern section of EL 18/79 is within the 'Tasmanite Basin' defined by Burns (1964) from outcrop and bore-holes. From Burns (1964, Figure 18), the thickness of the seam appears to be between 1 and 2 metres.

On the Devonport 1 mile geological sheet, the prospective unit is the Spreyton Mudstone. Burns (1964, Figure 21) suggests that oil-shale is missing from this unit in the northern part of the EL, however a test hole (L01) was placed in the north western corner, on an outcrop of Spreyton Mudstone on the upthrow side of a NNE-SSW tending fault (it did not intersect oil-shale).

On the Sheffield 1 mile geological sheet, the prospective unit is marked as Permian Basal Beds and it is noted on this map that these contain the "Tasmanite oil-shale member". The explanatory report for Sheffield (Jennings, 1979) states that oil-shale occurs around Dulverton, Latrobe, Kimberley and Beulah in the Sheffield quadrangle. The last mentioned area is on the southern section of Petro-Quest's EL 18/79. Latrobe and Kimberley are on the border, and Dulverton is within Endeavour Resources EL. Four holes were drilled near Kimberley; L04, L05, L07 and L08, and another, L06, near Beulah.

On the Frankford 1 mile geological sheet, two holes were drilled; L02 and L03. There is no reference to oil-shale in the legend on the map, but L02 was drilled into the Lower Permian which overlies a tillite sequence and L03 into a correlate of the Liffey Sandstone, which overlies the

Lower Permian. (It was noted in the introduction that the oil-shale often occurs a few metres above the tillite at the base of the Permian.)

L01 (TD 31.25m.)

L01 was logged with electric and gamma logs only; all logs extending to 20m. The hole, according to the Sheffield geological map, was sited on the Spreyton Mudstone, however after about 3m. of "alluvium ... soil with arkosic sandy siltstone" (a thin veneer of Permian?), the hole entered schists and slates, presumably the Pre-Cambrian Forth Metamorphics. There is some correlation between logs, and the gamma log in particular shows apparently significant variations, however since the rocks are of no interest for oil-shale (or coal) and only short intervals were logged, a detailed description is not given.

L03 (TD 51.25m.)

This hole was logged for all five properties; all logs extending to 44.8m. The hole was geologically logged as mudstone with varying amounts of sandstone or siltstone. The gamma log shows no large variations except for a decrease at the bottom of the log below about 43m. The SP and resistance logs are also fairly uniform but show large decreases and increases (respectively) at this level (no change noted in the geological log of what is presumably a more sandy layer). The gamma log shows little other significant variation but does correlate with the electric logs at about 20m., where the responses suggest sandier zones.

Of greater interest is a large decrease in the density log, centred on 12m.; this is apparently not due to change in hole diameter, although the caliper log shows it to be irregular down to 16m. There are two other bands; at 22.5m. and 26.2m., also of lesser density. Again the caliper log suggests that these layers are less competent. (The caliper log shows a diameter of 109mm. which compares reasonably well with the nominal diameter of 99mm.).

The two deeper zones at 22.5m. and 26.2m. are certainly considered to be of potential interest. The coarse scale of 5000 cps/cm. suggests

a very real change in density (it is noted that there was no coring in this hole).

L04 (TD 51.55m.)

All five properties were logged; electric logs to 37.8m., gamma to 34.8m., density to 37.6m. and caliper to 38m. The water table at 17.2m. meant that an interval of only 20.5m. was covered by the electric logs. The geological log shows a sandstone with minor amounts of siltstone and mudstone to 20m. From 20m. to 31m. a sandy siltstone was recorded, with minor amounts of mudstone. From 31m. to the end of the hole, a sandstone was recorded.

The resistance log shows the lower sandstone to be more conductive than the sequences above and the SP log is on the shale line. This suggests that there is a higher clay content in the 'sandstone' than in the overlying 'sandy siltstone'. The contact is shown at 27.5m. on the geophysical logs, in contrast to the 31m. of the geological log. However the electric logs confirm the change from sandstone to sandy siltstone at 20m.

The layer of increased density at 8 to 9m. is probably only a function of the decreased hole diameter, although there is also a matching decrease in gamma ray activity, suggesting a lithological change. A thick zone of lower density between 14 and 15m. may be of potential interest (i.e. a concentration of tasmanites), but the 'character' of the log is not the same as those where tasmanites has occurred. A thinner (less than one metre) less-dense zone occurs near 19m. The unfavourable stratigraphy, unlikely character of the logs, together with the facts that the caliper log shows a very variable hole diameter and that the density log was run without a bowspring, lead to a very low emphasis being placed on the 'zones of interest' in this hole.

Below the decrease in gamma activity at 8m. mentioned above, the gamma log shows a zone of gradually increasing activity down to 13m., with a minor step increase at 21m. which approximates the change from sandstone to sandy siltstone.

L06 (TD 37.76m.)

This hole was logged by electrical (to 37m.) and gamma probes (to 36.2m.) plus the top 7m. by density. The geological log recorded a sandy siltstone to 10.6m. with mudstone below. The electric logs confirm the lithology change with strong deflections at 10m. Below this contact, the electric logs show only minor variations, however at least two of these correlate with definite zones of decreased gamma activity (at 15.6m. and 18.8m.) reflecting sandier sequences.

The hole was positioned east of Beulah in Basal Beds of the Parmeener Super-Group and, since oil-shale has been found near Beulah (see above), might have been expected to intersect oil-shale. The Sheffield explanatory report (Jennings, 1979) does not state where the oil-shale occurs within the Basal Beds (above tillite?) but notes that the approximate thickness is somewhere between 75 and 180 plus metres.

L08 (TD 30.24m.)

The geophysical logs (electric, gamma and density) cover only a little over half this log and add little extra information to the geological log of this rather shallow hole (terminated at 30m. due to drilling problems. The geological log recorded sandstone with minor amounts of mudstone below 18m.

The resistance log shows little change, the very high values apparently 'saturating' the recorder amplifiers. The SP log shows a strong, narrow deflection at 9.6m. (which correlates with a small change in the resistance log) and this is interpreted as a fracture zone or contact. Above 9.6m. variations in the SP suggest changes in the permeability of the sandstone (the detailed geological log notes changes in grain size within the sandstone).

The positive SP response at 6.5m. corresponds with a zone of lower activity in the gamma log which may indicate a more permeable (sandy) zone, the positive SP indicating a fresher formation water than the bore hole fluid. However these features may merely be a result of the water table, since the large decrease in counts on the density log may indicate

either a decrease in hole diameter (not mentioned on the geological log) or the water table. The negative SP drift above 'the water table' may mean that the electrode is in contact with the side wall. If it is not the water table, the negative drift may indicate an increase in permeability up the hole (Schlumberger, 1958).

Like L06, this hole was drilled in an area expected to contain oil-shale (Burns, 1964, Figure 21). The lithology (mainly sandstone) is unpromising, although the geological log shows an increasing amount of mudstone with depth. The small deflections in the density log near 9m. are probably consistent with variations in the hole diameter. At the end of the density log the large increase in counts is certainly consistent with a tasmanites zone, however 'drilling difficulties' may have caused local wash outs (with the removed material blocking the hole at 16m.). Although an alternative explanation to tasmanites can readily be found for this zone of apparently lower density at 15.7m., it should nevertheless still be considered as a zone of possible interest.

Golden Valley:

Fourteen holes were drilled in the Golden Valley area, EL 19/79. These were concentrated in the northern half of the EL and all except two holes occur on the Quamby 1 mile series geological sheet. Table 4 shows that only seven holes were logged. Those not logged were either deemed too shallow to be worth logging or were blocked.

The Quamby geological sheet states that the tasmanite oil-shale occurs in the (Permian) Quamby mudstone above the Stockers Tillite. Oil-shale is indicated about 1km. east of Golden Valley near the Bogan Road and several holes were drilled in this locality (G8, G9, G10, G10A and G11). The prospective sequence is shown as the last unit going down the Western Tiers before the alluvium; in places (e.g. Meander) the alluvium has covered the Quamby Mudstone. Several holes were placed on the alluvium or talus to explore the Mudstone below (G1, G2, G5, G6, G7 and G12, the last being several kilometres to the east). The rest (G3, G4 and G13) were sited on the Golden Valley Group, the member immediately above the Quamby Mudstone.

In the explanatory report to the Quamby sheet, Pike (1973) states that

> "Approximately 1.5m. of 'Tasmanite oil' shale has been recorded by Wells (1957) and Clarke (1968) 96m. below the base of the Golden Valley Group. This shale unit crops out in the bed of Quamby Brook not far from Golden Valley (657737). Oil shale has also been reported to have been quarried at Gibson's sugarloaf. An extensive search by the author failed to find this shale locality, however the geology of the region suggests that oil shale probably occurs."

Elsewhere in the report (Table 1, p. 42), it is stated that

> "A 1.4m. seam indicated on the geological map near Golden Valley was investigated by Hills in 1921. It was estimated to occupy an area of about 4km.^{2}, but there have been no detailed prospecting operations carried out to establish grade or extent of the deposit."

G03 (TD 42.04m.)

The hole was logged by all five probes, however the resistance was saturated for all but 2m. near the base of the log. All logs were to within one metre of the end of hole.

This hole is particularly significant since it intersected tillite at the base of the hole, that is the hole explored 40m. of the most prospective section of the Quamby mudstone. All logs show a good correlation with the geological log and each gives its own contribution; the density log being, as usual, the most significant.

The transition to tillite from mudstone, with an intervening metre of sandstone, is recorded on all logs, although the depths are at variance with the geological log. The density log best shows the sharpest change - at 36m. to a more dense unit (which persists), presumably the tillite. The gamma log shows a change to a lower gamma activity at 36m., but shows a thin layer of decreased activity above this, presumably the sandstone (not seen in the density log). The main deflection on the electric logs at 35.3m. shows a relatively more conductive layer and this may be the sandstone (?) or one of the contacts. Above this layer the SP shows a uniform sequence to about 22m., where, the log suggests, it becomes more sandy.

There are three responses on the density log which signify thin layers of less-dense material, i.e. potentially zones of tasmanites. These zones occur at 7.3m. (density response partly due to a local increase in hole diameter); at 22.5m., the slight increase in hole diameter here, probably only confirms the less competent nature of the zone, with little contribution to the density response; at 32.5m. (no change in hole diameter). All three zones are less than one metre thick. The latter two zones are in the cored section of the hole. (The discrepancy of about 2m. between geophysical and geological logs at 36m. is again noted).

G04 (TD 56.72m.)

The monotonous sequence of mudstone logged in this hole suggests that it was sited on the Quamby Mudstone, but drilled to an unknown (?) depth above the tillites of the next lower unit. All five parameters were logged, although the very low water table (26.8m.) meant that the electric logs covered only 17m. (26.8m. to 43.8m.). The gamma log extended to 44.8m.; the density and caliper logs to 43.3m. and 43.6m. respectively.

The limited electrical coverage and the gamma logs confirm the unchanging lithology, each log showing only generally minor variations throughout the sequence. The density log has responded sharply at the water table (increased counts out of the water) and again at 9m., where the hole diameter has increased to over 200mm. (the hole is about 20mm. larger than the nominal diameter of the bit used). However this zone at 9m., about 1m. thick, is still considered of potential interest since (a) there is a slight mismatch between the caliper and density logs (although nuclear logs may show a delayed response), and (b) a less competent (less-dense, e.g. oil-shale) layer will wash-out more easily. There is a second less-dense zone at 17.7m., less than half a metre thick, that is also considered to be of potential interest. It is noted that neither of these zones is in a cored section of the hole.

G07 (TD 60.65m.)

All five parameters were logged at this hole, and all logs finished between 56m. and 57m. The hole was sited on alluvium (2m. thick) above the Quamby Mudstone. The base of this unit was not reached, but "Tasmanite spheroids" were intersected at about 50m.

The electrical logs are rather featureless, except for the zone of tasmanites. The resistance log shows a gradual increase in resistance of the strata, to a maximum coincident with the oil-shale as indicated on the density log. The SP log shows an atypically large response which suggests that it is a permeable zone. The gamma log gives no change in response at the tasmanites, which is the only variation in an otherwise monotonous sequence of mudstone (the electric logs below 50m. indicate variability in the permeability of the mudstone).

The density log shows two distinct less-dense layers, at 46.5m. and 48m.; the former zone .5m. to 1m. thick, the latter probably less than .5m. This interpretation correlates well with the geological log, which noted tasmanites spheroids above 50m. The straight caliper log shows that there is no contribution from a change in hole diameter. The response in the density log at 22m. is due to the water table.

G08 (TD 49.31m.)

This hole was apparently sited on, and drilled into, the Golden Valley Group (at Golden Valley), since fossil fragments are recorded in the geological log, and the Quamby Mudstone is noted as being unfossiliferous on the Quamby geological sheet (the Golden Valley Group is predominantly a "fossiliferous and erratic mudstone").

Electric, gamma and density logs were run in this hole; the former to 47m., the latter two to 47.5m. The electric logs clearly show the contact between siltstone and mudstone, noted on the geological log at 22m.; both resistance and electrical logs show a rapid variation typical of contact zones, between 20.5 and 22.5m. The other dominant feature on the electrical logs is a thin resistive unit, with an associated large negative SP at 37.5m.; also correlated are the gamma log (a decrease in activity) and the density log (an increase in density). This unit may correlate with one of the pebbly mudstone layers noted in the geological log. (Similar responses were noted in the Hellyer area, i.e. narrow, dense, resistive bands with a decreased gamma activity.) There are no other major or significant responses in the logs; as noted above it seems likely that this hole was drilled in the sequence above the prospective unit and there are no potentially interesting zones defined by the density log.

G09 (TD 42.69m.)

This hole was drilled about 2km. east of G08, but was drilled into the prospective Quamby Mudstone. However the bottom of this unit was not reached and no oil-shale was intersected. All logs except caliper were recorded; the electric logs to 40.2m., gamma to 40.4m. and density to 38.8m. The geological log recorded a mudstone without change and there is little variation in any of the logs.

The SP log shows a gradual positive increase to the water table, a behaviour which has previously been suggested as being caused by a temperature gradient up the hole. A thin resistive layer with associated SP response occurs at 32m. The deflections are much weaker than those on G08 and there are no corresponding changes in the gamma and density logs, such as were noted in G08. This reinforces the suggestion that

these two holes (G08 and G09) cannot be correlated since they have drilled through different groups of the Permian sequence. The density log has again been recorded on the very sensitive scale of 500 cps full scale, and no significant variations were recorded.

G10 (TD 17.95m.)

This hole, collared about half a kilometre north of G09 and approximately 10m. lower altitude, intersected tillite at 15.65m. on the geological log. Tillitic mudstone was recorded higher up the hole and the electric, gamma and density logs have clearly responded to this change in lithology. All four logs show a strong change at 11m. The electric logs show a more permeable layer (i.e. less shaley); the gamma log, a lower count (i.e. less shaley); and the density log slightly higher density beneath a sharp deflection (hole wash-out?) at 11m. The gamma log also defines the shale at 5m. Thus there was no prospective section within this hole.

G12 (TD 51.85m.)

This hole was drilled about 9km. to the east of G10; the hole was sited on alluvium and has intersected sandstone of either the Bogan Gap or Poatina Groups. Tillite was intersected at the end of the hole, and thus it appears that the prospective Quamby Mudstone unit is absent on the eastern side of the Cluan Tiers.

Electric, gamma and density logs were run; the first two to about 40.4m., the last to about 36.6m. The gamma log for the hole shows large variation and is quite different from other logs of the area. The gamma responses correlate with the electric logs, although the SP is unusually suppressed. These logs suggest that the geological log as shown is a simplification and that there is a considerable variation in shale content down the hole. In particular, there is a marked change at 31m., with a lower gamma count beneath 31m. and corresponding slight shifts in the resistance and SP logs, showing more sandy strata beneath 31m. The density log also picks up this contact, and shows a less-dense

sequence beneath 31m. (Commonly, sandy strata has been more dense in other holes in this project, however there is no caliper control for this hole and variable density contrasts exist between 'sandstones' and 'shales'.)

The density log shows a narrow, less-dense zone at 19m., with a signature typical of zones where oil-shale has been intersected. However the response of the electric logs is unusual, showing the zone to be less resistive (and a positive SP response): there is also a small increase in the gamma count. These responses may well be due to a local change in hole diameter.

Beaconsfield:

Seven holes were drilled in the north east corner of the Beaconsfield EL (EL 21/79) and four of these have been logged (Table 4). All the logged holes occur on the Pipers River 1 mile geological sheet (B01 is on the edge).

The Permian is divided into three groups on the Pipers River sheet; the Upper Permian, the Liffey Group and the Lower Permian. The explanatory notes (Marshall, 1969, Figure 3) correlate the Lower Permian with the prospective Quamby Mudstone to the south west and show that it too occurs above tillite. However the tillite apparently does not outcrop within the Pipers River sheet since it is not mentioned in the legend.

The only reference to oil-shale is in the Economic Geology appendix under Fuel Minerals, and is as follows:

> "A dense, black, carbonaceous shale crops out near the summit of the hill on the E bank of Pipers River, about midway between Bangor and Karoola. The shale horizon is very thin and consists of narrow shale layers interbedded with clay. Laboratory tests gave a yield of 15-20 gallons of crude oil per ton."

This location is close to where B05A and B05B were drilled. All holes except these two, were sited on the Lower Permian (which includes "conglomerate and pebbly mudstone and sandstone", Marshall, 1969). B05A and B05B were sited on the Liffey Group.

The title block of all the Beaconsfield sheets described the holes as being in the Bacala area: Bacala is a railway siding in the north east corner of the EL.

B01 (TD 53.50m.)

This hole was sited on the western side of Lilydale, and all four logs (both electric logs, gamma and density) exceeded the depth of hole as shown on the geological log. The logs generally show little variation and there is no strong correlation with the (gradational) change from mudstone to siltstone to sandstone recorded in the geological log.

The SP record (a composite of 2 logs) has the strong positive drift up-hole previously described as a thermal effect. Other than this, the log shows some shallow sandier beds which correlate with deflections on the resistance log. The resistance log shows a shift in average value at the base of the SP thermal drift (25m.), suggesting a change in formation water (?) at this level.

The gamma log shows deflections probably larger than statistical variations which indicates minor variations in shale content of the rocks. The density log shows several apparently less-dense sections, the most prominent at 7.5m. is possibly a reflection of a wash-out. Unfortunately there is no caliper log to check hole diameter variation. Other very minor and thin zones may also be due to variations in hole diameter, or possibly, minor changes in lithological densities (see cored section).

B02 (TD 54.50m.)

This hole was sited about 3½km. north of B01. Four logs were run (two electrical and two nuclear), the logs extending to between 47m. and 48m. The electric and to a lesser extent the gamma logs responded to the gradual change in lithology from mudstone to sandstone at 37m. Apart from this, the electric logs show remarkably little variation, particularly the resistance log (no contrast between formation and bore hole fluids?); the SP shows a gradual positive drift up the log due to temperature differences and, above 22m., a regular 'blip' due to a faulty electrical contact. This is also present on the resistance log but is much less evident. Apart from the one change at 37m., the gamma log shows no other prominent variation.

The density log has a strong response to an apparent low-density zone at 24.3m. (less than one metre thick). There is a small SP response (plus, then minus), which correlates with this zone. Although there has been no consistent type of SP response with zones of tasmanites in any of the EL's, this particular response may be due to a local increase in hole diameter. There are other zones with much smaller increases in count rate (e.g. 39m.), however given the sensitive scale of the log (1000 cps, full scale), these are not thought prospective. However the zone at 24.3m., discussed above, though thought likely to be due to a change in hole diameter, has not been confirmed as such by a caliper log and

is therefore, potentially, a zone of interest.

B05A (TD 38.50m.)

The four logs (two electrical and two nuclear) only cover the top two thirds of this hole; the logs extending to between 24 and 25m. The water table was at 18.3m. and there is little of significance in the less than 6m. covered by the electric logs. (It is noted that there is no correlation between any of the geophysical logs and the detailed lithology given over the interval covered by the electric logs (18 - 24m.).)

Variations in the gamma log suggest that there is considerable variation in the shale content of the sandstone above the water table. But it is considered likely that the variations in the density log reflect variations in the hole diameter, with the large change at 18.5m. being due to the water table.

B05B (TD 20.23m.)

All four logs (two electrical and two nuclear) extended to within 1m. of the bottom of this fairly shallow hole. The geological log shows sandstone with one intermediate band of shale, a little over a metre thick. The gamma log has its highest reading opposite this shale layer, but also shows large variations elsewhere. The electrical logs correlate well with the gamma log, showing the shale layer somewhat thicker than the geological log, but finishing at about the same depth. At 15m., the electric and gamma logs show a more sandy layer below this level, with thin shaley bands at 17 and 19m.

The density correlates with a decrease in gamma activity below 15m., and there is some correlation with the interpreted sand/shale sequences from 15 to 20m. Other variations in the density log may be associated with variations in hole diameter, with a large increase above 5.5m. (the difference of .5m. between the 1000 and 5000 cps logs is due to a difference in response time between the two scales).

CONCLUSIONS

I consider the geophysical logging of holes in the project to have been a worthwhile exercise: the results have been used for correlation between holes and for confirmation of the geological logging in open hole (uncored) sections. The density log in particular has confirmed the recognised intersections of tasmanites and has suggested several other possible occurrences.

Experience has shown the need for logging over the total length of the hole, especially the density log. This is best achieved by leaving sufficient casing at the top of the hole to keep it open and then logging soon after the rods are withdrawn. It is sometimes possible to run density and gamma probes inside the drilling rods, but useful results are not obtained in large diameter holes with thick walled casing or rods. The project has also shown the need to use a caliper log to assist in the interpretation of the density log. For any follow-up survey, the density log should be calibrated (i.e. response expressed as so many gm/c.c. rather than counts per second), and this calibration should also quantify the effect of hole diameter.

Despite the numerous 'zones of potential interest' described in this report, clearly the project has not defined any economic reserves of oil-shale. And although the possibility of economic zones cannot be excluded, one may take comfort from the fact that both Endeavour Resources Ltd. who hold the ground between the two sections of EL 18/79 and A.A.R. Ltd. who hold the ground between EL's 19/79 and 21/79, have recently announced that the oil-shales discovered on their EL's (4/74 and 20/80 respectively) are not economic deposits. Nevertheless, given the changing nature of 'economic reserves' we may confidently expect to see future exploration for tasmanites, and this project will have provided an excellent base on which to plan that exploration.

J.R. Bishop

J.R. Bishop

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042

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TABLE 1

WELL-LOGS OF THE HELLYER AREA

BORE HOLE	GEOPHYSICAL METHODS (intervals logged in metres)					TOTAL DEPTH (m)	PROSPECTIVE ZONES INTERPRETED	GEOLOGY[t,b]	APPROXIMATE LOCATION (AMG)
	Single Point Resistance	Self Potential	Natural Gamma	Density	Caliper				
H01	2.0 - 35.4	2.0 - 35.3	0.5 - 35.4	2.1 - 29.9		43.24	P (?)	Inglis Sltst.	381,600mE 5,452,000mN
H02	not drilled								
H03	not drilled								
H04	collapsed before logging attempted								376,400mE 5,441,400mN
H05	0.0 - 17.2	0.0 - 17.3	0.7 - 17.2	1.2 - 17.0		25.75		Basalt	382,200mE 5,438,200mN
H06	1.7 - 55.6	2.1 - 55.5	0.4 - 55.8	0.5 - 48.9	0.8 - 49.6	56.98	P	Inglis Sltst.	384,800mE 5,434,800mN
H07	collapsed before logging attempted								385,600mE 5,434,800mN
H08	3.0 - 35.0	3.0 - 34.9	0.4 - 35.0	3.0 - 27.0		35.59		Inglis Sltst.[b]	386,000mE 5,434,300mN
H09	31.1 - 56.0	31.4 - 56.0	0.4 - 55.5	0.7 - 54.9	0.8 - 55.8	56.31	P	Inglis Sltst.[b]	384,700mE 5,435,500mN
H10	6.7 - 47.0	0.0 - 47.0	0.3 - 46.6	0.5 - 46.6	0.8 - 47.0	50.47		Inglis Sltst.[b]	384,000mE 5,432,200mN
H11	8.9 - 37.0	5.6 - 37.0	0.3 - 37.0	0.3 - 34.4		37.81	P (?)	Inglis Sltst.[b]	381,800mE 5,432,900mN
H12	7.6 - 75.5	7.7 - 75.2	0.4 - 76.5	7.6 - 74.5		75.55	P	Inglis Sltst.	382,100mE 5,435,500mN
H13	2.4 - 44.2	2.1 - 44.1	0.6 - 43.3	2.0 - 43.0	0.8 - 43.1	46.07	P	Inglis Sltst.[t]	385,100mE 5,434,900mN
H14	dry	dry	0.2 - 19.0	0.2 - 18.0		21.45	P	Inglis Sltst.	385,---mE 5,434,---mN (?)
H15	0.2 - 36.5	0.2 - 36.3	0.5 - 36.4	1.3 - 36.8	0.7 - 29.5	39.33 488.56	P	Inglis Sltst.[t]	384,900mE 5,435,300mN

[t] : indicates that 'tasmanites' was recorded in the geological log

[b] : indicates that basement was reached

043

751044

TABLE 2

WELL-LOGS OF THE PREOLENNA AREA

BORE HOLE	GEOPHYSICAL METHODS (intervals logged in metres)					TOTAL DEPTH (m)	PROSPECTIVE ZONES INTERPRETED	GEOLOGY[t,b]	APPROXIMATE LOCATION (AMG)
	Single Point Resistance	Self Potential	Natural Gamma	Density	Caliper				
P01	0.0 - 28.0	1.3 - 28.0	0.4 - 27.9	1.1 - 27.7		29.57		Flowerdale Sdst.	377,300mE 5,444,800mN
P02	11.9 - 21.6	11.9 - 21.6	0.4 - 21.4	0.6 - 11.3		48.42 ~~47.99~~		Flowerdale Sdst.	376,700mE 5,444,100mN
P03	collapsed before logging attempted								375,900mE 5,443,400mN
P04	collapsed before logging attempted								376,300mE 5,443,800mN (?)

[t] : indicates that 'tasmanites' was recorded in the geological log

[b] : indicates that basement was reached

044

751045

TABLE 3

WELL-LOGS OF THE LATROBE AREA

BORE HOLE	GEOPHYSICAL METHODS (intervals logged in metres)					TOTAL DEPTH (m)	PROSPECTIVE ZONES INTERPRETED	GEOLOGY[t,b]	APPROXIMATE LOCATION (AMG)
	Single Point Resistance	Self Potential	Natural Gamma	Density	Caliper				
L01	5.0 - 20.1	5.0 - 20.0	0.5 - 19.9			31.25		Forth Metamorphics	440,800mE 5,437,800mN
L02	collapsed before logging attempted								460,200mE 5,424,400mN
L03	12.9 - 45.8	13.0 - 45.8	0.5 - 45.9	5.5 - 45.9	0.5 - 45.9	51.25	P	Liffey Sdst correlate	466,100mE 5,412,700mN (?)
L04	17.2 - 37.9	17.2 - 37.8	0.6 - 33.8	7.3 - 37.6	0.7 - 38.0	51.55	P (?)	Unassigned Permian	456,200mE 5,419,200mN
L05	collapsed before logging attempted								456,100mE 5,416,300mN
L06	6.0 - 37.0	6.0 - 36.9	0.0 - 36.2	0.8 - 6.8		37.76		Basal Beds	451,300mE 5,412,200mN
L07	collapsed before logging attempted								456,300mE 5,419,700mN
L08	0.0 - 18.0	0.0 - 18.1	0.5 - 18.0	0.6 - 16.0		30.24 / 202.05	P (?)	Unassigned Permian	457,100mE 5,417,300mN

t : indicates that 'tasmanites' was recorded in the geological log

b : indicates that basement was reached

045

751046

TABLE 4

WELL-LOGS OF THE GOLDEN VALLEY AREA

BORE HOLE	GEOPHYSICAL METHODS (intervals logged in metres)					TOTAL DEPTH (m)	PROSPECTIVE ZONES INTERPRETED	GEOLOGY[t,b]	APPROXIMATE LOCATION (AMG)
	Single Point Resistance	Self Potential	Natural Gamma	Density	Caliper				
G01	collapsed before logging attempted								459,300mE 5,393,600mN
G02	collapsed before logging attempted								458,100mE 5,391,600mN
G03	0.0 - 41.5	5.5 - 41.7	0.4 - 41.3	0.9 - 41.1	0.9 - 41.5	42.04	P	Quamby Mudst.[b]	460,200mE 5,391,200mN
G04	26.7 - 43.8	26.7 - 43.8	0.3 - 44.8	0.7 - 43.3	0.6 - 43.7	56.72	P	Quamby Mudst.	455,200mE 5,390,600mN
G05	collapsed before logging attempted								463,700mE 5,393,900mN
G06	too shallow to log								468,200mE 5,391,800mN
G07	21.9 - 56.5	22.0 - 56.2	0.3 - 56.1	3.2 - 56.8	0.8 - 56.9	60.65	P	Quamby Mudst.[t]	470,300mE 5,390,900mN
G08	6.2 - 47.0	6.2 - 46.8	0.2 - 47.5	0.6 - 47.4		49.31		Golden Valley Grp.	475,000mE 5,391,500mN
G09	6.0 - 40.3	6.0 - 40.3	0.4 - 40.4	6.6 - 38.8		42.69		Quamby Mudst.	477,000mE 5,391,700mN
G10	4.4 - 16.7	4.3 - 16.6	0.4 - 16.7	4.4 - 16.6		17.95		Quamby Mudst.[b]	477,000mE 5,392,300mN
G10A	collapsed before logging attempted								477,100mE 5,392,600mN
G11	collapsed before logging attempted								476,200mE 5,393,600mN
G12	0.7 - 40.4	0.7 - 40.4	0.4 - 40.5	3.9 - 36.7		343 51.85 32|21		Bogan Gap or Poatina Grp.[b]	485,900mE 5,394,400mN
G13	collapsed before logging attempted								466,800mE 5,387,700mN

[t] : indicates that 'tasmanites' was recorded in the geological log

[b] : indicates that basement was reached

TABLE 5

WELL-LOGS OF THE BEACONSFIELD AREA

BORE HOLE	GEOPHYSICAL METHODS (intervals logged in metres)					TOTAL DEPTH (m)	PROSPECTIVE ZONES INTERPRETED	GEOLOGY[t,b]	APPROXIMATE LOCATION (AMG)
	Single Point Resistance	Self Potential	Natural Gamma	Density	Caliper				
B01	3.8 - 54.8	3.8 - 54.8	0.4 - 54.9	4.0 - 53.9		53.50	P (?)	Lwr. Permian	516,700mE 5,433,500mN
B02	1.6 - 47.0	4.9 - 47.0	0.4 - 47.6	2.8 - 47.2		54.50	P	Lwr. Permian	516,600mE 5,437,000mN
B03	collapsed before logging attempted								514,600mE 5,439,600mN
B04	not drilled								
B05A	18.2 - 24.1	18.2 - 24.1	0.4 - 24.7	0.4 - 24.3		38.50		Liffey Grp.	512,800mE 5,433,800mN
B05B	0.4 - 19.2	2.3 - 19.2	0.3 - 19.3	0.6 - 19.3		20.23 / 1673		Liffey Grp.	512,800mE 5,433,700mN
B05C	collapsed before logging attempted								513,100mE 5,433,500mN
B06	collapsed before logging attempted								510,200mE 5,435,600mN

t : indicates that 'tasmanites' was recorded in the geological log

b : indicates that basement was reached

047

751048

5 cm

Bass Strait

E.L. 17/79

E.L. 18/79

E.L. 21/79

E.L. 19/79

H01 H04 H05 H06-09 H10 H11 H12 H13-15 P01 P02 P03 P04

L01 L02 L03 L04 L05 L06 L07 L08

B01 B02 B03 B05a b&c B06

G01 G02 G03 G04 G05 G06 G07 G08 G09 G10&10A G11 G12 G13

0 5 10 Kilometres

SCALE 1:500,000

MITRE GEOPHYSICS PTY. LTD.

PETRO-QUEST PTY. LTD.

OIL-SHALE PROJECT

HOLE LOCATIONS

DRAWN: J.BISHOP	SCALE: 1:500,000	FIG. 1
TRACED: T.G.D.S.	DATE: June 1981	

751049

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Vol 2/3

Hellyer -	H01, H05, H06, H08, H09, H10, H11, H12, H13, H14, H15
Preolenna -	P01, P02

Vol 3/3

Latrobe -	L01, L03, L04, L06, L08
Golden Valley -	G03, G04, G07, G08, G09, G10, G12
Beaconsfield -	B01, B02, B05A, B05B

SHEET No: 7915-II : 50 000 PROVISIONAL EDITION

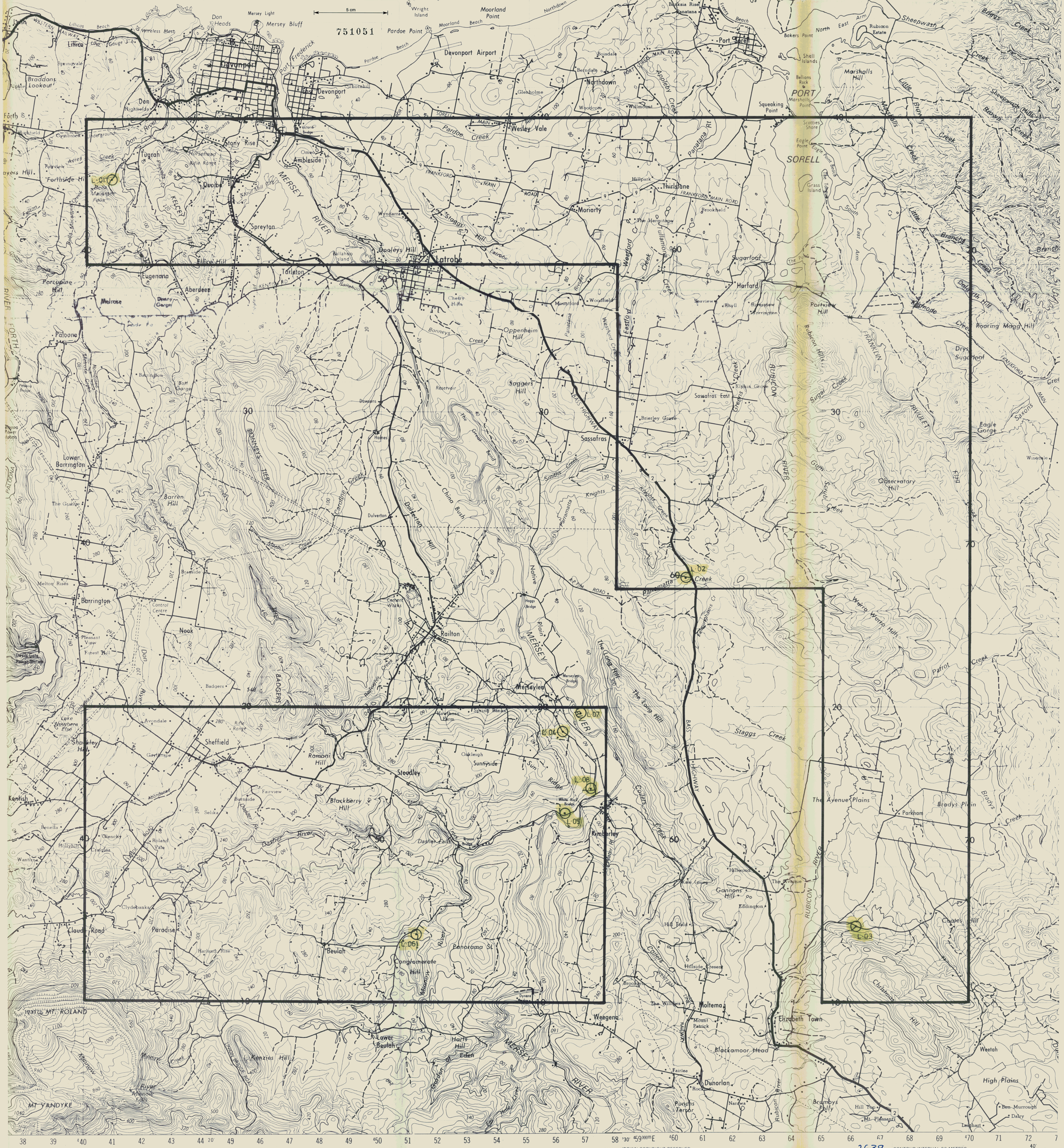
YOLLA

SHEET No: 8015-IV : 50 000 PROVISIONAL EDITION

751050

B

2638



ROWN COPYRIGHT RESERVED

CONTOUR INTERVAL 20 METRES

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2639.

CONTOUR INTERVAL 20 METRES

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CONTOUR INTERVAL 20 METRES

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751052

5 cm

751053


Gog
Range
MERSEY
RIVER
Standard
Dogs Head Hill
Den Plain
Mole
Creek
Mole Creek
Chudleigh
Whatleys Bottom
The Grunter
Mayberry
Caveside
Western Creek
Dairy
Plains
Montana
Dale
Brook
Needles Ridge
Dampers
Red Hills
Lemana
Deloraine
Bengeo
Magnetic
Hills
MEANDER
RIVER
HIGHWAY
Exton
Westbury
Hagley
Quamby Brook
Osmaston
Black Jack Hill
Black Hills
Glenore
Pumicestone Ridge
Long
Ridge
Cubits
Ritchies
Plain
Gibsons Sugarloaf
Thompsons Hill
Kentish Hill
Golden
Valley
Stockers
Muddy
Creek
Meander
QUAMBY BLUFF
Alcheria Sugarloaf
Warners Sugarloaf
Jackeys Marsh
Liffey
WESTERN BLUFF
GREAT
WESTERN
TIERS
Lake Mackenzie
Lake Balmoral
MOTHER CUMMINGS PEAK
Mother
Cummings
Rivulet
IRONSTONE MTN
BASTION BLUFF
PROJECTION BLUFF
LIFFEY BLUFF
TIERS
Lake Nameless
FORTY LAKES PEAK
BLUE PEAKS
DECEPTION POINT
FISHER BLUFF
Lake Explorer
Lake Meander
Lonely Lake
Lake Halkyard
Adams Peak
WESTERN
GREAT
G-01
G-02
G-03
G-04
G-05
G-06
G-07
G-08
G-09
G-10
G-10a
G-31
G-35
5 cm
2641

5 cm
Bell Bay
Interstate Ferry Terminal
Lawrences Bluff
Donovans Bay
Middle Island
Inspection Head
DALRYMPLE
751054
Middle Point
Ilfraville
Beauty Point
Shag Head
York Town
Westward Ho
Big Bay
Dirty Bay
SANCTUARY
RIVER
TAMAR
HIPPOGOREE
HILLS
EAST
TAMAR
HIGHWAY
Doctors Flats
Mount Direction
Evergreen
The Glen
Molmarney Sugarloaf
Retreat
Lebrina
Rowella
West Bay
Davis Cove
Kaoota
Beaconsfield
Richmond Hill
Little Devils Elbow
Sidmouth
Redwood Bay
Rocky Point
Spring Bay
Batman Bridge
Retreat Cove
Borretts Point
Brickmakers Pt
Mowbray Point
Craigburn
Kayena
Hazelwood
Beams
Constant Spring
Hillwoodvale
Hillwood
Egg Island Point
Egg Island
Leviathan Hill
Barnes Hill
Simmonds Hill
Anderson Creek
Mt Vulcan
Dans Hill
Ralstons Hill
Kildare
Gadfly Hill
Tea Walla
Mt Direction
Upbeat
Lower Turners Marsh
Bangor
Bacala
Brooksdale
B-01
B-02
B-03
B-04
B-05
B-06
B-07
Tunnel
Bromley
Lilydale
Katoola
Turners Marsh
Lalla
Mount Direction
DISMAL
RANGE
PIPERS
RIVER
Second River
Third River
Wings Flats
Flowery Gully
Peaked Hill
Marraway
High View
Robigana
Supply Bay
Paper Beach
Lightfoot Bay
Swan Point
TAMAR
RIVER
Lorinna
Den Bella
Walhalla
Little Swan Point
Swan Bay
Likemans Hill
Highfield
Cottons Hill
Holwell
1419 STEWARTS HILL
Rookery Creek
Sunbury
Winkleigh
Farnham
Wymblingham
Hillvue
Everest
Exeter
Glen Rose
Blackwall
Lanena
Gravelly Beach
Native Point
Low Angelo
Doctors Rise
Gaunts Hill
Windermere
Beecrofts Hill
Browns Hill
Underwood
Brambles Hill
Nelsons Shoal
Garden View
Cimitiere Pt
Rosevears
Dilston
Pedders Pt
Dog Point
Lone Pine Pt
Browns Bluff
Loch Lea
Freshwater Point
Finger Post Hill
Holloways Hill
Barbers Bottom
Frossets Forest
Rocherlea Hill
MT CARELESS
Kelly's Lookout
Little Black Sugarloaf
Frankford
Glengarry
Maryland
Notley Hills
Glenwood Park
Jeanyfield
Yellow Marsh
Bridgenorth
The Pump
Legana
Tamar Island
Green Hillock Point
Alanvale
Rocherlea
Mayfield
Newnham
Mowbray Heights
Riverside North
Haystock Pt
WEST TAMAR HIGHWAY
502 BLACK SUGARLOAF
Four Springs
Four Springs Plain
The Bald Top
Dido Hills
80
90
10
20
40
30

2642

SINGLE POINT RESISTANCE

25 Ohms

0 m
10 m
20m
30m
40m
50m
60m

255 — 505

250 Ohms full scale

SELF POTENTIAL

10 Millivolts

− +

-97 — 3

100 Millivolts full scale

NATURAL GAMMA

5 Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

100 Counts Per Second

0m
10m
20m
30m
40m
50m
60m

800 — 1800

1000 Counts Per Second full scale

GEOLOGY

Approx 170m ASL

ALLUVIUM

2 10m

MUDSTONE

16·20m

30 00m

Cored Section

33·25m

SILTSTONE

39 0m

43 24m EOH

NOTES:

1. Logging rates· electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants· 2 secs for gamma and density logs.
3. Spacing on density probe. 35cm

751055

5 cm

MITRE GEOPHYSICS PTY. LTD.

GEOPHYSICAL WELL– LOGS

HELLYER AREA

HOLE NO. HOI 2609

DRAWN JB	VERTICAL SCALE 1 100	FIG.
TRACED TGDS	DATE LOGGED 8-2-'81	

82-1788 2/3

SINGLE POINT RESISTANCE

←100→
Ohms

0 m
10 m
20m
30m
40m
50m
60m

resistivity 'saturated'

>1000

1000 Ohms full scale

SELF POTENTIAL

←50→
Millivolts

– +

-275 225

500 Millivolts full scale

NATURAL GAMMA

←5→
Counts Per Second

0 50

50 Counts Per Second full scale

DENSITY

←500→
Counts Per Second

0m
10m
20m
30m
40m
50m
60m

0 5000

5000 Counts Per Second full scale

GEOLOGY

Approx 500m ASL

ALLUVIUM

18m

BASALT

25·75m EOH

NOTES:

1. Logging rates: electrical logs 15m/min
   nuclear logs 6m/min.
2. Time constants 2 secs for gamma and density logs
3. Spacing on density probe. 35cm.

751056

5 cm

MITRE GEOPHYSICS PTY. LTD.

GEOPHYSICAL WELL– LOGS

HELLYER AREA

HOLE NO. H05 2610

DRAWN JB	VERTICAL SCALE 1 100	FIG.
TRACED TGDS	DATE LOGGED 17-1-'81	

82-1788 2/3

SINGLE POINT RESISTANCE

25
Ohms

0 m
10 m
20 m
30 m
40 m
50 m
60 m

200 — 450

250 Ohms full scale

SELF POTENTIAL

10
25
Millivolts

− +

(Not Calibrated)

-210 — -110

100 Millivolts full scale

250 Millivolts full scale

NATURAL GAMMA

5
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

50
100
Counts Per Second

500 / 270 — 1000 / 1270

500 Counts Per Second full scale

1000 Counts Per Second full scale

(2 different probes used. The 500cps full scale density log was run with the caliper log.)

CALIPER

(hole diameter)

25·8
Millimetres

0 — 258

258 Millimetres full scale

GEOLOGY

Approx 480m A.S.L.

ALLUVIUM

3·0m

MUDSTONE

54·0m

Cored Section

56·98m E.O.H.

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs. for gamma and density logs
3. Spacing on density probe: 35cm.

751057

5 cm

MITRE GEOPHYSICS PTY. LTD.

GEOPHYSICAL WELL-LOGS

HELLYER AREA 2611

HOLE NO. H 06

DRAWN J.B	VERTICAL SCALE 1:100	FIG.
TRACED T.G.D.S	DATE LOGGED 16 4 '81	

82-1788 2B

SINGLE POINT RESISTANCE

25
Ohms

0m
10m
20m
30m
40m
50m
60m

375 — 625

250 Ohms full scale

SELF POTENTIAL

10
Millivolts

− +

-160 — -60

100 Millivolts full scale

NATURAL GAMMA

5
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

100
Counts Per Second

0m
10m
20m
30m
40m
50m
60m

340 — 1340

1000 Counts Per Second full scale

GEOLOGY

Approx 440m ASL

ALLUVIUM

1.9m

MUDSTONE

11.96m

SILTSTONE

21.3m

25.1m

SHALE

26.45m

27.0m

SANDSTONE

30.0m

TILLITE

Cored Section

35.59m

E.O.H.

NOTES:

1. Logging rates: electrical logs 15m/min.
   nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe: 35cm

751058

5 cm

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GEOPHYSICAL WELL-LOGS
HELLYER AREA
HOLE NO. H08 2612

DRAWN J.B.	VERTICAL SCALE 1:100	FIG.
TRACED T.G.D.S.	DATE LOGGED 17-1-'81	

82-1788 2/3

SINGLE POINT RESISTANCE

→| 25 |←
Ohms

0 m
10 m
20m
30m
40m
50 m
60m

395 — 645

← 250 Ohms full scale →

SELF POTENTIAL

→| 10 |←
Millivolts

− +

-95 — 5

← 100 Millivolts full scale →

NATURAL GAMMA

→| 5 |←
Counts Per Second

13 — 63

← 50 Counts Per Second full scale →

DENSITY

→| 250 |←
Counts Per Second

500 — 3000

← 2500 Counts Per Second full scale →

CALIPER

(hole diameter)
→| 25·8 |←
Millimetres

0 — 258

← 258 Millimetres full scale →

GEOLOGY

Approx 440m A.S.L

ALLUVIUM

2 1m

9·24m

MUDSTONE

Cored Section

55·4m
TILLITE
56 31 E O H

NOTES·

1. Logging rates· electrical logs 15m/min. nuclear logs 6 m/min.
2. Time constants· 2 secs. for gamma and density logs.
3 Spacing on density probe: 35cm.

751059

5 cm

MITRE GEOPHYSICS PTY. LTD.

GEOPHYSICAL WELL—LOGS
HELLYER AREA
HOLE NO. H 09 2613

DRAWN J B	VERTICAL SCALE· 1:100	FIG.
TRACED T G D S	DATE LOGGED 16 4 '81	

82-1788 2/23

SINGLE POINT RESISTANCE

→| 50 |←
Ohms

0 m
10 m
20m
30m
40 m
50 m
60 m

720 — 1220

500 Ohms full scale

SELF POTENTIAL

→| 25 |←
Millivolts

− +

-50 — 200

250 Millivolts full scale

NATURAL GAMMA

→| 5 |←
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

250
→| 500 |←
Counts Per Second

500 — 0 — 3000 — 5000

2500 Counts Per Second full scale
5000 Counts Per Second full scale

(2 different probes used. 2500 cps full scale density log was run with caliper log.)

CALIPER

(hole diameter)
→| 25·8 |←
Millimetres

0 — 258

258 Millimetres full scale

GEOLOGY

APPROX 500m A.S.L.

ALLUVIUM — 9·9m

SANDY SILTSTONE — 17·0m

SILTSTONE — 21·0m

PEAT — 22·0m

CLAY — 35·6m

SILTSTONE — 45·0m

MUDSTONE
Cored Section — 49·18m

GRANITE, TILLITE
50·47m E O H

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe: 35cm.

751060

5 cm

MITRE GEOPHYSICS PTY. LTD.

GEOPHYSICAL WELL-LOGS
HELLYER AREA
HOLE NO. H 10 2614

DRAWN J.B.	VERTICAL SCALE: 1:100	FIG.
TRACED. T.G.D.S.	DATE LOGGED 16 4 '81	

82-1788 2B

SINGLE POINT RESISTANCE

25 Ohms

0 m
10 m
20m
30m
40m
50m
60m

>1000

250 Ohms full scale

SELF POTENTIAL

10 Millivolts

\- +

-200 -120

100 Millivolts full scale

NATURAL GAMMA

5 Counts Per Second

0 50

50 Counts Per Second full scale

DENSITY

100
500 Counts Per Second

0m
10m
20m
30m
40m
50m
60m

600 0
1600 5000

1000 Counts Per Second full scale
5000 Counts Per Second full scale

GEOLOGY

APPROX 480m A S L

ALLUVIUM

3 1m

MUDSTONE

13 0m

SILTSTONE

37 45m Cored Section
37 81m BASALT

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe. 35cm

751061

5 cm

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GEOPHYSICAL WELL-LOGS
HELLYER AREA
HOLE NO. H11 2615

DRAWN JB	VERTICAL SCALE 1 100	FIG.
TRACED TG DS	DATE LOGGED 17-1-'81	

82-1788 2/3

SINGLE POINT RESISTANCE

→|25|←
Ohms

0 m
10 m
20m
30m
40m
50m
60m
70m
80 m

460

250 Ohms full scale

SELF POTENTIAL

→|10 25|←
Millivolts

− +

-113 -13

not calibrated

100 Millivolts full scale
250 Millivolts full scale

NATURAL GAMMA

→| 5 |←
Counts Per Second

0 50

50 Counts Per Second full scale

DENSITY

→|100|←
Counts Per Second

460 1460

1000 Counts Per Second full scale

CALIPER

(hole diameter)
→|25·8|←
Millimetres

0 m
10 m
20m
30m
40m
50m
60m
70m
80m

0 258mm

258 Millimetres full scale

GEOLOGY

Approx 480m ASL
ALLUVIUM
2·85m
4·10m
SHALE
12·00m
MUDSTONE
23·00m
SHALE
26·90m
Cored Section
38·39m
MUDSTONE
75·55m E.O.H

751062

5 cm

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe: 35cm.

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GEOPHYSICAL WELL-LOGS
HELLYER AREA
HOLE NO. H12 2616

DRAWN J.B.	VERTICAL SCALE: 1:100	FIG.
TRACED: T.G.D.S.	DATE LOGGED: 17-1-1981	

82-1788 2/3

SINGLE POINT RESISTANCE

25
Ohms

0 m
10 m
20 m
30 m
40 m
50 m
60 m

200 — 450

250 Ohms full scale

SELF POTENTIAL

10
Millivolts

− +

-20 / 47 — 80 / 147

100 Millivolts full scale

NATURAL GAMMA

5
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

25
100
Counts Per Second

475 / 0 — 725 / 1000

250 Counts Per Second full scale
1000 Counts Per Second full scale

(2 different probes used. 250 cps full scale density log was run with caliper log.)

CALIPER

(hole diameter)

25·8
Millimetres

0 — 258

258 Millimetres full scale

GEOLOGY

Approx 440m A S L

MUDSTONE

2·08m

SHALE

2·96m

Tasmanites

Tasmanites

MUDSTONE

Cored Section

46·07 E O H

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe: 35cm.

751063

5 cm

MITRE GEOPHYSICS PTY. LTD.

GEOPHYSICAL WELL—LOGS

HELLYER AREA

HOLE NO. H 13 2617

DRAWN J B	VERTICAL SCALE 1:100	FIG.
TRACED T G D S	DATE LOGGED 16·4·81	

82-1788 2/3

SINGLE POINT RESISTANCE

Ohms

Dry Hole

DRY HOLE

Ohms full scale

SELF POTENTIAL

Millivolts

− +

Dry Hole

DRY HOLE

Millivolts full scale

NATURAL GAMMA

5

Counts Per Second

0 50

50 Counts Per Second full scale

DENSITY

100
500

Counts Per Second

1000 0
5000 2000

1000 Counts Per Second full scale
5000 Counts Per Second full scale

GEOLOGY

SHALE

100m

Cored Section

MUDSTONE

21 45m E O H

0m
10m
20m
30m
40m
50m
60m

751064

5 cm

NOTES:

1. Logging rates: electrical logs 15m/min.
   nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe: 35cm.

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GEOPHYSICAL WELL-LOGS

HELLYER AREA 2618

HOLE NO. H14

DRAWN J.B.	VERTICAL SCALE 1:100	FIG.
TRACED TGDS	DATE LOGGED. 6-2-'81	

82-1788 2/2

SINGLE POINT RESISTANCE

→| 25 |←
Ohms

0 m
10 m
20m
30m
40 m
50 m
60m

320 — 570

250 Ohms full scale

SELF POTENTIAL

→| 10 |←
Millivolts

− +

-230 — +130

100 Millivolts full scale

NATURAL GAMMA

→| 5 |←
Counts Per Second

15 — 65

50 Counts Per Second full scale

DENSITY

25
→| 50 |←
Counts Per Second

475 / 330 — 725 / 830

250 Counts Per Second full scale
500 Counts Per Second full scale

(2 different probes used. The 250cps full scale density log was run with the caliper log.)

CALIPER

(hole diameter)

→|25·8|←
Millimetres

0 — 258

258 Millimetres full scale

GEOLOGY

Approx 480m. ASL
SHALE
1.00m
Tasmanite Spheroids
MUDSTONE
Cored Section
39 33m E O H

NOTES:

1. Logging rates· electrical logs 15m/min. nuclear logs 6 m/min.
2. Time constants· 2 secs. for gamma and density logs.
3. Spacing on density probe: 35cm.

751065

5 cm

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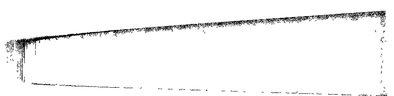
GEOPHYSICAL WELL—LOGS
HELLYER AREA
HOLE NO. H 15 2619

DRAWN· J.B	VERTICAL SCALE· 1:100	FIG.
TRACED T.G.D.S	DATE LOGGED 16 4 '81	

82-1788 2/3



SINGLE POINT RESISTANCE

25
Ohms

0m
10m
20m
30m
40m
50m
60m

275 — 525

250 Ohms full scale

SELF POTENTIAL

10
Millivolts

− +

-97 — 3

100 Millivolts full scale

NATURAL GAMMA

5
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

100
Counts Per Second

0m
10m
20m
30m
40m
50m
60m

620 — 1620

1000 Counts Per Second full scale

GEOLOGY

ALLUVIUM
2·00m
5·00m
SANDSTONE
Cored Section
29·57m E.O.H.

751066

5 cm

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe. 35cm.

MITRE GEOPHYSICS PTY. LTD.		
GEOPHYSICAL WELL-LOGS PREOLENNA AREA HOLE NO. P 01 2620		
DRAWN J.B.	VERTICAL SCALE 1:100	FIG.
TRACED T.G.D.S	DATE LOGGED: 8.2.'81	

82-1788 2/3

SINGLE POINT RESISTANCE

25
Ohms

0 m
10 m
water table
20m
30m
40m
50m
60m

325 — 575

250 Ohms full scale

SELF POTENTIAL

10
Millivolts

− +

water table

-60 — 40

100 Millivolts full scale

NATURAL GAMMA

5
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

500
1000
Counts Per Second

0m
10m
20m
30m
40m
50m
60m

1500 — 6500
0 — 10000

5 000 Counts Per Second full scale
10 000 Counts Per Second full scale

GEOLOGY

ALLUVIUM
8.00m
SANDSTONE
Cored Section
32.00m
SILTSTONE
37.00m
SANDSTONE
48·42m EOH

751067

5 cm

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe. 35cm.

MITRE GEOPHYSICS PTY. LTD.

GEOPHYSICAL WELL-LOGS
PREOLENNA AREA
HOLE NO. P02 2621

DRAWN J.B.	VERTICAL SCALE 1 100	FIG.
TRACED T.G.D.S	DATE LOGGED: 8 2·'81	

82-1788 2/3

751068

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MINERAL EXPLORATION AND ENGINEERING CONSULTANTS

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WELL-LOGS FOR:

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- **Preolenna** - P01, P02

Vol 3/3

- **Latrobe** - L01, L03, L04, L06, L08
- **Golden Valley** - G03, G04, G07, G08, G09, G10, G12
- **Beaconsfield** - B01, B02, B05A, B05B

SINGLE POINT RESISTANCE

25 Ohms

SELF POTENTIAL

10 Millivolts

− +

NATURAL GAMMA

5 Counts Per Second

DENSITY

Counts Per Second

GEOLOGY

0m
10m
20m
30m
40m
50m
60m

ALLUVIUM

3·0m

SILTSTONE

SCHISTS AND SLATES

30·25m
Cored Section
31·25m

585 — 835

250 Ohms full scale

-120 — -20

100 Millivolts full scale

0 — 50

50 Counts Per Second full scale

Counts Per Second full scale

751069

5 cm

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe: 35cm.

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GEOPHYSICAL WELL-LOGS

LATROBE AREA

HOLE NO. L OI 2622

DRAWN J.B.	VERTICAL SCALE 1:100	FIG.
TRACED T.G.D.S	DATE LOGGED 24-1-1981	

82-1788 2/6

SINGLE POINT RESISTANCE

→|25|←
Ohms

0 m
10 m
20m
30m
40m
50 m
60 m

water table

205 — 455

250 Ohms full scale

SELF POTENTIAL

→|10|←
Millivolts

− +

water table

-140 — -40

100 Millivolts full scale

NATURAL GAMMA

→|5|←
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

→|500|←
Counts Per Second

0 — 5000

5000 Counts Per Second full scale

CALIPER

(hole diameter)
→|25·8|←
Millimetres

0 m
10 m
20m
30m
40m
50m
60m

0 — 258

258 Millimetres full scale

GEOLOGY

ALLUVIUM
7·25m
SANDSTONE
19·00m
MUDSTONE
24·00m
SANDY SILTSTONE
30·80m
34·00m
SILTSTONE
51·25 EOH

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs. for gamma and density logs.
3. Spacing on density probe: 35cm.

751070

5 cm

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GEOPHYSICAL WELL—LOGS

LATROBE AREA

HOLE NO. L03 2623

DRAWN J.B.	VERTICAL SCALE: 1:100	FIG.
TRACED: TGDS	DATE LOGGED	

82-1788 2/2

SINGLE POINT RESISTANCE

→| 50 |←
Ohms

0 m
10 m
20m
30 m
40 m
50 m
60 m

water table

130 — 630

500 Ohms full scale

SELF POTENTIAL

→| 25 |←
− Millivolts +

water table

-150 — 100

250 Millivolts full scale

NATURAL GAMMA

→| 5 |←
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

→|250|←
Counts Per Second

650 — 3150

2500 Counts Per Second full scale

CALIPER

(hole diameter)
→|25·8|←
Millimetres

0 — 258

258 Millimetres full scale

NOTE: No bowspring attached to density probe.

GEOLOGY

ALLUVIUM
2·00m
SILTSTONE
9·80m
10·20m
SANDSTONE
20·00m
SANDY SILTSTONE
21·70m
MUDSTONE
29·50m
30·55m
31·00m
SANDSTONE
Cored Section
51·55m E.O.H

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs. for gamma and density logs.
3. Spacing on density probe: 35cm.

75107 one

5 cm

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GEOPHYSICAL WELL-LOGS
LATROBE AREA
HOLE NO. L 04 2624

DRAWN J.B.	VERTICAL SCALE: 1:100	FIG.
TRACED. T.G.D.S	DATE LOGGED:	

82-1788 3/3

SINGLE POINT RESISTANCE

25 Ohms

0 m
10 m
20m
30m
40m
50m
60m

735 — 985

250 Ohms full scale

SELF POTENTIAL

10 Millivolts

− +

water table

-170 — -70

100 Millivolts full scale

NATURAL GAMMA

5 Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

500 Counts Per Second

0 m
10 m
20m
30m
40m
50m
60m

1500 — 6500

5000 Counts Per Second full scale

GEOLOGY

ALLUVIUM

2.80m

SANDY SILTSTONE

10.60m

16.03m

MUDSTONE

Cored Section

37.76m E.O.H

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe. 35cm

751072

5 cm

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GEOPHYSICAL WELL-LOGS

LATROBE AREA

HOLE NO. L06 2625

DRAWN JB	VERTICAL SCALE 1:100	FIG.
TRACED TGDS	DATE LOGGED: 7.2.'81	

82-1788 g/b

SINGLE POINT RESISTANCE

100
Ohms

saturated

SELF POTENTIAL

10
Millivolts

– +

NATURAL GAMMA

5
Counts Per Second

DENSITY

500
1000
Counts Per Second

GEOLOGY

ALLUVIUM

2.00m

SANDSTONE

17.80m

MUDSTONE

30.24m EOH

0m
10m
20m
30m
40m
50m
60m

>1000
1000 Ohms full scale

-63 37
100 Millivolts full scale

0 50
50 Counts Per Second full scale

1500 6500
0 10000
5000 Counts Per Second full scale
10000 Counts Per Second full scale

751073

5 cm

NOTES:

1. Logging rates: electrical logs 15m/min.
   nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe: 35cm.

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GEOPHYSICAL WELL-LOGS

LATROBE AREA

HOLE NO. L 08 2626

DRAWN J.B.	VERTICAL SCALE 1:100	FIG.
TRACED T.G.D.S	DATE LOGGED 7 2 '81	

82-1788 3/3

SINGLE POINT RESISTANCE

→100←
Ohms

0 m
10 m
20m
30 m
40 m
50 m
60 m

resistance saturated

1000 Ohms full scale

SELF POTENTIAL

→25←
Millivolts

− +

-265 -15

250 Millivolts full scale

NATURAL GAMMA

→5←
Counts Per Second

0 50

50 Counts Per Second full scale

DENSITY

→250←
Counts Per Second

0 2500

2500 Counts Per Second full scale

CALIPER

(hole diameter)
→25·8←
Millimetres

0 m
10 m
20m
30 m
40 m
50 m
60 m

0 258

258 Millimetres full scale

GEOLOGY

ALLUVIUM
3·40m
MUDSTONE
Cored Section
32·90m
SANDSTONE
33·70m
TILLITIC MUDSTONE
37·20m
GREYWACKE (?)
42·04m E.O.H.

NOTES:

1. Logging rates: electrical logs 15m/min.
   nuclear logs 6 m/min.
2. Time constants: 2 secs. for gamma and density logs.
3. Spacing on density probe: 35 cm.

751074

5 cm

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GEOPHYSICAL WELL-LOGS

GOLDEN VALLEY AREA

HOLE NO. G 03

2627

DRAWN J.B	VERTICAL SCALE 1·100	FIG.
TRACED· T G D S	DATE LOGGED 7-2-1981	

82-1788 3/3

SINGLE POINT RESISTANCE

25 Ohms

0 m
10 m
20 m
30 m
40 m
50 m
60 m

Water Table

>1000

250 Ohms full scale

SELF POTENTIAL

10 Millivolts

− +

Water Table

-95 5

100 Millivolts full scale

NATURAL GAMMA

5 Counts Per Second

0 50

50 Counts Per Second full scale

DENSITY

500 Counts Per Second

500 5500

5000 Counts Per Second full scale

CALIPER

(hole diameter)

25·8 Millimetres

0 m
10 m
20 m
30 m
40 m
50 m
60 m

0 258

258 Millimetres full scale

GEOLOGY

ALLUVIUM

3·00m

MUDSTONE

46·07m

Cored Section

56·72m E O H

5 cm

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6 m/min.
2. Time constants: 2 secs. for gamma and density logs.
3. Spacing on density probe: 35 cm.

MITRE GEOPHYSICS PTY. LTD.		
GEOPHYSICAL WELL—LOGS		
GOLDEN VALLEY AREA		
HOLE NO. G 04 2628		
DRAWN J.B.	VERTICAL SCALE 1:100	FIG.
TRACED. T.G.D.S.	DATE LOGGED: 7-2-'81	

82-1788 3/3

SINGLE POINT RESISTANCE

→| 25 |←
Ohms

0 m
10 m
20 m
Water Table
30 m
40 m
50 m
60 m

55 — 305

250 Ohms full scale

SELF POTENTIAL

→| 10 |←
Millivolts

− +

Water Table

-96 — 4

100 Millivolts full scale

NATURAL GAMMA

→| 5 |←
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

→|250|←
Counts Per Second

0 — 2500

2500 Counts Per Second full scale

CALIPER

(hole diameter)

→|25·8|←
Millimetres

0 m
10 m
20 m
30 m
40 m
50 m
60 m

0 — 258

258 Millimetres full scale

GEOLOGY

ALLUVIUM
2·00m
6·00m
MUDSTONE
Cored Section
Tasmanite Spheroids
60·65 E.O.H.

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6 m/min.
2. Time constants: 2 secs. for gamma and density logs.
3. Spacing on density probe: 35 cm.

751076

5 cm

MITRE GEOPHYSICS PTY. LTD.

GEOPHYSICAL WELL—LOGS

GOLDEN VALLEY AREA

HOLE NO. G 07 2629

DRAWN J.B.	VERTICAL SCALE: 1:100	FIG.
TRACED: T.G.D.S	DATE LOGGED 7-2-'81	

82-1788 8L

SINGLE POINT RESISTANCE

25
Ohms

0m
10m
20m
30m
40m
50m
60m

330 — 580

250 Ohms full scale

SELF POTENTIAL

10
Millivolts

− +

-156 — -56

100 Millivolts full scale

NATURAL GAMMA

5
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

50
500
Counts Per Second

0m
10m
20m
30m
40m
50m
60m

450 — 950
0 — 5000

500 Counts Per Second full scale
5000 Counts Per Second full scale

GEOLOGY

ALLUVIUM
2 50m
MUDSTONE
6 40m
8 00m
SILTSTONE
21 97m
Cored Section
MUDSTONE
49 31m EOH

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe. 35cm

751077

5 cm

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GEOPHYSICAL WELL– LOGS

GOLDEN VALLEY AREA

HOLE NO. G08 2630

DRAWN J.B.	VERTICAL SCALE 1:100	FIG.
TRACED T.G.D.S	DATE LOGGED 7-2-'81	

82-1788 3/3

SINGLE POINT RESISTANCE

25 Ohms

0 m

Water Table

10 m

20m

30m

40m

50m

60m

575

825

250 Ohms full scale

SELF POTENTIAL

10 Millivolts

\- +

Water Table

-230

-130

100 Millivolts full scale

NATURAL GAMMA

5 Counts Per Second

0

50

50 Counts Per Second full scale

DENSITY

50 Counts Per Second

0m

10m

20m

30m

40m

50m

60m

290

790

500 Counts Per Second full scale

GEOLOGY

SHALE

1.87m

2.10m

Cored Section

MUDSTONE

42.69 EOH

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs
3. Spacing on density probe. 35cm

751078

5 cm

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GEOPHYSICAL WELL-LOGS

GOLDEN VALLEY AREA

HOLE NO. G09 2631

DRAWN J.B.	VERTICAL SCALE 1:100	FIG.
TRACED T.G.D.S	DATE LOGGED 7-2-'81	

82-1788 3/3

SINGLE POINT RESISTANCE

50
Ohms

0 m
10 m
20m
30m
40m
50m
60m

100 — 600

500 Ohms full scale

SELF POTENTIAL

25
Millivolts

− +

-141 — 109

250 Millivolts full scale

NATURAL GAMMA

5
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

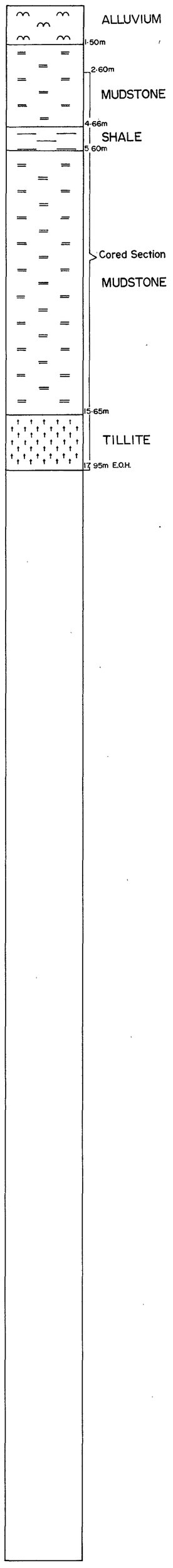
100
Counts Per Second

0m
10 m
20m
30m
40m
50m
60m

480 — 1480

1000 Counts Per Second full scale

GEOLOGY



NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe. 35cm

751079

5 cm

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GEOPHYSICAL WELL-LOGS

GOLDEN VALLEY AREA

HOLE NO. G10 2632

DRAWN JB	VERTICAL SCALE 1:100	FIG.
TRACED TGDS	DATE LOGGED. 7-2-'81	

82-1788 3/3

SINGLE POINT RESISTANCE

25
Ohms

0m
10m
20m
30m
40m
50m
60m

335 — 585

250 Ohms full scale

SELF POTENTIAL

25
Millivolts

– +

-175 — 75

250 Millivolts full scale

NATURAL GAMMA

5
Counts Per Second

10 — 60

50 Counts Per Second full scale

DENSITY

100
Counts Per Second

0m
10m
20m
30m
40m
50m
60m

600 — 1600

1000 Counts Per Second full scale

GEOLOGY

ALLUVIUM
1.30m
6.18m
14.00m
SANDSTONE
Cored Section
45.57m
MUDSTONE
51.40m
51.85m E.O.H.
TILLITES

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe. 35cm

751080

5 cm

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GEOPHYSICAL WELL-LOGS

GOLDEN VALLEY AREA

HOLE NO. G12 2633

DRAWN J.B.	VERTICAL SCALE 1:100	FIG.
TRACED T.G.D.S.	DATE LOGGED 4-2-81	

82-1788 2/3

SINGLE POINT RESISTANCE

→| 25 |←
Ohms

0 m
10 m
20m
30m
40m
50m
60m

255
505

250 Ohms full scale

SELF POTENTIAL

→| 10 |←
Millivolts

– +

water table

-125
-25

100 Millivolts full scale

NATURAL GAMMA

→| 5 |←
Counts Per Second

0
50

50 Counts Per Second full scale

DENSITY

→| 100 |←
Counts Per Second

0m
10m
20m
30m
40m
50m
60m

790
1790

1000 Counts Per Second full scale

GEOLOGY

ALLUVIUM

4.00m

MUDSTONE

37.00m

SILTSTONE

SANDSTONE

49.00m

50.10m SHALE
50.20m SANDSTONE
50.50m SHALE
50.80m SANDSTONE

Cored Section

52.55m SHALE
52.65m SANDSTONE

53.50m

751081

5 cm

NOTES:

1. Logging rates: electrical logs 15m/min.
   nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe: 35cm.

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GEOPHYSICAL WELL-LOGS

BACALA AREA

HOLE NO. B 01 2634

DRAWN J.B.	VERTICAL SCALE 1:100	FIG.
TRACED T.G.D.S.	DATE LOGGED 11.2.'81	

82-1788 3/5

SINGLE POINT RESISTANCE

50 Ohms

water table

0m
10m
20m
30m
40m
50m
60m

230 — 730

500 Ohms full scale

SELF POTENTIAL

10 Millivolts

− +

-280 — -180

100 Millivolts full scale

NATURAL GAMMA

5 Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

100 Counts Per Second

0m
10m
20m
30m
40m
50m
60m

220 — 1220

1000 Counts Per Second full scale

GEOLOGY

ALLUVIUM

40

MUDSTONE

38.80m

SANDSTONE

49.00m

50.00m

CONGLOMERATE

Cored Section

54.50m EOH

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe: 35cm.

751082

5 cm

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GEOPHYSICAL WELL-LOGS

BACALA AREA

HOLE NO. B 02 2635

DRAWN JB	VERTICAL SCALE 1:100	FIG.
TRACED TGDS	DATE LOGGED 12 2 '8	

82-1788 2/3

SINGLE POINT RESISTANCE

25
Ohms

0 m
10 m
20m
30m
40m
50m
60m

water table

515
765

250 Ohms full scale

SELF POTENTIAL

10
Millivolts

\- +

water table

-205
-105

100 Millivolts full scale

NATURAL GAMMA

5
Counts Per Second

0
50

50 Counts Per Second full scale

DENSITY

500
Counts Per Second

0m
10m
20m
30m
40m
50m
60m

320
5320

5000 Counts Per Second full scale

GEOLOGY

0 60m	ALLUVIUM
1 50m	SANDSTONE
18 67m	SHALE
19·03m	SANDSTONE
19 57m	SHALE
20·24m	SANDSTONE
21 50m	SHALE
21·95m	Core missing (SHALE ?)
22·57m	SHALE
23·58m	SANDSTONE
24 10m	SHALE
26 43m	Core missing
27·17m	SHALE
27·25m	SANDY SILTSTONE
28·01m	SHALE
28 66m	SILTSTONE
30·11m	SHALE
30·97m	Core missing
31·09m	SANDY SILTSTONE
33 63m	SHALE
33 81 m	SANDSTONE
36 81m	SHALE
37·24m	SANDSTONE
37 87m	SHALE
37·97m	SANDSTONE — E.O.H
38·50m	

Cored Section

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe: 35cm.

751083

5 cm

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GEOPHYSICAL WELL– LOGS

BACALA AREA

HOLE NO. B 05a 2636

DRAWN: J.B.	VERTICAL SCALE 1 100	FIG.
TRACED: T.G D.S.	DATE LOGGED 12 2 '81	

82-1788 2/3

SINGLE POINT RESISTANCE

50
Ohms

0m
10m
20m
30m
40m
50m
60m

650 — 1150

500 Ohms full scale

SELF POTENTIAL

25
Millivolts

− +

-140 — 110

250 Millivolts full scale

NATURAL GAMMA

5
Counts Per Second

0 — 50

50 Counts Per Second full scale

DENSITY

100
500
Counts Per Second

0m
10m
20m
30m
40m
50m
60m

750 — 1750
0 — 5000

1000 Counts Per Second full scale
5000 Counts Per Second full scale

GEOLOGY

ALLUVIUM
1 50m
SANDSTONE
8 02m
SHALE
9 10m
SANDSTONE
Cored Section
20 23m E.O H

751084

5 cm

NOTES:

1. Logging rates: electrical logs 15m/min. nuclear logs 6m/min.
2. Time constants: 2 secs for gamma and density logs.
3. Spacing on density probe. 35cm.

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GEOPHYSICAL WELL– LOGS

BACALA AREA 2637

HOLE NO. B 05b

DRAWN JB	VERTICAL SCALE 1 100	FIG.
TRACED TGDS	DATE LOGGED 10 2 '81	

82-1788 3/3