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PROGRESS REPORT

AUTHORITIES TO PROSPECT 354M & 375M

UNDILLA BASIN

NORTH WEST QUEENSLAND

QLD MINES DEPT
GSC 004658 CA

PLANT FOODS DIVISION

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

OPEN FILE

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PROGRESS REPORT
AUTHORITIES TO PROSPECT 354M & 375M
UNDILLA BASIN
NORTH WEST QUEENSLAND

INTRODUCTION

Authority to Prospect 354M was granted to Continental Oil Company of Australia Ltd. for a period of two years from 1st July, 1966. Originally the area comprised approximately 1023 square miles. Subsequently, this area was reduced to 500 square miles on 1st July, 1967, as agreed to in the Authority to Prospect.

On the 1st January, 1967, Authority to Prospect 375M was granted. This comprises approximately 467.5 square miles, which must be reduced to 100 square miles on 1st January, 1968. This Authority to Prospect was taken out to cover southern extensions on phosphate deposits, discovered in the initial drilling programme in 1966.

Precise descriptions of both Authorities are contained in the original documents.

The positions of corner points and boundaries of the Authorities to Prospect have been fixed by an authorised surveyor.

SUMMARY AND CONCLUSION

The Middle Cambrian section of the Mt. Isa area was selected as the most promising section in which to prospect for phosphate deposits. This opinion was based on a literature study of the sedimentary basins of Eastern Australia (see Fitzpatrick & Grasso February, 1966), the examination of cores and cuttings from the Middle Cambrian section and a field reconnaissance of the area.

While the reconnaissance did not reveal a phosphatic section of note, the carbonates, which form the bulk of the outcrop, were mildly phosphatic. Cores and cuttings from the Black Mountain well to the south and the Morstone well to the west, also contained phosphate.

An initial exploratory drilling campaign, designed to penetrate each member of the Middle Cambrian section was then proposed.

In the second well drilled, D-Tree No. 1, R. Grasso detected an encouraging phosphatic section from 99 feet to 132 feet. The highest analysis by AMDEL was 17.1% P_2O_5 at 112 feet.

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As a result of this intersection, the drilling programme was expanded. A total of 37 holes were drilled for a total footage of 5,387 feet. At this stage, wet weather forced the abandonment of the drilling programme in early December, 1966.

Drilling in the vicinity of Lily Creek, near the southern boundary of Authority to Prospect 354M, and one hole in the Sherrin Creek area indicated the possibility of a phosphatic section south of 354M. A new Authority to Prospect 375M was taken out to cover this area.

During the summer 1966/67, map sheets at air photo scale were prepared. The geological boundaries on these sheets are entirely after the Bureau of Mineral Resources published map sheets with some interpretative additions, i.e., a possible Beetle Creek outcrop on the eastern slopes of the Ogilvie Range.

Drilling was resumed in April, 1967 on both Authorities and continued until June, 1967.

On A to P 354M a further 31 holes were drilled for a total footage of 3,873 feet. On A to P 375M, 64 holes were drilled for a total footage of 7,978 feet.

Phosphatic sections of interest were found in the vicinity of D-Tree bore in the northern area and in the Lily Creek and Sherrin Creek areas, in the south.

Coring of the best phosphatic sections was attempted, but recoveries were generally poor. (See report by R. Grasso Appendix 2a and 4b).

During this period, a gamma ray logging unit was used to log all of the holes still open. The logs obtained are shown on the cross sections.

Lithological logs were prepared by the well site geologists and field analyses, using the Shapiro method, run on all the samples containing P_2O_5. Samples containing 3% or more P_2O_5 were then sent to AMDEL, Adelaide for chemical analysis. Petrographic studies of cores obtained were also carried out by AMDEL (see AMDEL reports Appendix).

From the information obtained to date, it is apparent that the B and D-Tree areas, in the northern part of A to P 354M cannot provide sufficient tonnage of phosphate rock to be of commercial interest.

In A to P 375M, the Lily Creek area could provide significant tonnages of low grade ore. The future of the Lily Creek deposit will depend entirely on a cheap and efficient beneficiation process. The depth of overburden over a large part of the area will remain a serious problem.

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In the Sherrin Creek area, large tonnages of average to low grade ore have been indicated by drilling. The extent of erosion of the phosphate section is yet to be determined. The present indications are that the southern extensions of the phosphate section have been seriously affected by erosion.

The amount of indicated ore is of the order of 100 million tons of 16% P_2O_5 average grade. The average depth of overburden is 75 feet, giving an overburden ratio of 5:1. A compositional grade classification commonly used by American mining engineers and mineral dressers to describe phosphate ores has been reported by Mabie and Hess (1964). The phosphate deposits of the Sherrin Creek area can be considered "Mill Shale (low-grade....10.0-18.0 P_2O_5 %)" according to the above classification.

It should be noted that there are two major obstacles to the development of this deposit. The first is a cheap and efficient method of beneficiation. To carry out research work on this project, a shaft must be sunk to obtain bulk samples of the ore. The second major problem is the method of transportation of the phosphate to a sea port. The limits of erosion of the phosphate section will be defined by drilling.

GEOLOGY

The areas covered by A to P's 354M and 375M lie within the boundaries of the Camooweal and Mt. Isa 4-mile map sheets, published by the Bureau of Mineral Resources.

Dr. Öpik has published papers (1954, 1957, 1960) on the Cambrian geology and palaentology of the area and his work forms the basis for the subdivision of the Middle Cambrian, incorporated in the 4-mile map sheets.

Dr. Whitehouse has also reported on the area.

REGIONAL GEOLOGY

The Undilla Basin, a marginal trough or deep of the larger Georgina Basin, developed during Middle Cambrian times. In its present form, the Camooweal Dolomite forms the western boundary. To the north, east and south Proterozoic rocks outcrop to define the Basin limits.

Numerous remnants of Middle Cambrian sediments, as outliers, indicate that contemporaneous deposition took place in the Undilla Basin and over at least part of the Proterozoic to the east, the bulk of which has since been removed by erosion. Interconnection between the Undilla Basin, the area east and south of Duchess and the Marqua-Huckitta area to the southwest is indicated by contemporaneous deposition.

Mesozoic sediments were deposited on the Middle Cambrian section and are now represented by lateritised mesas and dissected plateaus.

There were several periods of folding and granite emplacement during the Lower Proterozoic.

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The Pilpah Sandstone of Upper Proterozoic age was folded prior to the deposition of the Cambrian.

The Cambrian sediments are flat dipping where not involved in post Cambrian faulting.

A major uplift occurred in Middle or Upper Ordovician times (Opik 1960).

After the deposition of Mesozoic sediments, the area was again uplifted, to remain stable from that time on.

STRATIGRAPHY

PRE-CAMBRIAN

LOWER PROTEROZOIC

A tightly folded complex of metamorphosed sediments and interbedded volcanics, intruded by granites and basic igneous rocks comprise the Lower Proterozoic section.

UPPER PROTEROZOIC

Unconformably overlying the metamorphic basement is the Pilpah Sandstone, a massive moderately folded quartz sandstone with some conglomerate beds.

Either of the above units forms basement in the Undilla Basin area.

CAMBRIAN

CAMOOWEAL DOLOMITE

This formation is found in outcrop or subcrop over large areas to the west and south of the Authorities to Prospect. Originally, it was thought to be Upper Proterozoic. Opik (1957) thought it was older than Middle Cambrian and it is shown on the BMR 4-mile sheets as Upper Proterozoic or Lower Cambrian. Later work by Brown & Randal (1962) indicated that the Camooweal Dolomite interfingers with the Middle Cambrian section in the Undilla Basin.

Composed almost entirely of massive beds of dolomite with minor chert and limestone lenses, it is approximately 1,000 feet thick. Generally it's colour ranges from white to creamy brown. It is crystalline, dense, tough, very sparsely fossiliferous and contains pelletal zones. It was not found in the Morstone No. 1 well, nor in any of the subsequent holes drilled through the Middle Cambrian section to basement, further to the east and south.

A facies change from dolomite, to limestone with chert bands, to siltstones with interbedded cherts and phosphate indicates deepening water to the east and south, i.e. into the Undilla Basin.

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MIDDLE CAMBRIAN

THORNTONIA LIMESTONE

Outcropping strongly around the northern and north-eastern margins of the Undilla Basin. This formation is the time equivalent of the Beetle Creek formation and the Yelvertoft Bed. It is thickly bedded, massive dolomitic limestone with interbedded dolomite, limestone and chert. It is strongly and closely jointed on N.W.-S.E. Lines.

The formation is fossiliferous and mildly phosphatic. The maximum measured thickness is approximately 200 feet.

As the section is almost wholly carbonate, it is of little interest as a phosphate prospect.

THE BEETLE CREEK FORMATION

The time equivalent of the Thorntonia Limestone, in the southern extensions of the Undilla Basin, this Formation demonstrates the facies change from limestone to shale and siltstone. Drilling in the "B" area indicates that this facies change is quite sharp.

Öpik described the lithology as a basal conglomerate, the Yelvertoft Bed, sometimes represented by arkosic sandstone with Scolithus-like pipes, chert, siliceous shale and lenses of silicified limestone. To this must be added phosphatic siltstone, thin bedded phosphorite and phosphatic limestone. The lithology of the phosphatic section, the Beetle Creek Formation ? is described in detail in the well logs (Appendix 3a-b-6) It was not possible to subdivide the Beetle Creek Formation into three units as described from the Duchess Area, (R.T. Russell 1967). His Lower Breccia member and Lower Siltstone member are apparently missing in the Undilla Basin, the phosphatic section often being found to rest directly on Proterozoic.

Although the wells drilled were sampled every foot, air drilling with rotary rigs produces a pulverized sample. Consequently fossils were rarely found. Recovery from cores through the phosphate section was generally low, due largely to alternating thin bedded dense cherts and soft phosphatic siltstone. Few fossils were found in the core recovered. The phosphatic section is placed in the Beetle Creek Formation on comparative lithology and stratigraphic position.

AGE CREEK FORMATION

This formation is composed of coarsely current bedded calcarenites, dolomitic limestone and dolomite.

It is thought to be contemporaneous with the Mail Change Limestone, the V-Creek Limestone, the Currant Bush Limestone, the Inca Formation (Possibly the Camooweal Dolomite also), i.e. probably the whole Middle Cambrian section above Thorntonia Limestone.

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It contains interbeds of calcareous sandstone and oolites and has been described as a slope deposit. Slump structures are common.

So far as is known, the Age Creek Formation is confined to the western and northern parts of the Undilla Basin. Due to the nature of the bedding, true thicknesses are not known with any certainty.

CURRANT BUSH LIMESTONE

This formation is contemporaneous with the greater part of the Age Creek Formation and with the Inca Formation.

It is largely composed of bituminous, flaggy bedded limestone with interbedded oolites, shales and marls.

The maximum measured thickness is 500 feet in the Border Waterhole area. It is found in outcrop mainly along the present western margins of the Undilla Basin.

INCA CREEK FORMATION

This formation represents a facies change from the dominantly carbonate Currant Bush Limestone to dominantly siliceous shales, cherts and limestone lenses, some of which are bituminous.

Thickness variations noted are 10 feet in the vicinity of Thorntonia Homestead to a quoted 500 feet in the vicinity of Whistlers' Bore.

In the vicinity of the Authority to Prospect 354M, the lithologies of the Inca Formation and the Beetle Creek Formation are very similar and extremely difficult to tell apart.

In the south, in A to P 375M, the Inca Formation outcrops poorly and is often lateritised. The Beetle Creek Formation was only found in outcrop, within the Ogilvie Range.

THE V-CREEK LIMESTONE

A fossiliferous impure laminated limestone with interbedded calcilutites, this formation overlies the Currant Bush Limestone. So far as is known, the V-Creek Limestone is confined to the Undilla Basin.

It contains a similar fauna to the Mail Change Limestone and a similar litholog, , though thinner bedded.

The measured thickness varies between 100 and 200 feet in outcrop to 325 feet in Morstone No. 1.

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THE MAIL CHANGE LIMESTONE

A two-coloured, thick bedded, fine grained limestone, it conformably underlies the Split Rock Sandstone. It is confined to the Undilla Basin, is fossiliferous and does not exceed 20 feet in thickness.

SPLIT ROCK SANDSTONE

The highest unit of the Middle Cambrian in the Undilla Basin, it is described by Opik as having a rising contact with the V-Creek and Mail Change limestones and consequently a wide stratigraphic range. It is a fine grained current bedded quartz sandstone with interbedded siltstone. The maximum measured thickness is 70 feet.

DRILLING OPERATIONS

The drilling programme was carried out in two stages.

The first stage was terminated in December, 1966 by weather conditions. Drilling during the period was entirely within Authority to Prospect 354M.

The second stage was carried out between April and June, 1967 and included A to P 354M and A to P 375M.

A summary report on all drilling operations was prepared by R. Grasso, a condensed version of which is given here.

STAGE 1.

AUTHORITY TO PROSPECT 354M

The initial programme of two exploratory holes, was soon expanded when a phosphatic section was penetrated in D-Tree No. 1, the second hole drilled.

Geophysical Services International (G.S.I) the original contractor, supplied a Mayhew 1000 shot-hole rig.

After the discovery, a second contractor was called in, Glindeman & Kitching Enterprises (G. & K.). They supplied a truck mounted Mindrill E-1000 diamond drill and a rotary Mindrill G-Rig.

Lost circulation in the northern area was a problem. As the G.S.I rig was not supplied with casing, it was decided to move it to the southern area, where circulation problems were not so severe.

The G.S.I. rig commenced drilling on 21st October, 1966, working one 10-hour shift per day until 7th November, 1966, when two 12-hour shifts

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were introduced. As there was no significant increase in footage, this rig reverted to one 10-hour shift on 10th November, 1966 until 1st December, 1966, when all rigs were shut down.

The G-Rig (G & K) worked one 8-hour shift per day from 14th November, 1966 to 24th November, 1966, when a second 8-hour shift was introduced. It continued to work two shifts until 1st December, 1966. The original intention was that the G-Rig would dri ll to the top of the phosphatic section and set casing in areas where cores were needed. The E-1000 rig would then move over the hole and core through the zones of interest.

The E-1000 rig worked two 8-hour shifts per day from 16th November, 1966 to 24th November, 1966. Lost circulation problems of some magnitude and poor core recovery generally, forced the abandonment of the coring programme.

Summarised results are as follows:-

1. G.S.I. (Mayhew 1000)

(a)	Total footage drilled or cored	3905'
(b)	Total footage cored	48'
(c)	Total core recovered	20'

2. G. & K. (G-Rig and E-1000)

(a)	Total footage drilled or cored	1482'
(b)	Total footage cored	91'
(c)	Total core recovery	68'7"

STAGE 2.

The second stage of drilling was commenced on 10th April and completed on 5th June, 1967.

The drilling contract was awarded to Austral Geo Prospectors Pty. Ltd. who supplied two modified Failing shot-hole rigs, a trailer mounted air compressor, drilling equipment, vehicles and camp facilities. In addition, a surveyor and rod-man plus vehicle were supplied by the contractor. At Continental Oil Company's request, an extra man was supplied with each drill crew, i.e. three men to a crew, to assist the wellsite geologist with sampling and testing.

The drilling contractor was informed of the difficulties experienced in this area with core recovery and maintaining circulation. Special casing was designed with tungsten carbide tipped casing shoes. The rotary

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tables were modified to allow drilling through lost circulation zones. However, two consecutive twist-offs forced the abandonment of this method.

Despite virtually continuous experiment with various designs of core barrels and tungsten carbide bits, core recovery was disappointing.

A Mission hammer tool, fitted to a 3' core barrel was tried and seemed to produce better recovery. However, on several occasions it produced 3 feet of core from a one foot run. Obviously, it was caving the hole. As the inner tube was not split, the method of removal of core recovered ensured that it was broken up. Accurate estimation of recovery in this type of sediment then was not possible and the tendency was to overestimate.

A further 31 holes were drilled during this second stage for a total footage of 3,873 feet.

AUTHORITY TO PROSPECT 375M

A phosphatic section was intersected in several holes along the southern margin of A to P 354M. An Authority to Prospect 375M was taken out to cover southern extensions of these deposits.

One rig was used, working a 10-hour shift from 14th April until 10th June, 1967. Two areas were developed, the Lily Creek area and the Sherrin Creek Area.

A total of 55 holes were drilled from a total footage of 6455 feet.

GAMMA RAY WELL LOGGING

During Stage 2 of the drilling operation a Land Rover mounted Widco gamma ray logger was used to log the holes as soon as possible after completion of drilling.

An attempt was made to log holes completed during Stage 1. This was only partly successful, a number of holes having caved during the wet.

The gamma ray logs are shown on the composite sections. Good correlations with the phosphatic zones are demonstrated.

The phantom kick, often shown immediately above the phosphatic zones is attributed to crandallite. This may correlate with Russell's Lower Shale member of the Inca Formation in the Duchess area.

His subdivision is given as

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INCA FORMATION (MIDDLE CAMBRIAN)

Upper Limestone member; thin platy limestone, interbedded with calcareous shale and shale.

Lower Shale member; siliceous shale and siltstone (basal part crandallitic) minor chert.

Disconformity.

BEETLE CREEK FORMATION (LOWER MIDDLE CAMBRIAN)

Monastery Creek Phosphite member; phosphorite, chert, phosphatic siltstone, shale and sandstone, minor phosphatic limestone.

SURVEYING

In February, 1967, Mr. R.C. Todd, Authorised Surveyor of Mt. Isa, was retained to carry out a survey of Authority to Prospect 354M.

The prime object of the survey was to establish on the ground, the position of the meridian 138° 55'15" east longitude and to establish the position of the north east corner of the Authority.

It was also requested that the latitudes, longitudes and elevations of all holes drilled during Phase 1 of the operation be established.

An aerial reconnaissance located Army Trig Stations 457, 458 and 413.

The field party consisted of Authorised Surveyors Todd and Price with two field assistants.

Equipment used included two 101 telurometers, two Wild T2 theodolites, signalling and meterological equipment. The T2 theodolites were used to obtain simultaneous reciprocal vertical angles required to establish the collar levels of drill holes.

As required by government regulations, the results of the above survey have been lodged with the Department of Mines, Queensland.

Austral Geo Prospectors supplied a surveyor and chainman, together with a four-wheel drive vehicle.

This party carried out a plan-table survey over Authority to Prospect 354M and 375M. All the holes drilled subsequent to Todds survey were plotted on plane table sheets, scale 4 inches = 1 mile and their elevations obtained. Most traverses were closed and frequent ties with marks established by Todd reduced errors to a minimum.

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The results of this survey are incorporated in the plans and sections showing locations and elevations of holes drilled.

TRENCHING

Initial drilling in the Lily Creek area indicated that the phosphatic interval was shallowing towards the south.

In this direction the B.M.R. had mapped an area as outcropping Beetle Creek Formation. The air photos show a tonal difference in a pattern similar to that shown on the Mt. Isa 4-mile sheet.

A ground search and later, a systematic search using a helicopter, failed to find outcrop in the valley of Lily Creek.

It was decided to hire a D.8 bulldozer from Thiess Bros., Mt. Isa, to dig a series of trenches in an attempt to expose phosphatic beds.

A series of 4 trenches were dug. The most easterly is located near to the mapped contact of the Pilpah Sandstone and Beetle Creek Formation. The other 3 trenches, approximately one-tenth of a mile apart are on a line approximately west of this point.

Phosphate was not exposed in any of the trenches.

The bulldozer was also used to clear access tracks to drill sites in the Lily Creek area.

In the D-Tree area, access tracks and an airstrip were constructed by a grader, on hire from the Mt. Isa Shire Council. This work was completed in 1966.

CROSS SECTIONS

LILY CREEK AREA

GENERAL

An encouraging phosphate section was encountered in Hole Y and repeated in Hole Z, during the closing stages of the initial drilling campaign in November, 1966.

The top of the phosphatic section shallowed from 140' in Y to 114' in Z, indicating the possibility of finding phosphate near the surface to the south east, where Beetle Creek outcrop had been mapped by the B.M.R.

During the second drilling programme, completed in June, 1967, a further eight holes were drilled. Five of these holes, LC1, LC2, LC3, LC4 and LC5 penetrated a phosphatic section.

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Sections showing lithology, phosphate content, gamma ray logs and tentative lithological correlations accompany this report. It should be noted that the exaggeration factor of these sections is approximately 60.

In general, the grade of phosphate discovered in this area is disappointing and the thickness of overburden excessive.

SECTION Y - Z - L.C.2

In Hole Y, the lithological log shows phosphate occurring from 140' to 185' in varying, but generally low concentrations.

The section is largely argillaceous and is described as yellow, brown to white, vari-coloured, slightly calcareous silts and clays with chert interbeds.

As shown on the section, there are six zones which average 5% P_2O_5 or better in this hole. There is no detectable change in lithology between the phosphatic and the barren zones.

In Hole Z, there are eight zones averaging 5% P_2O_5 or more. It should be noted that the bottom zone, 196' to 205' is suspect in that the field analyses have not been verified by AMDEL. Marked variations between field shapiro results and AMDEL are found in the lithological log of this hole. This was probably caused by unstable Shapiro solution.

The section penetrated in Z is very similar to that found in Y, the only noticeable difference being a decrease in carbonate content in the former.

AMDEL assays for Fe_2O_3, Al_2O_3, CaO and CO_2 are recorded with the P_2O_5 content for Hole Z in the appendix. Higher grade samples were selected to check the iron, alumina and carbonate content. The results indicate a serious treatment problem exists. (See Appendix I, Report AN1777/67)

Hole LC2, approximately due south of Z, contains three phosphatic zones of interest. This direction is towards the centre of the valley of Lily Creek and shows deepening in this direction.

SECTION LC2 - LC3

This section demonstrates shallowing of the phosphates towards the eastern margins of the Lily Creek valley. There is good correlation between these two holes and once again there is no lithological change discernible between the phosphatic and non-phosphatic sections.

There is a fall off in grade from LC2 to LC3.

The abrupt change from a non-phosphatic to a phosphatic section found in these holes is typical of the entire area. In the bottom of the holes

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there is generally found low values, which gradually increase up the hole. The top of the phosphatic section is often high in P_2O_5 content with a short cut off. As there is no lithological break, this must represent some physical break in the temperature and/or pressure conditions at the time of deposition.

The correlation between gamma ray logs is good. The phantom kick in the log above the phosphatic sections has been investigated. AMDEL reports (see AMDEL AN-MP2885/67) that this is due to crandallite(see Appendix I).

SECTION LC1, LC3, LC4, LC5, LC6, LC7

This is a most informative section. From LC1 to LC5, the phosphatic zone is becoming shallower and stratigraphically thinner. Between LC5 and LC6 it has either lensed out or been faulted out. The section penetrated in LC6 and LC7, did not contain phosphate. LC5 encountered phosphate at 33 feet, and penetrated purple shales at 84 feet. These shales, not found in any other hole in the Lily Creek area have been assigned a Proterozoic age. An east-west trending fault has been postulated from air photographs, east of LC5. It seems probable that this fault continues towards the west, under the alluvium. It would pass between LC5 and LC6 but closer to LC5. Relative movement on this fault is north block up. This fault may be the controlling factor in the westerly course of Lily Creek.

The section penetrated in LC6 is difficult to explain. Pilpah sandstone outcrops in the vicinity of the site and it was predicted that it would be encountered at no great depth below the alluvium. Instead, cream-yellow-brown siltstone and chert identical to that containing the phosphate section was penetrated to 197 feet. No phosphate was detected. Air drilling of these holes did not provide any indication as to attitude of the beds. As the area is disturbed by faulting, it is possible that LC6 was drilled on a tilted block and does not represent truestratigraphic thickness.

LC7 is also difficult to correlate with any other hole. The cherty dolomite in the bottom section can only be correlated with the Camooweal Dolomite. As the age of this formation has now been extended to include all of the Cambrian, this section may represent the facies change to dolomitic muds. No phosphate was detected in the hole.

SECTION LC5 - LC8

This section indicates another fault, trending generally north-south as correlation between the holes is not possible. LC8 was designed to intersect the phosphate zone close to the surface, but in fact, did not encounter phosphate.

As the section penetrated in LC8 is typical of the Middle Cambrian in this area and purple shales were not encountered, the relative movement on this fault must be east block down.

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It was not possible in the field for the well site geologist to distinguish between phosphatic and non-phosphatic zones. The indications were that this was a bedded deposit and subsequent laboratory work by AMDEL established that phosphate occurred as collophane in sub-microscopic pellets.

FUTURE WORK

Although the grade of phosphate found in this area is disappointing and the depth of overburden excessive, further drilling is necessary to properly evaluate the area.

The following general locations are suggested:-

(1) South of LC2, approximately half-way between LC2 and outcropping Pilpah Sandstone, to the south.

(2) One half mile east of LC1. This location should show a shallowing phosphatic section. Should this prove so, then a series of holes, half a mile apart should be drilled on a line parallel to the line already drilled, i.e. LC1 to LC5.

Should the location south of LC2 prove a shallowing phosphatic section, then further locations west of the LC1 to LC5 line would be drilled.

CROSS SECTIONS

SHERRIN CREEK AREA

GENERAL

During the 1966 drilling, two holes were completed in this area, W and X. Hole W was drilled to 155 feet T.D. and penetrated a weakly phosphatic section below 60 feet.

Hole X was located further to the east and was found to be barren of phosphate. From the lithological log, it seems likely that this hole entered Proterozoic basement at 41 feet.

A further 36 holes were drilled in this area for a total footage of 4155 feet. This total includes redrilled holes.

For the sake of convenience, the area has be en subdivided into Upper and Lower.

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SHERRIN CREEK AREA (UPPER)

A series of cross-sections have been prepared showing lithology, tentative lithologic correlations, averaged phosphate content and gamma ray logs.

SECTION SC9, SC9A, SC1 & W

Hole SC1 confirmed the presence of phosphate in this area when it encountered a phosphatic section at 49 feet. The highest assay, 15.3% at 62 feet gave encouragement. The section penetrated was largely argillaceous and consisted of light brown to medium brown and mottled light grey silty shale with abundant chert interbeds.

Holes SC9A, and SC9 were disappointing in that the phosphatic section never exceeded 5% P_2O_5. The lithologies are similar throughout the section. The only recorded change is a marked increase in sand content towards Hole W. The gamma ray logs give a general correlation of the phosphatic section.

In SC1 the presence of crandallite is indicated by the pronounced kick above the phosphate zone. In SC9 and 9A, the absence of high grade phosphate indicates that the radio-active anomaly shown is probably due to crandallite.

SECTION SC14, SC12, SC10, SC13, SC2, SC26 & SC27

Correlation across this section from SC27 to SC10 is not difficult. The undulating nature of the phosphate zone is well demonstrated. Sharp variations in grade are found in SC2 and SC13.

In SC12, the phosphate zone was found at 113 feet while in SC10, it was first encountered at 43 feet. This indicates a fault with a maximum throw of the order of 70 feet, west block down. Gamma ray activity above the phosphatic section in SC12 is unexplained. It is probably due to the presence of crandallite adjacent to the fault zone.

Correlation between SC12 and SC14 is difficult. SC14 entered basement at 146 feet indicating another fault with SC14 upthrown relative to SC12. Secondary iron staining is abundant in SC14 and no phosphate was found in the hole. The pronounced gamma ray kicks shown on the log are typical of those obtained in a phosphatic section and again probably indicate the presence of crandallite.

The lithology of the phosphatic section is described as light grey-buff-creamy brown siltstone, commonly limonitic with interbedded chert.

As usual for this area as a whole, the change from non-phosphatic to phosphatic siltstones is sharp on the top of the zone, with a characteristic

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tailing off at the bottom. There is no noticeable change in lithology through the phosphate section and the presence of phosphate can only be detected by using Shapiro solution.

Holes SC2 and SC13 showthe varying nature (? lensing nature) of the phosphatic section. SC13 is anomalous in that the gamma ray log indicates a good phosphatic section. This was not supported by assay results, 7% P_2O_5 being the highest result obtained by AMDEL. Some check assays through the phosphatic section will be carried out.

SECTION SC18, SC16, & SC28

SC16 and SC28 penetrated a phosphatic section averaging 12.5% P_2O_5. In SC28 the phosphate has apparently lensed out to some extent and is considerably deeper. The basin apparently deepens to the south, as shown on the plan (Plate VI) and it is possible that a second phosphate horizon exists beneath.

SC18 did find a phosphate section but the values are consistently low. A fault is postulated between SC18 and SC16. Using the top of the phosphate section in each hole, the indicated throw is again approximately 70 feet.

SECTION SC17, SC11, SC15, SC3 & SC30

Good phosphatic intersections were obtained in all holes on this section line, with the exception of SC3. Since the construction of the sections (Plate VI) and contour plan of the top of the phosphate (Plate II) it is possible that SC3 is too shallow.

The grade of phosphate in this section is encouraging, particularly in SC15, which produced a 15 feet intersection averaging 23.5% P_2O_5. Three attempts were made to recover core from this location. The interbedded siltstones and cherts are extremely difficult to core throughout this area, and satisfactory recoveries were never achieved. The results of coring are shown in the appendix. The apparent discrepancy between phosphate percentages in rotary drilled holes and subsequent core drilling of the same sections can be attributed to poor recovery of core. (See Appendix 4a-b & 6).

There is good correlation between phosphate values and the gamma ray logs. The lithology of the phosphatic secti ons is again described as siltstone with colour variations from cream to grey, buff, light brown and khaki, depending on the amount of secondary iron staining. It is wo rth recording that the presence of chert in the cuttings invariably heralded the presence of the phosphatic section.

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Hole SC4 was drilled approximately 2 miles south of the SC17-SC30 line and produced a promising phosphatic section. The initial hole was drilled to 120 feet and penetrated phosphatic siltstone with interbedded chert from 97 feet to total depth. The section shows an average of 14.2% P_2O_5 over 20 feet. The highest AMDEL analysis being 26.5% P_2O_5 at 100 feet.

The change from non-phosphatic to phosphatic was again sharp and the concentration of phosphate showed the typical tailing off. The hole was still in low grade phosphate when circulation problems forced abandonment. Two attempts were made to core the phosphatic zone without success. (See Appendix 4a-b & 6).

The section above 87 feet in SC4 is dominantly sandy and silty with abundant rounded quartz and chert pebbles. This is considered to be Tertiary in age and represents infill of scour channels formed during that time. The chert pebbles are reworked Middle Cambrian.

The presence of these ? Tertiary pebble beds provides an alternate interpretation of sections SC18-SC28 and SC17-SC30.

The character of the gamma-ray log through the non-phosphatic section in SC4 is virtually featureless. This is repeated in SC29, SC32 down to 127 feet, SC3, SC28 down to 112 feet and SC18 down to 98 feet.

The log of SC17 is anomalous in that the gamma ray log changes character at 65 feet. The lithological log records quartz and chert pebbles right through the phosphatic section. This may be explained by heavy caving of the pebble beds. It seems certain that the ? Tertiary section extends below 65 feet to 92 feet where the chert interbeds and phosphate are first found. The kicks shown on the log may be due to resorted Middle Cambrian containing crandallite.

It seems certain then, that there has been erosion of the phosphatic section in this area. The deeper trough shown on the plan may exist. This may represent a comparatively minor roll in the Middle Cambrian sediments which had the effect of channelling the ? Tertiary scour and fill. In this case, phosphate should be found at greater depth beneath SC3 and should continue beneath SC28. Alternatively, the phosphate section might be eroded in this area. Supporting evidence for this view is found in SC32 which has a typical ? Tertiary gamma ray log down to 127 feet, where a weakly phosphatic section (the bottom of the zone ?) is found to overlie a limestone section. This situation of phosphate overlying a limestone was found in numerous holes in the Sherrin Creek area and strongly supports the hypothesis of erosion.

SC18 is shown on the down thrown side of a fault. The ? Tertiary section extends to approximately 99 feet and may indicate a scour channel localised by the fault.

The Middle Cambrian section in the Sherrin Creek - Lily Creek area is incomplete. If the crandallite zones found can be correlated with

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Russell's basal Inca Formation, then at least Inca and Beetle Creek were deposited. In the Ogilvie Range, between the two areas, Split Rock sandstone has been mapped, unconformably overlying Beetle Creek. This indicates that Middle Cambrian sedimentation was incomplete and restricted. There are no known equivalents of Russell's Lower Breccia Member or Lower Siltstone Member. The underlying carbonate section is more easily correlated with the Camooweal Dolomite than the Thorntonia Limestone, although no positive evidence, either way, has been found.

On the evidence available, almost all of the Beetle Creek has been removed by ? Tertiary erosion. In some areas, the actual extent is yet to be defined, erosion has apparently also removed the phosphatic section.

SHERRIN CREEK AREA (LOWER)

The phosphatic section in this area is disappointing. The concentration of phosphate was expected to increase towards the south east. In fact, the section was found to thin in this direction and the phosphate content fell off.

SECTION SC22, SC5, SC6 & SC7

In SC-22, a Tertiary section was penetrated to 51 feet. At this depth a weakly phosphatic section extended to 62 feet. The highest AMDEL assay for this section is 3.8% P_2O_5. A weak phosphatic section persisted to the total depth of the hole where a pale pink dolomitic limestone was found. Limonite is common throughout the phosphatic section, indicating deep weathering.

SC5 did not encounter phosphate to 80 feet, where the hole was abandoned due to caving sand. This hole was in Tertiary sediments at total depth. Due to caving, it was not possible to gamma-ray log this hole.

SC6 penetrated Tertiary unconsolidated sands to 85 feet. At this depth, there was some indication of phosphate, but again the hole was lost due to caving sand.

SC7 found a weak phosphatic section at 72 feet to 88 feet. The hole was deepened to 170 feet but probably entered Proterozoic basement at 112 feet. The presence of crandallite is indicated on the gamma-ray log directly above the phosphate zone.

SECTION SC19, SC5B, SC21 & SC25

Little more than trace amounts of phosphate were found in SC19. A Tertiary section was penetrated to approximately 72 feet. Directly below this, a crandallitic zone is indicated in the gamma-ray log. Basement was entered at 100 feet.

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In SC5B a typical Tertiary section with rounded quartz pebbles was encountered to 61 feet. Phosphate was found at 71 feet and good values continued to 89 feet. The highest AMDEL analysis for this section was 21.2% P_2O_5. Below 89 feet low phosphate values continued to 113 feet. Below 116 feet a carbonate section was entered, which continued to total depth.

SC21 found a thin (4 feet) phosphatic section from 44 feet to 48 feet. Tertiary was found to 38 feet overlying the phosphate with carbonate beneath. The phosphate section isshallower and thinner in this hole.

In SC25, the Tertiary section was bottomed at 26 feet. The phosphate section below this horizon has almost lensed out, a 1-foot bed assaying 7% at 59 feet, is all that remains. A weakly phosphatic section was found from 70 feet to 79 feet. Proterozoic basement was found at 102 feet.

SECTION SC24, SC5A & SC20

No phosphate as found in SC24. The section represents Tertiary unconformably overlying Proterozoic.

In SC5A the Tertiary section extends to 21 feet. The Middle Cambrian section below is typical for the phosphate zone, but here it has almost lensed out. Two feet of section at 43 feet and 44 feet averaged 14.5% P_2O_5. Basement was encountered at 75 feet.

SC20 found little more than trace amounts of phosphate. The Tertiary persisted to 55 feet and the hole entered carbonates at 69 feet.

In this area there is no conclusive evidence of erosion of the phosphatic section. The general impression gained is one of lensing out of the section, which is mostly poor in phosphate. Only three holes, SC5B, SC5A and SC21 produced significant concentrations of phosphate. It is probable that SC5 and SC6 are too shallow.

The area apparently holds little promise as a phosphate prospect. Subsequent drilling in the area to the north may indicate a continuing phosphate section in the vicinity of SC5. On the evidence available, a section of interest could only be expected through SC5 to SC5B and south towards SC5A.

PHOSPHATE OCCURRENCE

Detailed chemical, mineralogical, petrographic and radiometric analyses have been carried out by AMDEL to determine the nature of the phosphate occurrence. In addition, screen analyses of selected samples have been completed in an attempt to find a ready method of beneficiation. These various AMDEL reports are included in the appendices 1 and 4a.

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It has been mentioned in this report that the macro lithologies of the phosphatic sections throughout the area investigated are very similar.

Invariably, the phosphate was found in an interbedded siltstone and chert sequence of presumed Beetle Creek formation (lower Middle Cambrian). The presence of phosphate could only be detected by the use of Shapiro solution. In nearly all cases, the grade of phosphate increased markedly within a few feet of the top of the phosphatic zone. In contrast to this, the grades gradually tailed off over a far greater thickness of sediment in the bottom sections of the holes. In almost all cases, the increase in phosphate content was paralleled by a noticeable increase in the chert and iron content. In the opinion of the wellsite geologists, the limonite appeared to be secondary, introduced along joint and bedding planes during deep weathering. However, petrographic examination of core from Hole P, Whistler's Creek area, established the presence of sub-microscopic goethite. (AMDEL REPORT MP1298-67 in Appendix I).

In this report, the rock type is described as arenaceous phosphorite. Clastic quartz grains, varying from sub-angular to sub-rounded, average 0.10 mm in diameter. The phosphate occurs as sub-microscopic collophane in the matrix. Sub-rounded pellets of goethite averaging 0.32 mm. in diameter are described as partially enclosing clastic grains and are considered to be diagenic.

The sediments are described as being typical phosphorites containing chemically or biogenically precipitated phosphate and iron minerals.

The screen analysis shows that in the two samples tested, 77.65% and 76.50% by weight respectively has passed a 200 mesh BSS series (76 micron). In each case, this fraction contained the bulk of the apatite.

AMDEL Report MP3025-67 refers to work done on samples from Hole SC27. This hole was deliberately cored above the phosphatic zone in an attempt to prove the presence of crandallite. In two samples crandallite was proved in accessory amounts (5-20%) by semi-quantitative analysis. Table 1 in this report also demonstrates remarkably little change in lithology from poorly phosphatic claystone to richly phosphatic phosphorite.

Apatite is the dominant phosphate mineral, occurring as collophane mud, ovulitic pellets and fossil fragments. Crandallite has been detected in trace amounts in most samples. The main gangue mineral is quartz which occurs as clastic sand and silt grains and as sedimentary chert. Mr. N.A. Trueman compares this collophane mud with the microsphorite of the Bone Valley Formation of Florida.

Sediments with this grain size were obviously deposited on a deep water, low energy environment. Micro intraformational breccias are

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common. Trueman suggests that these breccias indicate " periods of high energy and reworking" of the sediments. However in this grain size, minor submarine slumping would produce the same result within a low energy zone.

Table 2, page 15 of the above Trueman Report (see Appendix 1) shows the chemical composition of the phosphatic samples. Here the Al_2O_3 and Fe_2O_3 content is reasonable. The extreme fineness of grain size remains a problem.

Report MP3088-67 by N.A. Trueman refers to Hole SC10. The rock type is again phosphatic claystone with apatite the only phosphate mineral. This is found as collophane in irregular fragments without sedimentary or crustiform textures, ovulitic pellets and fossil fragments.

X-ray diffraction of the matrix shows the clay consists mainly of smectite with minor amounts of illite and kaolin. In other samples examined, kaolin was dominant. Trueman suggests that SC10 is a more marine facies than SC27.

The presence of clastic quartz grains, varying in grain size from sand to fine silt "indicates an influence of terrigenous sedimentation in the depositional environment."

Non clastic rocks, in the form of phosphorite and chert are indicative of a deep water environment. The presence of both non clastic and clastic constituents indicates a marginal deep or continental slope facies.

It should be remembered that the apparent low concentration of phosphate in these samples sent to AMDEL for detailed study are not truly representative. Poor core recovery accounts for the discrepancy in results between rotary drilled samples and cored samples of the same location. (See Appendix 4a).

Screen analysis of these samples were again disappointing. Apatite is found in all size fractions, but is mostly found in the extremely fine minus 350 mesh fraction.

FUTURE WORK

The most immediate need in the Sherrin Creek area is for a bulk sample of the phosphate rock for laboratory studies. The results of beneficiation tests carried out by AMDEL on small samples are inconclusive. It is proposed that the bulk sample will be obtained by shaft sinking.

Further fill-in drilling is necessary to delineate the area of apparent erosion of the phosphate beds. Until this is done, no accurate estimate of indicated tonnage can be made.

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CROSS SECTIONS

B AREA

GENERAL

A very encouraging phosphate section was encountered in Hole B during the latter stages of the 1966 drilling programme. Located approximately 6 miles north of D-Tree bore, a phosphate zone was encountered 8 feet from the surface and extends to a depth of 28 feet where loss of circulation and caving prevented further drilling. The interval averages 10.0% P_2O_5 over 19 feet, as analysed by AMDEL, Adelaide, with foot interval "highs" of 18.6 and 18.4% P_2O_5. Subsequent holes (B2 and B3) were drilled during the 1966 programme in an attempt to penetrate the entire phosphate zone. These were unsuccessful because circulation was again lost in the top of the phosphate zone each time. Similar high phosphate, however, was also encountered.

During the 1967 drilling programme, an 8-hole grid was drilled as step-out holes from Hole B in order to further delineate the phosphate prospect.

Sections showing lithology, phosphate content, gamma-ray logs, and tentative lithological correlations that accompany this report are discussed below. It should be noted that the vertical exaggeration of these sections is 8 times true scale.

SECTION A-B6

Hole A, drilled during the 1966 programme, is the most northerly hole drilled in A to P 354M. It penetrated vari-coloured silty shales with chert bands to a depth of 81 feet. A major lithologic change to hard, grey to light brown, fine grained, dolomitic limestone with interbedded cherty shales and shaly limestone is recorded to the total depth of 90 feet. A slightly phosphatic interval was encountered at 76 feet approximately 5 feet above the carbonate section. This interval is described as soft, weathered, silty shales with chert. Hole B6 encountered a similar section of silty and clayey shales with interbedded chert underlain by a similar carbonate.

Two distinct phosphate zones were encountered in B6. The upper zone, intercepted at 34 feet, is only 2 feet but analysed 19.9% and 5.8% P_2O_5 AMDEL. The change from non-phosphatic to phosphatic sediments is abrupt. The second zone occurs from 40 to 45 feet where the hole was abandoned due to lost circulation. The 5-foot interval averages 8.8% P_2O_5 AMDEL. This zone also changes abruptly from non-phosphatic to phosphatic sediments. Carbonate material was noted near the T.D. of the hole. This accounts for the lost circulation and indicates the phosphatic zone overlies a carbonate section.

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The phosphate zones are described as light grey, silty shale containing white, partially ferruginous, phosphorite oolites, intimately associated with limonite, soft, silty and in places, very finely micaceous shale with chert bands and minor dolomitic limestone.

Correlation of Holes A and B6 is lithologically sound. The top of the carbonate rises south-eastward very gently from A to B6. The phosphatic interval increases in thickness towards B6 and also rises toward the south-east. This may demonstrate that the thinning out of the phosphate zones to the north-west is due to a facies change.

Gamma log correlation between A and B6 is only fair. The gamma log from B6 shows a kick just above the phosphate which is tentatively attributed to crandallite. Another kick, in the phosphate zone and approximately four times background, is probably due to the additive effects of both crandallite and oolitic phosphorite.

SECTION B2-B1A

Hole B2 encountered silty shale with chert beds from 20 to 26 feet and a similar but more calcareous and clayey section from 26 to the total depth of well. Caving and loss of drilling circulation in this calcareous section caused abandonment of the hole at 40 feet.

As in B6, two distinct phosphatic zones were identified. Both zones came in abruptly, although no noticeable change in lithology was observed. The first zone is 3 feet in thickness and averages 5.0% P_2O_5 AMDEL. The second zone, some 9 feet in thickness, averages 12.0% P_2O_5 AMDEL. No oolitic phosphorite, however, was observed.

Hole B1A was drilled as a twin hole B, in an attempt to completely penetrate and gamma log the shallow high grade phosphate found in that hole. The phosphate zone, encountered at 8 feet in Hole B, was intercepted at 26 feet in Hole B1A, located only 25 feet away. The phosphate zones also show marked differences. Hole B has a 19 feet interval averaging 10.0% P_2O_5 AMDEL while Hole B1A found only 14 feet averaging 6.0% P_2O_5 AMDEL. Advanced weathering of the phosphatic intervals is indicated by the high secondary iron-aluminium content (see AMDEL Report AN1777/67 in Appendix and by the vughy nature of the top of the carbonate below the zones. The vughs are also characteristically filled with secondary calcite and red clay which may indicate past leaching by ground water circulation and subsequent subaerial weathering.

Correlation of Hole A, B6, B2 and B1A is fairly good. The phosphate zones increase in P_2O_5 content while shallowing to the east of B6. The highly weathered phosphatic zones found above a carbonate in Holes B2, B6 and A, may be explained as a weathering phenomenon at a prior water table, the level of which remained constant for an appreciable period. However, some evidence exists that the zone is suggestive of an erosional surface.

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A surface of unconformity is purported to represent a hiatus between the limestone and the above calcareous shale.

As part of the grid programme, Hole B7, B8 and B9 were drilled approximately 0.5 miles due south of Hole B and step-out holes B8 and B9 were drilled due west of B7 at .25 mile intervals. All 3 holes penetrated phosphate zones.

Hole B7 encountered a low P_2O_5 interval at or just above the top of a carbonate section. This minor interval is characterized by weathered, ferruginous, silty shale and vughy carbonate below. Similar low P_2O_5 intervals are found in Holes B8 and B9 and are also in the zone of silty shale and vughy carbonate. This again suggests an interval of advanced weathering and is probably correlative with that found in B6 and other northern holes.

Three non-distinct phosphate zones are recorded below the low P_2O_5 interval in B7. Found between 47 and 57 feet, P_2O_5 values are generally low; the change to phosphatic sediments is gradational.

To the west, however, Holes B8 and B9 encountered phosphate zones at depth in hard "calcarenitic" carbonate. B8 found two zones at 93 and 108 feet. The first zone averages 6.4% P_2O_5 AMDEL over 19 feet. The second zone averages 7.0% P_2O_5 over 8 feet. Hole B9 encountered similar phosphate zones at depths of 114 and 126 feet. The first zone is only two feet in thickness and averages 5.0% P_2O_5 while the second zone is at least fifteen feet in thickness and averages 6.7% P_2O_5 AMDEL. The bottom of this zone was not reached due to loss of circulation in hard, vughy carbonate.

The calcareous phosphate zones in B9 rise eastward at about 1° to B8 and hence are correlative with those zones found nearer the surface in Holes B6, B2 and B-B1A. The calcareous phosphate zones found at depth are also tentatively correlated with Unit 2 of the Thorntonia Limestone defined by I.M.C. (1966) north of Thorntonia Homestead. This implies a limited and variable thickness of calcareous phosphate associated with carbona te deposition or diagenic replacement by ground water perculation. However, a change in facies from dominantly phosphatic limestone to a more desirable low carbonate and highly phosphatic shale is also indicated in Holes B6-B2-B. The zone of advanced weathering, indicated in the phosphate zones of the northern holes and also indicated in B7, B8 and B9 some 50 to 70 feet above their major calcareous phosphate zones, appears to coincide with the rising phosphate zones in the area south east of Hole A and north of Holes B7 and B8. With the mixing of the calcareous phosphate and the material of the weathered zone, the phosphatic zones become relatively high in iron and aluminium of various clay minerals and crandallite.

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SECTION C3-C4-C5

Drilled south of B7-B8 and B9 as part of the grid drilled during 1967, Holes C4 and C5 encountered phosphate zones at depths which are directly correlative with those found in Holes B8 and B9. Hole C3 penetrated the shale-carbonate zone of weathered sediments, but failed to find any significant sign of pelletal phosphate. This hole was apparently abandoned above the calcareous phosphate zone due to loss of circulation in typically hard, vughy carbonate. Holes C4 and C5, however, found calcareous phosphate zones at depth, as found in B8 and B9. Hole C4 found a major zone at 88 feet which averages 6.1% P_2O_5 AMDEL over a 14-foot interval. Hole C5 found a similar zone at 133 feet which averages 6.7% P_2O_5 AMDEL, also over 14 feet. Both zones were gradational at the top. The shallowing to the east of these zones is at a rate similar to those found in Holes B8 and B9, i.e. at about 1°. Holes C4 and C5 also found additional phosphate zones of relatively higher P_2O_5 content above their major zones. These zones are wanting in Holes B8 and B9. They occur at the shale-carbonate contact and appear to represent the southward extension of the locally phosphatic zone of advanced weathering found in the holes to the north which, as previously mentioned, may be associated with a prior water table.

Hole C4 encountered a large cavern near the bottom of the hole. A ram core was taken and the material recovered tested 7.0% P_2O_5. This cavern is particularly interesting in that the gamma log for the interval of the cavern records gamma radio-activity of 5 to 6 times background. The lack of mass in the cavern should have had a decreasing effect on the relative radio-activity. The gamma log, however, indicates a large-scale increase which suggest that this cavern may be lined with crandallite or high secondary phosphate derived from solution of highly phosphate carbonate.

HOLES C and C2

Hole C and C2 were drilled during the 1966 drilling programme, and are located south of Holes C3, C4 and C5. They link the information gained from the holes of the north to that gained from the holes drilled in the D-Tree area to the south.

Hole C encountered two phosphate zones at depth. The first zone was found at 115 feet and averages 9.7% P_2O_5 AMDEL over a 17-foot interval. The second zone was encountered at 135 feet and averages 7.0% P_2O_5 Field Shapiro. The first zone was semi-gradational at the top, while the second was gradational. What may be a zone of advanced weathering was found some 50 feet above the phosphate zones. The zone is described as very limonitic, ferruginous, silty shale and chert. The gamma log records a characteristic "platform" kick in the interval which is indicative of the weathered zones found in the logs for some of the holes to the north. The lack of phosphate

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in this typically phosphatic zone may be due to the alteration of sedimentary phosphate to its weathering product, crandallite. Hole C is dominantly a shale section with an interval of thin interbeds of carbonate just below the indicated highly weathered zone and just above the phosphate zones. This indicates the change of facies from carbonate to shale occurs below the weathered zone, which is only suggested in Holes B6, B2 and B. This change appears to commence in the B area and develops to the east and to the south toward the D-Tree Area.

The high amplitude kick recorded on the gamma log for this hole in an interval low in P_2O_5 may be attributed to the presence of crandallite.

Hole C2 also encountered two phosphate zones but is somewhat difficult to correlate with Hole C. The first zone, however, was particularly high in P_2O_5 content averaging 18.5% P_2O_5 AMDEL over a 4-foot interval. This zone occurs in an interval of soft, weathered (?) silty shale with chert pebbles and overlies a small interval of dominant carbonate. The zone is correlated with the upper phosphate zones of Holes C4 and C5 on the basis of its similar thickness, relatively high P_2O_5 content, its stratigraphic position above a carbonate and its sharp increase in P_2O_5 at the top of the zone. Its elevation is also about the same as that of the upper zones in C4 and C5.

The second zone, found only about 20 feet beneath the carbonate interval, averages 9.3% P_2O_5 AMDEL over 3 feet in silty shales with chert interbeds. This zone may increase in thickness toward the east and is correlated with both zones found in Hole C. The zones of C and the lower zone of C2 appears to be the facies equivalent of the strictly carbonate phosphate zones found in the holes to the north and appears to be increasing in thickness toward the east and toward the D-Tree Area to the south.

SUMMARY

The overall grade, prohibitive depth, impurities and indicated tonnages of phosphate in the B area present a disappointing picture. The zones presently appear to be of very marginal economic importance.

The phosphate zones are predominantly associated with either a carbonate or a highly ferruginous weathered zone, and as such, are of doubtful worth. However, a facies change from phosphatic limestone to a more desirable non-calcareous shale with increasing phosphate, has been detected at depth in Holes C and C2. The facies change to highly phosphatic shale increases in thickness toward the south in the D-Tree Area.

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CROSS SECTIONS - D-TREE AREA

GENERAL

Drilled during the 1966 programme, Holes D-Tree 1 and 2A, located approximately three miles south of D-Tree bore, encountered very encouraging phosphate zones at depth. P_2O_5 values of 17.1 and 15.2% in hole D-Tree 1 and 28.3% P_2O_5 A.M.D.E.L. in D-Tree 2 are recorded as "highs". Additional holes were drilled during the 1967 drilling programme to further delineate phosphate occurrence in the D-Tree Area.

Sections showing lithology, phosphate content, gamma-ray logs, and tentative lithological correlations that accompany this report are discussed below. It should be noted that the vertical exaggeration of these sections is approximately 30 times true scale.

SECTION E3-E2-E6-D

This section indicates a dominantly argillaceous lithology with carbonate development down a central zone in the E6 area. This central zone, roll or ridge, apparently continues southward through Holes D-Tree 13 and D-Tree 7-7A. Phosphate intervals of considerable, but variable extent, are recorded east of this ridge. In this section, Hole E2 intercepted a 19-feet interval averaging 7.3% P_2O_5 A.M.D.E.L. The lithology of the phosphate zone is described as interbedded carbonate and clayey shale with chert stringers (see Appendix 1, AN1777/67). Coring of this section was generally unsuccessful due to loss of circulation. Hole E3 to the east, encountered only minor phosphatic zones in a strictly non-carbonate section of silty shale with interbedded chert. To the west of E6, Hole D encountered five minor zones at depth in calcareous, clayey and silty shale also with interbedded chert. Proterozoic sediments were presumably encountered in Hole E6 at depth. These sediments are tentatively considered Proterozoic in age on the basis of the absence of chert interbeds, which, in this area, almost invariably indicates Middle Cambrian sediments. However, these sediments are not correlative lithologically with the known Proterozoic sediments found in Hole H and H2. They may be a calcareous member of the Paradise Creek Formation of Proterozoic age.

Correlation of this section with Holes C2 and C of the B Area to the north is difficult. The phosphate zones of Hole C, and at least the lower zone of C2 may be correlative with the phosphate zones of E2 and E3, indicating a major facies change from non-clastic sediments in the C area with relatively non-calcareous phosphatic sediments of appreciable thickness found at a depth of about 100 feet. The phosphate zones extend southward from C, remain east of the carbonate roll (?), and rise to within 50 feet of the surface at Hole E2.

SECTION D-TREE 11 - D-TREE 13

This section is located approximately .75 miles south of E2. D-Tree 11 encountered one phosphate zone which averages 11.3% P_2O_5 A.M.D.E.L. over an interval of 18 feet. A change to a sandy and clayey siltstone with interbedded chert is found at 38 feet. A further change from non-phosphatic to phosphatic sediments occurs at 56 feet. The change is gradational in

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nature with P_2O_5 values increasing from less than 1.0% to 3.0% to 9.0% P_2O_5 A.M.D.E.L. over a three-foot interval. A six-foot interval averaging greater than 18.0% P_2O_5 A.M.D.E.L. is also recorded in the major zone of D-Tree 11. The zone trails off at the bottom with no observed change in lithology from phosphatic to non-phosphatic sediments. Coring of the phosphate interval was unusually successful (see Appendix 1, Report AN28/68 and Appendix 4a and 4b).

The gamma log is relatively active for this hole and is typical of the gamma curves for the holes containing high P_2O_5 east of the carbonate roll or ridge. This may indicate the presence of relatively greater amounts of crandallite as a secondary replacement of what was once higher grade phosphate now altered to iron-aluminium phosphate through sub-aerial weathering and iron-aluminium rich ground water circulation.

Hole D-Tree 13, drilled approximately .50 miles west-northwest of D-Tree 11, and due south of the predominantly carbonate section in Hole E6, also encountered a carbonate section. Two phosphate zones of minor extent are recorded. Partial loss of drilling ;circulation signalled the presence of the typically vughy interbedded cherty shale and carbonate containing the minor phosphatic zones. Zone 1, averages 5.0% P_2O_5 A.M.D.E.L. over a three-foot interval, while zone 2 averages 13.0% P_2O_5 A.M.D.E.L. over a one-foot interval, four feet below the bottom of zone 1. The two zones may join, but loss of circulation between the two zones prohibited good sample collection. About two to three feet below zone 2, a silty limestone with interbedded chert was encountered. The limestone was typically mildly phosphatic, generally .50 to 1% P_2O_5.

No gamma log is available for D-Tree 13, due to caving of the hole during the 1966-67 "wet" season.

SECTION D-TREE 9 - D-TREE 7 - 7A

This section is similar to those to the north with the carbonate roll (?) at D-Tree 7-7A and with major phosphate zones found to the east in D-Tree 9. D-Tree 9, located .50 miles south of D-Tree 11 encountered a predominantly clastic lithology which is similar to that of D-Tree 11. Five phosphate zones are recorded over an interval of approximately 100 feet in silty, partly sandy shale, with interbedded chert. The zones constitute a phosphatic section from 49 feet, where the change to phosphatic sediments is abrupt, to 107 feet, with intermittent gaps between the zones of less than 5.0% P_2O_5 A.M.D.E.L. The zone of maximum P_2O_5 content averages about 9.0% P_2O_5 A.M.D.E.L. over a 16-foot interval. Below the major zones, P_2O_5 values tail off to below 2.0% P_2O_5 in calcareous and silty shale interbedded with stringers of chert.

Hole D-Tree 7A, drilled to intersect an interval of highly phosphatic, silty limestone found in outcrop about 600 feet north-northeast of Hole D-Tree 7 in a bank of the West Thorntonia Creek, encountered a predominantly

/ Page 29 .....

carbonate section (see Appendix 1, Report MP295/68). It intersected approximately 20 feet of silty limestone with interbedded chert. The limestone is underlain by a 16-foot interval of thinly interbedded calcareous siltstone with chert stringers and silty limestone. Most of this interval is highly phosphatic with three major phosphate zones. Zone 1 averages 8.5% P_2O_5 A.M.D.E.L. over a two-foot interval. The change from non-phosphatic to phosphatic sediments is gradational at the top of this zone. Zone 2, however, averages 8.1% P_2O_5 A.M.D.E.L. over an 11-foot interval and is also gradational at the top of the zone. Zone 3, occurring in an interval of silty limestone, averages 5.5% P_2O_5 A.M.D.E.L. over only two feet. Below the major phosphate zones, occasional silty interbeds contain higher P_2O_5 in a dominantly carbonate section.

The gamma log for DT-7A is especially interesting. A high amplitude kick occurs just above the top of zone 1. This kick is again attributed to the presence of crandallite. The gamma curve for the rest of the hole is intermittently active, indicating the thinly interbedded nature of the more gamma active calcareous shale and less active silty limestone.

D-Tree 7, drilled approximately 450 feet southwest of D-Tree 7A, encountered no major phosphate zones in a predominantly carbonate section. The calcareous phosphate zones occurring high in the D-Tree 7A section have apparently been eroded in the D-Tree 7area, leaving only phosphatic alluvium (see Plate XI).

SECTION D-TREE 2A - D-TREE 4A - D-TREE 1 - D-TREE 5C-G2-F

This section consists primarily of non-carbonates. The carbonate roll or ridge (?) indicated in holes to the north was not encountered in the holes of this section. However, if it has not lensed out, it would be expected between Holes D-Tree 1 and D-Tree 5C. Phosphate zones of relatively major extent were found in Holes D-Tree 1 at 102 feet, and in D-Tree 2A at 78 feet. D-Tree 1 encountered two zones at depth, the first averages 9.3% P_2O_5 A.M.D.E.L.; the second zone averages 9.2% P_2O_5 A.M.D.E.L., also over 11 feet (see Appendix 1, Report AN1777/67). D-Tree 2A encountered better phosphate zones at shallower depths. Zone 1 averages 11.6% P_2O_5 A.M.D.E.L. over 16 feet, while zone 2 encountered 32 feet of phosphatic sediments averaging about 9% Field Shapiro. Due to difficult drilling in this area, the second zone is shown as a composite of two drilling attempts, i.e. D-Tree 2 and 2A, completed during the 1966 drilling programme.

Coring of Hole D-Tree 2B was attempted but was largely unsuccessful due to loss of circulation and poor recovery (see Appendix 4b).

An increase in clay content is recorded as a lithologic change at the top of the first phosphate zones in both D-Tree 1 and D-Tree 2A. The lithology of the phosphate zones is described as dominantly argillaceous, silty shales with interbedded chert. The change from non-phosphatic to phosphatic sediments is abrupt in both holes with a tailing off toward the bottom of the lower zones.

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Gamma logs for both holes are correlative, with two distinct non-P_2O_5 kicks above the first phosphate zones. Crandallite as an alteration product of once higher grade phosphate is again thought to be present above the major phosphate zones.

While correlation of phosphate zones between D-Tree 1 and 2A appears certain, lithologic correlation is uncertain. D-Tree 1 bottomed in a calcareous silty sandstone of presumed Proterozoic age, while 2A bottomed in silty, non-calcareous shale with interbedded chert at about the same elevation. The appearance of Proterozoic sediments in D-Tree 1 may be associated with the ridge, roll or undulating nature of the basement as indicated by the carbonate ridge or roll to the north, and presumably to the west of the hole.

Local folding is indicated in the D-Tree 5 area. In an attempt to reach the major phosphate zones found in D-Tree 1-2A, a closely spaced grid was drilled. None of the four holes encountered major phosphate zones. All lost circulation at about 100 feet in predominantly sandy siltstone without chert. Three of these holes may have encountered Proterozoic sediments near the T.D. of the holes. The grid indicates a minor anticlinal structure plunging at about 2° toward the southeast. The dip is at about 3° toward the northeast and southwest (see Plate XI). Local folding in the area has been recognised in outcrop nearby.

Minor phosphate zones were encountered near the T.D. of the holes. D-Tree 5C encountered a zone of four feet averaging 5.0% P_2O_5 A.M.D.E.L. To the west, Hole G2 also encountered a 4-foot interval of phosphate averaging 12.6% P_2O_5 A.M.D.E.L. in lithology very similar to that found in the phosphate zones of D-Tree 1 and 2A.

A silty chert breccia-conglomerate was encountered near the T.D. of Hole G2. This may be correlative with that found outcropping in a creek approximately 1 mile south of Hole D-Tree 11 near the major track. The indicated dip of the beds in the D-Tree 5 area allows for reasonable correlation of the chert breccia-conglomerate with that found in outcrop. It must be remembered that the vertical exaggeration of the sections in Plate X is about 30 times natural scale. Hole F was drilled to 100 feet and found near the T.D. what may be the top of a deep phosphatic zone, similar perhaps to the phosphatic zone found in G2. Correlation of D-Tree 1-2A and the holes to the west is fair, keeping in mind the indicated local folding.

HOLES H2 - H - 13 - D-TREE 3

Hole H2 and H, located due south of D-Tree 1, failed to encounter the anticipated major phosphate zones. Hole H, however, encountered a minor phosphate zone at about 70 feet averaging 5.0% P_2O_5 A.M.D.E.L. over a 5-foot interval. A thinning of the phosphate zones and a facies change from shale to carbonate, is indicated in this area. This may be due to the shallowing effects of the Middle Cambrian sea over a topographically high Proterozoic floor toward the south and also perhaps, in the same manner, to the east of D-Tree 2A. Proterozoic sediments were encountered

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in Holes H and H2 at elevations which indicate the shallowing of the top of the Proterozoic sediments is to the south.

Carbonate is noted in H2 but is wanting in H to the south. The presence of carbonate in H2 is particularly interesting in that it appears to have developed instead of the typical silty, phosphatic shales of the D-Tree 1-2A area. Carbonate development is also noted in Holes 13 and D-Tree 3, both to the west of H2 and H. Phosphate zones are absent, presumably as a result of the facies change and carbonate development. No indications of erosion have, to date, been identified.

Correlation of Middle Cambrian sediments in H and H2 is difficult. Marked differences exist in both lithology and comparative gamma logs.

A fault, mapped by the B.M.R. in the area of the JF holes to the south, is indicated as what may have been a major control of the deposition in the H, H2 and D-Tree 1-2A areas and may explain the absence or thinning out of the phosphate zones toward the south. Minor outcrops found near the fault, in nearly vertical beds, and just north of it, in nearly horizontal beds, however, indicate deposition of unusually high grade phosphate in relatively thin beds (see Appendix 1, Report MP295/68). Holes J1, 2 and 3 are apparently stratigraphically below the major phosphate zone and record only minor phosphate intervals near the surface.

SUMMARY

Limited reserves of low to medium grade phosphate are available in the D-Tree 11 - D-Tree 9 - D-Tree 1-2A area at depths from 61 feet at Hole D-Tree 11 to 78 feet at Hole D-Tree 2A. Additional reserves at shallower depths may be available southeast of D-Tree 1 as indicated by minor outcrops in the Hole JF area. The variable thickness and low grade of the major phosphate zones, the excessive overburden and the nature of the chemical impurities, indicate major economic difficulties in developing this deposit.

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APPENDIX I

A.M.D.E.L.

PETROLOGICAL, CHEMICAL

and

MINERALOGICAL REPORTS

APPENDIX I

CONTENTS

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A.M.D.E.L.

REPORT

AN-MP1298/67 & AN1570/67

CONCERNING:

HOLE P

(WHISTLER'S CREEK AREA)

THREE PHOSPHORITE SAMPLES

Hole P

1. INTRODUCTION

Three samples from core marked 190 to 192 feet were selected for mineralogical and petrographic examination. A portion of each sample was crushed and examined by x-ray diffraction (powder diffractometry). The remainder was used for thin section preparation. Owing to the soft incoherent nature of the matrix it was necessary to impregnate the samples with araldite prior to sectioning.

2. RESULTS

2.1 Mineralogy

The mineralogical constituents and their relative concentration (expressed semi-quantitatively[1]) is as follows:

Sample 1: Quartz dominant, apatite sub-dominant, goethite accessory.
Sample 2: Quartz and apatite co-dominant, goethite sub-dominant.
Sample 3: Apatite dominant, quartz sub-dominant, goethite accessory.

2.2 Petrography

Sample 1: TS18441

This rock is an arenaceous phosphorite. It consists essentially of clastic quartz grains in a matrix of sub-microscopic (less than 0.001 mm) collophane and goethite.

The quartz grains are sub-angular to sub-rounded and constitute about 30% of the rock. They vary from 0.05 to 0.38 mm in diameter and average 0.12 mm.

The matrix is sub-microscopic. It consists of light to dark brown collophane and goethite intimately associated. Some opaque ?pellets of goethite are also present. Microcrystalline quartz (chert) may also be present but masked by the other matrix constituents.

Sample 2: TS18442

This rock is also an arenaceous phosphorite.

Clastic quartz constitutes about 10% of the rock. The grains are angular to sub-angular and vary from 0.016 to 0.36 mm (average 0.09 mm).

---

[1] The abundance of the components is estimated from the intensity of characteristic x-ray diffraction lines.

Dominant = greater than 50%
Co-dominant = two equal components comprising more than 50%
Sub-dominant = 20 to 50%
Accessory = less than 20%

The matrix consists of light brown, sub-microscopic collophane and contains sub-rounded pellets of goethite averaging 0.32 mm in diameter. The goethite pellets partially enclose clastic grains and are considered to be diagenic. They constitute about 10% of the rock.

Sample 3: TS18443

This rock is similar to Samples 1 and 2. It is an arenaceous phosphorite.

Clastic quartz grains constitute about 10% of the rock. They vary from 0.016 to 0.38 mm in diameter and average 0.09 mm. They are angular to sub-rounded.

The matrix consists of light brown, sub-microscopic phosphorite. Irregular brown staining of goethite is present in patches.

Some microcrystalline quartz may be present in the matrix but this was not observed optically.

3. DISCUSSION

These rocks are typical of phosphorite sediments. They are mainly non-clastic and consist of chemically or biogenically precipitated phosphate and iron minerals. Some interaction between non-clastic sedimentation and the introduction of terrigenous sediments is evidenced by the variable content of detrital quartz grains. Diagenesis is evident, particularly in Sample 2, where pellets of goethite have formed in the matrix. Generally the iron hydroxide and the phosphate minerals are of sub-micron size and are intimately associated.

It is possible that by light grinding followed by screening and classification the clastic gangue can be separated. However the sub-micron association of goethite and apatite makes further upgrading doubtful. Feasability tests would be necessary to determine the practicability of beneficiation.

During discussions with Mr. T. Cheyney of Continental Oil Co. of Australia Ltd. the author was requested to remove the clastic components of the samples by screening and to analyse the non-clastic fractions. Two samples were selected which were not crushed previously. These are the top and bottom samples of Core 190-195 feet. The samples were lightly crushed by impact with a mortar and pestel and wet seived through a 200 mesh BSS screen (76 micron). The fractions were then dried (at 80°C) weighed and a fraction of each examined by x-ray diffraction. The results are as follows:

Core 190-195 feet

Sample	Fraction	% of whole rock	Mineralogy
Top	+200 mesh	22.35	Quartz dominant, apatite trace.
Top	-200 mesh	77.65	Apatite and goethite dominant, quartz trace.
Bottom	+200 mesh	23.50	Quartz dominant, apatite and goethite accessory.
	-200 mesh	76.50	Apatite and goethite dominant, quartz accessory.

The -200 mesh fractions were submitted to the Analytical Section for determination of P_2O_5, Al_2O_3, Fe_2O_3. These results, together with the chemical analyses of the untreated samples, will be reported separately.

Footnote: At the request of Mr. T. Cheyney, the thin sections of these rocks were forwarded to Continental Oil Co. of Australia on the 21st November, 1966. Owing to insufficient time it was not possible to apply cover glass to the sections.

mb:3

ANALYSIS

	P_2O_5 %	Al_2O_3 %	Fe_2O_3 %	Acid Insoluble %	CaO %	MgO %	CO_2 %	F %
P Core 190 - 195 Top	23.6	1.8	26.3	10.5	29.6	0.18	0.37	1.79
P Core 190 - 195 Bottom	22.6	3.0	20.6	17.7	28.0	0.16	0.39	1.73
190 - 192 sample A	22.5	2.2	15.5	25.7	28.6	0.19	0.32	1.71
190 - 192 sample B	17.5	2.7	26.3	24.3	21.5	0.17	0.52	1.27
190 - 192 sample C	19.0	2.5	19.0	30.6	23.2	0.18	0.42	1.50
Deslimed samples				- 200 #%				
P Core 190 - 195 Top	26.6	3.0	19.1	77.6				
P Core 190 - 195 Bottom	20.0	6.1	18.8	76.5				

hg:3

ANALYSIS
%

	2% Citric Acid Soluble P_2O_5	Water Soluble P_2O_5	Loss on Ignition	Total Sulphate	Total Chloride Cl
Core P.					
Top	5.8	0.007	5.48	* 0.01	* 0.01
Bottom	6.0	0.028	5.44	* 0.01	* 0.01
Combined A + B + C	5.3	0.008	5.04	* 0.01	* 0.01

* indicates less than

A.M.D.E.L.

REPORT

AN1561/67 AND AN1435/67

CONCERNING:

HOLE T

(WHISTLER'S CREEK AREA)

HOLE U

(SHERRIN CREEK AREA)

ANALYSIS
%

Sample mark		Acid Insoluble Matter	Ferric Oxide Fe_2O_3	Aluminium Oxide Al_2O_3	Phosphorus pentoxide P_2O_5
Hole T					
Core 1	241' - 242'4"	90.8	0.47	2.4	1.27
Core 2a	242'4" - 243'	65.1	5.75	5.55	7.35
Core 2b	243' - 243'2"	83.9	0.82	3.95	3.2
Core 3a	243'2" - 243'8"	72.3	1.51	6.4	5.6
Core 3b	243'8" - 246'8"	71.3	4.4	3.7	5.6
Core 4	247'8" - 249'2"	63.4	4.65	5.4	5.6
Core 5	249'2" - 252'5"	65.5	4.0	5.0	5.8
Core 6	252'5" - 255'4"	56.8	5.1	5.2	10.5

(R.L.D. - 3.54 m
Hole "U"

ANALYSIS
%

	Acid Insoluble Matter %	Fe_2O_3 %	Al_2O_3 %	P_2O_5 %
Core 1				
220' - 221'	68.2	4.0	8.4	5.2
221' - 222'	60.3	4.3	8.0	8.4
222' - 223'	63.9	3.8	8.2	6.6
223' - Bottom (223'6")	65.0	3.9	7.8	6.3
Core 2				
223'6" - 224'6"	60.5	3.9	6.1	9.6
224'6" - 225'6"	68.5	2.6	4.7	8.1
225'6" - Bottom (230'4")	78.9	3.3	6.3	6.5
Core 3				
228'4" - 229'4"	61.8	3.8	8.1	7.8
229'4" - 230'4"	57.0	4.5	8.6	9.1
230'4" - 231'4"	50.0	4.9	8.5	11.6
231'4" - Bottom (12?)	40.8	4.3	5.8	16.9

Fe_2O_3 - Ferric oxide
Al_2O_3 - Aluminium oxide
P_2O_5 - Phosphorus pentoxide

A.M.D.E.L.

REPORT

AN1777/67

CONCERNING:

HOLES: B (B AREA)
E2 (D-TREE AREA)
DT-1 (D-TREE AREA)
Z (LILY CREEK AREA)

Holes: B
E2
D Tree 1
Z

Q40
354m
Analyses
E

RESEARCH FOR INDUSTRY



THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

CONYNGHAM STREET · FREWVILLE · SOUTH AUSTRALIA
TELEPHONE 791662 · TELEGRAMS 'AMDEL' ADELAIDE

Please quote this reference in your reply:

AN 3/249/0

2nd February, 1967

Your reference:

Mr. R. Arrington,
Continental Oil Co. of Aust. Ltd.,
IBM Centre,
168 Kent Street,
SYDNEY, N.S.W.

REPORT AN1777/67

YOUR REFERENCE: Letter of transmittal dated 6/1/67

IDENTIFICATION: As listed

DATE RECEIVED: 11/1/67

ANALYSIS
%

Sample mark	P_2O_5	Ferric oxide Fe_2O_3		Aluminium oxide Al_2O_3		Calcium oxide CaO	Carbon dioxide CO_2	
B7	2.8	2.85	2.81	7.1	7.1	4.3	0.10	0.6
B9	8.5	1.75		5.2		12.9	0.76	
B11	17.4	2.25		7.0		24.4	0.53	
B13	18.4	4.4		9.2		27.0	1.05	
B15	8.4	3.0		8.3		22.0	15.0	
B17	4.9	0.65		1.15		30.6	36.1	
B19	8.2	1.05		1.75		29.5	27.1	
B21	11.2	4.25		9.6		16.5	0.48	
B23	9.5	6.05		15.9		15.2	1.73	
B25	8.6	5.2		14.3		13.6	2.0	
B27	4.0	1.45		2.2		27.2	32.3	

Ave. P_2O_5
8'-14' = 13%

ANALYSIS
%

Sample mark	% P_2O_5	Ferric oxide Fe_2O_3	Aluminium oxide Al_2O_3	Calcium oxide CaO	Carbon dioxide CO_2
E2-40-45	8.2	3.4	3.25	18.2	7.0
E2-45-50	11.3	4.55	3.65	21.1	5.6
DT-1-108	10.8	1.95	5.1	15.0	0.29
DT 103	14.8	0.8	2.7	18.2	0.34
DT 106	10.5	1.8	6.55	16.9	0.38
DT 107	13.2	5.25	5.85	19.3	0.46
DT 111	11.2	1.95	8.9	17.0	0.37
DT 112	17.1	1.3	8.9	22.4	0.42
DT 121	11.5	4.35	3.7	16.5	0.43
DT 122	13.8	5.3	4.4	19.7	0.43
DT 123	15.2	7.65	3.35	20.9	0.43
DT 124	13.5	7.25	4.5	19.9	0.48
Z 117' 721	10.8	6.45	5.85	14.0	0.25
Z 123' 748	15.0	6.35	3.6	21.9	0.34
Z 125' 740	13.5	4.15	3.95	20.8	0.36
Z 141' 732	11.7	4.7	4.3	14.8	0.34
Z 155' 759	12.0	1.55	4.0	16.2	0.25

Enquiries quoting AN1777/67 to Officer in Charge please.

Analysis by: R.B. Oliver and S.A. Alexander

Officer in Charge, Analytical Section: A.B. Timms

P.A. Young
Director.

hg:2
c.c. Mr. R. Grasso,
Fitzpatrick Johnson & Associates,
77 Grenfell Street,
ADELAIDE

A.M.D.E.L.

REPORT

AN-MP2885/67

CONCERNING:

HOLES: L.C.2 (LILY CREEK AREA)
L.C.5 (LILY CREEK AREA)

SAMPLES 2044 - 2053

1. CHEMICAL ANALYSIS

The samples were analysed semi-quantitatively for phosphate (P_2O_5) and the total γ-activity was determined radiometrically. The results are as follows:

Hole	Depth	SAMPLE	SEMI-QUANTITATIVE P_2O_5 (%)	γ-ACTIVITY ≡ U_3O_8 (ppm)
LC-2	108	2044	0.4	30
"	109	2045	0.25	<10
"	110	2046	0.4	<10
"	111	2047	0.85	<10
"	112	2048	0.2	<10
"	113	2049	0.2	20
"	114	2050	0.05	<10
"	115'	2051	0.05	<10
"	116'	2052	<0.05	10
LC-5	25-30	2053	0.75	25

The results confirm that samples 2044 and 2053 have higher γ-activities than average and that the samples contain very little phosphorus.

2. MINERALOGICAL ANALYSIS

The mineralogy of the two samples of higher gamma-activity was determined by x-ray diffraction. The results are as follows:

Sample 2044: Quartz dominant, kaolin accessory, illite accessory, smectite trace, feldspar trace, crandallite trace.

Sample 2053: Quartz dominant, kaolin accessory, smectite accessory, illite trace, crandallite trace.

3. CONCLUSIONS

The gamma activity of these samples is about seven or eight times lower than that of marine, sedimentary phosphorite and is generally consistent with the phosphate assays.

A quantitative test for thorium in the samples of higher radioactivity was negative.

The presence of crandallite in the two samples may be responsible for the higher radioactivity. The aluminium phosphate zones of the Florida phosphate field and at Christmas Island (Indian Ocean), both of which contain dominant crandallite, are more radioactive than the underlying apatitic phosphorites.

em.2

A.M.D.E.L.

REPORT

MP3025/67

CONCERNING:

HOLE: S.C.27 (SHERRIN CREEK AREA)

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GEORGINA BASIN PHOSPHATE SAMPLES 10001 TO 10006

1. INTRODUCTION

The six samples submitted were examined mineralogically and petrographically and some were analysed chemically. As the samples were submitted in packets and separately packaged fractions of the same sample appeared to be lithologically different, each packaged sample was examined separately.

A representative portion of each sample was first separated and analysed chemically for phosphate (semi-quantitative P_2O_5). A further representative portion was then split and sieved on a 14 mesh BSS screen. The plus 14 mesh fraction was examined lithologically and fragments of various lithologies selected. These fragments were analysed chemically for phosphate, examined mineralogically by X-ray diffraction and sections were prepared and described petrographically. The minus 14 mesh fraction was examined mineralogically by X-ray diffraction.

Complete chemical analyses were subsequently carried out on the bulk samples which assayed more than 10% P_2O_5.

2. GENERAL DESCRIPTION OF THE SECTION

I. Samples 10001 to 10003 are dominantly claystone. Below 10003 the samples consist of claystone, phosphatic claystone, chert and phosphorite.

II. The mineralogy of the samples is summarised in Table 1. Owing to variations in crystallinity and matrix effects, the abundance of the constituents could be determined only semi-quantitatively. The terminology used in Table 1 and Section 3 is as follows:

(D)	Dominant:	greater than 50%
(C-D)	Co-dominant:	two major components of approximately equal abundance
(S-D)	Sub-dominant:	20 to 50%
(Ac)	Accessory:	5 to 20%
(Tr)	Trace:	less than 5%
(F-Tr)	Faint Trace:	just detectable.

TABLE 1: QUANTITATIVE MINERALOGICAL AND PHOSPHATE ANALYSES[a]

Hole #	Sample	Fraction Mesh	Weight % of Sample	P_2O_5 %	Mineralogy							Depth
					Apatite	Crandallite	Quartz	Kaolin	Illite	Smectite	Feldspar	
S.C.27	10001A	- 14	34.3	-	-	Tr	S-D	D	S-D	Ac	F-Tr	75'-79'6"
"	10001A	+ 14	65.7	1.1	-	Ac	S-D	D	S-D	-	F-Tr	"
"	10001B	- 14	15.4		-	Tr	S-D	D	S-D	Ac	F-Tr	"
"	10001B	+ 14	84.6	0.3	-	Tr	C-D	C-D	S-D	-	F-Tr	"
"	10001C	- 14	29.3	-	-	Tr	S-D	D	S-D	Ac	F-Tr	"
"	10001C	+ 14	70.7	0.45	-	Tr	C-D	C-D	Ac	F-Tr	F-Tr	"
"	10002A	- 14	23.9	-	-	Tr	C-D	C-D	S-D	Ac	F-Tr	"
"	10002A	+ 14	76.1	0.6	-	Tr	D	Ac	Ac	-	F-Tr	"
"	10002B	- 14	29.7	-	-	Tr	C-D	C-D	S-D	Ac	F-Tr	"
"	10002B/a	+ 14	65.0	1.85	-	Ac	D	S-D	Ac	-	Tr	"
"	10002B/b	+ 14	5.3	-	-	Tr	D	-	-	Tr	Tr	"
"	10003A	- 14	< 1.0	-	Ac	Tr	C-D	C-D	S-D	Ac	F-Tr	79'6"-83'0"
"	10003A	+ 14	>99	0.75	-	Tr	D	S-D	S-D	Ac	_	"
"	10003B	- 14	3.6	-	S-D	Tr	C-D	C-D	S-D	Tr	-	"
"	10003B	+ 14	96.4	6.6	Ac	Tr	D	S-D	Ac	Tr	-	"
"	10004A	- 14	30.5	-	C-D	Tr	C-D	Ac	Ac	Ac	-	"
"	10004A	+ 14	69.5	12.4	S-D	-	D	Ac	Ac	Tr	-	"
"	10004B	- 14	17.0	-	S-D	Tr	D	S-D	Ac	Tr	-	"
"	10004B	+ 14	83.0	8.2	Ac	-	D	S-D	S-D	Ac	-	"

Continued....

TABLE 1: CONTINUED

Hole #	Sample	Fraction Mesh	Weight % of Sample	P_2O_5 %	Mineralogy							Depth
					Apatite	Crandallite	Quartz	Kaolin	Illite	Smectite	Feldspar	
SL-27	10005A	- 14	3.2	-	C-D	F-Tr	C-D	S-D	Ac	Tr	-	83'0"-86'6"
"	10005A	+ 14	96.8	7.4	S-D	-	D	S-D	Ac	Tr	-	"
"	10005B	- 14	35.2	-	S-D	Tr	D	S-D	Ac	Tr	-	"
"	10005B	+ 14	64.8	1.7	Ac	-	D	-	Tr	Ac	-	"
"	10006A	- 14	15.7	-	C-D	F-Tr	C-D	Ac	Ac	Tr	-	"
"	10006A	+ 14	84.3	31.7	D	Tr	Ac	-	-	Tr	-	"
"	10006B	- 14	11.4	-	D	F-Tr	S-D	Ac	Ac	Ac	-	"
"	10006B	+ 14	88.6	25.0	D	F-Tr	S-D	F-Tr	Ac	Ac	-	"

(a) P_2O_5 analyses by R.L. Bruce.

III. From Table 1 it can be seen that apatite is the dominant phosphate mineral and occurs mainly in samples 10004A to 10006B. It occurs as collophane forming a mudstone or ovulitic pellets. Samples 10003, 10004 and 10005 contain collophane pellets and breccia fragments within a dominantly argillaceous matrix. Sample 10006 was the only sample found to contain phosphorite.

The collophane pellets average 0.051 mm in diameter. They are normally ovulitic and irregular in shape. Some encased pellets were observed.

Irregular collophane breccia fragments occur mainly in samples 10003, 10004 and 10005. They are up to 0.7 mm in width and are considered to be intraformational.

Samples 10006A and 10006B contain fragments of phosphorite consisting of a collophane mud matrix through which are dispersed chert and quartz grains.

The collophane mud may be compared with the microsphorite of the Bone Valley Formation, Florida (Riggs and Freas, 1965). It differs from the Florida microsphorite in containing chert fragments and finer clastic constituents.

The collophane is generally sub-microscopic (less than 0.002 mm) in crystallite size.

In general, the abundance of collophane increases towards the higher sample numbers.

IV. Crandallite, the only other phosphate mineral detected, occurs in most samples in trace amounts. Its occurrence is difficult to establish petrographically, owing to the sub-microscopic particle size and the low abundance.

V. The main gangue is quartz. It occurs both as clastic sand and silt grains and as fine-grained sedimentary chert.

Kaolin and illite are also common. The claystones comprising the lower sample numbers consist dominantly of these minerals. The presence of kaolin in these sediments may indicate a depositional environment of low salinity. However acid weathering or diagenic processes could also form kaolin from illitic sediments.

Mineralogical analyses indicate a generally inverse relationship between kaolin and apatite. This is consistent with their different chemical stabilities.

Smectite is a persistent impurity occurring in accessory to trace amounts in most samples. Smectite is a common associate of sedimentary phosphorite.

VI. Intraformational brecciation is a common feature of these rocks. Although the generally minor content of clastic minerals indicates that these sediments are essentially of a low energy

depositional environment, the common occurrence of sedimentary breccias suggests periods of high energy and reworking of semi and previously consolidated beds.

3. SYSTEMATIC DESCRIPTIONS

3.1 Sample 10001A

Lithology: Claystone, buff coloured, thin bedded.

P_2O_5 of whole sample: 0.9%

P_2O_5 of + 14 mesh fraction: 1.1%

Mineralogy of + 14 mesh fraction: Kaolin dominant, quartz sub-dominant, illite sub-dominant, crandallite accessory, (?)feldspar trace.

Mineralogy of - 14 mesh fraction: Kaolin dominant, quartz sub-dominant, illite sub-dominant, smectite accessory, crandallite trace, (?)feldspar trace.

Petrography (TS19302): This sample consists of silty claystone. It consists dominantly of a fine-grained to sub-microscopic aggregate of clay minerals and contains silt-size quartz grains and sericite flakes.

Detrital quartz grains vary from less than 0.006 mm to 0.1 mm and average 0.03 mm in diameter. They constitute about 30% of the rock. Fine sericite flakes comprise about 25%.

The remainder consists of an aggregate of clay minerals less than 0.002 mm in width.

No phosphate minerals were identified optically.

3.2 Sample 10001B

Lithology: Claystone, buff coloured.

P_2O_5 of sample: 0.95%

P_2O_5 of + 14 mesh fraction: 0.3%

Mineralogy of + 14 mesh fraction: Quartz and kaolin co-dominant, illite subdominant, crandallite trace, (?)feldspar trace.

Mineralogy of - 14 mesh fraction: Kaolin dominant, quartz sub-dominant, illite sub-dominant, smectite accessory, crandallite trace, (?)feldspar trace.

Petrography (TS19303): This is a silty claystone. It is similar to Sample 10001A but the clastic quartz is finer averaging 0.02 mm.

A few opaque flakes are dispersed throughout the claystone. Their identity could not be positively established but their low reflectance suggests that they are carbonaceous.

No phosphate minerals could be identified optically.

3.3 Sample 10001C

Lithology: Claystone, buff coloured. Contains some black chert fragments.

P_2O_5 of sample: 0.6%

P_2O_5 of + 14 mesh fraction: 0.45%

Mineralogy of + 14 mesh fraction: Quartz and kaolin co-dominant, illite accessory, crandallite trace, (?)feldspar trace.

Mineralogy of - 14 mesh fraction: Kaolin dominant, quartz sub-dominant, illite sub-dominant, smectite accessory, crandallite trace, (?)feldspar trace.

Petrography (TS19304): This rock is a silty claystone similar to sample 10001B.

3.4 Sample 10002A

Lithology: Buff coloured, claystone, similar to Sample 10001B.

P_2O_5 of sample: 0.8%

P_2O_5 of + 14 mesh fraction: 0.6%

Mineralogy of + 14 mesh fraction: Quartz dominant, illite accessory, kaolin accessory, crandallite trace, (?)feldspar trace.

Mineralogy of - 14 mesh fraction: Quartz and kaolin co-dominant, illite sub-dominant, smectite accessory, crandallite trace, (?)feldspar faint trace.

Petrography (TS19305): This is a claystone, similar to sample 10001A but contains less silt-size quartz grains. Sericite flakes are also more common and constitute about 30%. A few quartz grains up to 0.06 mm occur but the average grain size is 0.02 mm. Clay constitutes about 50% of the rock.

3.5 Sample 10002B

Lithology: Buff coloured claystone, similar to sample 10001B constitutes about 95% of this sample. Remainder consists of black chert.

P_2O_5 of sample: 1.4%

P_2O_5 of + 14 mesh fraction: 1.85%

Mineralogy of claystone fragments: Quartz dominant, kaolin sub-dominant, illite accessory, crandallite accessory, feldspar trace.

Mineralogy of chert: Quartz dominant, crandallite trace, smectite trace, (?)feldspar trace.

Mineralogy of - 14 mesh fraction: Quartz and kaolin co-dominant, illite sub-dominant, smectite accessory, crandallite trace, (?)feldspar faint trace.

Petrography:

(i) Claystone (TS19306A). This is a bedded claystone containing sub-ordinate silt grains. Some iron staining occurs along bedding planes.

The majority of the rock consists of clay-size aggregates of clay minerals and possibly fine quartz.

Clastic quartz grains varying in diameter from 0.006 mm to 0.16 mm and averaging 0.02 mm constitute about 20%. The silt is concentrated in selected sedimentary beds. Detrital sericite also occurs.

The crandallite could not be identified optically. It is considered to be sub-microscopic and associated with the clay.

(ii) Chert (TS19306B). This consists essentially of a sub-microscopic to fine-grained mosaic of quartz grains. Replaced carbonate rhombs are common and now consist of quartz. Detrital silt-size quartz grains and sericite flakes occur in trace amounts.

The majority of the rock consists of a fine-grained to sub-microscopic mosaic of quartz. Local recrystallization occurs in places forming grains averaging 0.03 mm in diameter.

Small rhombic outlines of replaced carbonate are common. They average 0.013 mm in width and normally occur in aggregates. No carbonate minerals were detected by optical or X-ray diffraction methods and the rhombs now consist of cloudy quartz. They comprise about 20% of the rock.

Clay mineral aggregates occur in places within the chert. The clay (determined by X-ray diffraction to be smectite) consists of fine-grained to sub-microscopic flakes randomly oriented.

Detrital quartz grains, averaging 0.052 mm in diameter are dispersed throughout the rock and constitute about 2%.

3.6 Sample 10003A

Lithology: This sample consists dominantly of fragments of buff coloured claystone, some of which contain silt beds. The remainder consists of claystone containing chert breccia fragments.

P_2O_5 of sample: 1.75%

P_2O_5 of claystone: 0.75%

Mineralogy of Claystone: Quartz dominant, kaolin sub-dominant, illite sub-dominant, random stratified clay (mainly smectite) accessory, crandallite trace.

Mineralogy of - 14 mesh fraction: Quartz and kaolin co-dominant, illite sub-dominant, apatite accessory, smectite accessory, crandallite trace, (?)feldspar faint trace.

Petrography:

(i) Bedded Claystone (TS19307A). This rock is a thinly bedded, silty claystone.

The claystone is similar to that of sample 10001B. It consists dominantly of a sub-microscopic to fine-grained aggregate of clay with some detrital quartz grains and sericite flakes of silt-size. A few grains of tourmaline also occur.

Layers containing more silt alternate with the dominantly claystone layers. These beds contain up to 50% detrital quartz grains varying from 0.006 mm to 0.06 mm in diameter. Sericite flakes, averaging 0.05 mm in length are common and tabular tourmaline crystals also occur.

(ii) Claystone with Chert Breccia (TS19307B). This rock consists of angular fragments of chert, some of which contain dispersed collophane pellets, in a matrix of silty claystone.

The chert fragments are angular and up to 1 cm in width. Most fragments consist of a uniform fine-grained mosaic of quartz grains. A few contain sinuous fossil fragments.

One chert fragment observed in thin section is phosphatic. It contains collophane pellets and elongated collophane fossil fragments dispersed in a chert matrix. The pellets are irregular shape, ovulitic, varying in diameter from 0.025 mm to 0.099 mm and average 0.057 mm. A few encased pellets were also observed. The elongated fossil fragments are thought to be brachiopods.

Fragments and pellets, consisting entirely of collophane, are also dispersed throughout the claystone. They consist of a uniform sub-microscopic aggregate of collophane and show no internal structures. The pellets average 0.25 mm in diameter and the fragments are up to 0.7 mm in width. Collophane constitutes about 10% of the rock.

3.7 Sample 10003B

Lithology: This sample consists of claystone, claystone containing black chert fragments and chert fragments up to 2 cm in width. The chert constitutes about 10% of the sample. Approximately

96% of the sample consists of fragments larger than 14 mesh BSS.

P_2O_5 of sample: 4.7%

P_2O_5 of claystone: 6.6%

Mineralogy of claystone: Quartz dominant, kaolin sub-dominant, illite accessory, apatite accessory, crandallite trace, (?) smectite trace.

Mineralogy of - 14 mesh fraction: Quartz and kaolin co-dominant, illite sub-dominant, apatite sub-dominant, crandallite trace, smectite trace.

Petrography:

(i) Claystone (TS19309A). This is a phosphatic silty claystone. It consists of collophane pellets in a silty claystone of similar texture to Sample 10001A. The rock also contains layers of sericite flakes and fragments of chert.

Collophane pellets are dispersed within sedimentary beds. They are of irregular shape and are ovulitic. Some small fragments of collophane are dispersed in layers. These fragments are possibly brecciated pellets. Elongated fossil fragments are also present. The collophane fragments vary from 0.015 mm to 0.14 mm and average 0.05 mm.

The claystone consists of a fine-grained to sub-microscopic aggregate of clay minerals and poorly sorted, silty quartz grains. This sample contains more birefringent clay than those described previously. Irregular aggregates of fine-grained clay particles occur in optically continuous zones. The clay mineral species could not be identified positively by optical means but the birefringence and refractive index suggests an illitic composition.

Quartz clasts constitute about 30% of the rock and occur as irregular grains varying from 0.006 mm to 0.17 mm in diameter and averaging 0.026 mm.

(ii) Cherty Claystone (TS19309B). This consists of angular fragments of chert within a silty claystone of similar texture to that described in (i). Some collophane pellets are contained in beds within the claystone.

The silty claystone is generally similar to that described above.

Silty layers containing dispersed collophane pellets occur sporadically. The collophane pellets are ovulitic, are moderately dispersed(a) and average 0.045 mm in diameter.

(a) The terminology of pelletal textures used in this report is that of Mabie and Hess, 1964.

Irregular quartz grains avering 0.07 mm in diameter, sericite flakes and clay comprise the rest of the layers.

The chert fragments consist dominantly of a fine-grained quartz mosaic. Cloudy flakes of (?)silicified carbonate minerals are common and the chert is stained light brown with organic matter. A few collophane pellets were observed in the chert. They are well dispersed and average 0.033 mm in diameter. Collophane constitutes less than 2% of the chert fragments.

3.8 Sample 10004A

Lithology: Friable, earthy and sandy, phosphatic claystone with minor chert fragments. Approximately 30% of the sample is less than 14 mesh BSS.

P_2O_5 of sample: 12.4%

P_2O_5 of phosphatic claystone: 12.4%

Mineralogy of phosphatic claystone: Quartz dominant, apatite sub-dominant, kaolin accessory, illite accessory, smectite trace.

Mineralogy of - 14 mesh fraction: Quartz and apatite co-dominant, kaolin accessory, illite accessory, crandallite trace, smectite trace.

Petrography (TS19310): This rock is a bedded claystone containing fragments of chert, collophane fragments and pellets, and fine sand grains.

The detrital constituents constitute about 60% of the rock. Irregular chert fragments are dominant and consist of a fine mosaic of quartz crystals. Chert fragments vary from 0.1 mm to 8.0 mm and average 0.32 mm in width. Some recrystallized chert fragments consisting of larger quartz crystals are present and these may be derived from metamorphic rocks.

Fragments and pellets of collophane constitute about 30% of the rock. The pellets are ovulitic and the fragments consist of uniform sub-microscopic collophane aggregates without sedimentary structures. Some fragments contain trace amounts of sericite flakes and fine quartz grains. Encased collophane pellets also occur but are rare. The collophane fragments are up to 0.5 mm in width. Pellets vary from 0.015 mm to 0.17 mm and average 0.04 mm in diameter. They are loosely dispersed in the claystone.

Quartz grains, varying from fine silt size to fine sand are common. They are normally sub-angular and constitute about 10% of the rock.

The matrix consists of sub-microscopic clay.

Sorting of the clastic constituents is generally poor. However, less clastic beds of claystone occur in places.

3.9 Sample 10004B

Lithology: This sample consists of fragments of phosphatic and silty claystone, chert breccia and bedded chert. Approximately 17% is less than 14 mesh BSS.

P_2O_5 of sample: 9.5%

P_2O_5 of claystone: 8.2%

P_2O_5 of chert: 1.7%

Mineralogy of claystone: Quartz dominant, kaolin sub-dominant, illite sub-dominant, apatite accessory, smectite trace.

Petrography:

(i) Phosphatic Claystone (TS19311A and TS19311B). This is a phosphatic and argillaceous siltstone. It consists of beds of collophane pellets and collophane breccia fragments within a dominantly silty claystone.

The collophane is mainly pelletal. The pellets are normally ovulitic and are generally loosely semi-dispersed. Rare encased pellets also occur. Although irregular in shape, the pellets are mainly sub-spherical to elliptical. The mean diameter varies from 0.03 mm to 0.16 mm and the average is 0.065 mm. Pellets constitute about 15% of the rock.

Collophane breccia fragments are also common. They are similar in shape and structure to those of sample 10004A and average 0.16 mm in width.

Some thin beds of collophane occur in places. They average 0.03 mm thick and are plastically deformed. In general, these beds are discontinuous and are squeezed and brecciated into boudinage structures.

Collophane fossil fragments also occur sporadically. Normally these fragments are elongated but some tabular sections are also preserved.

The gangue consists mainly of quartz grains and clay. Most of the quartz is less than 0.03 mm but a few grains up to 0.3 mm in diameter are also present. Quartz constitutes about 40% of the rock.

The remainder consists of fine-grained to sub-microscopic clay.

(ii) Chert (TS19312). The black chert is typical of that occurring in samples 10003 to 10006 as breccia fragments in claystone or as discrete beds. It consists dominantly of a fine-grained to sub-microscopic mosaic of quartz crystallites. Cloudy inclusions are dispersed throughout, some of which are rhombic in outline suggesting relict structures after euhedral carbonate crystals.

The rock is typically non-clastic. Collophane pellets averaging 0.07 mm in diameter occur in trace amounts.

3.10 Sample 10005A

Lithology: This sample consists mainly of light grey phosphatic claystone. Light brown phosphorite (c.f. that described in Sample 10006A) and black chert fragments constitute about 2%. Approximately 3% of the sample is less than 14 mesh BSS.

P_2O_5 of sample: 6.6%

P_2O_5 of phosphatic claystone: 7.4%

Mineralogy of phosphatic claystone: Quartz dominant, apatite sub-dominant, kaolin sub-dominant, illite accessory, smectite trace.

Mineralogy of - 14 mesh fraction: Apatite and quartz co-dominant, kaolin sub-dominant, illite accessory, smectite trace, crandallite faint trace.

Petrography:

Phosphatic Claystone (TS19313A and B). This rock is a phosphatic and silty claystone. It consists of pellets and fragments of collophane, and quartz grains in a clay matrix. Breccia fragments of chert, quartzite and phosphatic shale are also present.

The collophane pellets and fragments are similar to those of sample 10004. The pellets are loosely dispersed, vary from 0.025 mm to 0.09 mm and average 0.065 mm in diameter. Collophane fragments up to 0.5 mm were observed.

Irregular chert fragments occur throughout the rock. Some are recrystallized and contain cavities suggesting dissolution of another (?carbonate) constituent. Other chert fragments consist of a homogeneous fine-grained mosaic of quartz. Fragments of coarser crystalline quartzite are also present. The breccia fragments are up to 0.12 mm in width.

Quartz grains averaging 0.05 mm constitute about 20% of the rock. They vary in concentration within sedimentary layers.

In one section, a fragment consisting of claystone and collophane occurs. The collophane occurs mainly as a sub-microscopic mud and contains some dispersed collophane fragments and pellets dispersed throughout. Other collophane pellets, averaging 0.08 mm in diameter, occur within the claystone. This fragment also contains a sub-rounded collophane nodule, 1.3 mm in diameter showing crustiform banding.

The whole rock is cemented by sub-microscopic clay particles.

3.11 Sample 10005B

Lithology: This sample consists of white to grey claystone and chert and some (about 10%) black chert. Approximately 35% of this sample is less than 14 mesh BSS.

P_2O_5 of sample: 8.2%

P_2O_5 of grey chert: 1.7%

Mineralogy of grey chert: Quartz dominant, smectite accessory, apatite accessory, illite trace.

Mineralogy of - 14 mesh fraction: Quartz dominant, apatite sub-dominant, kaolin sub-dominant, illite accessory, crandallite trace, smectite trace.

Petrography:

(i) Grey Chert (TS19314). This chert consists dominantly of a fine-grained mosaic of quartz with accessory collophane pellets and thin clay layers. Sericite flakes and tourmaline crystals occur in trace amounts.

It is similar to the chert of sample 10004B described above, except in that it contains less cloudy inclusions.

The thin clay layers are discontinuous and are thought to consist of smectite although this could not be confirmed optically.

3.12 Sample 10006A

Lithology: This sample contains three lithologies; light brown phosphorite, light grey chert and black carbonaceous chert. Approximately 16% is less than 14 mesh BSS.

P_2O_5 of whole sample: 16.6%

P_2O_5 of phosphorite: 31.7%

Mineralogy of phosphorite: Apatite dominant, quartz accessory, smectite trace, crandallite trace.

Mineralogy of - 14 mesh fraction: Apatite and quartz co-dominant, kaolin accessory, illite accessory, smectite trace, crandallite faint trace.

Petrography:

Phosphorite (TS19315A and B). This rock consists essentially of a fine-grained collophane mud through which are dispersed chert and collophane breccia fragments. Fine sand grains and clay pellets are also present in sub-ordinate amounts and opaque staining by (?)manganese occurs in places.

The collophane mainly occurs as a sub-microscopic matrix. Some collophane fossil fragments and collophane breccia

fragments are dispersed throughout the matrix but constitute less than 10% of the rock. A few collophane pellets also occur.

Irregular fragments of chert comprise most of the gangue. They are concentrated in sedimentary beds moderately dispersed within a collophane matrix. They vary in width from 0.03 mm to 0.64 mm and average 0.25 mm.

Clay pellets occur sporadically within the collophane, averaging 0.08 mm in diameter but some form thin discontinuous beds. The clay occurs as randomly oriented crystallites. The composition of the clay could not be determined by optical methods. The pellets are light brown and are throught to be oxidised glauconite.

Quartz grains averaging 0.1 mm in width comprise about 3% of the rock. Some grains contain acicular crystals of (?)rutile.

3.13 Sample 10006B

Lithology: Light brown phosphorite and phosphorite containing black chert fragments. The two lithologies are present in about equal proportions. Approximately 11% of the sample is less than 14 mesh BSS.

P_2O_5 of sample: 22.5%

P_2O_5 of cherty phosphorite: 25.0%

Mineralogy of phosphorite: Apatite dominant, quartz sub-dominant, illite accessory, smectite accessory, crandallite faint trace, kaolin faint trace.

Mineralogy of cherty phosphorite: Apatite and quartz co-dominant, smectite accessory, crandallite trace.

Petrography:

(i) Light Brown Phosphorite (TS19316). This consists of a thinly bedded collophane mud containing numerous collophane fossil fragments and some pellets. Aggregates of clay and fine sand grains are present in subordinate amounts.

The majority of the rock consists of a uniform mud of sub-microscopic collophane, similar to that of sample 10006A.

The rock is thinly bedded and contains numerous elongated collophane fossil fragments oriented generally parallel to the bedding.

Clay pellets and thin beds of clay comprise about 10% of the rock. The clay is similar in occurrence to that of sample 10006A.

Detrital quartz grains, varying from 0.007 mm to 0.22 mm in diameter and averaging 0.08 mm constitute a further 5%.

They are dispersed throughout the rock. Some irregular chert fragments are also present but are rare.

(ii) Cherty Phosphorite (TS19317). This rock consists of chert fragments and a collophane mud matrix in approximately equal proportions. Irregular clay aggregates and detrital quartz grains are also present.

The collophane matrix is similar to that described in sample 10006A. Collophane fossil fragments and pellets are also common.

The chert occurs as extremely irregular fragments up to 0.12 mm in width. They consist of recrystallized mosaic quartz. Detrital quartz grains are also present. They average 0.03 mm in diameter and constitute about 5% of the rock.

The clay occurs in aggregates dispersed through the rock. It is similar in occurrence to that of Sample 10006A and constitutes about 10%.

4. CHEMISTRY

The three samples assaying more than 10% P_2O_5 by the semi-quantitative method were analysed completely. The results are included in Table 2.

TABLE 2: CHEMICAL COMPOSITION OF PHOSPHATIC SEDIMENTS(a)

	10004A	10006A	10006B
CaO	15.8	22.1	29.6
MgO	0.43	0.30	0.38
Na_2O	0.05	0.04	0.04
K_2O	0.28	0.14	0.17
Al_2O_3	5.59	4.00	3.45
Fe_2O_3	0.24	0.31	0.31
P_2O_5	12.2	16.5	22.4
CO_2	0.30	0.36	0.50
SO_4	0.24	0.14	0.19
F	0.95	1.42	1.78
Acid Insol	60.1	51.5	37.5
Loss on ignition 550°C	2.12	1.65	1.86
Loss on ignition 800°C	2.68	2.11	2.43

(a) Analyses by H. Kresse.

Owing to the presence of clay and minor crandallite in these samples, the precise composition of the collophane could not be determined. However, the ionic proportions of phosphorus, carbonate carbon, sulphate sulphur and fluorine were calculated on a basis of 5 calcium atoms for apatite, viz, $Ca_5(PO_4,CO_3,F,OH)_3(F,OH)$. The results are included in Table 3.

TABLE 3: ATOM RATIOS OF APATITIC IONS CALCULATED ON A BASIS OF 5 CALCIUM ATOMS

Atom	10004A	10006A	10006B
Ca	5.000	5.000	5.000
P	3.025	2.944	2.979
C	0.160	0.101	0.104
S	0.035	0.013	0.009
F	0.890	0.939	0.882

These results show an excess of (PO_4, SO_4, CO_3) ions over the stoichiometric value for calcium. This may result from the presence of crandallite in these samples or may indicate the alkalies in substitution for calcium in the apatite lattice. The presence of clay in these samples prevents interpretation on the basis of alkali constituents.

Fluorine is slightly less than the stoichiometric requirement for fluorapatite and, in fact, the deficiency is somewhat greater when compared with most marine sedimentary phosphorite. These sediments normally contain additional fluorine together with carbonate ions substituting for the orthophosphate ions.

The trace elements of samples 10004A, 10006A and 10006B were determined on a semi-quantitative basis by emission spectroscopy. The results are included in Table 4.

TABLE 4: SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS[(a)]

Element	Sample		
	10004A	10006A	10006B
Cu	40	40	40
Pb	100	50	120
Zn	30	40	70
Co	20	10	4
Ni	8	8	7
Sn	3	3	1
Ag	1	0.5	0.4
Cr	20	12	10
U	30	15	12
Be	7	8	20
Mo	2	1	<1
Ga	10	7	7
Ge	1	<1	<1
Mn	30	150	200
Rb	80	100	70
Li	25	25	15
Ba	200	250	300
Sr	60	100	100
B	50	40	15
Zr	70	50	<50
Sc	12	150	150
Y	120	300	200

(a) Analysis by G.R. Holden. Results in ppm.

5. BRIEF COMMENTS ON THE POSSIBILITIES OF BENEFICIATION[a]

Although ore dressing experiments were not carried out on any of the samples, some aspects of beneficiation procedures are indicated by the petrographic textures.

Samples 10003 to 10005 contain collophane pellets and fragments within a dominantly clay matrix. Chert fragments and silt-size quartz grains are also present. The grade of these samples is low. Liberation, dispersion and classification may be suitable for removal of much of the clay and fine quartz. Further size classification on the coarser material may produce a collophane fraction but in general this will not result in high yields.

The samples containing phosphorite, samples 10006A and 10006B, may be amenable to treatment by a similar process of size classification but from these samples the collophane should be recoverable in the fine fraction. Liberation of the contaminating chert by light grinding may be possible, and size analysis may remove the silica in the coarser fractions. If clay is present in significant amounts this may need to be removed from the collophane subsequently.

6. REFERENCES

MABIE, C.P. and HESS, H.P., 1964: "Petrographic Study and Classification of Western Phosphate Deposits". U.S. Department Int. Bur. Mines, R of I. 6468.

RIGGS, S.R. and FREAS, D.H., 1965: "Stratigraphy and Sedimentation of Phosphorite in the Central Florida Phosphate District". Soc. of Min. Eng. of A.I.M.E., Preprint 65H84.

(a) These remarks result from discussions with Mr. P.K. Hosking, Officer in Charge, Metallurgy Section.

PHOTOMICROGRAPHS

PLATE 1

A. Sample 10001A. Silty claystone consisting of quartz grains (Q) averaging 0.02 mm in diameter and fine sericite flakes in a kaolinitic matrix. Opaque flecks could not be positively identified but reflectance suggests that they are carbonaceous.
ppl, x40

B. Sample 10003B. Phosphatic silty claystone consisting of clastic quartz grains (Q), averaging 0.026 mm in diameter dispersed within a clay matrix. Fragments and pellets of collophane (arrow) are opaque under crossed nicols. A fragment of carbonaceous chert is illustrated in the upper right of the photomicrograph.
XN, x25

C. Sample 10003A. Chert fragments (Ch) and collophane pellets within silty claystone. The chert fragment here illustrated is not phosphatic but others contain dispersed collophane pellets. Collophane fragments and pellets (Co) within the claystone are opaque under crossed nicols owing to the sub-microscopic crystallite size. Silty quartz (Q) is common.
XN, x25

D. Sample 10003A. Same field as illustrated in C, in plane polarised light. Most collophane pellets are ovulitic but an elliptical encased pellet (arrow) is here illustrated.
ppl, x25

PLATE 2

A. Sample 10004A. Irregular fragments of chert (Ch) and collophane (CO) together with silt-size quartz grains (Q), dispersed in a clay matrix. The rock is poorly sorted.
ppl, x40

B. Sample 10004B. Collophane pellets (OV) and fossil fragments (F) in beds consisting of silt-size quartz (Q) and clay. The collophane pellets are ovulitic and constitute about 15% of the rock.
ppl, x25

C. Sample 10005A. Phosphatic and silty claystone consisting of collophane pellets (OV) and fragments (Co) and silt-size quartz grains in a matrix of clay. A large fragment of silty chert containing some collophane ovules (OV) is illustrated in the bottom right of the photomicrograph.
ppl, x25

D. Sample 10005A. Same field as illustrated in C, under crossed nicols. The birefringent quartz detritus (white) and the sub-microscopic collophane and clay (opaque) are more obvious.
XN, x25

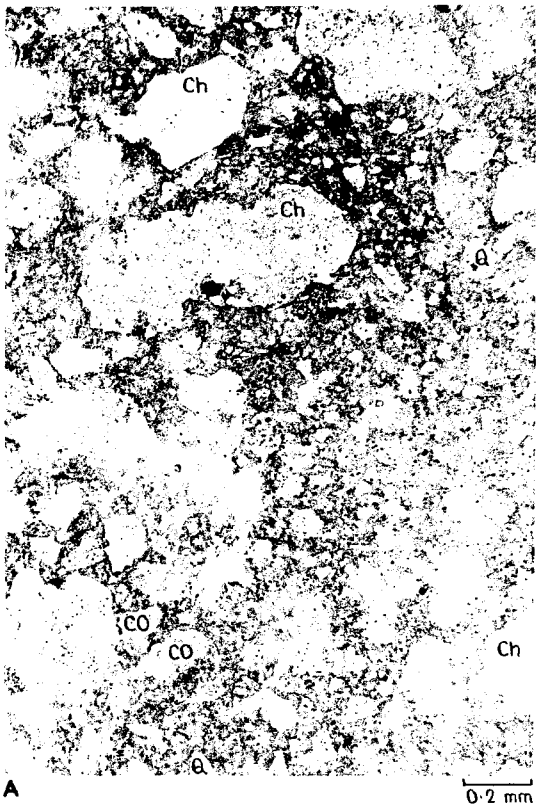




PLATE 2



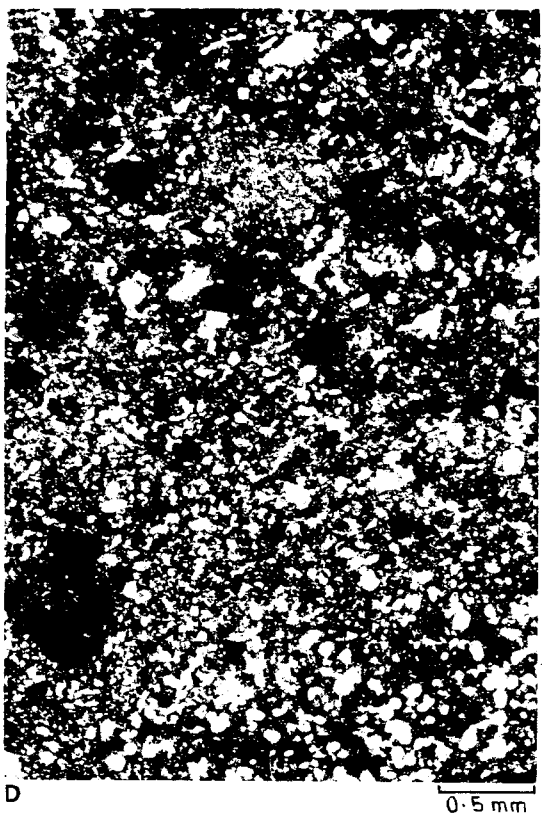


PLATE 3

A. Sample 10006B. Cherty phosphorite. Irregular fragments of chert (Ch), detrital quartz grains (Q) and clay aggregates (C) within a matrix of sub-microscopic collophane mud. Fragments of collophane fossil fragments (F) and collophane ovules (OV) are also dispersed through this rock. Opaque matter is carbonaceous.
ppl, x40

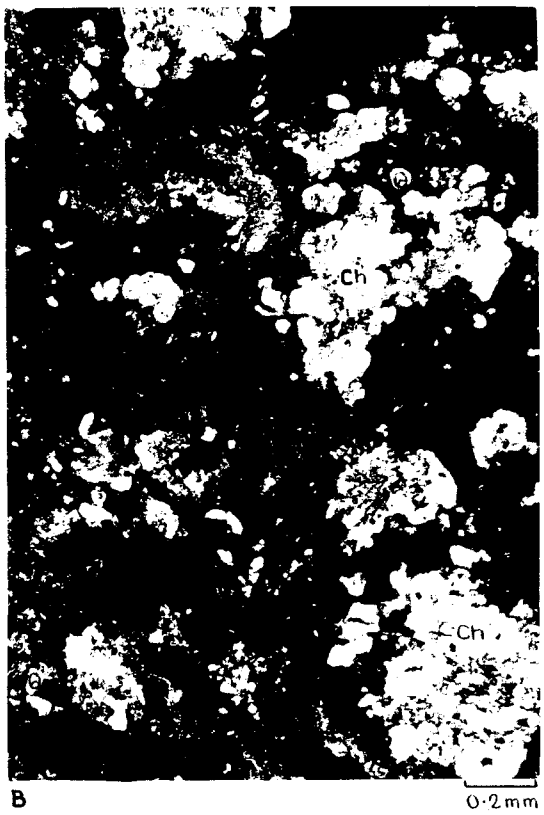
B. Sample 10006B. Same field as illustrated in A, under crossed nicols. Birefringent, recrystallized chert (Ch) and detrital quartz grains (Q) are in contrast to the opaque collophane matrix. Clay aggregates (C) are also birefringent.
XN, x40

C. Sample 10006B. Another section of the cherty phosphorite. The irregular shape of the chert fragments (Ch) and clay aggregates (C) which are dispersed through a matrix of sub-microscopic collophane is illustrated. Collophane fossil fragments (F) and pellets (OV) are common.
ppl, x25

D. Sample 10006B. Same field as illustrated in C, under crossed nicols. Recrystallized chert (Ch), quartz grains (Q) and clay aggregates (C) are contained within sub-microscopic collophane (opaque).
XN, x25

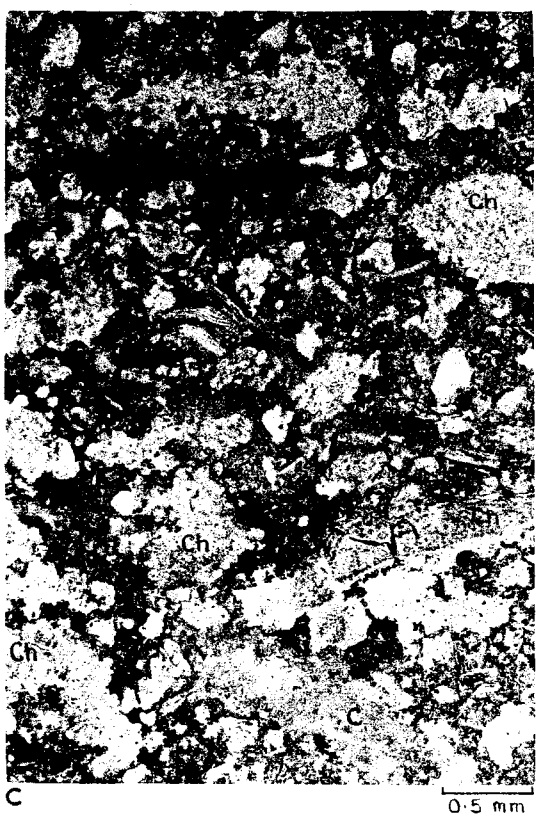


A



B

PLATE 3



C



D

A.M.D.E.L.

REPORT

AN28/68

CONCERNING:

HOLES: S.C.4 (SHERRIN CREEK AREA)
S.C.4X (SHERRIN CREEK AREA)
S.C.15X (SHERRIN CREEK AREA)
S.C.15Y (SHERRIN CREEK AREA)
S.C.15Z (SHERRIN CREEK AREA)
D.T.11A (D-TREE AREA)

ANALYSIS

%

Hole #	Sample mark	Depth	Acid Insoluble	Acid Sol. Ferric oxide Fe_2O_3	Acid Sol. Aluminium oxide Al_2O_3	Calcium oxide CaO	Magnesium oxide MgO	Sodium oxide Na_2O	Potassium oxide K_2O
S.C.4	10032	101'-103'(Bot)	44.4	0.81	1.5	27.5	0.35	0.22	0.30
S.C.15Z	10041	95'8"-98'2"(Bot)	51.6	3.8	2.5	20.1	0.95	0.17	0.46
DT-11A	10045	53'5"-56'5"(Bot)	53.8	1.55	3.75	20.7	0.17	0.09	0.31
"	10046	56'5"-57'5"	52.8	2.1	4.85	19.0	0.23	0.09	0.41
"	10047	57'-5"-58'5"	46.2	2.35	5.35	21.9	0.29	0.10	0.53
"	10048	58'5"-59'0"	47.5	2.5	7.8	20.1	0.31	0.10	0.47
S.C.4X	10078	105'10"-107'2"	51.2	0.93	2.45	23.2	0.31	0.09	0.44
"	10079	107'2"-108'6"	61.9	0.91	1.9	18.1	0.25	0.17	0.37
"	10081	110'8"-112'0"	55.5	1.75	2.85	19.6	0.50	0.18	0.40
S.C.15Y	10089	85'6"-87'6"	17.9	0.64	1.95	41.9	0.25	0.29	0.31
"	10090	87'0"-88'8"	35.9	3.8	1.25	27.0	0.25	0.23	0.24
"	10091	82'0"-85'6"	51.0	0.45	2.35	23.0	0.31	0.16	0.56
S.C.15X	10093	88'0"-90'0"	56.4	0.54	3.85	19.6	0.52	0.14	0.53
"	10095	92'0"-94'6"	34.7	0.93	2.9	30.7	1.51	0.20	0.39
"	10096	94'6"-96'6"	36.2	0.74	3.5	28.9	1.78	0.16	0.50

ANALYSIS

%

Hole #	Sample mark	Depth	Loss on Ignition at 550°C	Loss on Ignition at 800°C	Sulphate SO_4	Fluorine F	Carbon Dioxide CO_2
*	10032	*	1.3	1.75	0.64	1.9	0.6
	10041		2.9	4.25	0.60	1.2	1.9
	10045		2.25	2.6	0.28	1.2	0.3
	10046		3.05	3.55	0.24	1.0	0.38
	10047		3.4	3.9	0.31	1.0	0.46
	1004		4.05	4.65	0.27	1.0	0.45
	1007		1.65	2.0	0.70	1.3	0.61
	1007		1.45	1.85	0.38	1.2	0.47
	10081		2.55	3.2	0.45	1.2	0.58
	1008		1.2	1.6	0.91	2.7	0.80
	10090		1.45	1.9	0.68	1.9	0.60
	10091		1.75	2.15	0.45	1.3	0.36
	10093		2.0	2.7	0.38	0.98	0.42
	10095		2.05	4.85	0.54	1.95	3.30
	10096		2.8	6.05	0.46	1.65	4.37

*SEE PREVIOUS PAGE.

REPORT AN P/68

SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

C.P.8216

Sample No.	Cu	Pb	Zn	Co	Ni	Sn	Bi	Ag	Cr	V	Be	Mo
[illegible] 10032	30	70	120	8	12	1	<1	1.	15	10	20	<1
[illegible] 41	70	50	200	40	50	1	1	1·0	20	12	15	3
[illegible] 45	60	70	80	8	15	1	<1	1·2	20	12	5	1
" 56'5"-57'5" 46	30	70	70	8	15	2	1	0·4	40	20	3	2
" 57'5"-58'5" 47	50	80	100	7	25	2	1	0·5	15	12	5	1
" 58'5"-59' 48	20	70	80	4	10	2	1	0·3	15	12	4	<1
[illegible] 105'6"-107½' 78	40	70	60	7	20	1	<1	2·	15	10	4	1
" 107½'-108'6" 79	100	60	500	30	60	2	1	3·	20	50	4	3
" 110'8"-112' 81	30	20	80	3	30	2	1	2·	15	12	4	2
15Y 85'-87' 89	80	70	120	10	60	2	1	1·2	30	15	5	4
" 87'-88'8" 90	40	60	150	10	70	2	<1	0·8	20	15	3	3
[illegible] 92'-95' 91	30	70	150	8	50	2	1	1·2	20	12	4	3
15X 88'-92' 93	50	120	100	15	40	1	<1	7·	20	15	4	2
" 92'-94'6" 95	40	100	70	12	40	1	"	2·	30	15	5	3
" 96'-98'6" 96	40	80	200	70	70	1	"	1·0	15	12	3	2

REPORT AN 25/68

SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

C.P.8216

Sample No.	Zr	Ba	Sr	B	P	Y	La	Sc	Ce	Cu	Ge	Mn
3C-A [illegible] 10032	<50	200	100	25	>10,000	[illegible]	120	5	800	6	<1	400
S[illegible] 15E98' - 98'2" 41	"	200	100	20	"	150	150	[illegible]	<400	4	1	200
DI-11A 98' - 98'5" 45	70	120	15	50	"	120	<100	5	"	7	1	40
" 98'5" - [illegible] 46	100	120	25	40	"	100	"	5	500	8	1	40
" 57'6" - 58'5" 47	<50	250	100	20	"	120	150	25	<400	4	1	300
" 58'6" - 59' 48	"	120	100	40	"	120	120	20	500	5	1	150
SE-1X 103'6" - 103'2" 78	"	250	120	20	"	150	120	20	<400	3	<1	200
" 103'2" - 103'6" 79	120	80	30	40	"	100	<100	5	"	4	1	150
" 110'8" - 111' 81	70	120	25	30	"	100	100	5	400	5	<1	60
15Y 85' - 87' 89	100	100	20	20	"	100	100	5	<400	8	1	120
" 87' - 88'6" 90	70	70	5	25	"	<100	<100	<1	500	12	1	120
[illegible] 82' - 85' 91	<50	60	4	20	"	"	"	"	600	12	2	150
15X 88' - 90' 93	"	50	10	15	"	100	"	"	600	5	1	60
" 92' - 94'6" 95	150	200	8	20	"	100	100	"	<400	3	1	50
" 10096 96'6" - 96'6"	<50	30	2	30	>> "	<100	<100	"	400	4	1	250

See A5. Results in ppm SPSH 18.8.67.

ELEMENTS NOT DETECTED.

Cd. Au. W. In Pd. As Sb Os In Pt Rh Ru Ta Te Tl Cs

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

REPORT AN 2 1/68

SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

C.P.8216

Sample No.	Nb	Rb	Li	Depth
10032	<50	120	25	101'–103' (Bottom)
41	"	70	15	95'8"–98'2" (Bottom)
45	"	120	30	53'5"–56'5" (Bottom)
46	"	100	20	56'5"–57'5" "
47	"	150	30	57'5"–58'5" 1'
48	"	200	40	58'5"–59'0" 1'
78	"	60	20	105'10"–107'2" Rec. 1'4"
79	"	100	25	107'2"–108'6" 1'4"
81	"	40	25	110'8"–112'0" 1'3"
89	50	120	30	85'–87' 1'10"
90	<50	150	40	87'–88'8" 10"
91	"	100	30	82'–85' Rec. 1'4"
93	"	120	25	88'–90' 1'6"
95	"	80	20	92'–94'6" 1'4"
10096	"	70	30	94'6"–96'6" 1'6"

A.M.D.E.L.

REPORT

MP3088/67

CONCERNING:

HOLE: S.C.10X (SHERRIN CREEK AREA)

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	2.2 Mineralogy and Petrography	2
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PHOSPHATIC SEDIMENTS, SAMPLES 10007 TO 10024

1. INTRODUCTION

The samples were first analysed for phosphate semi-quantitatively. Four samples assaying over 10% P_2O_5 were then analysed completely.

The different lithologies present in three of the samples containing over 10% P_2O_5 were then selected, examined mineralogically by X-ray diffraction techniques and described petrographically.

Representative portions of the four samples were then crushed and subjected to sieve analyses.

2. RESULTS

2.1 Phosphate Analyses

The semi-quantitative phosphate analyses of all samples are included in Table 1.

TABLE 1: Semi-Quantitative Phosphate Analyses(a).

Hole No.	Core Run No.	Sample	P_2O_5 %	Depth
SC-10X	#2	10007	0.95	35' - 36'3"
"	#4	10008	1.30	40' - 45'
"	#6	10009	8.9	50' - 51'
"	#6	10010	13.5	49' - 50'
"	#5	10011	7.5	Part of Core Rec. in Core No. 6
"	#6	10012	7.8	51' - 51'6"
"	#7	10013	5.0	51'6" - 61'6"
"	#7	10014	3.7	2nd 1' of Rec.
"	#7	10015	3.7	3rd 1' of Rec.
"	#7	10016	9.9	4th 1' of Rec.
"	#7	10017	20.0	5th 1' of Rec.
"	#7	10018	20.5	Bottom 6" of Rec.
"	#8	10019	3.3	61'6" - 64'6" Top 10"
"	#8	10020	14.3	Second 1'
"	#8	10021	1.95	Bottom 1'
"	#9	10022	6.8	64'6" - 67'6" Top 1'
"	#9	10023	1.80	Middle 1'
"	#9	10024	3.1	Bottom 1'

(a) Analysis by H. Kresse.

2.2 Mineralogy and Petrography

Sample 10017

Two specimens were selected from this sample.

10017

Lithology: Phosphatic claystone, buff to light brown, earthy, friable.

Mineralogy(a): Quartz and kaolin co-dominant, smectite sub-dominant, illite accessory, apatite accessory, goethite accessory.

Petrography (GS19412): This rock consists mainly of claystone with subordinate, clastic quartz grains averaging 0.01 mm in diameter. Some goethite staining occurs in patches. The goethite is considered to be diagenic.

Fragments of chert and collophane and collophane pellets occur in some areas of the rock. The chert fragments are up to 1.75 mm in width. The collophane fragments and pellets average 0.22 mm in diameter. Detrital quartz grains, averaging 0.17 mm in diameter, also occur in these areas.

10017B

Lithology: Phosphatic claystone, buff coloured, earthy, friable and containing light brown fragments.

Mineralogy: Apatite dominant, quartz sub-dominant, kaolin accessory, smectite accessory, illite trace.

Petrography (GS19413): This is a phosphatic claystone, similar to 10017. There is, however, a higher concentration of collophane fragments and pellets.

The collophane particles are loosely dispersed(b) in the clay matrix and average 0.22 mm in diameter. The pellets are ovulitic and the fragments are without sedimentary or crustiform textures.

(a) Owing to variations in crystallinity and matrix effects, the abundance of the constituents could only be determined semi-quantitatively. The terminology used is as follows:

Dominant:	greater than 50%
Co-dominant:	two major components of approximately equal abundance
Sub-dominant:	20 to 50%
Accessory:	5 to 20%
Trace:	less than 5%

(b) The terminology of textural types of phosphate ores used in this report is that of Mabie and Ross (1964).

Quartz grains, averaging 0.17 mm in width constitute about 2% of the rock. Some pale green (?)glauconite pellets also occur and average 0.22 mm in diameter.

The rock contains a number of phosphorite fragments up to 2.3 mm in width consisting of layers and pellets of collophane (see Plate 1D). The collophane layers are discontinuous and are plastically deformed into a compacted mass. Some quartz grains, averaging 0.15 mm, and glauconite pellets are included in the phosphorite fragments.

Sample 10018

Two specimens were examined from this sample.

10018A

Lithology: Phosphatic claystone, buff coloured, earthy, friable.

Mineralogy: Apatite dominant, quartz sub-dominant, kaolin trace, illite trace, smectite trace.

Petrography (TS19414): This rock is similar to 10017B but does not contain large phosphorite fragments. It consists essentially of collophane fragments and pellets, chert fragments and quartz grains in a matrix of clay. Irregular staining by goethite occurs in places.

The collophane pellets and fragments are irregular in shape, vary from 0.015 mm to 0.18 mm in width and average 0.08 mm. Some collophane fragments contain vermicular aggregates of collophane crystallites but most are without internal structures. The vermicular habit may be relicts of an organic cell texture but this could not be positively established. The pellets are sub-rounded and ovulitic.

Quartz grains varying from 0.015 mm to 0.34 mm constitute about 5% of the rock. Chert fragments averaging 0.23 mm comprise a further 3%.

The remainder of the rock consists of clay matrix, some of which is stained light brown by goethite.

10018B

Lithology: Sandy, phosphatic claystone, buff coloured, earthy, friable. The rock contains dark sand grains dispersed throughout.

Mineralogy: Quartz dominant, apatite sub-dominant, smectite sub-dominant, kaolin accessory, illite accessory, goethite trace, dolomite trace.

Petrography (TS19415): A sandy and phosphatic claystone. This rock is similar to 10018A except in that it contains more clastic quartz. Fragments and pellets of collophane are moderately dispersed throughout. Chert fragments occur in accessory amounts.

the mean diameter of the collophane fragments and pellets is 0.06 mm. They are similar to those in Sample 10018A being extremely irregular in shape and size.

Sample 10020

Two specimens were selected from this sample.

10020A
Lithology: Phosphatic claystone, light brown, earthy, friable.

Mineralogy: Apatite and quartz co-dominant, goethite accessory, smectite accessory, illite trace.

Petrography (GS19416): This rock consists of pellets and fragments of collophane, together with abundant collophane fossil fragments in a clayey and goethitic matrix.

Detrital quartz grains, averaging 0.07 mm constitute about 30% of the rock and some minor chert fragments are also present.

The collophane fragments are similar to those in Sample 10018. They average 0.065 mm in width.

This rock differs from those described previously in that it contains an abundance of elongate fossil fragments composed of collophane. The fragments average 0.013 mm in thickness and constitute about 10% of the rock.

The matrix is stained opaque with goethite.

10020B.
Lithology: Chert, dark brown, resinous, massive.

Mineralogy: Quartz dominant, cristobalite sub-dominant, apatite trace.

Petrography (GS19417): This rock is a fine-grained chert or silcrete and consists of opaline silica (sub-microscopic cristobalite) and some fine-grained recrystallized quartz.

Rare collophane pellets averaging 0.17 mm in diameter occur within opaline silica and detrital quartz grains averaging 0.03 mm also occur in minor amounts.

Chalcedony occurs lining cavities.

2.3 Chemical Analyses

The major elements of samples 10010, 10017, 10018 and 10020 are included in Table 2.

The atomic ratios of the apatite elements, phosphorus, calcium, carbon, sulphur and fluorine were computed for the four samples on a basis five calcium atoms per formula unit ($Ca_5(PO_4,SO_4,CO_3.F)_3F$). The results are included in Table 3.

TABLE 2: CHEMICAL ANALYSES OF SAMPLES CONTAINING MORE THAN 10% P_2O_5 (a).

Element	Sample			
	10010	10017	10018	10020
Fe_2O_3	1.12	1.35	1.31	1.9
Al_2O_3	9.6	6.25	6.2	3.9
CaO	18.6	27.7	28.1	28.1
MgO	0.74	0.55	0.45	0.55
K_2O	0.16	0.23	0.22	0.19
Na_2O	1.03	0.47	0.53	0.45
P_2O_5	13.5	20.1	20.8	14.6
SO_4	0.26	0.50	0.54	0.56
CO_2	0.50	0.50	0.60	0.45
F	1.35	1.15	1.35	0.80
Organic C(b)	0.05	0.05	0.05	0.05
Acid Insol.	47.3	35.8	35.2	50.9
Acid Insol. Fe_2O_3	0.21	0.07	0.07	0.10
Acid Insol. Al_2O_3	1.73	0.54	0.53	0.46

(a) Analysis by R.C. Hanekel and S.A. Alexander.

(b) Organic carbon was determined by difference of CO_2 evolved on heating sample at 1300°C and CO_2 evolved by acid digestion, recalculated as C.

TABLE 3: ATOMIC RATIOS OF APATITE ELEMENTS

Element	Sample			
	10010	10017	10018	10020
Ca	5.000	5.000	5.000	5.000
P	2.861	2.864	2.924	2.877
C	0.166	0.111	0.110	0.140
S	0.045	0.051	0.060	0.056
F	1.069	0.607	0.708	0.506

4.4 Screen Analysis (a)

A representative portion of samples 10010, 10017, 10018 and 10020 were selected for screen analyses to determine the effectiveness of size classification in separating collophane, chert and clay.

Each sample was separately reduced in a laboratory jaw crusher to minus ¼ inch size.

A 200 gram portion of each sample was soaked in water for approximately 10 minutes and a major physical breakdown occurred. 200 grams of each sample were then wet screened on 350 mesh aperture, after soaking in water for 48 hours.

The plus 350 mesh material was dried, and then screened on a Ro-tap machine for a period of 15 minutes, and the results are shown in Table 4.

Selected fractions from each sample were combined and analysed for total P_2O_5, Al_2O_3 and acid insoluble content. Results are shown in Table 5.

TABLE 4: SCREENS

Nominal Width of Aperture	Mesh BSS	Weight Retained %			
		10010	10017	10018	10020
2.80 mm	6	6.4		0.4	10.0
2.00 "	8	3.9	0.5	0.1	3.6
1.40 "	12	5.7	0.9	0.5	3.5
1.00 "	16	5.1	0.9	0.6	2.5
710 microns	22	5.2	1.4	1.1	2.4
500 "	30	5.5	1.9	1.6	2.5
355 "	44	6.0	3.4	2.5	3.6
250 "	60	5.1	5.0	3.4	4.3
180 "	85	5.4	8.5	5.6	4.5
125 "	120	5.5	11.5	8.5	6.2
90 "	170	4.7	9.6	7.5	6.5
63 "	240	3.2	6.0	6.0	6.0
45 "	350	2.6	4.3	4.7	5.6
-45 "	-350	35.7	43.7	57.5	33.8
		100.0	100.0	100.0	100.0

(a) Screening by S. Armstrong and C.V. Agate

TABLE 5: ANALYSES OF SIZE FRACTIONS

Fraction	Weight %	Assay %			Distribution %		
		P_2O_5	Al_2O_3	Insol.	P_2O_5	Al_2O_3	Insol.
Sample No.10010							
-½ in + 16 mesh	31.1	20.9	5.75	34.6	34.6	14.1	14.9
-16 + 44 "	16.7	13.3	8.85	47.9	17.7	17.2	16.3
-44 + 85 "	10.5	11.8	9.75	50.5	9.8	11.9	10.8
-85 + 170 "	10.2	10.1	10.3	52.8	8.2	11.9	11.0
-170 + 350 "	5.8	11.3	7.85	53.1	5.1	5.3	6.3
-350 "	35.7	8.8	9.5	55.9	24.6	39.6	40.1
Calc. Head	100.0	12.7	8.56	49.0	100.0	100.0	100.0
Sample No.10017							
-¼ in + 44 mesh	10.9	20.1	4.0	37.9	9.4	8.6	15.8
-44 + 85 "	13.5	25.3	3.7	29.2	14.7	9.9	13.2
-85 + 170 "	21.1	28.6	3.15	20.4	26.0	13.1	14.5
-170 + 350 "	10.8	26.4	3.9	24.7	13.5	8.3	8.9
-350 "	43.7	19.9	6.95	34.6	37.4	60.1	49.6
Calc. Head	100.0	23.2	5.06	29.9	100.0	100.0	100.0
Sample No.10018							
-¼ in + 44 mesh	6.8	19.8	3.75	36.7	6.4	4.7	8.0
-44 + 85 "	9.0	25.0	4.15	27.7	10.7	6.9	7.5
-85 + 170 "	16.0	16.5	2.55	25.8	20.2	7.5	12.5
-170 + 350 "	10.7	20.8	2.55	41.3	10.5	5.0	13.4
-350 "	57.5	19.0	7.2	33.8	52.2	75.9	58.6
Calc. Head	100.0	20.9	5.45	33.1	100.0	100.0	100.0
Sample No.10020							
-¼ in + 6 mesh	15.0	3.0	0.33	88.3	3.2	1.4	20.0
-6 + 16 "	9.6	7.35	0.75	74.4	5.1	2.0	15.1
-16 + 44 "	8.5	16.0	2.60	47.3	9.7	6.1	8.5
-44 + 85 "	8.8	24.1	3.35	40.7	15.1	8.2	7.6
-85 + 170 "	13.7	20.5	3.90	33.8	18.6	13.7	8.9
-170 + 350 "	11.6	15.5	3.65	44.5	12.9	11.7	10.9
-350 "	33.8	14.6	6.10	29.4	35.3	56.9	21.0
Calc. Head	100.0	13.9	4.62	47.3	100.0	100.0	100.0

3. Discussion

The samples examined mineralogically and petrographically [illegible] this group mainly consist of phosphatic clayst[illegible]. Apatite is the only detectable phosphate mineral. It occurs as collophane forming very irregular fragments, generally without sedimentary or crystalline textures, and as ovalitic pellets. The distinction between ovalitic pellets and collophane fragments is difficult in some samples as both are of variable shape and size. One rock examined contains collophane fossil fragments which constitute up to 10%.

The collophane is dispersed to varying degrees within a matrix composed essentially of clay. X-ray diffraction shows that the clay consists mainly of smectite with illite and kaolin normally present in subordinate amounts. The clay mineralogy of these samples differs from samples No.10001 to 10006 examined previously (Amdel Report 3025/67) which are dominantly kaolinitic. This may suggest a more marine facies than that of samples 10001 to 10006 or an influx of sediment derived from basic igneous rocks. No mafic minerals were observed, however.

Clastic quartz grains varying in size from sand to fine silt are common minor constituents. The presence of such detritus indicates an influence of terrigenous sedimentation in the depositional environment.

Fragments of sedimentary chert are also common.

The presence of fragments of non-clastic rocks (phosphorite and chert) and detrital quartz indicates a marginal facies.

The computed composition of the apatite (Tables 2 and 3) show a deficiency of F stoichiometric for the PO_4 or Ca ions. This indicates that the apatite contains some hydroxyl ions in substitution for fluorine, an abnormal composition for marine sedimentary phosphorite. The fluorine content of these apatites is generally less than that of Samples 10004 and 10006 reported previously (Amdel Report 3025-67).

On the basis of the generally fragmentary and pelletal textures of the collophane, preliminary screen analyses were carried out to determine trends for ore dressing experiments.

All samples dispersed readily in water (presumably because of the abundance of smectite in the matrix). However, classification alone did not yield a collophane concentration of marketable grade in any size fraction. One sample (No.10020) produced a significantly barren coarse fraction which could be rejected. This sample contained coarse chert fragments described above as sample 10020B. The apatite is distributed in most size fractions but clay is generally higher in the minus 350 mesh fraction, as indicated by the Al_2O_3 assays.

The screen analyses are not considered to be particularly meaningful. The samples used were small and testing very limited. However, it is apparent that the chert fragments and detrital quartz grains tend to concentrate in the coarser size fractions and the clay to concentrate in the fines.

It is recommended that a larger representative sample be supplied for systematic feasibility studies of ore dressing processes.

4. REFERENCE

MABIE, C.P. and HESS, H.D., 1964: "Petrographic Study and Classification of Western Phosphate Deposits". U.S. Dept. Int. Bur. Mines R. of I. 6468

PHOTOMICROGRAPHS

PLATE 1

A. Sample 10017B. Interbeds of claystone (Cl) and claystone containing fragments of chert (Ch), quartz grains (Q) and collophane pellets (CO). The collophane pellets are ovulitic. (V) are voids.
ppl, x25

B. Sample 10017B. Same field as illustrated in A, under crossed nicols. The birefringent, illitic clay (Cl) and the birefringence of the quarts in chert fragments (Ch) and clastic grains (Q) are in contrast to the isotropic (opaque) collophane. Cavities also appear opaque.
x.., x25

C. Sample 10017A. Fragments of collophane (CO) and quartz grains (Q) loosely dispersed within a dominantly claystone matrix.
ppl, x40

D. Sample 10017B. Fragment of phosphorite consisting of closely compacted collophane beds and pellets (CO). The collophane layers are plastically deformed and discontinuous. Quartz grains (Q) are included in the phosphorite and there is some irregular iron staining (opaque). The phosphorite fragment is contained in claystone (Cl) in which other collophane pellets (CV) are dispersed.
ppl, x25



A



B

PLATE I



C



D

A. Sample 10017D. Quartz grains (Q) and fragments and pellets of collophane (CO) loosely dispersed in a clayston[illegible] matrix.
[illegible], x25

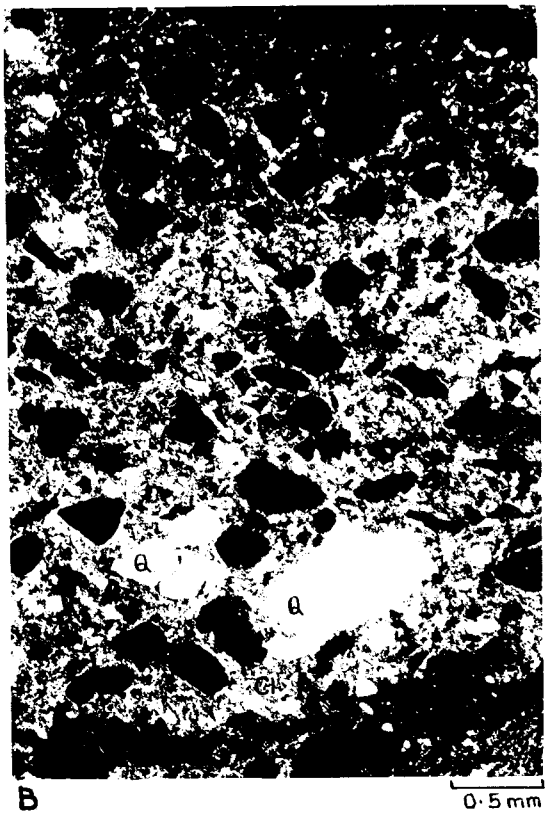
B. Sample 10017D. Same field as illustrated in A, under crossed nicols. Collophane appears opaque, owing to the sub-microscopic crystallite size. Quartz grains (Q) and clay matrix (Cl) are birefringent.
XN, x25

C. Sample 10018A. Chert fragments (Ch), sub-angular, sand-size quartz grains (Q) and collophane fragments and pellets (CO) in a matrix of clay. Some collophane fragments contain vermicular aggregates of crystallites (arrow) but most are without internal structures. The lower half of the section illustrated is stained light brown with goethite.
ppl, x25

D. Sample 10018A. Same field as illustrated in C, under crossed nicols. Birefringent constituents are quartz grains and chert fragments. The coll[illegible]ne fragments composed of vermicular aggregates are weakly birefringent.
XN, x25



A



B

PLATE 2



C



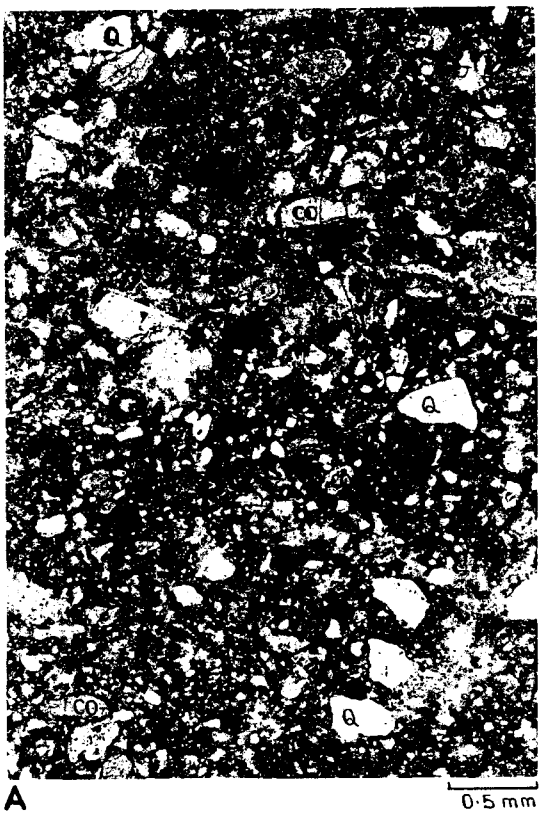
D

A. Sample 100103. Detrital quartz grains (Q) and pellets and fragments of collophane (CO) moderately dispersed in a clay matrix. The collophane fragments are irregular and without internal structures. Pellets are normally ovulitic but a few encased pellets occur.
ppl, x25

B. Sample 100103. Same field as illustrated in A, under crossed nicols. The isotropic collophane fragments and pellets (opaque) can be readily distinguished from the birefringent quartz grains (Q) and clay matrix.
XN, x25

C. Sample 100203. Collophane pellets, breccia fragments (CO) and elongated collophane fossil fragments (F) together with quartz grains (Q) and chert fragments (Ch) in a matrix of iron stained clay.
ppl, x40

D. Sample 100203. Ovulitic collophane pellets (CO), quartz grains (Q) and green (?)glauconite pellets (G) in a matrix of opal cristobalite.
ppl, x40.


Q
Q
Q

A.M.D.E.L.

REPORT

MP295/68

CONCERNING:

MINOR OUTCROPS

Near

HOLES: J.F.1 (D-TREE AREA)
J.F.3 (D-TREE AREA)
DT-7 (D-TREE AREA)

PHOSPHATE SAMPLES 10105 TO 10110

1. INTRODUCTION

The six samples were chemically analysed for phosphate, iron and aluminium. Those containing more than 15% P_2O_5 were then examined by X-ray diffraction to determine the mineralogical constituents and thin sections were prepared and described petrographically.

2. RESULTS

2.1 Chemical Analyses

The results are included in Table 1.

TABLE 1: PARTIAL CHEMICAL ANALYSES

Sample	HoCo No.	P_2O_5 %	Fe_2O_3 %	Al_2O_3 %	Depth
10105	JF-1	26.5	4.40	0.83	Surface
10106	"	31.9	8.15	0.98	"
10107	JF-3	23.5	0.71	0.62	"
10108	"	7.75	5.55	0.69	"
10109	"	18.9	0.92	1.32	"
10110	JT-7	8.45	0.75	0.41	"

2.2 Mineralogy

Representative portions of the four samples assaying over 15% P_2O_5 were examined by X-ray diffraction techniques. Owing to variations in crystallinity and matrix effects, the abundance of the constituents could be determined only semi-quantitatively. The terminology used is as follows:

D	Dominant:	greater than 50%
CD	Co-dominant:	two major components of approximately equal abundance

SD	Sub-dominant:	20 to 50%
Ac	Accessory:	5 to 20%
Tr	Trace:	less than 5%
F-Tr	Faint Trace:	just detectable

The results are shown in Table 2.

TABLE 2: SEMI-QUANTITATIVE MINERALOGY

Sample	Apatite	Quartz	Calcite	Goethite	Illite	Kaolin	R.S.C.(a)
10105	D	SD	-	Tr	Tr	Tr	-
10106	D	Tr	-	Ac	-	-	Tr
10107	CD	F-Tr	CD	-	-	-	Ac
10109	CD	CD	-	-	Tr	Tr	Tr

Note (a): The random stratified clay (R.S.C.) is a mixed layer clay of poor crystallinity. The nature of the mixed layering could not be accurately determined but the clay includes some smectite layers.

2.3 Petrography

Sample 10105 (TS19676)

This rock is a cherty phosphorite. It consists essentially of moderately compacted collophane pellets(a) and interstitial chert and collophane. Accessory clastic quartz grains of silt size are also present. Irregular masses of goethite occur in places.

The collophane pellets are ovulitic, irregular in shape and commonly contain finely dispersed flakes of opaque (?)organic matter. They vary from 0.033 to 0.25 mm and average 0.11 mm

(a) The nomenclature and classification of pelletal textures used in this report is that of Mabie and Hess, 1964.

in width. Encased collophane pellets and collophane brachiopod fragments occur in trace amounts. Welded pellets form irregular masses of collophane in places.

Chert and collophane cement occur interstitially between the collophane pellets. In many places the composition of the cement is difficult to determine, owing to the sub-microscopic particle size of the chert and collophane. Clear chert occurs subordinately to a cloudy mixture of chert and collophane. The interstitial areas between pellets are commonly free of mineral matter and form irregular cavities.

Opaque masses of goethite also occur interstitially in some small sections of the rock. The goethite is considered to be diagenic.

Clastic components constitute about 5%. They consist of angular quartz grains averaging 0.033 mm in diameter and sericite laths approximately 0.04 mm in length.

Secondary chalcedonic silica occurs in some cavities.

Sample 10106 (TS19677)

This rock is a phosphorite of the microsphorite type (Riggs and Freas, 1965). It consists essentially of a uniform mass of collophane and contains a trace of clastic quartz grains and quartzite fragments dispersed throughout. Roughly spherical masses of goethite occur which are considered to be diagenic. The rock shows vague indications of sedimentary bedding.

The collophane occurs as a very uniform mass of sub-microscopic crystallites. It is generally pale brown and is not pelletal. In some places, the rhombic outlines of what are possibly the relict boundaries of carbonate minerals are visible. This suggests that at least some of the collophane has originated by replacement of limestone or dolomite.

Clastic quartz grains are dispersed through the collophane. They constitute less than 5% of the rock and average 0.052 mm in diameter. Rare quartzite fragments were also observed.

Goethite occurs in spherical aggregates dispersed through the collophane. It constitutes about 10% of the rock.

Poorly preserved bedding is evident by the distribution of the clastic quartz grains.

Sample 10107 (TS19678)

This is a phosphatic limestone. It consists of ovulitic and encased collophane pellets moderately compacted to loosely dispersed within a matrix of calcite. Pellets of glauconite and quartz grains occur in trace amounts. The collophane pellets are extensively replaced by calcite as a result of diagenesis.

The collophane pellets are mainly ovulitic and of irregular, sub-spherical to elliptical shape. Approximately 50% are encased pellets having at least one concretionary overgrowth layer of collophane. The pellets vary from 0.05 mm to 0.22 mm and average 0.15 mm in width.

The matrix consists of a recrystallized aggregate of calcite.

Rare pellets of glauconite were observed. They are irregular in shape and average 0.08 mm in diameter.

Angular quartz grains, averaging 0.05 mm in width also occur in trace amounts.

A notable feature of this rock is the extensive replacement of the collophane pellets by calcite. This replacement has taken place during diagenesis when the matrix calcite was recrystallized.

Sample 10109 (TS19679)

This rock consists of interbeds of silt and cherty phosphorite. Loosely semi-dispersed collophane pellets in a matrix of chert constitute the cherty phosphorite; sub-angular quartz grains and sericite flakes together with chert and clay constitute the silt layers.

The collophane pellets are ovulitic, irregular in shape and light brown. They vary from 0.066 mm to 0.30 mm and average 0.154 mm in diameter. Collophane brachiopod fragments also occur in accessory amounts.

The matrix consists of a recrystallized chert. It is composed of quartz crystals of variable size forming a tight mosaic.

The silt layers contain sub-angular quartz grains averaging 0.05 mm in width and laths of sericite up to 0.12 mm in length. These clastic components are contained in a sub-microscopic matrix of chert and clay. The relative proportion of sericite and quartz grains varies slightly from layer to layer.

In general, the rock is moderately sorted, collophane pellets being less abundant in the silt laminae. However, there is poor sorting of the pellets in the cherty phosphorite.

3. REFERENCES

MABIE, C.P. and HESS, H.D., 1964: "Petrographic Study and Classification of Western Phosphate Deposits". U.S. Dept. Int., Bur. Mines., R of I 6468.

HIGGS, S.R. and FREAS, D.H., 1965: "Stratigraphy and Sedimentation of Phosphorite in the Central Florida Phosphate District". Soc. of Min. Eng. of A.I.M.E., Preprint 65H84.

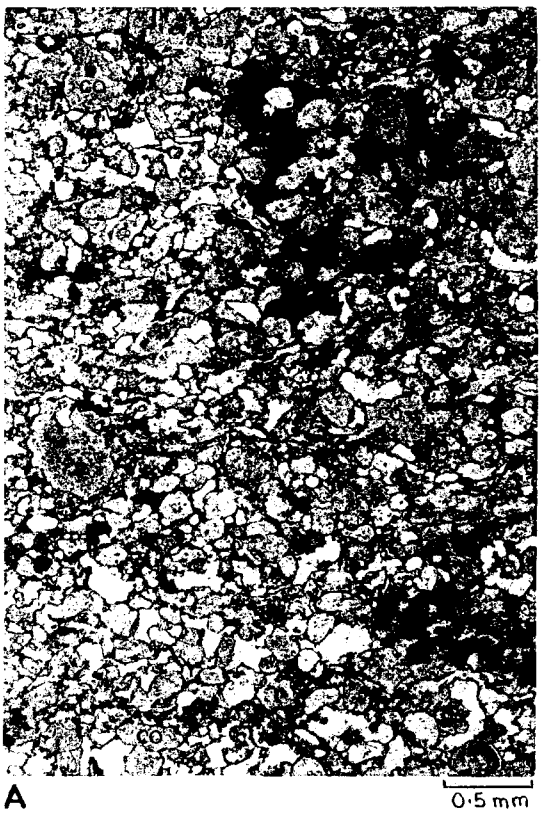
PLATE 1

A. Sample 10105. Siliceous phosphorite consisting of ovulitic collophane pellets (CO) moderately compacted, and interstitial collophane, chert and clastic quartz. Goethite (opaque) also occurs interstitially in irregular patches.
x25, ppl

B. Sample 10105. Siliceous phosphorite. Same field as illustrated in A, under crossed nicols. The birefringent, detrital quartz (white) is distinctive against the grey chert, collophane and goethite.
x25, XN

C. Sample 10106. Microsphorite consisting dominantly of collophane mudstone (CO) and containing clastic quartz grains (Q). Opaque aggregates are diagenic goethite.
x25, ppl

D. Sample 10106. A further illustration of the ferruginous microsphorite. Brecciated chert fragments (Ch) are dispersed in irregular layers.
x25, ppl



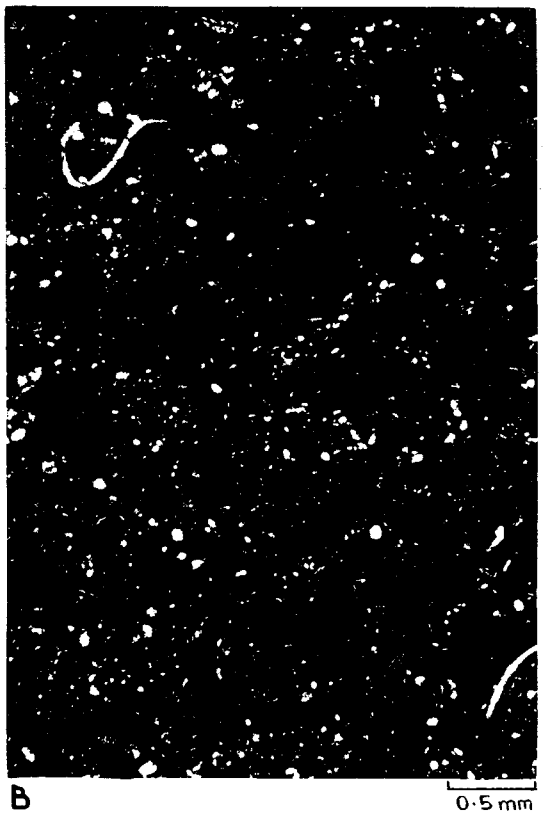


PLATE I



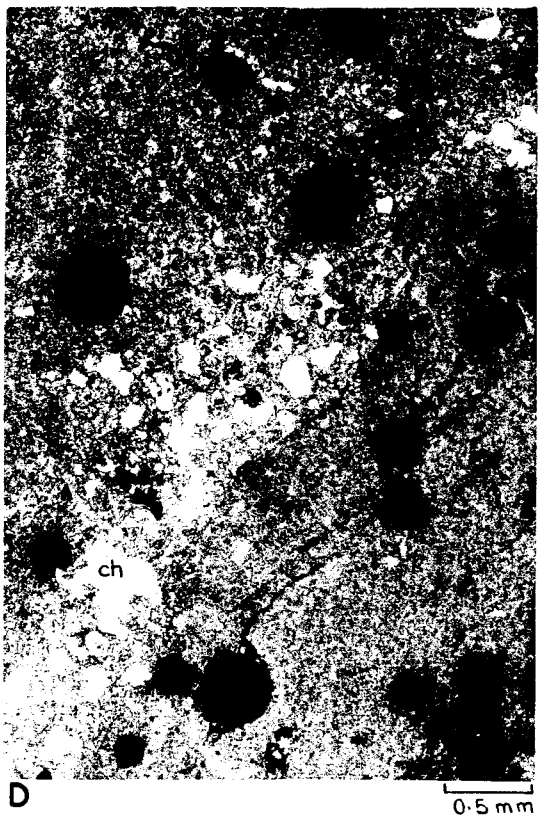


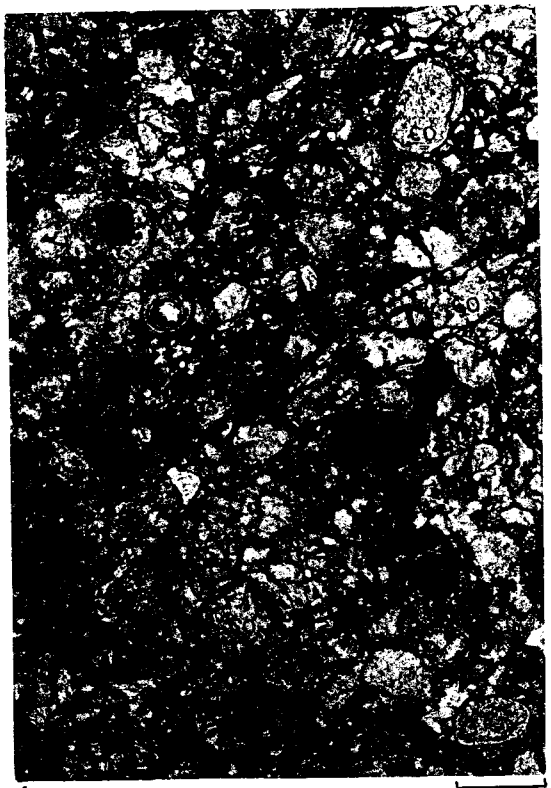
PLATE 2

A. Sample 10107. Phosphatic limestone consisting of ovulitic and encased collophane pellets (CO) moderately dispersed in a matrix of recrystallized limestone.
x[illegible] ppl

B. Sample 10107. Phosphatic limestone. Same field as illustrated in A, under crossed nicols. Collophane (opaque) is isotropic, owing to the sub-microscopic crystallite size. The extensive replacement of collophane pellets by the limestone (light grey) is illustrated.
x25, XN

C. Sample 10109. Siliceous phosphorite consisting of irregular, ovulitic collophane pellets (CO) semi-dispersed in a chert matrix. Thin silty interbeds also occur.
x25, ppl

D. Sample 10109. Siliceous phosphorite. Same field as illustrated in C, under crossed nicols. The distribution of silt (composed mainly of quartz) is evident by its higher birefringence. Collophane is opaque.
x25, XN



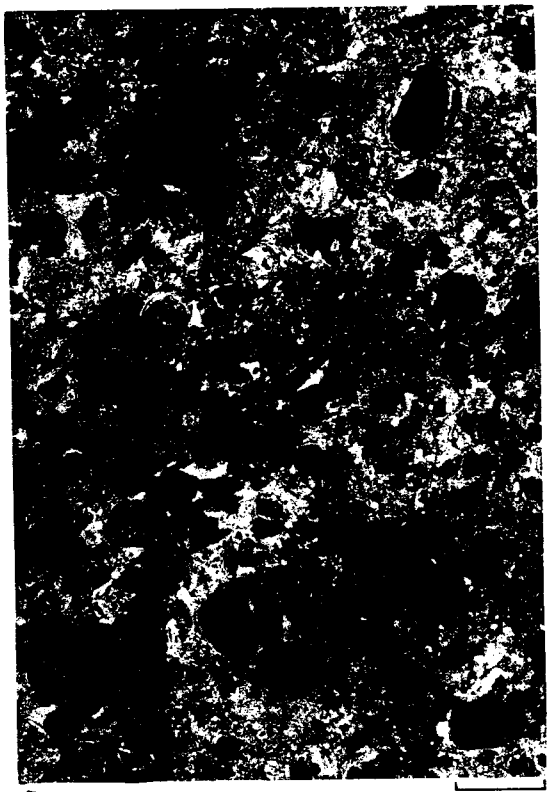
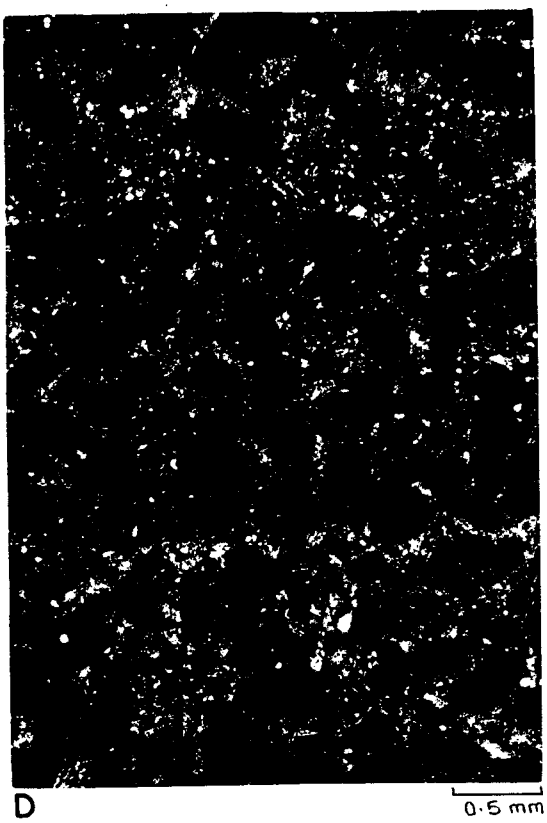


PLATE 2





A.M.D.E.L.

REPORT

MP365/68

CONCERNING:

HOLE S.C.4 (SHERRIN CREEK AREA)
HOLE S.C.15Z (SHERRIN CREEK AREA)
HOLE D-TREE 11A (D-TREE AREA)
HOLE S.C.4X (SHERRIN CREEK AREA)
HOLE S.C.15Y (SHERRIN CREEK AREA)
HOLE S.C.15X (SHERRIN CREEK AREA)

REFERENCE

A.M.D.E.L. REPORT MP365/68

A.M.D.E.L. NO.	HOLE NO.	HOLE AREA	DEPTH OF CORE EXAMINED *
10032	S.C.4	SHERRIN CREEK	101' - 103' (Bott.4")
10041	S.C.15Z	SHERRIN CREEK	95'8"-98'2" (Bott.)
10045	D-Tree 11A	D-TREE	53'5"-56'5" (Bott.)
10046	D-Tree 11A	D-TREE	56'5"-57'5"
10047	D-Tree 11A	D-TREE	57'5"-58'5"
10048	D-Tree 11A	D-TREE	58'5"-59'0"
10078	S.C.4X	SHERRIN CREEK	105'10"-107'2"
10079	S.C.4X	SHERRIN CREEK	107'2"-108'6"
10081	S.C.4X	SHERRIN CREEK	110'8"-112'0"
10089	S.C.15Y	SHERRIN CREEK	85'0"-87'0"
10090	S.C.15Y	SHERRIN CREEK	87'0"-88'8"
10091	S.C.15Y	SHERRIN CREEK	82'0"-85'0"
10093	S.C.15X	SHERRIN CREEK	88'0"-90'0"
10095	S.C.15X	SHERRIN CREEK	92'0"-94'6"
10096	S.C.15X	SHERRIN CREEK	94'6"-96'6"

* See attached Appendix 4a

PHOSPHATIC SEDIMENTS 10032 TO 10096

1. INTRODUCTION

Fifteen diamond drill core samples of phosphatic sediments were examined mineralogically and described petrographically. A lithological examination was first carried out to determine the number of lithologies represented by the various sample intervals. Samples of each lithology were then thin sectioned and described petrographically. Owing to the fine grain size of the sediments, X-ray diffraction (powder diffractometry) was used to determine the mineralogical constituents. Because of variations in crystallinity and matrix effects the abundance of the minerals could be determined only semi-quantitatively. The terminology used is as follows:

Dominant:	greater than 50%
Co-dominant:	2 major components of approximately equal abundance
Sub-dominant:	20 to 50%
Accessory:	5 to 20%
Trace:	less than 5%

2. RESULTS

2.1 Sample 10032

Lithology: Phosphatic claystone, buff coloured, earthy friable and containing fragments of light brown bedded phosphorite.

Mineralogy: Apatite dominant, quartz sub-dominant, smectite accessory, kaolin trace, illite trace.

Petrography (TS 19680): This is a sandy and argillaceous phosphorite of the microsphorite[a] type. It consists of sub-angular to rounded quartz grains, shale fragments and collophane pellets in a matrix of collophane and clay.

Detrital quartz grains constitute about 20%. They vary from 0.02 mm to 2.1 mm and average 0.136 mm in width. Chert fragments also occur but are present in only trace amounts.

Shale breccia fragments, up to 2.5 mm in width constitute a further 10%. They are irregular in shape, sub-rounded and consist of high-birefringent clay (presumably smectite).

(a) The term microsphorite here used is that defined by Riggs and Freas, 1965. It is a rock consisting mainly of lithified collophane mud.

Collophane breccia fragments and ovulitic pellets constitute about 40% of the rock. They are very irregular in shape and generally without internal structures. Some collophane fossil fragments also occur.

The matrix consists of collophane mudstone and clay, generally of patchy distribution. The clay is of high birefringence (smectitic); the collophane is sub-microscopic in particle size.

The rock is very poorly sorted which, together with the high content of clastic constituents suggests a near-shore depositional environment. The clastics were evidently transported only a short distance from their source.

2.2 Sample 10041

Lithology: This sample contains 3 rock types:

A. Phosphorite, earthy and sandy, light grey.
B. Black chert, massive.
C. Brown chert.

Mineralogy of Phosphorite: Apatite and quartz co-dominant, smectite accessory, kaolin trace, illite trace.

A. Phosphorite (TS19683): This is a sedimentary breccia. It consists of quartz grains, fragments of collophane, chert and shale together with accessory glauconite pellets in a clay matrix. The rock is poorly sorted.

The quartz grains constitute about 10% of the rock, vary from 0.02 mm to 0.45 mm and average 0.17 mm in width. They are angular. Chert occurs as very irregular fragments and constitutes a further 15%.

The collophane mainly occurs as irregularly shaped breccia fragments. Some fossil fragments and ovulitic pellets are also present but are minor constituents. Much of the collophane is banded (corresponding optically to dahllite) and this suggests that it is of secondary origin. Fragments of phosphorite consisting of compacted pellets, similar to the fragments is sample 10017B (Amdel Report 3088-67) were also observed. They are up to 1.7 mm in width.

Glauconite pellets occur sporadically. They are light brown, presumably as a result of oxidation, and average 0.068 mm in width.

The rock is cemented by clay and collophane mud. The clay is highly birefringent and compares with smectite. Poorly defined bedding is evident in the distribution of collophane and clay matrix.

B. Black Chert (TS19681): This is a spicular chert. The great majority of the rock consists of a mosaic of fine-grained to sub-microscopic quartz. Poorly preserved sponge spicules are dispersed throughout and rare quartz grains of silt size are also present.

Irregular patches of chert in which the relict outlines of carbonate rhombs are preserved, also occur. The carbonate is now completely replaced by silica.

Small veins of recrystallized chalcedony occur in minor amounts.

C. Brown Chert (TS19682): A weathered dolomitic chert. This rock mainly consists of recrystallized quartz and iron stained dolomite forming a granoblastic intergrowth. Fragments of collophane are present in accessory amounts.

The quartz mosaic is somewhat coarser than that of the black chert but the crystallite size is variable. Quartz constitutes about 60% of the rock.

Much of the dolomite is stained brown with iron oxide and there is evidence of replacement of the dolomite by quartz as a result of diagenesis. Dolomite constitutes about 30%.

The collophane occurs as elongated fragments and is loosely dispersed through the rock. The fragments are without sedimentary or concretionary structures and are normally fractured. Some are up to 3.2 mm in length.

Detrital quartz sand grains also occur within the chert in trace amounts.

2.3 Sample 10045

Lithology: Phosphorite, light grey, earthy and containing fragments of grey chert.

Mineralogy: Apatite dominant, quartz sub-dominant, kaolin sub-dominant, random stratified clay trace.

Petrography (TS19684): A sedimentary breccia consisting of fragments of chert and collophane cemented by clay. The rock is poorly sorted.

The chert fragments vary in width from 0.15 mm to over 12 mm. They are extremely irregular in shape and contain many cavities. Secondary veins of chalcedony (partially recrystallized) are common and some replaced brachiopod fragments are also present.

The collophane fragments are also very irregular in shape and vary considerably in size. Some show poorly developed layering but the majority are without sedimentary structures. A few are fossiliferous and exhibit organic cell structures. The average width of the collophane fragments is 0.33 mm.

The rock is cemented by light brown clay which consists dominantly of kaolin. Although the rock is slightly weathered, most of the kaolin is considered to be primary, suggesting a near shore or lacustrine, depositional environment.

2.4 Sample 10046

Lithology: This sample contains 2 lithologies:

A. Phosphorite, sandy, light brown, friable, earthy.
B. Black chert, massive.

Mineralogy: Apatite and kaolin co-dominant, quartz sub-dominant, illite trace, smectite trace.

Petrography:

A. Phosphorite (TS19686): This consists of massive and pelletal phosphorite and minor chert fragments cemented by light brown clay.

The collophane pellets are ovulitic and the majority consist of globular aggregates of sub-microscopic crystallites. The pellets are generally elongated and are loosely semi-dispersed. They vary from 0.08 mm to 0.42 mm and average 0.21 mm in width.

Massive phosphorite occurs subordinately. It is bedded and contains accessory amounts of quartz silt and sericite laths. Some primary dip (cross bedding) occurs in this phosphorite.

Chert fragments compose about 15% of the rock. They are irregular in shape and average 0.5 mm in width.

Brown, iron stained clay occurs interstitially between collophane pellets and chert fragments. The clay consists mainly of kaolin.

B. Black Chert (TS19685): This is a siliceous coquinite. Mosaic quartz constitutes the bulk of the rock; chalcedony and collophane occur in minor amounts.

The rock consists essentially of fossil fragments which are considered to be derived from phosphatic brachiopods. They are now largely replaced by silica. Some collophane is present in a few of the fragments.

Chalcedony is a common accessory. It lines cavities and occurs in fibrous radiating aggregates within some of the fossil fragments.

A few collophane pellets are dispersed through the chert. They average 0.24 mm in diameter.

Mineralogy: Apatite and quartz co-dominant, kaolin accessory, random stratified clay trace.

Petrography (TS19687): This is a sedimentary breccia consisting of angular fragments of chert and collophane cemented by light brown clay.

The chert fragments are similar to those in sample 10046. They mainly consist of fine-grained quartz and chalcedony and some contain silicified fossil fragments. They are angular to sub-angular and up to 7 mm in width. Irregular cavities are common within the chert fragments, some of which contain light brown clay.

The collophane fragments are also irregular in shape and vary considerably in thickness. Some are fossiliferous but most are without internal structures. They are moderately dispersed in the clay matrix and constitute about 40% of the rock. The average width of the collophane fragments is 0.2 mm.

Light brown, iron stained kaolin constitutes the matrix.

The rock is not sorted and the fragments are generally angular, indicating little transportation and rapid deposition.

2.6 Sample 10048

Lithology: Phosphatic claystone, light brown to buff coloured, earthy, friable.

Mineralogy: Apatite and quartz co-dominant, kaolin sub-dominant, smectite trace.

Petrography (TS19688): This rock is a sedimentary breccia, similar to sample 10047. It consists of angular fragments of chert and collophane cemented by light brown, iron stained kaolin. Sorting is poor.

The principal difference between this and sample 10047 is the slightly higher clay content. In other respects they are directly comparable.

2.7 Sample 10078

Lithology: Phosphatic claystone, light grey, earthy, friable and containing fragments of chert and quartzite up to 5 cm thick.

Mineralogy: Apatite and quartz co-dominant, smectite accessory, kaolin trace, illite trace.

Petrography (TS19689): A sedimentary breccia consisting of large fragments of chert, siltstone and quartzite, and smaller fragments and pellets of collophane, cemented by clay. Sorting is poor but the larger fragments are more rounded than those of samples 10047 and 10048.

Approximately 40% of the rock is composed of fragments of chert and siltstone averaging 3 mm in width. The chert is dense and contains varying amounts of quartz silt. Some is finely laminated and contains accessory amounts of carbonaceous matter. A few collophane pellets and collophane fossil fragments (brachiopods) were observed in some of the chert. Coarser grained, recrystallized chert containing abundant siliceous fossils occur subordinately. This latter type is considered to be a silicified coquinite.

Quartzite fragments and quartz sand grains constitute about 10% of the rock. These particles are normally angular and fractured.

Collophane also mainly occurs as fragments. Its occurrence is very similar to that of samples 10047 and 10048. Most of the collophane is without sedimentary or secondary structures and the fragments are very angular. They vary from less than 0.015 mm to 1.5 mm and average 0.1 mm in width. Ovulitic collophane pellets also occur in accessory amounts.

The rock contains a few glauconite pellets, the average diameter of which is 0.065 mm. Collophane overgrowths on glauconite pellets were observed in rare instances.

The matrix of the rock consists of clay, dominantly of smectitic composition. It is a minor constituent comprising less than 20%.

2.8 Sample 10079

Lithology: This sample consists of 2 lithologies:

A. Phosphatic claystone, earthy, friable and containing fragments of chert and quartzite.

B. Black chert, massive with a white weathered surface.

Mineralogy (of phosphatic claystone): Apatite and quartz co-dominant, smectite accessory, kaolin trace, illite trace.

Petrography:

A. Phosphatic Claystone (TS19691): A sedimentary breccia similar to sample 10078. This rock consists of fragments of chert and siltstone, quartzite, quartz sand grains and collophane fragments cemented by a minor clay matrix.

The chert fragments are up to 7 mm in width and are rounded. Quartzite and quartz grains averaging 0.35 mm in width constitute about 15% of the rock.

Collophane fragments and pellets are similar to those of sample 10078.

The clastic constituents are unsorted.

B. Chert (TS19690): A phosphatic, fossiliferous chert. This rock is a silicified coquinite which originally consisted of phosphatic brachiopod fragments and collophane pellets in a matrix of unknown composition.

It now consists dominantly of a fine-grained quartz mosaic through which are dispersed collophane ovules and phosphatic fossil fragments. Collophane now constitutes about 5% of the rock.

Relict fossil fragments, now mainly consisting of quartz, constitute about 60%.

The rock is considered to be the result of replacement during diagenesis and its origin is thought to be comparable to that of common flint nodules.

Rare quartz grains, averaging 0.15 mm in diameter are the only clastic constituents.

2.9 Sample 10081

Lithology: This sample contains 2 lithologies:

A. Phosphatic claystone, brown, earthy, friable.

B. Phosphorite, grey, sandy.

Mineralogy: Phosphatic Claystone: Apatite and quartz co-dominant, smectite accessory, kaolin accessory, illite trace.

Petrography:

A. Phosphatic Claystone: This rock consists of fragments and pellets of collophane, chert and quartzite fragments and sand grains in a matrix of collophane and clay. The particle size of the detrital constituents is somewhat less than in samples 10078 and 10079 and there is some evidence of sorting.

Collophane breccia fragments constitute about 50% of the rock. One fragment was observed averaging 6 mm in width but generally the fragments vary from less than 0.015 mm to 0.33 mm and average 0.115 mm. They are generally closely dispersed and irregular in shape. Some have cellular organic structures and most are without sedimentary or concretionary layering. The large fragment consists of closely compacted ovulitic pellets, similar to that of sample 10017B (Amdel Report 3088-67).

Quartz sand constitutes about 20%. The grains are normally angular or sub-angular and many have overgrowths forming idiomorphic crystals. The grains vary from 0.016 mm to 0.5 mm and average 0.115 mm in width.

Chert fragments constitute less than 5% of the rock. The fragments are irregular in shape and average 0.15 mm in width. Quartzite fragments of similar dimensions constitute about 2%.

Rare glauconite pellets are also present. They are normally discrete and average 0.08 mm in diameter. A few are encased with collophane.

The matrix of the rock consists of uniform, collophane mud and patches of clay. The framework to matrix ratio varies from layer to layer but nowhere does the matrix constitute more than 50% of the rock. Clay is estimated to account for about 20% of the matrix but this is difficult to estimate precisely, owing to the fine particle size.

2.10 Sample 10089

Lithology: Phosphorite, silty, light grey, very friable.

Mineralogy: Apatite dominant, quartz sub-dominant, smectite accessory, kaolin trace, illite trace.

Petrography (TS19693): A sandy phosphorite of the microsphorite type. This sample consists of collophane fragments and quartz sand grains cemented by collophane and some clay. A few sericite grains are also present.

The collophane fragments are very irregular in shape, vary from 0.01 mm to 0.15 mm and average 0.04 mm in width. They are mainly without internal features but some contain organic cell structures. Some may be fractured ovulitic pellets. The fragments constitute about 50% of the rock.

Quartz sand constitutes about 5%. The grains are normally angular and average 0.1 mm in width. A few chert fragments of similar dimensions are also present, but constitute less than 1% of the rock.

The matrix consists mainly of collophane mud. Clay also occurs in the matrix in irregular patches. It constitutes less than 20% of the rock.

2.11 Sample 10090

Lithology: This sample contains 2 lithologies:

A. Phosphorite, silty, light grey, friable.
B. Black chert, similar to sample 10079B.

Mineralogy of phosphorite: Apatite dominant, quartz sub-dominant, smectite accessory, kaolin trace, illite trace.

Petrography:

Phosphorite (TS19694): This is a sandy phosphorite of the microsphorite type. It is very similar to sample 10089, consisting of collophane fragments and ovulitic pellets (about 50%), quartz sand (5%) and a matrix of collophane and clay. The quartz sand grains average 0.08 mm in width and, although very variable in size, the collophane fragments are of comparable dimensions.

There is some indication of bedding in this rock but sorting is generally poor.

2.12 Sample 10091

Lithology: Phosphorite, silty, light grey, very friable.

Mineralogy: Apatite dominant, quartz sub-dominant, smectite trace, kaolin trace, illite trace.

Petrography (TS19695): This is a bedded pelletal phosphorite composed of clastic layers of collophane and quartz sand cemented by chert, carbonate minerals and clay. Some matrix collophane also occurs in places. A few large phosphorite breccia fragments are also present.

Approximately 40% of the rock is composed of collophane pellets and fragments. The pellets are ovulitic and the fragments are of similar shape making distinction difficult. The collophane particles are more uniform in size than those of samples described above. The majority of the particles vary from 0.05 mm to 0.41 mm and average 0.08 mm in width. A significant minority of the fragments contain organic structures.

Quartz grains, varying from 0.015 mm to 0.33 mm and averaging 0.08 mm in width, constitute about 20% of the rock. They are generally concentrated in sedimentary layers and are normally angular.

Chert occurs interstitially to pellets and quartz grains in some laminae but chert breccia fragments are comparatively rare.

Clay, chert and quartz silt composes the matrix of the more clastic beds and fine carbonate also forms the matrix in irregular zones. The distinction between sedimentary beds is not readily apparent and most are discontinuous.

Hematite also occurs interstitially and constitutes as much as 15% of some layers.

Large fragments of phosphorite consisting essentially of compacted ovulitic collophane pellets are also present in this rock. These fragments are similar to those reported in samples 10041 and 10081. They contain accessory amounts of quartz sand and hematite occurs in cavities.

2.13 Sample 10093

Lithology: Sandy and phosphatic claystone, light grey, earthy, friable.

Mineralogy: Quartz dominant, apatite sub-dominant, smectite accessory, kaolin accessory, illite accessory.

Petrography (TS19696): This is a phosphatic and sandy claystone. It is thinly laminated. The essential constituents are collophane fragments and pellets, quartz sand grains and a dominant clay matrix.

The collophane fragments and pellets are similar to those of sample 10091. They are moderately dispersed, vary from 0.033 mm to 0.5 mm and average 0.25 mm in width. In one section of the rock a phosphorite facies occurs within an essentially argillaceous bed. The phosphorite contains a more compact aggregate of collophane fragments in a dominantly collophane matrix. Some quartz grains and interstitial clay are present in the phosphorite but are accessory.

Collophane constitutes about 30% of the rock.

Quartz sand composes about 50%. The quartz grains are angular, vary from 0.016 mm to 1 mm and average 0.3 mm in width. They are generally concentrated in discrete laminae.

The matrix of the rock is composed almost entirely of clay. Kaolin, illite and smectite were determined by X-ray diffraction to be present in approximately equal amounts. The distribution of the various clay minerals could not be determined visually.

The rock contains a few randomly dispersed glauconite pellets.

2.14 Sample 10095

Lithology: This sample consists of 2 rock types:

A. Phosphorite, silty, light grey, very friable.
B. Phosphatic chert, white, massive.

Mineralogy:
A. Of Phosphorite. Apatite dominant, quartz sub-dominant, dolomite sub-dominant, kaolin trace, illite trace, smectite trace.

B. Of chert. Quartz dominant, talc sub-dominant, apatite accessory, kaolin trace, smectite trace.

Petrography:

Chert (TS19697): This is a phosphatic chert of the silicified coquinite type. It consists essentially of a fine-grained quartz mosaic through which are loosely dispersed collophane pellets, collophane fossil fragments and glauconite pellets. The rock contains many irregular cavities some of which contain aggregates of talc.

The chert is typical of the silicified coquinites. Its grain size is variable from sub-microscopic (less than 0.002 mm) to 0.035 mm. A few detrital quartz grains averaging 0.08 mm in width are also present.

Much of the rock consists of silicified fossil fragments. These resemble brachiopod shell debris and are considered to have been phosphatic.

Ovulitic, collophane fragments constitute about 10% of the rock. They are loosely dispersed and average 0.08 mm in diameter. Collophane brachiopod fragments constitute a further 3%. Some of the fossil fragments consist of banded dahllite and some are partially replaced by silica.

Glauconite pellets averaging 0.1 mm in diameter occur sporadically and constitute about 1% of the rock. They are unweathered and consist of randomly oriented fine crystallites.

Trace amounts of a clay mineral comparable in optical properties with talc occur in some cavities. Talc was identified in the X-ray diffraction pattern in sub-dominant proportions. It is possible that much of the talc was plucked from the section during preparation leaving only a trace in cavities. It is evidently a late stage (possibly supergene) mineral.

2.15 Sample 10096

Lithology: This sample contains 2 rock types:

A. Phosphatic siltstone, light grey, friable.
B. Carbonate rock, light brown, friable.

Mineralogy:

A. Phosphatic Siltstone: Quartz dominant, smectite accessory, feldspar accessory, quartz faint trace.

Petrography:

A. Phosphatic Siltstone: This rock consists of sand grains, glauconite pellets and collophane fragments in a matrix of silt and clay. Sorting is generally poor although there is some development of graded bedding.

The quartz sand grains are generally angular to sub-angular and average 0.25 mm in width. They constitute about 30% of the rock. Trains of inclusions are common within the quartz grains indicating that they are derived from metasediments.

The collophane fragments are similar to those in sample 10093. They are very variable in size, are angular and poorly sorted. A significant proportion of elongated fossil (brachiopod) fragments are present. Collophane constitutes about 25% of the rock.

Glauconite pellets are important accessory constituents. They are irregular in shape and consist of randomly oriented clay crystallites of fine particle size. The pellets average

0.11 mm in width but some patches of glauconite up to 1.0 mm in length occur parallel to the bedding. Glauconite constitutes about 2% of the rock.

The matrix consists of quartz silt and clay. The silt grains average 0.007 mm in diameter and are normally angular. X-ray diffraction examinations indicate that the clay consists mainly of kaolin and smectite.

In general sorting is poor. However, in one section of the rock graded bedding of the settling type is evident. Overlying the finest sediments of the graded beds is a layer of phosphorite consisting essentially of collophane mud and patches of glauconite. Some minor chert also occurs in the phosphorite.

B. Carbonate Rock (TS19699): A dolomite. This consists dominantly of an interlocking mosaic of rhombic carbonate crystals. Trace amounts of plagioclase occur in irregular aggregates.

Dolomite constitutes about 90% of the rock. The crystals are rhombic, vary from 0.015 mm to 0.43 mm and average 0.16 mm in width.

Calcic plagioclase constitutes about 2% of the rock. It occurs in aggregates and irregular patches, is poorly crystallized and has undulose, indistinct extinction. It is probably authigenic.

A few relict oolite structures are preserved in the dolomite. The pellets now consist of granular dolomite.

Clay minerals, identified in the x-ray pattern could not be observed optically. They probably occur within the dolomite aggregates.

Rare collophane fragments are the only phosphatic constituents. They are banded and are probably fossil fragments.

3. CONCLUSIONS

The majority of rocks examined in this investigation are breccias and contain fragments of both clastic and non-clastic sediments. Collophane occurs in most samples, mainly as reworked sedimentary fragments. Some (such as samples 10032, 10081, 10089 and 10090) contain collophane mud as a prominent matrix component. Apatite is the only phosphate mineral present in these sediments.

Quartz sand is also common. The grains are normally angular and some samples (10078, 10079 A and 10081) contain fragments of quartzite.

Glauconite occurs in accessory amounts in a few samples. It is normally pelletal but some glauconite patches were observed in the matrix of sample 10096A.

Smectite is the principal clay mineral of most of the sediments but in 3 samples (numbers 10046A, 10047 and 10048) kaolin is dominant. The clay minerals constitute most of the matrix of the breccias. Some chert, collophane and carbonate minerals occur in the matrix of a few.

In the large majority of these sediments, sorting is poor, and this, together with the angularity of the clastic components indicates little transportation and rapid deposition. The presence of kaolin and fragments of metasediments suggests that the depositional environment was probably paralic.

The presence of cherts formed by the silicification of phosphatic coquinite is evidence of the movement of silica during diagenesis. Some of the quartz grains have secondary overgrowths providing further evidence of this process.

4. REFERENCE

RIGGS, S.R. and FREAS, D.H., 1965: "Stratigraphy and Sedimentation of Phosphorite in the Central Florida Phosphate District". Soc. of Min. Eng. of A.I.M.E., Preprint 65H84.

ns:13

PHOTOMICROGRAPHS

PLATE 1

A. Sample 10032. Sandy and argillaceous microsphorite consisting of shale fragments (Sh), quartz sand (Q) and collophane breccia fragments (CO) in a matrix of clay and collophane mud.
ppl

B. Sample 10032. Same field as illustrated in A, under crossed nicols. The highly birefringent clay of the shale fragment and in the matrix of the rock, together with the birefringent quartz grains are distinctive against the isotropic collophane (opaque). The isotropy of the collophane results from the sub-microscopic crystallite size.
XN

C. Sample 10041A. Phosphatic sedimentary breccia consisting of fragments of collophane (CO), quartz grains (Q) and chert fragments (Ch) cemented by clay (CL) and collophane mud. Some of the collophane fragments show layering typical of crustiform textures (arrow).
XN

D. Sample 10046B. Silicified coquinite consisting essentially of fossil fragments (F) partially or completely replaced by quartz or chalcedony. Some fossil fragments are composed of collophane (C-F) and much of the fossil debris is considered to be derived from phosphate brachiopods. Some collophane pellets (CO) are also present in this rock.
XN

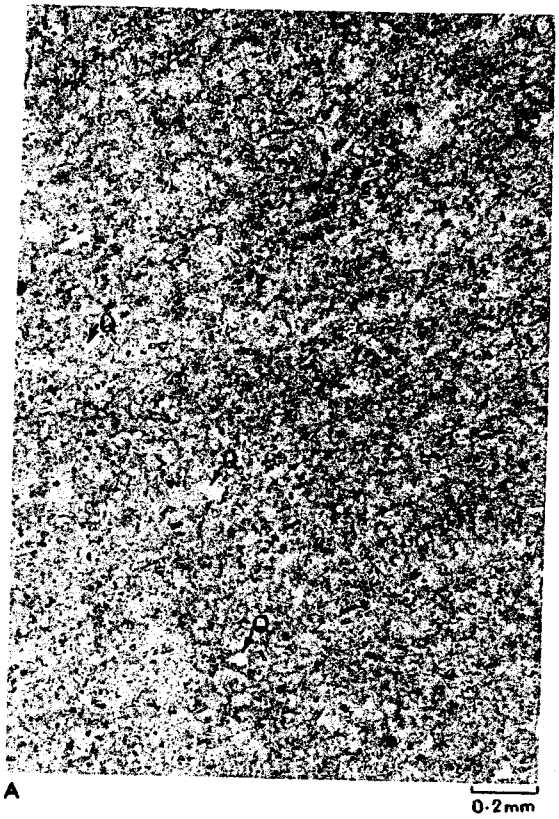
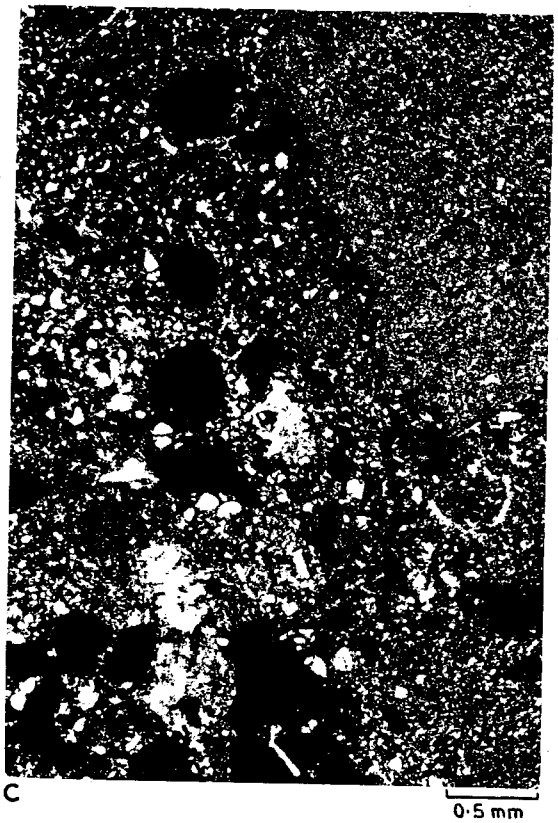
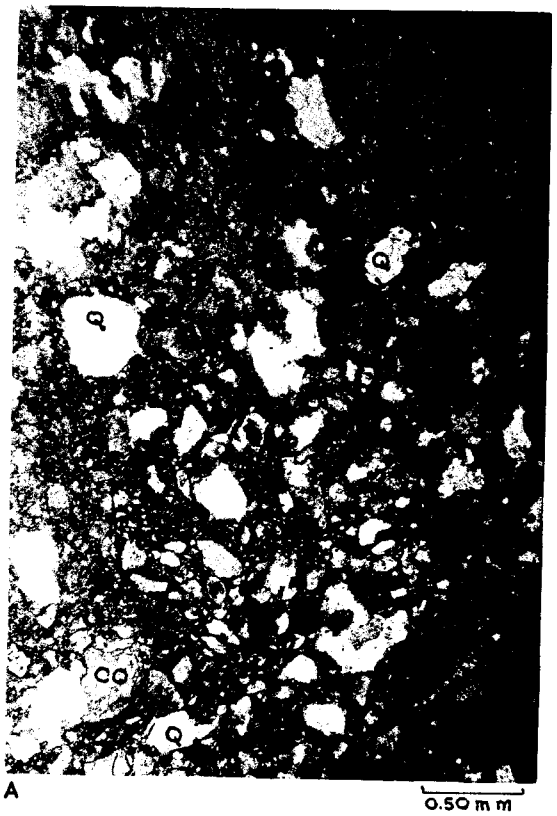




PLATE I







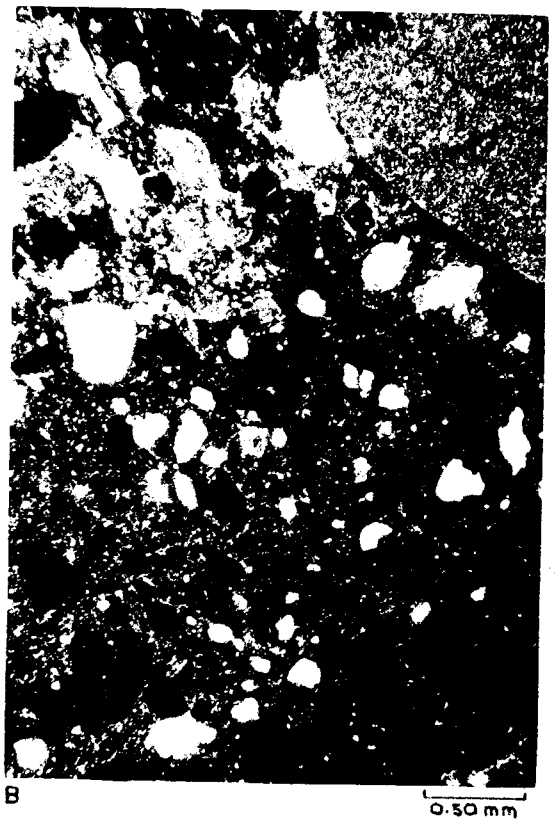


PLATE I





PLATE 2

A. Sample 10046A. Sandy phosphorite, consisting dominantly of collophane pellets and fragments (CO) partially cemented by kaolin. Some of the pellets contain organic structures (F) and were derived from phosphatic fossils. Chert fragments (Ch) also occur in minor amounts. The rock contains many cavities (V).
ppl

B. Sample 10046A. Same field as illustrated in A, under crossed nicols. The birefringent chert fragments (Ch) are evident against the opaque collophane and cavities. The thin layers of clay binding the pellets are also evident.
XN

C. Sample 10047. Sedimentary breccia consisting of fragments of collophane (CO) and chert (Ch) cemented by kaolinitic clay (CL).
ppl

D. Sample 10048. Sedimentary breccia consisting of collophane (CO) and chert (Ch) fragments cemented by kaolin. This sample differs from 10047 only in that it contains more clay matrix.
ppl


V
V
Ch
CO
Ch
Ch
V
A
0.50. mm

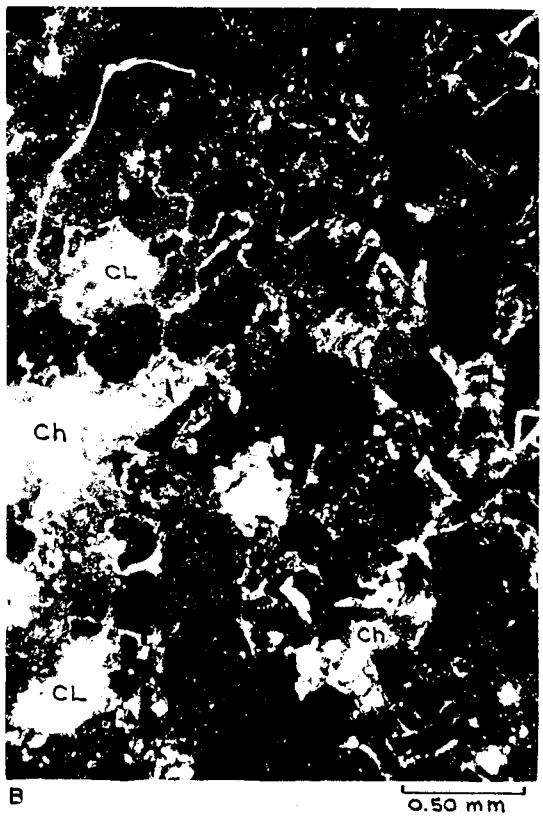

CL
Ch
Ch
CL
B
0.50 mm

PLATE 2


CL
Ch
Ch
C
0.50 mm


Ch
D
0.50 mm

PLATE 3

A. Sample 10078. Phosphatic sedimentary breccia consisting of large fragments of chert (Ch), quartzite (Qtz) and quartz sand grains (Q) cemented by clay. Smaller fragments of collophane (CO) are also present. The clay in this rock is mainly smectite.
ppl

B. Sample 10079A. Phosphatic sedimentary breccia. Fragments of chert (Ch), quartz grains (Q) and collophane fragments (CO) cemented by smectite clay. The angularity of the fragments and the lack of sorting suggests little transportation and rapid sedimentation.
ppl

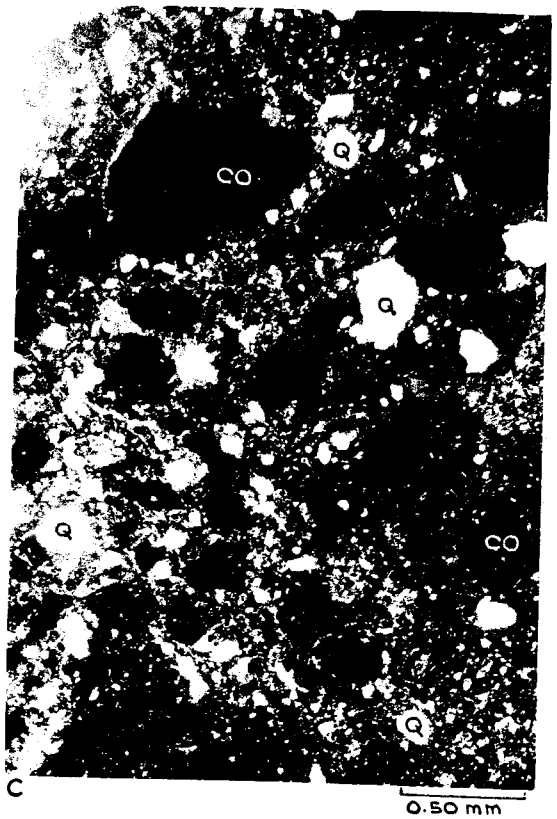
C. Sample 10079A. Phosphatic sedimentary breccia. Higher magnification than that illustrated in Plate 3B. The collophane fragments (CO) and quartz grains (Q) are randomly distributed in the clay matrix.
XN

D. Sample 10081. Phosphatic claystone. Irregular fragments of collophane (CO) with minor quartz sand (Q) and chert fragments (Ch) in a prominent clay matrix. The clay consists of smectite and kaolin.
ppl


Qtz
Ch
Ch
A
0.50 mm


Q
CL
Ch
B
0.50 mm

PLATE 3


CO
Q
Q
Q
CO
Q
C
0.50 mm


Ch
Q
Q
CO
D
0.50 mm

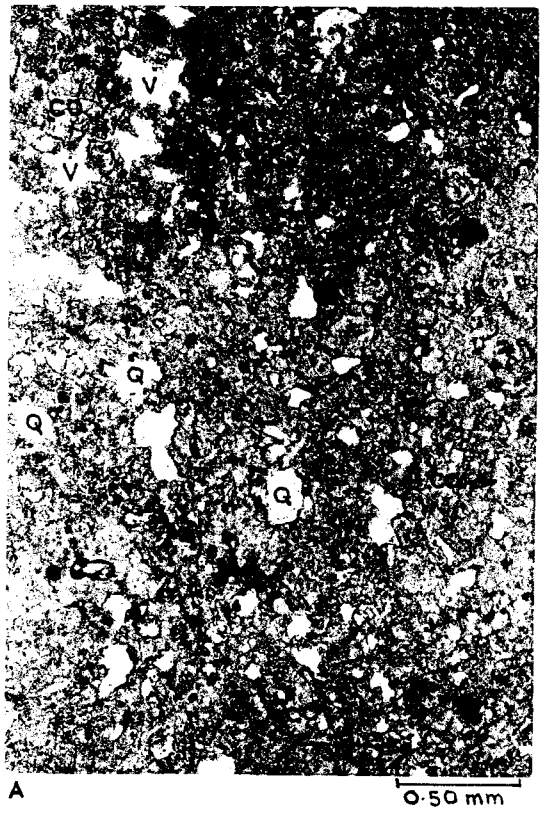
PLATE 4

A. Sample 10089. Sandy microsphorite, consisting of irregular fragments of collophane (CO) and accessory quartz grains (Q), cemented by a collophane matrix. The rock contains numerous irregular cavities (V).
ppl

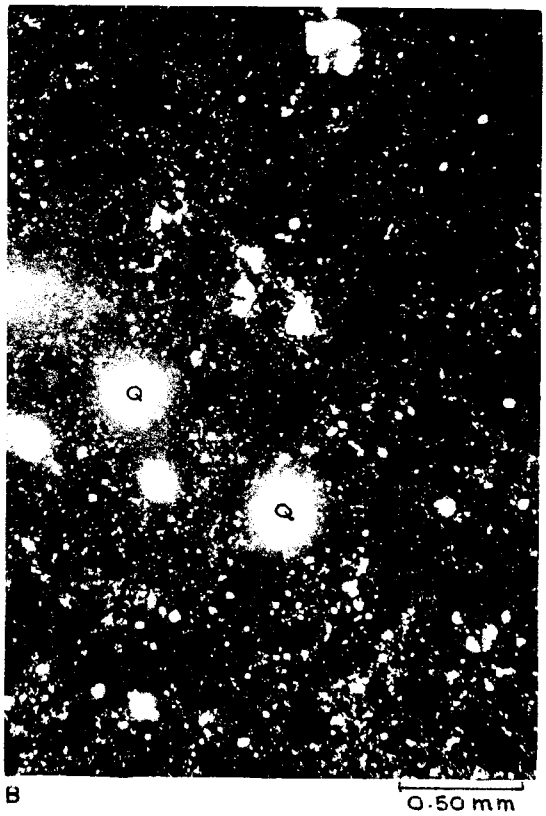
B. Sample 10089. Same field as illustrated in A, under crossed nicols. The distribution of quartz grains (Q) is here apparent.
XN

C. Sample 10091. Sandy pelletal phosphorite. This rock consists of collophane pellets and fragments (CO) and quartz sand grains (Q) cemented by clay, carbonate minerals and opaque goethite.
ppl

D. Sample 10091. A large fragment of phosphorite, consisting mainly of compacted collophane pellets, is illustrated in the upper right of the photo-micrograph. Opaque, goethite and sand grains (Q) are present in the fragment in accessory amounts.
ppl



A

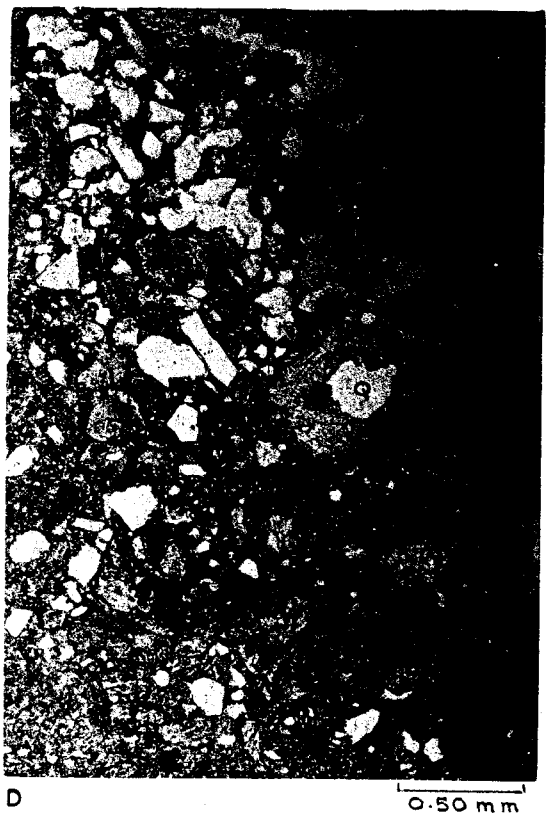


B

PLATE 4



C



D

PLATE 5

A. Sample 10090. Phosphorite of the microsphorite type. This sample consists of fragments and pellets of collophane (CO), together with accessory quartz grains (Q) in a matrix of collophane mud and smectite clay.
ppl

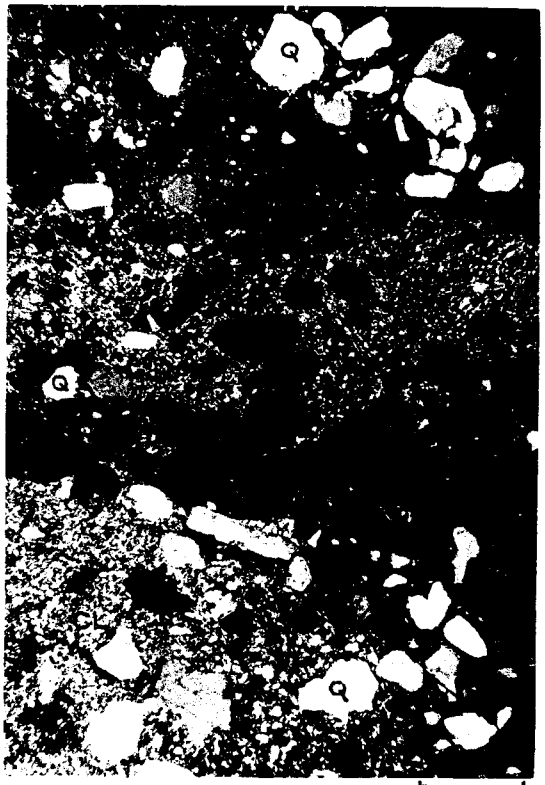
B. Sample 10093. Phosphatic and sandy claystone. This photomicrograph illustrates intertongueing sandy claystone (left) and phosphorite facies. The claystone consists dominantly of quartz sand (Q) in a matrix of clay (CL). Collophane pellets (opaque) are also present. The phosphorite facies consists of collophane pellets in a matrix which also consists mainly of collophane.
XN

C. Sample 10096A. Bedded phosphatic siltstone; consisting of clastic layers containing quartz grains (Q) of sand with silt size and collophane fragments (CO) with thin interbeds of clay and silt (CL).
ppl

D. Sample 10096B. Recrystallized dolomite consisting dominantly of rhombic crystals. The remnant of a partially recrystallized dolomitic oolite (O) is illustrated. Fragments of collophane (CO) are dispersed through the rock as accessory constituents.
ppl



A 0.50 mm



B 0.50 mm

PLATE 5



C 0.50 mm



D 0.50 mm

CR 2338(C)
App 2 & 3

APPENDIX 2

CONTINENTAL OIL COMPANY OF AUST. LTD.

PLANT FOOD EXPLORATION

QLD MINES DEPT
GSC 004650 CA

REPORT

ON

DRILLING OPERATIONS FOR PHOSPHATE

"1966 PROGRAMME"

AUTHORITY TO PROSPECT NO. 354 M.

UNDILLA BASIN

QUEENSLAND,

AUSTRALIA.

OPEN FILE

by

R. GRASSO, M.Sc.

FITZPATRICK, JOHNSON & ASSOCIATES

INTRODUCTION

This report is a summary of drilling activities undertaken by the Continental Oil Company of Australia Limited in the search for phosphate deposits within Authority to Prospect No. 354 M. Queensland, Australia.

The area is located in the Undilla Basin, western Queensland. The mining town of Mount Isa (population approximately 10,000) is the largest town in the area; this is 50-70 miles distant from the southern phosphate occurrence and 90-100 miles from the northern phosphate occurrence. The area is affected by floods caused by monsoonal thunder-storms which make accessibility during some of the summer months unreliable. In the dry season accessibility varies from very poor (some cross-country) to very good. (Along the Barkly Highway, established roads and tracks).

DRILLING

Initially, only two holes were programmed to test the area; but after the discovery of a phosphatic section in the D-Tree No. 1 Hole (second hole drilled) the programme was extended. In all 37 holes were drilled for a total footage of 5,387 feet.

The contract for drilling the original two holes was let to Geophysical Service International (G.S.I.) who supplied a Mayhew 1,000 shot-hole rig. The additional two rigs which were hired after the discovery at D-Tree No. 1 hole were supplied by Glindemann & Kitching Enterprises. These additional rigs, a rotary Mindrill G-Rig and a Mindrill E-1000 diamond rig, with casing facilities were used in the northern area where the G.S.I. rig had experienced severe cavings and loss in circulation problems. The G.S.I. rig which had no access to casing was then moved to the southern area where cavings and loss circulation difficulties were not so severe.

The G.S.I. crew with the Mayhew 1,000 rig commenced drilling on the 21st October, 1966; apart from several breakdown periods, it drilled a one 10-hour shift per day until the 7th November, 1966, when two 12-hour shifts were introduced. Drilling generally did not improve with the additional shift, hence the second crew was released

on the 10th November 1966. The rig then continued to operate on a one 10-hour shift basis to the 1st December, 1966, whence drilling stopped.

The G-Rig (Glindemann & Kitching Enterprises) drilled on a one 8-hour shift per day basis, (with minor overtime) from the 14th to 24th November when an additional 8-hour shift was introduced and continued until the 1st December 1966. The E-1000 diamond drilling plant was operated with two 8-hour shifts per day from the 16th to the 24th November, 1966, whence increased coring difficulties necessitated the coring programme to be abandoned.

The following figures show the footage drilled and cored by the two contractors.

1. G.S.I. (Mayhew 1,000 Rig)

(a)	Total footage drilled or cored	-	3,905 feet
(b)	Total footage cored	-	48 feet
(c)	Total core recovery	-	20 feet

2. Glindemann & Kitching Enterprises (G. Rig and E - 1,000 Rig)

(a)	Total footage drilled or cored	-	1,482 feet
(b)	Total footage cored	-	91 feet
(c)	Total core recovery	-	68' 7"

SAMPLING

Samples were usually taken at every foot; but the top 5 feet of each hole was taken as a composite sample. In several instances it was not possible to take foot samples because of loss in circulation. Also since holes 2A, E2 and B3 were re-drilled holes, 5 foot samples were taken to the depth reached in the previously drilled adjacent holes, and one-foot samples thereafter.

Because of the severe loss in circulation experienced in most holes, (especially in the northern area) it is possible that the samples are not representative. The large amounts of chert cavings and the partial loss of phosphatic dust (poor sample collection equipment) would almost certainly have a dilution effect on the P_2O_5 content. Also when weight (several tons) is applied to the bit, contamination could result by the scraping effect of the drill pipe against the sides of the hole. As the phosphatic horizons are usually soft, the scraping

effect may be most in those zones, and the P_2O_5 content of samples representing underlying sediments would thus be enhanced.

At this stage, it is not possible to state whether the overall effect is dilution, enhancement or reasonably close to true representation.

Most cuttings which contained greater than 2% P_2O_5 by the Shapiro method of testing were split into two cuts. One was stored in Mount Isa while the other cut was bagged, given a number and sent to A.M.D.E.L., Adelaide, for accurate P_2O_5 analysis.

The few cores cut were logged, tested and sent to the Sydney office if they contained appreciable amounts of phosphate, or stored in Mount Isa if they were not very phosphatic.

LOGGING AND TESTING

Logging of the cuttings and cores was performed by B. Menzel, M. Campbell and the writer. Because of the relatively fast drilling, the need to run "Shapiro" tests and other duties, the lithological logs are brief descriptions mostly compiled from a quick macro-inspection of the cuttings. All the cuttings should be re-logged with a binocular microscope if the logs are required for a detailed geological study. Also it was not possible to log parts of holes 2, 2A and 3 as the respective cuttings were taken by T. Cheney to the Sydney office.

Field testing for phosphate was carried out by dropping one or two cuttings in a test tube containing ammonium vanado-molybdate solution in nitric acid (Shapiro solution). Samples which showed a positive reaction (yellow colouration) were processed and analysed by the Shapiro method. Ones showing little or no reaction were recorded as containing 0-1% P_2O_5. Most samples, which showed greater than 2% P_2O_5 by the Shapiro method were sent to A.M.D.E.L., Adelaide, for accurate analysis.

The graphic logs attached show the P_2O_5 content as estimated in the field by the Shapiro method against the P_2O_5 content as established by A.M.D.E.L. in their analytical laboratories Adelaide. The correlation can be seen to be generally good; especially if one appreciates the inaccuracies involved in poor representation of the sample when running a Shapiro test.

TABLE I

HOLE	TOTAL DEPTH	FOOTAGE DRILLED	FOOTAGE CORED	FEET RECOVERED
D-TREE 1	185'	185'		
D-TREE 2	94'	94'		
D-TREE 2A	171'	171'		
D-TREE 3	170'	170'		
D-TREE 4	112'	109'	3'0"	0'6"
A	90'	90'		
B	28'	28'		
B2	40'	40'		
B3	43'	43'		
C	152'	152'		
C2	200'	200'		
D	241'	241'		
E	51'	35'	16'0"	13'7"
E2	85'7"	56'4"	29'3"	17'3"
E3	75'	75'		
F	100'	100'		
G	82'10"	82'10"		
G2	138'6"	120'0"	18'6"	15'9"
H	125'	125'		
I	65'	65'		
I2	76'	76'		
I3	108'4"	75'	33'4"	26'2"
M	90'	90'		
N	105'	105'		
O	95'	95'		
P	263'	253'	10'0"	1'0"
Q	215'	204'	11'0"	2'6"
R	194'	194'		
S	238'	238'		
T	280'	241'6"	14'4"	5'0"
U	257'	245'11"	11'1"	10'2"
V	142'	142'		
Whistler No.1	276'	276'		
W	155'	155'		
X	245'	245'		
Y	196'	191'	5'0"	Nil
Z	227'	227'		
37 Holes	5,387'	5,235'6"	151'6"	91'7" TOTALS

RESULTS

The results of the drilling are best studied from the descriptive logs, graphic logs and from the various reports submitted by A.M.D.E.L.

At this time it is not possible to establish with certainty the mode of occurrence or origin of the phosphate, but the following facts were noted during logging.

1. The phosphate occurs mostly if not invariably as clay-size particles.

2. The phosphatic material is usually in the form of a soft silty clay.

3. The phosphatic horizons are usually associated with cavernous, vughy, "loss-circulation" zones with evidence of ferruginous and silica "boxwork" type weathering.

4. The phosphatic horizons in the northern area appear to be generally more cavernous than those in the southern area.

5. The best phosphate sections were recorded in holes which were <u>not</u> spudded in limestone outcrops.

R. Grasso

R. GRASSO, M.Sc.

FITZPATRICK, JOHNSON & ASSOCIATES

ADELAIDE,
3rd January, 1967

APPENDIX 2a

CONTINENTAL OIL COMPANY OF AUST. LTD.

PLANT FOODS EXPLORATION

NOTES

ON

DRILLING OPERATIONS FOR PHOSPHATE
"1967 PROGRAMME"
AUTHORITY TO PROSPECT 354M

UNDILLA BASIN

QUEENSLAND,

AUSTRALIA

by

R. GRASSO, M.Sc.

INTRODUCTION

This report outlines the statistical drilling data of the recent phosphate exploratory programme carried out on behalf of the Continental Oil Company of Aust. Ltd. in tenement, Authority to Prospect 375M, Queensland, Australia. The application of A to P 375M was filed shortly after a phosphatic section was cut in A to P 354M, immediately to the north. A to p 375M covers an area of almost 500 square miles in north-west Queensland. Mount Isa a relatively large mining town is approximately 50 miles to the south.

DRILLING

The basic drilling programme was designed to test the southern extension of the phosphatic horizons discovered in A to P 354M during the 1966 programme. These include the Sherrin Creek and the Lily Creek areas. Apart from the many "fill-in" and delineation holes which were sited as drilling progressed, one hole was drilled in the north-western part of the tenement (B/D No. 1).

Austral Geo Prospectors Pty. Ltd. contracted to drill the area, and supplied two modified Failing shot-hole rigs, a trailer mounted air compressor, drilling equipment and general camp facilities. A surveyor and rodman, as well as an extra man on each rig (to assist the geologist) were supplied by the drilling contractor on a daily hire basis. The camp was erected near the Yelvertoft Dip, on the Barkly Highway, approximately 70 miles north of Mount Isa.

The drilling contractor also supplied casing and special casing shoes to "drill" through loss circulation zones; this was not successful and whenever circulation could not be regained, the hole was abandoned.

Drilling commenced on the 14th April and was completed on the 10th June 1967; but as the drilling on this tenement was carried out at the same time as that on A to P 354M and A to P 376M, an average of one rig would have been active during that period. Apart from breakdowns the rigs worked 8 hour shifts plus approximately 2 hours per day travelling time.

In all 55 holes were drilled or cored for a total footage of 6,455'4". This figure includes several re-drill holes which were necessary when coring was attempted or when the original hole was lost. Table 1 lists details of the holes drilled.

T A B L E 1.

Hole	Total Depth	Footage Drilled	Footage Cored	Feet Recovered
L.C.1	160	160	-	-
L.C.2	195	195	-	-
L.C.3	162	162	-	-
L.C.4	180	180	-	-
L.C.5	120	120	-	-
L.C.6	200	200	-	-
L.C.7)	80	80	-	-
L.C.7R)	160	160	-	-
L.C.8	140	140	-	-
B.D.1	200	200		
S.C.1	90	90		
S.C.2)	90	90		
S.C.2R)	157	157		
S.C.3	120	120		
S.C.4	29	29		
S.C.4R	120	120		
S.C.4RR	120	114	6' 0"	1' 0"
S.C.4RRR	118	101	17' 0"	4' 0"
S.C.4X	131½"	98'4"	32'10"	20' 3½"
S.C.5	25	25	-	-
S.C.5R	80	80	-	-
S.C.5A	80	80	-	-
S.C.5B	159	157	2' 0"	2' 0"
S.C.6	40	40	-	-
S.C.6R	88	88	-	-
S.C.7	170	170	-	-
S.C.9	92	92	-	-
S.C.9A	115	115	-	-
S.C.10	95	95	-	-
S.C.10R	134	109'3"	24' 9"	21' 10"
S.C.11	106	106	-	-
S.C.12	140	140	-	-
S.C.13	105	105	-	-
S.C.14	220	220	-	-

TABLE 1. cont'd.

Hole	Total Depth	Footage Drilled	Footage Cored	Feet Recovered
S.C.15	101	101	-	-
S.C.15R	104'5"	90'8"	13'9"	5' 2"
S.C.15X	97'9"	85'2"	12'7"	7'11"
S.C.15Y	100'0"	87'4"	12'8"	4' 0"
S.C.16	106	106	-	-
S.C.17	120	120	-	-
S.C.18	154	154	-	-
S.C.19	125	125	-	-
S.C.20	83	83	-	-
S.C.21	60	60	-	-
S.C.22	90	90	-	-
S.C.23	60	60	-	-
S.C.24	100	100	-	-
S.C.25	120	120	-	-
S.C.26	90	90	-	-
S.C.27	123	123	-	-
S.C.28	140	140	-	-
S.C.29	60	60	-	-
S.C.30	120	120	-	-
S.C.31	100	100	-	-
S.C.32	180	180	-	-
55 Holes	6,455'4"	6,333'9"	121'7"	66'2½" TOTALS

CORING

Coring was generally unsuccessful. Several types of core barrels and bits were tried, but only poor recoveries were obtained. Where the section being cored contained little or no chert the retractor, split-inner tube barrel was most successful; but whenever chert was cut the recovery was poor. Towards the end of the contract a special barrel and bit attached to a Mission hammer drill produced good, but very disturbed core recoveries.

The total footage cored was 121' 7" for an apparent recovery of 66' 2½". However, as some of the apparent core recovered in the hammer core barrel may be cavings, the core actually recovered may be considerably less than 66' 2½". Table 1 gives details of the coring.

SAMPLING

Originally it was decided to catch five-foot samples of the non-phosphatic section, and then to core the phosphatic interval. However, since coring was not successful, one-foot samples were usually taken of the cuttings while drilling or coring the phosphatic zone.

About half way through the drilling programme the completed holes were logged with a Gamma Ray unit. The logs of some of these holes showed "kicks" in the character of the logs above those produced by the phosphatic zones picked up by the Shapiro tests. As these "kicks" would need to be investigated, it was decided that in future holes one-foot (except for the top 5 feet) samples should be caught for the entire depth of the hole.

Sample cuttings and some cores are presently stored in Continental's warehouse in Mount Isa. Most of the core and cuts of some of the samples were sent to Continental's Sydney office and to A.M.D.E.L., Adelaide, for investigation and detailed analysis.

LOGGING AND TESTING

Logging of the cuttings and core was performed by geologists N. Murphy, J. Simpson, M. Campbell, B.F. Fitzpatrick and the writer.

The lithologic logging procedure was relatively simple. It allowed only a brief description (with the aid of hand lens) of the cuttings and cores. If the logs are required for detailed studies, it is suggested that the cuttings be washed and relogged using a binocular microscope.

Chip-testing for phosphate was performed by the well-site geologist while the hole was being drilled: but the semi-quantitative Shapiro analyses for the P_2O_5 content were performed in the temporary laboratory at the camp site. The analyses were run mostly by N. Murphy, J. Simpson and the writer.

Samples which gave a Shapiro P_2O_5 content greater than 4% or those which appeared mineralogically interesting were sent to A.M.D.E.L. for accurate P_2O_5 determination. Some samples were sent to A.M.D.E.L. for broad coverage Emission Semi Quantitative analyses.

RESULTS

Semi-quantitative Shapiro results are listed with the lithological logs.

Reports and results of analyses or cuttings and cores sent to A.M.D.E.L. have not yet been completed. Also cross-sections, isopachs and graphic assessments are presently being compiled. These results, their geological significance and interpretation, together with metallurgical and general economic considerations will be reported on when all the relative information is collated.

R. GRASSO, M.Sc.

R. GRASSO PTY. LTD.

ADELAIDE,

21st July, 1967.

APPENDIX 2b

CONTINENTAL OIL COMPANY OF AUST. LTD.

PLANT FOODS EXPLORATION

NOTES

ON

DRILLING OPERATIONS FOR PHOSPHATE
"1967 PROGRAMME"
AUTHORITY TO PROSPECT 375M

UNDILLA BASIN

QUEENSLAND

AUSTRALIA

by

R. GRASSO, M.Sc.

INTRODUCTION

This report records the statistical drilling data of the recent exploratory work carried out on behalf of the Continental Oil Company of Australia Limited in the tenement, Authority to Prospect 354M, Queensland, Australia.

The programme was designed to delineate and follow some of the phosphatic intersections discovered in a previous (1966) drilling programme. Several areas which were not tested previously were also drilled.

The tenement covers almost 1,000 square miles of north west Queensland. It is separated into two areas. Mount Isa, a relatively large mining centre is 50-70 miles south of one of the areas and 90-100 miles south of the other.

DRILLING

A basic drilling programme was prepared and adhered to generally; but additional delineation and "fill-in" holes were chosen as drilling progressed.

The drilling contract was awarded to Austral Geo Prospectors Pty. Ltd., who supplied two modified Failing shot-hole rigs, a trailer mounted air compressor, drilling equipment, several vehicles and general camp facilities. A surveyor and rodman as well as an extra man on each rig (to assist the geologist) were supplied by the drilling contractor on a daily hire basis. The camp was erected near the Yelvertoft Dip, on the Barkly Highway, approximately 70 miles north of Mount Isa. A tent was used as a temporary laboratory for the running of Shapiro analyses, and a telephone was installed in the "office" tent.

The drilling contractor was advised of the difficult drilling and coring conditions experienced in the 1966 programme and was asked to provide suitable casing. Special tungstan carbide-tipped, serated casing-shoes were manufactured and several attempts were made to drill through loss circulation zones by drilling with the casing. After experiencing two twist-offs, it was decided not to attempt any further drilling with the casing, consequently whenever a loss in circulation could not be restored, the hole was abandoned.

Drilling commenced on the 10th April, and was completed on the 5th June, 1967. The programme was executed at the same time as those for A to P 375M and A to P 376M, consequently, an average of one rig would have operated in A to P 354M during that period. Except for breakdown periods the rigs worked one 10 hour shift per day. This included travel time which amounted to approximately two hours per day.

In all, 31 holes were drilled or cored for a total footage of 3,873 feet. These figures include several re-drill holes where coring was attempted or where the original hole was lost. Table 1 lists details of the holes drilled.

T A B L E 1.

Hole	Total Depth	Footage Drilled	Footage Cored	Feet recovered
B1-A	105	105	Ram core	Few inches
B6	45	45		
B7	85	85		
B8	126	126		
B9	140	140		
C3	42	42		
C4	166	166	Ram core	Few inches
C5	185	185		
D/T.2B	89	80	9.0"	5'4"
D/T.4A	91	91	Ram core	Few inches
D/T.5	91	91		
D/T.5A	102	102		
D/T.5B	100	100		
D/T.5C	114	114		
D/T.7	157	157		
D/T.7A	180	180		
D/T.9	132'6"	117'6"	15'	1'
D/T.11	120	115'3½"	4'8½"	6"
D/T.11A	84	51'5"	32'7"	32'7"
D/T.13	181	181		
E5	44	44		
E6	186'6"	186'6"		
H2	185	185		
J1	40	40		
J2	100	100		
J3	63	63		
JF1	245	245		
JF2	245	245		
JF3	85	85		
JF3A	99	99		
JF4	245	245		
31 holes	3,873 ft.		61' 3½"	39 ' 5" Totals

CORING

Although the drilling contractor experimented with several kinds of core barrels and bits, coring was generally unsuccessful. Custom built barrels and bits included split and tapered inner barrels. Hard Formation Coring Heads (H.F.C.H.), tungstan carbide saw-tooth insert bits, tungstan carbide chip bits, two and three tooth tungstan carbide insert bits and several other variations. Towards the end of the contract a special barrel and bit attached to a Mission hammer drill produced good, but very disturbed core recoveries.

The total footage cored was 61' 3½" for an apparent recovery of 39' 5". However, as some of the apparent core recovered in the hammer core barrel may be cavings, the core actually recovered may be considerably less than 39' 5". Table 1 gives details of coring.

SAMPLING

Originally it was decided to catch five foot samples of the non-phosphatic section, and then to core the phosphatic interval. However, since coring was not successful, one foot samples were usually taken of the cuttings while drilling or coring the phosphatic zone.

About half way through the drilling programme the completed holes were logged with a Gamma Ray unit. The logs of some of these holes showed "kicks" in the character of the logs above those produced by the phosphatic zones picked up by the Shapiro tests. As these "kicks" would need to be investigated, it was decided that in future holes one-foot (except for the top 5 feet) samples should be caught for the entire depth of the hole.

Sample cuttings and some cores are presently stored in Continental's warehouse in Mount Isa. Most of the core and cuts of some of the samples were sent to Continental's Sydney office and to A.M.D.E.L., Adelaide, for investigation and detailed analysis.

LOGGING AND TESTING

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Samples which gave a Shapiro P_2O_5 content greater than 4% or those which appeared mineralogically interesting were sent to A.M.D.E.L. for accurate P_2O_5 determination. Some samples were sent to A.M.D.E.L. for broad coverage Emission Semi Quantitative analyses.

RESULTS

Semi-quantitative Shapiro results are listed with the lithological logs.

Reports and results of analyses or cuttings and cores sent to A.M.D.E.L. have not yet been completed. Also cross-sections, isopachs and graphic assessments are presently being compiled. These results, their geological significance and interpretation, together with metallurgical and general economic considerations will be reported on when all the relative information is collated.

R. Grasso

R. Grasso, M.Sc.

R. GRASSO PTY. LTD.

ADELAIDE,

20th July, 1967.



APPENDIX 2

Drilling Operations

A. to P. 354M

1966 Programme

R. GRASSO

CONTINENTAL OIL COMPANY OF AUST. LTD.

PLANT FOOD EXPLORATION

REPORT

ON

DRILLING OPERATIONS FOR PHOSPHATE

AUTHORITY TO PROSPECT NO. 354 M.

UNDILLA BASIN

QUEENSLAND,

AUSTRALIA.

by

R. GRASSO, M.Sc.

FITZPATRICK, JOHNSON & ASSOCIATES

INTRODUCTION

This report is a summary of drilling activities undertaken by the Continental Oil Company of Australia Limited in the search for phosphate deposits within Authority to Prospect No. 354 M. Queensland, Australia.

The area is located in the Undilla Basin, western Queensland. The mining town of Mount Isa (population approximately 10,000) is the largest town in the area; this is 50-70 miles distant from the southern phosphate occurrence and 90-100 miles from the northern phosphate occurrence. The area is affected by floods caused by monsoonal thunder-storms which make accessibility during some of the summer months unreliable. In the dry season accessibility varies from very poor (some cross-country) to very good. (Along the Barkly Highway, established roads and tracks).

DRILLING

Initially, only two holes were programmed to test the area; but after the discovery of a phosphatic section in the D-Tree No. 1 Hole (second hole drilled) the programme was extended. In all 37 holes were drilled for a total footage of 5,387 feet.

The contract for drilling the original two holes was let to Geophysical Service International (G.S.I.) who supplied a Mayhew 1,000 shot-hole rig. The additional two rigs which were hired after the discovery at D-Tree No. 1 hole were supplied by Glindemann & Kitching Enterprises. These additional rigs, a rotary Mindrill G-Rig and a Mindrill E-1000 diamond rig, with casing facilities were used in the northern area where the G.S.I. rig had experienced severe cavings and loss in circulation problems. The G.S.I. rig which had no access to casing was then moved to the southern area where cavings and loss circulation difficulties were not so severe.

The G.S.I. crew with the Mayhew 1,000 rig commenced drilling on the 21st October, 1966; apart from several breakdown periods, it drilled a one 10-hour shift per day until the 7th November, 1966, when two 12-hour shifts were introduced. Drilling generally did not improve with the additional shift, hence the second crew was released

on the 10th November 1966. The rig then continued to operate on a one 10-hour shift basis to the 1st December, 1966, whence drilling stopped.

The G-Rig (Glindemann & Kitching Enterprises) drilled on a one 8-hour shift per day basis, (with minor overtime) from the 14th to 24th November when an additional 8-hour shift was introduced and continued until the 1st December 1966. The E-1000 diamond drilling plant was operated with two 8-hour shifts per day from the 16th to the 24th November, 1966, whence increased coring difficulties necessitated the coring programme to be abandoned.

The following figures show the footage drilled and cored by the two contractors.

1. G.S.I. (Mayhew 1,000 Rig)

(a)	Total footage drilled or cored	-	3,905 feet
(b)	Total footage cored	-	48 feet
(c)	Total core recovery	-	20 feet

2. Glindemann & Kitching Enterprises (G. Rig and E - 1,000 Rig)

(a)	Total footage drilled or cored	-	1,482 feet
(b)	Total footage cored	-	91 feet
(c)	Total core recovery	-	68' 7"

SAMPLING

Samples were usually taken at every foot; but the top 5 feet of each hole was taken as a composite sample. In several instances it was not possible to take foot samples because of loss in circulation. Also since holes 2A, E2 and B3 were re-drilled holes, 5 foot samples were taken to the depth reached in the previously drilled adjacent holes, and one-foot samples thereafter.

Because of the severe loss in circulation experienced in most holes, (especially in the northern area) it is possible that the samples are not representative. The large amounts of chert cavings and the partial loss of phosphatic dust (poor sample collection equipment) would almost certainly have a dilution effect on the P_2O_5 content. Also when weight (several tons) is applied to the bit, contamination could result by the scraping effect of the drill pipe against the sides of the hole. As the phosphatic horizons are usually soft, the scraping

effect may be most in those zones, and the P_2O_5 content of samples representing underlying sediments would thus be enhanced.

At this stage, it is not possible to state whether the overall effect is dilution, enhancement or reasonably close to true representation.

Most cuttings which contained greater than 2% P_2O_5 by the Shapiro method of testing were split into two cuts. One was stored in Mount Isa while the other cut was bagged, given a number and sent to A.M.D.E.L., Adelaide, for accurate P_2O_5 analysis.

The few cores cut were logged, tested and sent to the Sydney office if they contained appreciable amounts of phosphate, or stored in Mount Isa if they were not very phosphatic.

LOGGING AND TESTING

Logging of the cuttings and cores was performed by B. Menzel, M. Campbell and the writer. Because of the relatively fast drilling, the need to run "Shapiro" tests and other duties, the lithological logs are brief descriptions mostly compiled from a quick macro-inspection of the cuttings. All the cuttings should be re-logged with a binocular microscope if the logs are required for a detailed geological study. Also it was not possible to log parts of holes 2, 2A and 3 as the respective cuttings were taken by T. Cheney to the Sydney office.

Field testing for phosphate was carried out by dropping one or two cuttings in a test tube containing ammonium vanado-molybdate solution in nitric acid (Shapiro solution). Samples which showed a positive reaction (yellow colouration) were processed and analysed by the Shapiro method. Ones showing little or no reaction were recorded as containing 0-1% P_2O_5. Most samples, which showed greater than 2% P_2O_5 by the Shapiro method were sent to A.M.D.E.L., Adelaide, for accurate analysis.

The graphic logs attached show the P_2O_5 content as estimated in the field by the Shapiro method against the P_2O_5 content as established by A.M.D.E.L. in their analytical laboratories Adelaide. The correlation can be seen to be generally good; especially if one appreciates the inaccuracies involved in poor representation of the sample when running a Shapiro test.

TABLE I

HOLE	TOTAL DEPTH	FOOTAGE DRILLED	FOOTAGE CORED	FEET RECOVERED
D-TREE 1	185'	185'		
D-TREE 2	94'	94'		
D-TREE 2A	171'	171'		
D-TREE 3	170'	170'		
D-TREE 4	112'	109'	3'0"	0'6"
A	90'	90'		
B	28'	28'		
B2	40'	40'		
B3	43'	43'		
C	152'	152'		
C2	200'	200'		
D	241'	241'		
E	51'	35'	16'0"	13'7"
E2	85'7"	56'4"	29'3"	17'3"
E3	75'	75'		
F	100'	100'		
G	82'10"	82'10"		
G2	138'6"	120'0"	18'6"	15'9"
H	125'	125'		
I	65'	65'		
I2	76'	76'		
I3	108'4"	75'	33'4"	26'2"
M	90'	90'		
N	105'	105'		
O	95'	95'		
P	263'	253'	10'0"	1'0"
Q	215'	204'	11'0"	2'6"
R	194'	194'		
S	238'	238'		
T	280'	241'6"	14'4"	5'0"
U	257'	245'11"	11'1"	10'2"
V	142'	142'		
Whistler No.1	276'	276'		
W	155'	155'		
X	245'	245'		
Y	196'	191'	5'0"	Nil
Z	227'	227'		
37 Holes	5,387'	5,235'6"	151'6"	91'7" TOTALS

RESULTS

The results of the drilling are best studied from the descriptive logs, graphic logs and from the various reports submitted by A.M.D.E.L.

At this time it is not possible to establish with certainty the mode of occurrence or origin of the phosphate, but the following facts were noted during logging.

1. The phosphate occurs mostly if not invariably as clay-size particles.

2. The phosphatic material is usually in the form of a soft silty clay.

3. The phosphatic horizons are usually associated with cavernous, vughy, "loss-circulation" zones with evidence of ferruginous and silica "boxwork" type weathering.

4. The phosphatic horizons in the northern area appear to be generally more cavernous than those in the southern area.

5. The best phosphate sections were recorded in holes which were not spudded in limestone outcrops.

R. Grasso

R. GRASSO, M.Sc.

FITZPATRICK, JOHNSON & ASSOCIATES

ADELAIDE,
3rd January, 1966.

APPENDIX 2a

DRILLING OPERATIONS

A.TO P. 354M

R. GRASSO

CONTINENTAL OIL COMPANY OF AUST. LTD.

PLANT FOODS EXPLORATION

NOTES

ON

DRILLING OPERATIONS FOR PHOSPHATE

AUTHORITY TO PROSPECT 354M

UNDILLA BASIN

QUEENSLAND,

AUSTRALIA

by

R. GRASSO, M.Sc.

INTRODUCTION

This report records the statistical drilling data of the recent exploratory work carried out on behalf of the Continental Oil Company of Australia Limited in the tenement, Authority to Prospect 354M, Queensland, Australia.

The programme was designed to delineate and follow some of the phosphatic intersections discovered in a previous (1966) drilling programme. Several areas which were not tested previously were also drilled.

The tenement covers almost 1,000 square miles of north west Queensland. It is separated into two areas. Mount Isa, a relatively large mining centre is 50-70 miles south of one of the areas and 90-100 miles south of the other.

DRILLING

A basic drilling programme was prepared and adhered to generally; but additional delineation and "fill-in" holes were chosen as drilling progressed.

The drilling contract was awarded to Austral Geo Prospectors Pty. Ltd., who supplied two modified Failing shot-hole rigs, a trailer mounted air compressor, drilling equipment, several vehicles and general camp facilities. A surveyor and rodman as well as an extra man on each rig (to assist the geologist) were supplied by the drilling contractor on a daily hire basis. The camp was erected near the Yelvertoft Dip, on the Barkly Highway, approximately 70 miles north of Mount Isa. A tent was used as a temporary laboratory for the running of Shapiro analyses, and a telephone was installed in the "office" tent.

The drilling contractor was advised of the difficult drilling and coring conditions experienced in the 1966 programme and was asked to provide suitable casing. Special tungstan carbide-tipped, serated casing-shoes were manufactured and several attempts were made to drill through loss circulation zones by drilling with the casing. After experiencing two twist-offs, it was decided not to attempt any further drilling with the casing, consequently whenever a loss in circulation could not be restored, the hole was abandoned.

Drilling commenced on the 10th April, and was completed on the 5th June, 1967. The programme was executed at the same time as those for A to P 375M and A to P 376M, consequently, an average of one rig would have operated in A to P 354M during that period. Except for breakdown periods the rigs worked one 10 hour shift per day. This included travel time which amounted to approximately two hours per day.

In all, 31 holes were drilled or cored for a total footage of 3,873 feet. These figures include several re-drill holes where coring was attempted or where the original hole was lost. Table 1 lists details of the holes drilled.

T A B L E 1.

Hole	Total Depth	Footage Drilled	Footage Cored	Feet recovered
B1-A	105	105	Ram core	Few inches
B6	45	45		
B7	85	85		
B8	126	126		
B9	140	140		
C3	42	42		
C4	166	166	Ram core	Few inches
C5	185	185		
D/T.2B	89	80	9.0"	5'4"
D/T.4A	91	91	Ram core	Few inches
D/T.5	91	91		
D/T.5A	102	102		
D/T.5B	100	100		
D/T.5C	114	114		
D/T.7	157	157		
D/T.7A	180	180		
D/T.9	132'6"	117'6"	15'	1'
D/T.11	120	115'3½"	4'8½"	6"
D/T.11A	84	51'5"	32'7"	32'7"
D/T.13	181	181		
E5	44	44		
E6	186'6"	186'6"		
H2	185	185		
J1	40	40		
J2	100	100		
J3	63	63		
JF1	245	245		
JF2	245	245		
JF3	85	85		
JF3A	99	99		
JF4	245	245		
31 holes	3,873 ft.		61' 3½"	39' 5" Totals

CORING

Although the drilling contractor experimented with several kinds of core barrels and bits, coring was generally unsuccessful. Custom built barrels and bits included split and tapered inner barrels. Hard Formation Coring Heads (H.F.C.H.), tungstan carbide saw-tooth insert bits, tungstan carbide chip bits, two and three tooth tungstan carbide insert bits and several other variations. Towards the end of the contract a special barrel and bit attached to a Mission hammer drill produced good, but very disturbed core recoveries.

The total footage cored was 61' 3½" for an apparent recovery of 39' 5". However, as some of the apparent core recovered in the hammer core barrel may be cavings, the core actually recovered may be considerably less than 39' 5". Table 1 gives details of coring.

SAMPLING

Originally it was decided to catch five foot samples of the non-phosphatic section, and then to core the phosphatic interval. However, since coring was not successful, one foot samples were usually taken of the cuttings while drilling or coring the phosphatic zone.

About half way through the drilling programme the completed holes were logged with a Gamma Ray unit. The logs of some of these holes showed "kicks" in the character of the logs above those produced by the phosphatic zones picked up by the Shapiro tests. As these "kicks" would need to be investigated, it was decided that in future holes one-foot (except for the top 5 feet) samples should be caught for the entire depth of the hole.

Sample cuttings and some cores are presently stored in Continental's warehouse in Mount Isa. Most of the core and cuts of some of the samples were sent to Continental's Sydney office and to A.M.D.E.L., Adelaide, for investigation and detailed analysis.

LOGGING AND TESTING

Logging of the cuttings and cores was performed by geologists N. Murphy, J. Simpson, M. Campbell, B.F. Fitzpatrick and the writer.

The lithologic logging procedure was relatively simple. It allowed only a brief description (with the aid of hand lens) of the cuttings and cores. If the logs are required for detailed studies, it is suggested that the cuttings be washed and relogged using a binocular microscope.

Chip-testing for phosphate was performed by the well-site geologist while the hole was being drilled; but the semi-quantitative Shapiro analyses for the P_2O_5 content were performed in the temporary laboratory at the camp site. The analyses were run mostly by N. Murphy, J. Simpson and the writer.

Samples which gave a Shapiro P_2O_5 content greater than 4% or those which appeared mineralogically interesting were sent to A.M.D.E.L. for accurate P_2O_5 determination. Some samples were sent to A.M.D.E.L. for broad coverage Emission Semi Quantitative analyses.

RESULTS

Semi-quantitative Shapiro results are listed with the lithological logs.

Reports and results of analyses or cuttings and cores sent to A.M.D.E.L. have not yet been completed. Also cross-sections, isopachs and graphic assessments are presently being compiled. These results, their geological significance and interpretation, together with metallurgical and general economic considerations will be reported on when all the relative information is collated.

R. Grasso

R. Grasso, M.Sc.

R. GRASSO PTY. LTD.

ADELAIDE,

20th July, 1967.

APPENDIX 2b

DRILLING OPERATIONS

A.TO P. 375M

R. GRASSO

CONTINENTAL OIL COMPANY OF AUST. LTD.

PLANT FOODS EXPLORATION

NOTES

ON

DRILLING OPERATIONS FOR PHOSPHATE

AUTHORITY TO PROSPECT 375M

UNDILLA BASIN

QUEENSLAND

AUSTRALIA

by

R. GRASSO, M.Sc.

INTRODUCTION

This report outlines the statistical drilling data of the recent phosphate exploratory programme carried out on behalf of the Continental Oil Company of Aust. Ltd. in tenement, Authority to Prospect 375M, Queensland, Australia. The application of A to P 375M was filed shortly after a phosphatic section was cut in A to P 354M, immediately to the north. A to p 375M covers an area of almost 500 square miles in north-west Queensland. Mount Isa a relatively large mining town is approximately 50 miles to the south.

DRILLING

The basic drilling programme was designed to test the southern extension of the phosphatic horizons discovered in A to P 354M during the 1966 programme. These include the Sherrin Creek and the Lily Creek areas. Apart from the many "fill-in" and delineation holes which were sited as drilling progressed, one hole was drilled in the north-western part of the tenement (B/D No. 1).

Austral Geo Prospectors Pty. Ltd. contracted to drill the area, and supplied two modified Failing shot-hole rigs, a trailer mounted air compressor, drilling equipment and general camp facilities. A surveyor and rodman, as well as an extra man on each rig (to assist the geologist) were supplied by the drilling contractor on a daily hire basis. The camp was erected near the Yelvertoft Dip, on the Barkly Highway, approximately 70 miles north of Mount Isa.

The drilling contractor also supplied casing and special casing shoes to "drill" through loss circulation zones; this was not successful and whenever circulation could not be regained, the hole was abandoned.

Drilling commenced on the 14th April and was completed on the 10th June 1967; but as the drilling on this tenement was carried out at the same time as that on A to P 354M and A to P 376M, an average of one rig would have been active during that period. Apart from breakdowns the rigs worked 8 hour shifts plus approximately 2 hours per day travelling time.

In all 55 holes were drilled or cored for a total footage of 6,455'4". This figure includes several re-drill holes which were necessary when coring was attempted or when the original hole was lost. Table 1 lists details of the holes drilled.

T A B L E 1.

Hole	Total Depth	Footage Drilled	Footage Cored	Feet Recovered
L.C.1	160	160	-	-
L.C.2	195	195	-	-
L.C.3	162	162	-	-
L.C.4	180	180	-	-
L.C.5	120	120	-	-
L.C.6	200	200	-	-
L.C.7)	80	80	-	-
L.C.7R)	160	160	-	-
L.C.8	140	140	-	-
B.D.1	200	200		
S.C.1	90	90		
S.C.2)	90	90		
S.C.2R)	157	157		
S.C.3	120	120		
S.C.4	29	29		
S.C.4R	120	120		
S.C.4RR	120	114	6' 0"	1' 0"
S.C.4RRR	118	101	17' 0"	4' 0"
S.C.4X	131½"	98'4"	32'10"	20' 3½"
S.C.5	25	25	-	-
S.C.5R	80	80	-	-
S.C.5A	80	80	-	-
S.C.5B	159	157	2! 0"	2' 0"
S.C.6	40	40	-	-
S.C.6R	88	88	-	-
S.C.7	170	170	-	-
S.C.9	92	92	-	-
S.C.9A	115	115	-	-
S.C.10	95	95	-	-
S.C.10R	134	109'3"	24' 9"	21' 10"
S.C.11	106	106	-	-
S.C.12	140	140	-	-
S.C.13	105	105	-	-
S.C.14	220	220	-	-

TABLE 1. cont'd.

Hole	Total Depth	Footage Drilled	Footage Cored	Feet Recovered
S.C.15	101	101	-	-
S.C.15X	104'5"	90'8"	13'9"	5' 2"
S.C.15X	97'9"	85'2"	12'7"	7'11"
S.C.15Y	100'0"	87'4"	12'8"	4' 0"
S.C.16	106	106	-	-
S.C.17	120	120	-	-
S.C.18	154	154	-	-
S.C.19	125	125	-	-
S.C.20	83	83	-	-
S.C.21	60	60	-	-
S.C.22	90	90	-	-
S.C.23	60	60	-	-
S.C.24	100	100	-	-
S.C.25	120	120	-	-
S.C.26	90	90	-	-
S.C.27	123	123	-	-
S.C.28	140	140	-	-
S.C.29	60	60	-	-
S.C.30	120	120	-	-
S.C.31	100	100	-	-
S.C.32	180	180	-	-
55 Holes	6,455'4"	6,333'9"	121'7"	66'2½" TOTALS

CORING

Coring was generally unsuccessful. Several types of core barrels and bits were tried, but only poor recoveries were obtained. Where the section being cored contained little or no chert the retractor, split-inner tube barrel was most successful; but whenever chert was cut the recovery was poor. Towards the end of the contract a special barrel and bit attached to a Mission hammer drill produced good, but very disturbed core recoveries.

The total footage cored was 121' 7" for an apparent recovery of 66' 2½". However, as some of the apparent core recovered in the hammer core barrel may be cavings, the core actually recovered may be considerably less than 66' 2½". Table 1 gives details of the coring.

SAMPLING

Originally it was decided to catch five-foot samples of the non-phosphatic section, and then to core the phosphatic interval. However, since coring was not successful, one-foot samples were usually taken of the cuttings while drilling or coring the phosphatic zone.

About half way through the drilling programme the completed holes were logged with a Gamma Ray unit. The logs of some of these holes showed "kicks" in the character of the logs above those produced by the phosphatic zones picked up by the Shapiro tests. As these "kicks" would need to be investigated, it was decided that in future holes one-foot (except for the top 5 feet) samples should be caught for the entire depth of the hole.

Sample cuttings and some cores are presently stored in Continental's warehouse in Mount Isa. Most of the core and cuts of some of the samples were sent to Continental's Sydney office and to A.M.D.E.L., Adelaide, for investigation and detailed analysis.

LOGGING AND TESTING

Logging of the cuttings and core was performed by geologists N. Murphy, J. Simpson, M. Campbell, B.F. Fitzpatrick and the writer.

The lithologic logging procedure was relatively simple. It allowed only a brief description (with the aid of hand lens) of the cuttings and cores. If the logs are required for detailed studies, it is suggested that the cuttings be washed and relogged using a binocular microscope.

Chip-testing for phosphate was performed by the well-site geologist while the hole was being drilled: but the semi-quantitative Shapiro analyses for the P_2O_5 content were performed in the temporary laboratory at the camp site. The analyses were run mostly by N. Murphy, J. Simpson and the writer.

Samples which gave a Shapiro P_2O_5 content greater than 4% or those which appeared mineralogically interesting were sent to A.M.D.E.L. for accurate P_2O_5 determination. Some samples were sent to A.M.D.E.L. for broad coverage Emission Semi Quantitative analyses.

RESULTS

Semi-quantitative Shapiro results are listed with the lithological logs.

Reports and results of analyses or cuttings and cores sent to A.M.D.E.L. have not yet been completed. Also cross-sections, isopachs and graphic assessments are presently being compiled. These results, their geological significance and interpretation, together with metallurgical and general economic considerations will be reported on when all the relative information is collated.

R. GRASSO, M.Sc.

R. GRASSO PTY. LTD.

ADELAIDE,

21st July, 1967.

HOLE No.: E-3 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO ~~CORE XXXINE~~ % P_2O_5	DESCRIPTION	DATE
42	43							0 - 1	As above	
	44							approx.14	Dark brown silty material, differing apprec-	
									iably from 43 ft.	
	45							" 1	As above	
	46							" 1	As above	
	47							" 2	As above	
	48							1 - 2	As above; but becoming less dark brown;	
									approaching khaki.	
	49							1 - 2	Colour intermediate of khaki and dark brown	
									chert.	
	50							1 - 2	As above.	
	51							1 - 2	As above.	
	52							1 - 2	As above.	
	53							1 - 2	Becoming more khaki colour od same silty shales.	
	54							1 - 2	As above	
	55							1 - 2	As above	
	56							approx. 5	As above; but chert diminishing in abundance.	
	57							" 5	As above.	
	58							" 7	As above	
	59							" 3	Becoming brown of above and somewhat softer.	
	60							" 2	As above	
	61							" 2	As above	
	62							" 2	As above	
	63							" 2	As above	
	64							" 2	As above	
	65							" 2	Becoming more khaki colour as for 53 ft. sample.	
	66							" 2	As above	
	67							" 4	Asabove	
	68							" 3	As above	
	69							" 3	As above	

HOLE No.: E-3 HOLE LOGGED BY: M. CAMPBELL PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO ~~CORE EXTRACT~~ % P_2O_5	DESCRIPTION	DATE
69	70							approx. 2	As above.	
	71							" 4	Becoming dark grey but unchanged material.	
	72							" 2	As above.	
	73							" 7	Grey silty shales with chert and only very slightly calcareous (?dolomitic) occasional blue clay (silty) material.	
	74							" 3	Same as above; with chert coated occasionally with blue clay.	
	75							" 2	As above.	
		75 feet T.D.		HOLE	E-3	30/11/66.				

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.

PROJECT: MOUNT ISA PHOSPHATE

HOLE No.: F

STATE: QUEENSLAND COUNTY:

PARISH: HOLDING: Coolootai

LAT. LONG. CO-ORDINATES:

INCLINATION: Vertical

TOTAL DEPTH: 100 ft. approx. ¾ mile west of G.

ROTARY DRILLING: Depth from 0 to 100 ft.

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL: 940'

DRILLING CONTRACTOR: GLINDEMANN & KITCHING ENTERPRISES

SPUDDED: 29/11/66

COMPLETED: 29/11/66

HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO	DESCRIPTION	DATE
0	5							0 - 1	Calcareous silty shale; some chert and ferruginous clay.	29/11/66
	6							0 - 1	Calcareous silty shale, some chert and little ferruginous clay.	
	7							0 - 1	As above.	
	8							0 - 1	As above.	
	9							0 - 1	Siltstone with some dark brown-black chert and slightly calcareous (?dolomitic)	
	10							0 - 1	As above	
	11							0 - 1	As above; with increasing chert.	
	12							0 - 1	As above; with slightly calcareous (?dolomitic).	
	13							0 - 1	As above; slightly calcareous	
	14							0 - 1	As above	
	15							0 - 1	As above	
	16							0 - 1	As above	
	17							0 - 1	As above	
	18							0 - 1	As above	
	19							0 - 1	Same as above; with small amounts of dark clay in spots and along bedding.	
	20							0 - 1	As above	

HOLE No.: F HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
20	21							0 - 1	As above	
	22							0 - 1	As above; except a dark grey.	
	23							0 - 1	As above; also usual khaki colour.	
	24							0 - 1	As above.	
	25							0 - 1	As above.	
	26							0 - 1	As above; but only very slightly calcareous.	
	27							0 - 1	As above	
	28							0 - 1	As above	
	29							0 - 1	As above	
	30							0 - 1	As above	
	31							0 - 1	As above	
	32							0 - 1	As above	
	33							0 - 1	As above	
	34							0 - 1	As above	
	35							0 - 1	Silty shale with minor chert (black to brown. Slightly calcareous (?dolomitic)	
	36							0 - 1	As above	
	37							0 - 1	As above	
	38							0 - 1	As above	
	39							0 - 1	As above	
	40							0 - 1	As above	
	41							0 - 1	As above	
	42							0 - 1	As above	
	43							0 - 1	As above	
	44							0 - 1	As above	
	45							0 - 1	As above	
	46							0 - 1	As above	
	47							0 - 1	As above; but increasing chert abundance.	
	48							0 - 1	As above	
	49							0 - 1	As above; chert still abundant.	

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO ~~CORE XXXX XXXXXXX~~ % P_2O_5	DESCRIPTION	DATE
49	50							0 - 1	As above.	
	51							0 - 1	As above.	
	52							0 - 1	As above; but chert very abundant and colours sample much darker to a grey or black from finely ground chert or siliceous siltstone or shale.	
	53							0 - 1	As above	
	54							0 - 1	As above; but with occasional light ferruginous "coatings" on siltstone - indicates cavernous ground.	
	55							0 - 1	As above; but with increasing high ferruginous "coatings".	
	56							0 - 1	As above	
	57							0 - 1	As above; still darker colour; due to fine chert fragments.	
	58							0 - 1	As above	
	59							0 - 1	As above; but with ferruginous (siderite) material or goethite.	
	60							0 - 1	As above	
	61							0 - 1	As above; still dark with high ferruginous (goethite) material.	
	62							0 - 1	As above	
	63							0 - 1	As above	
	64							0 - 1	As above; but with predominantly ferruginous mineral, also chert and slight amounts of only slightly ?calcareous shale.	
	65							0 - 1	As above.	
	66							0 - 1	As above; but with much less ferruginous mineral and siltstone (shale). Not appreciably ?calcareous.	

HOLE No.: F HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO ~~CORE XANTHATE~~	DESCRIPTION	DATE
66	67							0 - 1	As above	
	68							0 - 1	As above	
	69							1 - 2	As above; but with ferruginous material as minor constituent.	
	70							1 - 2	As above	
	71							1 - 2	As above	
	72							1 - 2	Still dark material with large amounts of iron. Less chert. Abundant shale - still only slightly calcareous.	
	73							1 - 2	As above	
	74							1 - 2	As above	
	75							1 - 2	As above; but becoming more brown in colour. Less chert.	
	76							1 - 2	As above.	
	77							1 - 2	As above.	
	78							1 - 2	As above.	
	79							1 - 2	As above.	
	80							1 - 2	As above but less ferruginous.	
	81							1 - 2	As for 72 feet.	
	82							1 - 2	As above.	
	83							1 - 2	As above; but approx. 60% ferruginous minerals.	
	84							1 - 2	As above.	
	85							1 - 2	As above.	
	86							1 - 2	As above; but with increasing ?siderite.	
	87							1 - 2	As above; but with decreasing ferruginous minerals and chert. Still khaki colour in silty shale.	
	88							1 - 2	As above.	
	89							1 - 2	As above.	

HOLE No.: F HOLE LOGGED BY: M. CAMPBELL PAGE 5

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO ~~CORE XRFXX XRFUOR~~ $\%P_2O_5$	DESCRIPTION	DATE
89	90							1 - 2	As above	
	91							1 - 2	As above	
	92							1 - 2	As above; also microscopic subrounded quartz with possible calcite crystals.	
	93						approx.	3	As above	
	94							" 3	As above	
	95							" 3	As above	
	96							" 3	As above	
	97							" 1	As above; but with less ferruginous and chert cuttings.	
	98							" 3	As above; but with increased ferruginous cuttings. Minor chert. Generally darker coloured than above.	
	99							" 3	As above	
	100							" 3	As above	
			100 feet	T.D.	Hole F	29/11/66				

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: G-2
STATE: Queensland
COUNTY:
PARISH:
HOLDING: Coolootai
LAT. LONG. CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 138'6"
Approx. 30 ft. South of G.

ROTARY DRILLING: Depth from 0 to 120'
DIAMOND CORE DRILLING: Depth from 120' to 138'6"
DRILLING: Depth from to
GROUND LEVEL: 906'
DRILLING CONTRACTOR: GLINDEMANN & KITCHING ENTERPRISES
SPUDDED: 17/11/66
COMPLETED: 20/11/66
HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~XCORK ATTRONK~~ % P_2O_5	DESCRIPTION	DATE
0	5							0 - 1	Brown loam and sand with chert and silty-shale fragments. Carbonate present.	17/11/66
	6							0 - 1	As above	
	7							0 - 1	As above	
	8							0 - 1	Medium brown clay and silty clay with pebbles of chert and white silty shale.	
	9							0 - 1	Mostly med. brown clay and silty clay with minor chert and partly silicified white silty shale fragments.	
	10							0 - 1	Mostly clay as above; minor chert fragments; minor carbonate fragments.	
	11							0 - 1	Mostly chert fragments with minor med. brown powdery silty clay (weathered shale).	
	12							0 - 1	Medium brown, medium soft calcareous silty shale.	
	13							0 - 1	As above; but minor fragments light brown to cream silty shale.	
	14							0 - 1	As above; (slightly damp) also minor brown ochreous silty clay. Minor pink-red silty shale fragments.	

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HOLE No.: G-2 HOLE LOGGED BY: R. GRASSO PAGE 2

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO ~~CORE~~ ATTITUDE % P_2O_5	DESCRIPTION	DATE
14	15							0 - 1	Approx. 40% cream to light brown med. soft to med. hard silty shale and approx 60% pink and re-brown silty shale. Minor chert fragments.	
	16							0 - 1	Brown and red-brown and faint mauve, med. soft silty shale approaches a siltstone. Slightly calcareous.	
	17							0 - 1	As above	
	18							0 - 1	Mostly red-brown to purple brown, med. soft silty shale.	
	19							0 -1	As above	
	20							0 - 1	As above	
	21							0 - 1	As above; but more powdery. Trace chert.	
	22							0 - 1	Med. brown with faint mauve tinge med. soft silty shale.	
	23							0 - 1	As above	
	24							0 - 1	As above	
	25							0 - 1	AS above	
	26							0 - 1	As above	
	27							0 - 1	Med. brown and light brown and slight pink-brown, med. soft powdery silty shale.	
	28							0 - 1	As above	
	29							0 - 1	As above; but mostly powder.	
	30							0 - 1	Mostly light brown med. soft powdery silty shale. Slightly calcareous.	
	31							0 - 1	As above.	
	32							0 - 1	as above	
	33							0 - 1	As above	
	34							0 - 1	As above; light pink tinge.	
	35							0 - 1	As above.	

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO ~~XXXXX XXXXXX~~ % P_2O_5	DESCRIPTION	DATE
35	36							0 - 1	As above	
	37							0 - 1	As above; but abundant chert.	
	38							0 - 1	As above; mostly chert.	
	39							0 - 1	As above; mostly chert.	
	40							0 - 1	As above; mostly chert. Also shale slightly harder.	
	41							0 - 1	As above; abundant chert; shale slightly harder.	
	42							0 - 1	As above; mostly chert and shales slightly silicified.	
	43							0 - 1	As above; abundant chert.	
	44							0 - 1	Med. brown, soft to med. hard and hard silty partly silicified shale. Also powdery in places. Chert common.	
	45							0 - 1	As above; but less chert.	
	46							0 - 1	As above.	
	47							0 - 1	Light brown, med. soft, powdery silty shale. Minor amount med. hard shale fragments.	
	48							0 - 1	As above.	
	49							0 - 1	As above.	
	50							0 - 1	Med. brown, med. soft, powdery silty shale slightly calcareous. Also minor hard partly silicified shale fragments.	
	51							0 - 1	As above.	
	52							0 - 1	As above; but also vughy silica masses and chert fragments.	
	53							0 - 1	As above; but more chert and vughy silica masses.	
	54							0 - 1	as above	
	55							0 - 1	As above; chert abundant minor amounts partly silicified med. hard shale.	
	56							0 - 1	As above; abundant chert.	

HOLE No.: H HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~CORE ASSAYS~~ % P_2O_5	DESCRIPTION	DATE
18	19							0 - 1	As above; but with med. hard to hard l.grey and pink silty (partly silicified) shale fragments.	
	20							0 - 1	As above; but lighter coloured and less clay. Cuttings are probably of med. brown to cream silty shale and alluvial pebbles fragments.	
	21						approx.2		Mostly light grey, cream and light brown, med. hard to med. soft silty shale. Also alluvial chert pebble frags.	
	22							" 4	Mostly light grey with cream and light brown med. soft silty shale-clay/	
	23							" 2	Mostly cream and light brown, med. soft to soft silty shale. Abundant chert frags.	
	24							" 2	Mostly cream, med. soft, silty shale with abundant chertfrags.	
	25							" 2	As above; but most cuttings slightly harder (partly silicified). Chert abundant.	
	26							1 - 2	Mostly cream to l.brown, well bedded med. hard, partly silicified silty shale approaches a siltstone.	
	27							0 - 1	Mostly light brown and cream silty shale as above.	
	28							0 - 1	As above, light grey to l.cream and l.brown, med. hard, partly silicified silty shale. Well bedded. Chert common.	
	29							0 - 1	As above.	
	30							0 - 1	As above; but shale more silicified also more chert frags.	
	31							0 - 1	As above	
	32							0 - 1	As above	

HOLE No.: H HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ~~XXXX~~ ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SHAPIRO No.	SHAPIRO ~~XXXX~~ % P_2O_5	DESCRIPTION	DATE
32	33							0 - 1	Cream, light brown and light grey, med. hard to hard (cherty). Chert abundant.	
	34							0 - 1	As above; chert abundant.	
	35							0 - 1	As above	
	36							0 - 1	As above	
	37							0 - 1	As above	
	38							0 - 1	As above; large cuttings, chert abundant.	
	39							0 - 1	As above.	
	40							0 - 1	Mostly light brown, cream to med. red-brown, partly silicified silty shales.	
	41							0 - 1	As above.	
	42							0 - 1	As above; but very cherty.	
	43							0 - 1	As above.	
	44							0 - 1	As above; but mostly chert.	
	45							0 - 1	As above; partly silicified silty shales. Chert abundant.	
	46							0 - 1	As above.	
	47							1 - 2	As above	
	48	2.8					approx.	5	Mostly chert and cream dust with rounded fragments of l.grey, med. hard silty shale-clay.	
	49							0 - 1	Mostly chert and cream to medium brown silty shale (partly silicified).	
	50							1 - 2	Cream to med. brown and l.grey med. soft. silty shale-clay. Cuttings are rounded except for hard cherty fragments (abundant) and chert (common).	
	51	2.3					approx.	2	As above.	
	52	3.1					"	2	Mostly cream to l.brown, med. soft to med. hard silty shale, chert frags. common but less than above/	

HOLE No.: H HOLE LOGGED BY: R. GRASSO PAGE 4

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	% P_2O_5 Analysis AMDEL	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
52	53	3.1						approx. 3	Mottled cream and red-brown soft slightly silty clay. Chert common.	
	54							" 3	Mottled red-brown, cream and l.grey soft silty clay.	
	55							" 3	Light grey, cream, red-brown, l.brown soft med.soft silty clay. Abundant chert frags.	
	56	6.2						" 8	Light grey, cream, l.brown, red-brown (mottled) soft silty plastic clay. Minor fragments medium soft.	
	57							0 - 1	Med. brown to dark brown and slightly red-brown soft silty clay.	
	58							0 - 1	Red-brown, soft, plastic slightly silty clay.	
	59							approx. 1	Red brown, slightly silty clay as above.	
	60							" 3	As above.	
	61							" 1	As above	
	62							" 1	As above; also chert fragments.	
	63							" 4	Mainly fine clayey silt with irregular vughy silica masses. Chert common.	
	64							" 5	Light to med. brown, soft to med. soft silty clay. Also l.grey and brown mottled silty and slightly silicified shale.	
	65							" 3	Silty clay-shale as above plus abundant irregular vughy silica masses.	
	66	4.5						" 5	As above. Also chert frags. common.	
	67	5.8						" 6	Light grey, l.brown, med. brown, grey brown soft to med. soft silty clay. Trace chert.	
	68	4.2						" 5	As above; but abundant chert.	
	69							" 5	Mostly light grey to cream soft silty clay as above. Plus abundant chert.	
	70	5.0						" 3	Mostly light grey to cream, med. soft, silty	

HOLE No.: H HOLE LOGGED BY: R. GRASSO PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
69	70	contd.							shales; also coloured clays as above and abundant chert.	
	71							approx.3	Red-brown and med. brown, med. soft to soft silty clayey shale (mottled). Chert common.	
	72							0 - 1	Mostly light grey to white and cream med. hard, partly silicified shale. Chert abundant.	
	73							0 - 1	Mostly cream to l.brown dust (decomposed silty shale) and chert.	
	74	3.3						approx.2	Mostly partly silicified white and light grey silty shale; (hard to med. hard). Chert abundant.	
	75							" 3	Mostly cream dust and cherty silty shale frags.	
	76	2.0						" 2	Mostly chert and as above.	
	77	2.0						" 3	As above	
	78	2.0						" 2	As above; chert is coated with powder from cream silty shale.	
	79							0 - 1	As above	
	80							approx.1	As above	
	81		Hammer Bit					" 1	As above	
	82							0 - 1	As above but mostly chert.	
	83	2.0						approx.3	Light brown dust; hard partly silicified silty shale, cherty shale and chert.	
	84	2.5						" 2	Mostly cream to l.brown and l.grey, med.hard, partly silicified silty shale and chert.	
	85							0 - 1	Mostly brown, (grey-brown and red-brown) soft clay and cherty shale as above.	
	86							0 - 1	Mostly med. to dark tan-brown silty clay.	
	87							0 - 1	Med. brown, med. hard to med. soft silty shale. Minor soft clay; minor chert frags.	
	88							0 - 1	Mostly brown clay-shale (soft to med. soft).	

HOLE No.: H. HOLE LOGGED BY: R. GRASSO PAGE 6

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
88	89							0 - 1	Brown soft clay; chert common; med. hard silty shale.	
	90						approx.1		Mostly med. brown, soft clay, minor chert and slightly silty shale.	
	91							0 - 1	Mostly med. brown soft clay.	
	92							0 - 1	Mostly med. brown (tobacco-brown) soft silty clay. Minor l.grey cherty silty shale.	
	93							0 - 1	As above; abundant chert.	
	94							0 - 1	As above.	
	95		? basement					0 - 1	Mostly chert l.grey siltstone and red-brown ferruginous, very fine grained, med. hard, porous sandstone.	
	96							0 - 1	Chert; med. brown (tobacco brown) porous shaly siltstone' l.grey silty shale and clay. (Some of above may be cavings.	
	97							0 - 1	As above	
	98							0 - 1	Mostly light brown to pink brown, light grey and med. grey, med. hard silty shale (fairly silty). Chert common.	
	99							0 - 1	As above; also red-brown, ferruginous sandy siltstone (porous).	
	100							0 - 1	Light grey and cream to tan-brown soft clay. Chert common.	
	101							0 - 1	As above.	
	102							0 - 1	As above; less chert.	
	103							0 - 1	As above; also minor frags of slightly red-brown tinged soft clay-shale.	
	104							0 - 1	As above	
	105							0 - 1	As above; mostly slightly red-brown tinged, soft clay-shale. Minor chert.	

HOLE No.: H HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
105	106							0 - 1	Cream to tan-brown, soft shale chert ?cavings common.	
	107							0 - 1	As above; but slightly calcareous in places.	
	108							0 - 1	As above.	
	109							0 - 1	As above; but abundant chosolate med. soft to med. hard slightly calcareous shaly silt-	
									stone or silty shale. Chert ?cavings common.	
	110							0 - 1	As above; chert ?cavings common/	
	111							0 - 1	As above.	
	112							0 - 1	Med. red-brown, med. grey, chocolate brown and tan brown, med. hard silty shale or	
									shaly siltstone.	
	113							0 - 1	As above. Slightly calcareous.	
	114							0 - 1	As above; but generally a little harder.	
	115							0 - 1	As above.	
		Hole made a little water overnight.								
115	118	difficulty in getting cuttings to surface						0 - 1	Mostly med. to dark grey, med. hard shaly siltstone. Also l.cream and l.brown med. soft slightly calc. shale (clayey).	
	119							0 - 1	As above.	
	120							0 - 1	Mostly med. grey to med. brown grey hard shaly siltstone. Minor cream to l.brown softer shale and clay.	
	121							0 - 1	Mostly as above.	
	122							0 - 1	Mostly chocolate, med. hard to med. soft slightly calcareous shale.	
	123							0 - 1	Mostly dark brown, slightly chocolate tinged, hard siltstone.	
	124							0 - 1	As above; but still hard.	

HOLE No.: H

HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
124	125							0 - 1	Mostly dark brown, slightly chocolate tinged, dark grey hard siltstone (?quartzite).	
			125 feet Total Depth Hole H.					23/11/66.		

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.

PROJECT: MOUNT ISA PHOSPHATE

HOLE No.: I and I2

STATE: Queensland COUNTY:

PARISH: HOLDING: Coolootai

LAT. LONG. CO-ORDINATES:

INCLINATION: Vertical

TOTAL DEPTH: I - 0-65'. I 2 0-76'

ROTARY DRILLING: Depth from I. 0-65' to I-2 0-76'

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL: 943'

DRILLING CONTRACTOR: Glindemann & Kitching Enterprises

SPUDDED: I. 8/11/66. I-2 8/11/66

COMPLETED: I. 8/11/66. I-2 10/11/66

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~XXXXX~~ % P_2O_5	DESCRIPTION	DATE
0	5							-	Sandy siltstone approaching a very fine grained white sandstone.	8/11/66
	6							-	As above	
	7							-	As above	
	8							-	As above; colour trending to pinkish brown	
	9							-	As above	
9	26							-	Sandy, argillaceous siltstone approaching a very light brown silty, very fine grained sandstone.	
26	46							-	As above; colour becoming slightly darker.	
46	65							-	Yellow brown mottled very fine grained sandstone (slightly argillaceous).	
				LOST CIRCULATION - ABANDONED HOLE.						
	HOLE I-2. Drilled a few feet from I. Samples collected but not logged . 76 feet Total Depth. Hole I-2.									

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: I-3
STATE: Queensland
COUNTY:
PARISH:
HOLDING: Coolootai
LAT. LONG.
CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 108'4"
adjacent to I & I-2

ROTARY DRILLING: Depth from 0 to 75'
DIAMOND CORE DRILLING: Depth from 75' to 108'4"
DRILLING: Depth from to
GROUND LEVEL: 944' Elev.
DRILLING CONTRACTOR: Glindemann & Kitching Enterprises
SPUDDED: 14/11/66
COMPLETED: 17/11/66
HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO ~~CORE~~ % P_2O_5	DESCRIPTION	DATE
										14/11/66
0	5							0 - 1	White to l.grey, med. hard silty shale.	
	6							0 - 1	As above; but with pink-red ferruginous stains.	
	7							0 - 1	White to l.grey and cream and l.brown med. hard silty shales.	
	8							0 - 1	As above; but also minor amounts of med-brown and red-brown ferruginous fragments.	
	9							0 - 1	Mostly cream and white to l.grey med. hard silty shale.	
	10	Set surface pipe at 10 feet.						0 - 1	As above.	
	11							0 - 1	Cream, l.brown, white, l.grey med. hard silty shale. Minor amounts slightly harder (silicified). Also hard brown and grey cherts fragments common.	15/11/66
	12							0 - 1	As above; but generally softer (med. hard to med. soft). Less chert.	
	13							0 - 1	As above (silty shale); but also common amounts having thin red-brown ferruginous layers.	

MCA. 7000

HOLE No.: I-3 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO ~~XXXXX~~ ~~XXXINDEX~~ % P_2O_5	DESCRIPTION	DATE
13	14							0 - 1	As above; but mostly soft to med. soft.	
	15							0 - 1	As above.	
	16							0 - 1	As above; but abundant fragments having thin	
									layers of red-brown and mauve ferruginous	
									silty shale.	
	17							0 - 1	Mostly cream, med. hard to med. soft silty	
									shale. Light to med. brown ferruginous	
									layers common.	
	18							0 - 1	As above.	
	19							0- 1	As above	
	20							0 - 1	As above	
	21							0 - 1	Generally as above; but much of the silty	
									shale is harder and slightly silicified.	
	22							0 - 1	Mostly l.grey soft to med. hard silty shale.	
									Minor amounts show mauve tinge.	
	23							0 - 1	Mostly cream, med. hard (minor amounts slightly	
									harder)shaly siltstone.	
	24							0 - 1	As above; but more powdery and also abundant	
									chert fragments.	
	25							0 - 1	Mostly cream shaley siltstone (med. hard).	
									Minor amounts harder (more silicified).	
	26							0 - 1	Mostly cream and light red-brown to light	
									mauve well bedded med. hard silty shale.	
	27							0 - 1	As above	
	28							0 - 1	Mostly cream and l.grey silty shale as above.	
	29							0 - 1	As above; but harder.	
	30							0 - 1	Light grey to cream med. hard (but softer	
									than above) silty shale.	
	31							0 - 1	Cream and light grey powdery med. soft to	
									med. hard silty shale.	

HOLE No.: I-3 HOLE LOGGED BY: R. GRASSO PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO	DESCRIPTION	DATE
31	32							0 - 1	As above	
	33							0 - 1	As above; but mostly l.grey.	
	34							0 - 1	Mostly cream and light grey med. soft to	
									med. hard, well bedded silty shale with thin	
									med. brown ferruginous layers.	
	35							0 - 1	As above; but very powdery.	
	36							0 - 1	As above; but abundant chert.	
	37							0 - 1	As above.	
	38							0 - 1	Cream, light brown and l.grey, silty shale,	
									mostly med. hard but some harder (more	
									silicified). Also contain thin brown	
									ferruginous layers. Chert common.	
	39							0 - 1	As above.	
	40							0 - 1	Mostly chert. Also silty shale as above.	
	41							0 - 1	As above; but the silty shale is also harder	
									(slightly silicified).	
	42							0 - 1	As above, silicifed silty shale and also	
									chert fragments.	
	43							0 - 1	As above; light brown and light grey silicifed	
									silty chert.	
	44							0 - 1	Light grey to cream med. spft to med. hard	
									and hard silty shale.	
	45							0 - 1	As above; but less silicified (med. soft to	
									med. hard) very powdery.	
	46							0 - 1	As above; mostly powdery.	
	47							0 - 1	As above; chert common.	
	48							0 - 1	Mostly l.brown powder. The silty shale is	
									very friable, the few cuttings are rounded.	
	49							0 - 1	As above; but vughy silica masses common.	

HOLE No.: I-3 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~XXXX CORE XXXXXX~~ % P_2O_5	DESCRIPTION	DATE
49	50							0 - 1	As above; but mostly cream powder with minor chert.	
	51							0 - 1	As above; but less powder and more hard silicified silty shale.	
	52							0 - 1	Mostly light cream and light brown, soft to med. gard, silty shale. Also abundant vughy silica masses and grey-brown chert frags.	
Silty shale - partly silicified	53							0 - 1	As above; slightly silicified hard silty shale.	
	54							0 - 1	Cream to med. hard partly silicified silty shale. Minor amounts converted to chert.	
	55							0 - 1	Mostly light grey & cream & light brown med. hard to hard partly silicified silty shale.	
	56							0 - 1	As above; fairly hard in places.	
	57							0 - 1	As above	
	58							0 - 1	As above; but more cherty.	
	59							0 - 1	As above	
	60							0 - 1	As above	
	61							0 - 1	As above	
	62							0 - 1	As above	
	63							0 - 1	As above	
	64							0 - 1	As above	
	65							0 - 1	As above; but less amounts of chert.	
	66							0 - 1	As above; also abundant vughy silica masses.	
	67							0 - 1	As above	
	68							0 - 1	As above; but generally less silicified.	
	69							0 - 1	As above.	
	70							0 - 1	As above.	
	71							0 - 1	As above. The finer cuttings are phosphatic; but the whole sample is ?diluted with partly silicified silty shale.fragments.	

HOLE No.: I-3 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
71	72							0 - 1	As above.	
	73							0 - 1	As above.	
	74							0 - 1	As above; but slightly softer.	
	75						approx.1%		As above	
		At 75 feet casing was lowered in preparation for coring								
		CORING								
75	79		1 6				approx.2		Mostly l.brown and cream, med.soft to med. hard silty shale. Hard & partly silicified in places. Chert near bottom of core. Top of core also contains chert cavings.	
79	84		4 3					" 3	Top 5" med. brown to dark brown silty clay. ? ferruginous.	
						next 4"		" 2	Light grey to white, med. soft marl containing l.grey to cream, hard finely crystalline massive limestone.	
						Bottom 3'6"		" 1	Cream to l.grey, hard ?dolomitic limestone (crystalline) containing abundant vughs (good porosity in places).	
84	87		3 0				approx.2		Mostly l.grey, hard to med. hard dolomitic limestone. Very vughy joints and packings contain brown phosphatic clay. Near top 3" of med. brown to light brown silty calcareous clay (approx. 8% P_2O_5). Bottom 2" is light grey dolomitic limestone 1 - 2% P_2O_5)	
87	89		1 6					" 1	Cream to l.grey vughy crystalline limestone. Very indurated and vughs give it a sponge-like appearance in places.	

HOLE No.: I-3 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet	ins.	To feet	ins.	BIT	CORE RECOVERED feet	ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	ins.	To feet	ins.	No.	SHAPIRO ~~CORE~~ ~~AXIOLITE~~ % P_2O_5	DESCRIPTION	DATE
89	-	93	6		4	3							1 - 2	Light grey and cream vughy impure and partly indurated crystalline limestone. In places the vughs contain phosphatic and ferruginous infillings. Sponge-like vughy appearance in places. Mostly med. soft to med. hard. Massive limestone is hard.	
93	6	96	9		1	6						approx.1		Top 5" light grey, hard massive crystalline ? dolomitic limestone. Fractured and indurated in places.	
								Bottom	1' 1"				1 - 2	Bottom 1' 1" cream and l.grey, soft to med. soft silty shale. Clayey in places. Also lens of hard ?dolomitic. Core fairly broken. Bedding appears to be generally flat.	
96	8	97	10		1	2							" 1	Mainly light grey with cream tinge, coarsely crystalline vughy and impure limestone. Sponge-like appearance in places whence soft an friable. Otherwise tough and hard.	
97	10	99	10		1	4							1 - 2	Mostly impure vughy limestone. Friable where sponge-like appearance (very vughy) also minor amounts hard massive. The limestone is probably marly and silty.	
99	10	101	2		1	4							1 - 2	As above; but more fractured.	
101	2	106			4	-						approx.2		Mostly cream and light grey impure marly and vughy limestone. Very vughy and friable in places. Hard where massive, crystalline.	
106	-	108	4		2	4							" 2	As above; chert in cavings.	
					Total Depth I-3 108'4"										

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: M
STATE: COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION: 1 mile along graded track, about
TOTAL DEPTH: 90 ft. 1 mile south of Lady Annie Mine Turnoff.

ROTARY DRILLING: Depth from 0 to 90'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL:
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 1/12/66
COMPLETED: 1/12/66
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO ~~XXXXXX~~ ~~ALTITUDE~~ % P_2O_5	DESCRIPTION	DATE 1/12/66
0	10	4¼"						-	Alluvium.	
10	20	Chevron						-	Clayey siltstone (yellowish pink)	
20	25	&						-	As above, bottom pink	
25	30	4¼"						-	Brown very silty clay	
30	40	VHI						-	Yellow very silty clay	
40	50							-	Yellow white, slightly clayey very calcareous siltstone	
50	80							-	Whitish grey limestone very silty in part; slightly clayey with apparent thin interbeds of amphillite and chert	
80	90							-	Grey limestone slightly silty, dense, hard (6-8 min. ft.)	
		Total Depth Hole M - 90 feet.								

MCA. 7000

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.

PROJECT: MOUNT ISA PHOSPHATE

HOLE No.: N

STATE: Queensland COUNTY:

PARISH: HOLDING:

LAT. LONG. CO-ORDINATES:

INCLINATION:

TOTAL DEPTH: 105' ½ mile along Lady Annie Road.

ROTARY DRILLING: Depth from 0 to 105

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL:

DRILLING CONTRACTOR: G.S.I.

SPUDDED: 1/12/66

COMPLETED: 1/12/66

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	SHAPIRO ~~CORE~~ % P_2O_5	DESCRIPTION	DATE
0	20							-	Alluvium	1/11/66
20	40							-	Silty clayey alluvial of chert pebbles and other pebbles.	
40	72							-	Brown very silty clay	
73								3	73' - 84' Brown & yellow, very clayey, siltstone.	
74								4		
75								5		
76								5		
77								4		
78								3		
79								3		
80								4		
81								3		
82								< 2		
83								< 2		
84								3	) Interval 84' - 99' brown, very silty clay	
85								6	)	
86								5	)	
87								3	)	

HOLE No.: N HOLE LOGGED BY: B.W. MENZEL PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~CORE~~ ALTITUDE % P_2O_5	DESCRIPTION	DATE
88								4	) Interval 84' → 99' brown, very silty clay.	
89								3	)	
90								3	)	
91								3	)	
92	99							< 2	) Interval 99' - 105' sandy dolomite, slightly silty, slightly limey with thin interbeds of quartzite sandstone.	
100								0 - 1	Sandy dolomite with thin interbeds of	
101								0 - 1	quartzite sandstone.	
102								0 - 1		
103								0 - 1		
104								0 - 1		
105								0 - 1		
			Tptal Depth		105 ft.	Hole N.				

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.

PROJECT: Mount Isa Phosphate

HOLE No.: 0

STATE: Queensland COUNTY:

PARISH: HOLDING:

LAT. LONG. CO-ORDINATES:

INCLINATION:

TOTAL DEPTH: 95 ft.

ROTARY DRILLING: Depth from 0 to 95

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL:

DRILLING CONTRACTOR: G.S.I.

SPUDDED: 1/12/66

COMPLETED: 1/12/66

HOLE LOGGED BY: B.W. MENZEL

2

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO ~~XXXXX ATNOMX~~ % P_2O_5	DESCRIPTION	DATE
0	10							-	Brown alluvium	1/12/66
10	24							-	Yellow, very silty clay, & in part tending to a very clayey siltstone	
24	33							-	Yellow brown siltstone, calc. in part, clayey in part.	
33	34							-	Light grey limestone, silty in part, slightly clayey.	
34	37							-	Brown siltstone, calcareous & clayey	
37	40							-	as above with interbedded red limestone which is very silty and grades erratically into a very calcareous siltstone.	
40	85							-	Red and light brown calcareous siltstone with interbeds (above 44/of slightly cherty, black, silty limestone. Below 44' - dominant lithology is brown, calc. siltstone (2 mins. per foot).	
85	95								as above, but dolomite content more than calcite content.	
			Total Depth		95 ft.					

McA. 20

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: P
STATE: Queensland COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION:
TOTAL DEPTH: 263 ft. approx. ¾ mile south Whistler's Tank

ROTARY DRILLING: Depth from 0 to 263'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL:
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 12/11/66
COMPLETED: 13/11/66
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO	DESCRIPTION	DATE 12/11/66
0	11							–	Red, lateritic, silty clay. Slightly calc.	
11	30							–	Red clay.	
								–	Red clay with white clay predominant after 34'	
30	41							–	White yellow with 'iron staining'	
41	51							–	Red siltstone, very clayey in part.	
51	53							–	Red and white very silty clay.	
53	60							–	Red and white mottled clay	
									Red and yellow laminated, slightly clayey, siltstone - very porous.	
60	63							–	Cream clay - trace of chert.	
63	78							–	Yellow 'limonitic' clay.	
78	99							–	Very light yellow - cream clay	
99	102							–	As above with light black chert.	
102	103							–	Brown yellow clay with chert (< 10%)	
									Cream cherty clay.	
103	107							–	Brownish yellow clay with chert in low quantities (< 5%)	
107	111							–	Yellow 'limonitic'clay	

McA. 29

HOLE No.: P

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ~~XRX~~ ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	~~XCOREX~~ ~~ANALYSIS~~ % P_2O_5	DESCRIPTION	DATE
111	112							-	Brown, soft clay	
112	114							-	White clay	
114	116							-	Whitish brown clay	
116	117							-	Brown talcose clay - cherty	
117	123							-	Light brown talcose clay	
123	125							-	Brown-yellow talcose clay	
125	129							-	Yellow-white " "	
129	137							-	Yellow & pink clay-cherty (black and white)	
137	149							-	Yellow clay, slightly silty.	
149	150	0.30							as above	
150	151	0.25							as above	
151	152	0.45							as above	
152	153	0.40							as above	
153	154	0.30							as above with chert	
154	155	0.50							As above with black chert in medium proportions.	
155	156	0.45						-	" " " "	
156	157	0.50						-	" " " "	
157	158	0.70						-	" " " "	
158	159	0.45						-	" " " "	
159	160	0.30						-	" " " "	
160	161	0.25						-	" " " "	
161	162	-						-	" " " "	
162	163	0.30						-	" " " "	
163	164	0.35						-	" " " "	
164	165	0.25						-	" " " "	
165	166	0.25						-	" " " "	
166	167	0.40						-	Yellow slightly silty clay with no chert.	
167	168	0.50						-	" " " "	
168	169	1.15						-	" " " "	

HOLE No.: P HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	SHAPIRO ATTITUDE % P_2O_5	DESCRIPTION	DATE
169	170	2.1							Dark brown silty shale with minor clay.	
170	171	2.2							" " "	
171	172	-							" " "	
172	173	1.6							" " "	
173	174	2.0							" " "	
174	175	-							" " "	
175	176	5.0						< 4%	Brown and white clay	
176	177	6.0						< 2%	Yellow, light brown & white mottled clay	
177	178	10.8						6%	with chert occuring in minor quantities	
178	179	7.0						>10%	throughout these samples (appears that chert	
179	180	11.0						9%	is caving as drilling was smooth throughout	
180	181	11.5						8%	this section).	
181	182							9%	" " " "	
182	183							16%	" " " "	
183	184							12%	" " " "	
184	185							11%	" " " "	
185	186							11%	Core No. 1 (185'-190') Rec. 3"	
186	187				AMDEL*			12%	Yellow 'limonitic' very slightly silty clay	
187	188				%Fe_2O_3	%Al_2O_3 %CaO %CO_2		13%	with traces of red clay interlaminations.	
188	189							11%	" " " "	
189	190							10%	" " " "	
190	191	7.8	) Core No. 2		26.3	1.8	29.6 037	11%	Dark yellow clay	13/11/66
191	192		) 190' - 195'					10%	Dark yellow "limonitic"clay.	
192	193	14.0	) Rec. 9"					20%	" "	
193	194	13.0	)		20.6	3.0	28.0 016	15%	" "	
194	195		)					9%	" "	
195	196		)					7%	" "	
196	197	5.0						6%	" "	
197	198	7.3						3%	" "	
198	199	6.2						4%	" "	

*(See AMDEL Report MP1298/67 and AN1298/67)

HOLE No.: P

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO CORE ANALYSIS % P_2O_5	DESCRIPTION	DATE
199	200A	6.5						4	Dark yellow 'limonitic' clay.	
	200B	3.8						4	" " "	
200	201	3.8						3	" " "	
201	202	2.1						2	" " "	
202	203							2	" " "	
203	204							1	" " "	
204	205	0.85						1	Light yellow 'limonitic'clay	
205	206	0.75						1	" " "	
206	207							1	" " "	
207	208							1	Light cream clay with up to 70% red, yellow,	
208	209							1	green, purple shale.	
209	210							1	" " " "	
210	212							1	" " " "	
212	235							-	Light green and purple shale.	
235	263							-	Purple, very, very hard shale with traces	
263									of white chert.	
			TOTAL DEPTH	263 feet.	13/11/66.					

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: Q
STATE: Queensland COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 215 feet 1½ miles S.E. Whistlers Tank

ROTARY DRILLING: Depth from 0 to 215'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL:
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 15/11/66
COMPLETED: 15/11/66
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE 15/11/66
0	8								Ferruginous soil & iron oxide gravel with chert pebbles	
8	10								White & brown ferruginous clay & iron pebbles.	
10	21								White, slightly ferruginous clay.	
21	22								As above with ferruginous pebbles. Cavings.	
22	37								As above.	
37	38								As above, with black chert beds.	
38	41								White, slightly ferruginous clay.	
41	50								As above	
50	52								White, talcose clay with chert.	
52	66								As above, but no chert.	
66	67								Chert and white clay.	
67	71								Light yellow 'limonitic' clay	
71	72								Brown talcose clay with chert	
72	75								As above with chert band at 74'	
75	77								Brown soft clay	
77	88								Yellow 'limonitic' clay	
88	96								Brown ochre	
96	99								Yellow ochre (chert at 99')	
99	106								White and cream, soft clay.	

HOLE No.: Q

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ~~XBNX~~ ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~XOXR~~ ~~XYXYX~~ ~~ATTITUDE~~ % P_2O_5	DESCRIPTION	DATE
106	144								Cream and light brown, soft clay.	
144	149								Light brown & cream clay (soft & talcose)	
149	150								Chocolate coloured clay (soft).	
150	153								Light cream clay.	
153	167								Light brown and cream, talcose clay.	
167	169								Cream & yellow brown, soft, talcose, clay.	
									Trace of P_2O_5 at 168 ft.	
169	170	3.8							Yellow brown, cherty clay.	
	171	5.5						Tr.	Dark brown, soft clay	
	172	0.8						-	Yellowish brown clay.	
	173	0.85						< 1	" " "	
	174	4.0						10	Brownish yellow clay, soft.	
	175	4.7						6	" " " "	
	176	3.7						20	" " " "	
	177	5.0						6	Core No. 1 (177' - 181'4") Rec. 1'	
	178	5.8						16	Top 2" white-light grey, soft, clay.	
	179	8.8		23%				8	Resembles soapstone	
	180	3.2						5	Bottom 10" - dark brown, 'limonitic' clay	
	181	3.9						8	with intermixtures of yellow & light grey	
	182	3.9						10	clay (few chert pebbles - cavings?)	
	183	5.1		30%				8	Core No. 2. (181'4"-5") yellow & dark brown	
	184	4.5						8	& partly red iron rich, soft clay with light	
	185	4.3						8	grey chert pebbles up to 1" longest diameter	
	186	2.9						8	(definitely not cavings)	
	187	4.5						6	Top 16" as above without chert except for	
									top 2".	
	188	4.0						6	Core No. 3. As above with chert pebbles	
									(less than 2 cm.)throughout.	
	189	-							Yellow, brown & light grey, soft clay.	
	190	6.0							" " " "	

HOLE No.: Q

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	% P_2O_5 Analysis AMDEL	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
190	191	8.8							Yellow, brown & light grey, soft clay.	
	192	8.5							" " "	
	193	9.5							)Yellow and light brown soft clay with	
	194	5.7							)numerous chert interbeds.	
	195	1.7							) "	
	196	0.25							) "	
	197	0.25							) "	
	198	0.35							) "	
	199	0.2							) "	
	200	0.3						1	) "	
	201	0.8						1	) "	
	202	0.4						1	) "	
	203	0.25						1	) "	
	204	0.35						< 1	Red-brown siltstone, clayey in part with	
	205							< 1	interbedded black chert.	
	206							< 1	" " "	
	207								" " "	
	208								" " "	
	209								" " "	
	210								" " "	
	210-215								Very silty shale - red purprle in colour	
			TOTAL DEPTH - 215 feet.							

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.

PROJECT: MOUNT ISA PHOSPHATE

HOLE No.: R

STATE: Queensland COUNTY:

PARISH: HOLDING:

LAT. LONG. CO-ORDINATES:

INCLINATION: Vertical

TOTAL DEPTH: 194 feet = 4 miles south east Whistlers Tank.

ROTARY DRILLING: Depth from 0 to 194'

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL:

DRILLING CONTRACTOR: G.S.I.

SPUDDED: 16/11/66

COMPLETED: 17/11/66

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~XXXXX~~ % P_2O_5	DESCRIPTION	DATE 16/11/66
0	5								Brown caliche, soil and chert pebbles.	
5	8								Red brown silty limestone with interbedded red-brown chert.	
8	9								Red silty limestone with < 50% pink clay	
9	12								As above with limestone and clay equipro-portional	
12	20								Pink limestone (silty slightly clayey) green silty limestone (< 30%)	
20	36							Tr.	Green-grey and yellow, very calcareous, slightly clayey siltstone. Hard silt content varies erratically mainly a silty limestone - limey siltstone sequence with very thin bands of black chert throughout.	
36	51							Tr.	Light grey siltstone - very limey, slightly clayey with microcrystals of mica. As above with traces pyrite & black chert.	
51	120							Tr.	As above	
120	194							Tr.	As above - strong petroliferous odour at 165 ft. (11-12 min./ft.)	
			Total depth - 194 feet							

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FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: S
STATE: Queensland COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 238 ft.

ROTARY DRILLING: Depth from 0 to 238'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL:
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 17/11/62
COMPLETED: 17/11/62
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO ~~CORE ATTITUDE~~ % P_2O_5	DESCRIPTION	DATE 17/11/66
0	10								Orange-red calcareous, silty, ferruginous clay.	
10	24								Grey green, slightly pink, clayey limestone.	
24	41								Pink, very calcareous, silty clay.	
41	51								Pink, very calcareous clay, very silty in part with numerous chert bands.	
51	87								Yellow clay, with slight pink colouration, slightly calcareous.	
87	115								Yellow clay as above) Interval 100' - 117'	
115	118								As above; slightly calcareous) yellow brown, silty.	
118	147								As above; with calcareous beds at 120', 128', 134' and from 137' - 147'.	
147	197							< 1½%	'Limonitic' yellow silty clay, soft, only slightly calcareous.	
197	212							< 3%	As above; (chert apparently cut at 210'-212½' but not evident in cuttings).	
212	215							6%	Light yellow, silty, clay with aggregates of white, very fine grained quartz, very unconsolidated - caving fast - water needed to condition.hole. Apparently chert is a is a lost circulation zone - went in with water - circulation restored.	

HOLE No.: S

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~XSORK~~ ~~XXXXX~~ ~~ATHTUDE~~ % P_2O_5	DESCRIPTION	DATE
215	228								Yellow clayey sandstone, white quartzite,	
228	238								chert (4 ft.) cavity	
			TOTAL DEPTH		238 feet.					

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: T
STATE: Queensland COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 280 feet

ROTARY DRILLING: Depth from 0 to 280'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL:
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 18/11/66
COMPLETED: 20/11/66
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE 18/11/66
0	7								Brown alluvium	
7	47								Bright red, silty clay.	
47	71								Yellow and white mottled clay, slightly silty, soft.	
71	81								Red and yellow mottled clay, slightly silty, moderately hard.	
81	84								White clay, slightly silty, soft.	
84	88								Bright red silty clay, siltstone (very clayey) in part, moderately hard with very thin and few chert beds.	
88	118								Red orange and minor yellow very clayey siltstone, often tending to silty clay soft.	
118	119								Yellow limonitic clay - very silty in part.	
119	121								Pink, very silty clay, soft.	
121	133								Yellowish pink clay as above.	
133	134								Red clay	
134	135								Yellow clay	
135	138								Pink clay	
138	157								Yellow silty clay.	
157	167								Pinkish cream soft, silty clay.	

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	SHAPIRO ~~XXXXX~~ % P_2O_5	DESCRIPTION	DATE
167	175							Tr.	Bright light yellow silty clay.	18/11/66
175	180							Tr.	As above	
180	193							Tr.	Yellowish cream clay.	
193	215							Tr.	Creamy white clay - slightly silty.	
215	225							Tr.	Light brownish yellow clay	
225	235							Tr.	Light yellow clay with approximately 30% white clayey siltstone and brown chert (10%)	
					A.M.D.E.L*					
235	237				% Fe_2O_3	% Al_2O_3	% Insol.	< 2½	Creamy white clay, very silty in part.	
237	241							6-8	Creamy white silty clay, moderately soft, with < 5% brown chert.	
241	242'4"		approx. 9"	52%	0.47	2.4	90.8	10-12%	Core 1.) Note: No cuttings) returned. While	
242'4"	244'2"		approx. 1'	60%	5.75 (see Core 2b)	5.55	65.1	12%	Core No. 2) cutting cores 1,2,3 -) due to use of water to) condition hole.	
244'2"	247'8"		approx. 1'3"	38	1.51 (See Core 3b)	6.4	72.3	12%	Core No. 3))	
247'8"	249'2"		9"	50	4.65	5.4	63.4	av.18%	Core No. 4. Yellowish-brown, silty, slightly calcareous clay with numerous chert & white siltstone pebbles (less than 1" in longest dimension). Yellowish clay "matrix" has a $P_2\theta_5$ content up to 18%; white siltstone pebbles up to 6% P_2O_5 (no samples caught due to lack of accurate representation).	
					↓4.0 every ft. drilled	5.0	65.5↓			
249'2"	252'5"		11"	28				av.18%	Core No. 5. As above, with white mottling; some of the non siltstone white fragments have P_2O_5 content up to 40%.	
					5.1	5.2	56.8			
252'5"	255'4"		4"	11	"	" "		av.18%	as above, higher rotary speed.	

* (See AMDEL Report AN1561/67)

HOLE No.: T

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
255'4"	256	1.6						less than 1%	Light grey - off white sandstone. Fine	
	257	0.55						"	very fine grained, with calcareous cement.	
	258	1.1						"	Washed sandstone sample contains less than 1%	
	259	1.1						"	P_2O_5 with trace chert (brown) at 263'.	
	260	0.95						"	Note: Approx. 50% of sandstone was clay	
	261	1.2						"	matrix - This sandstone shows approx. 3%	
	262	0.9						"	P_2O_5 - probably phosphate leached from	
	263	0.6						"	above?	
	264	0.7						"	)	
	265	1.1						"	)	
	266	0.6							)	
	267	0.6							)	
	268	0.65							)	
	269	0.55							)	
	270	0.7							) No information	
	271	0.4							)	
	272	0.3							)	
	273	0.3							)	
	274	0.35							)	
	275	0.95							)	
	276	0.85							)	
	277	1.1							)	
	278	0.7							)	
	279	0.7							)	
	280	0.65							)	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: THE CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: U
STATE: Queensland
PARISH:
LAT. LONG.
INCLINATION: Vertical
TOTAL DEPTH: 257 ft.

COUNTY:
HOLDING:
CO-ORDINATES:
approx. 28 miles along track from Yelvertoft H's.

ROTARY DRILLING: Depth from 0 to 257
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL:
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 21/11/66
COMPLETED: 23/11/66
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
0	25							–	River gravel.	21/11/66
25	33							–	Clayey silty sand with a few pebbles of green clay.	
33	40							–	Silty, sandy clay with fine grained clayey sand.	
40	60							–	Red and yellow green, sandy, clayey siltstone.	
60	117							–)	Red, clayey, silty, very fine to fine grained	
117	118	0.5						–)	sandstone becoming a siltstone in part.	
118	142							–)		
142	148							)	Orange-yellow clayey, silty, fine grained	
148	149	0.1						)	sandstone.	
149	150	0.25						)		
150	151	9.5						)		
151	152	0.20						)		
152	160							)		
160	164							Tr.	A very clayey fine grained silty sandstone.	
164	165	0.2						Tr.	As above	
	166	0.2						Tr.	As above	
	167	1.25						Tr.	As above	
	168	0.95						Tr.	As above.	

HOLE No.: G-2 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~CORE ATTITUDE~~	DESCRIPTION	DATE
56	57							0 - 1	Med. brown, med. soft, powdery silty shale-clay. Chert abundant. Rounded cuttings Also partly silicified shale fragments common.	
	58							0 - 1	As above; but abundant fragments med. to hard brown partly silicified silty shale.	
	59							0 - 1	As above; hard fragments common.	
	60							0 - 1	Med. brown, med. hard, silty shale. Trace chert.	
	61							0 - 1	Mostly chert and med. hard light brown silty shale as above.	
	62							0 - 1	As above; some chert may be cavings.	
	63							0 - 1	As above	
	64							0 - 1	As above	
	65							0 - 1	As above	
	66							0 - 1	Mostly chert; also med. hard to hard partly silicified, redbrown silty shale and soft to med. soft silty clay (weathered shale).	
	67							0 - 1	As above	
	68							0 - 1	As above	
	69							0 - 1	As above	
	70							0 - 1	Mostly chert and med. hard light to med. brown silty slightly silicified shale. Minor red-brown shale fragments. Minor soft silty clay.	
	71							0 - 1	As above	
	72							0 - 1	As above	
	73							0 - 1	As above	
	74							0 - 1	As above	
	75							0 - 1	As above	
	76							0 - 1	As above	

HOLE No.: G-2 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	% P_2O_5 ~~XRF~~ ANALYSIS AMDEL	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO ~~CORE ANALYSIS~~ % P_2O_5	DESCRIPTION	DATE
76	77	Phosphatic						0 - 1	Light to med. brown Khaki soft silty clay chert abundant but less than above.	
	78						approx.2		Med. brown, soft silty clay (rounded cuttings) minor red-brown fragments. Minor chert.	
	79							" 3	As above	
	80							" 6	As above	
	81							" 3	As above; but abundant chert.	
	82	1.3						" 1	Mostly chert; also light brown, soft to med. soft silty clay and shale.	
	83	1.5						" 1	As above; abundant chert? cavings.	
	84	4.3						" 8	Mostly med. to light brown silty clay plastic when moist. Chert common but much less than above.	
	85	15.0						" 15	Med. brown silty clay, very soft balls up in cuttings.	
	86	13.5						" 15	As above; but more chert (? some is caving)	
	87	14.6						" 15	As above.	
	88	7.3						" 8	As above	
	89	4.0						" 10	As above; but a lot of chert (?cavings)	
	90	2.0						" 6	As above; " " " "	
	91	3.0						" 6	As above	
	92	4.4						" 5	As above.	
	93	4.3						" 5	As above.	
	94	3.5						" 4	As above	
	95	3.5						" 4	As above	
	96	4.0						" 4	Cream to light brown, soft silty clay (rounded cuttings) also white to light grey soft silty clay (rounded cuttings). Chert common.	
	97							" 3	As above; but about 50% of cuttings are white silty clay. Remainder cream silty clay. Chert common.	

HOLE No.: G-2 HOLE LOGGED BY: R. GRASSO PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ~~XRX~~ ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~XXXXX~~ ~~CORE~~ ~~XXXXXX~~ ATTITUDE % P_2O_5	DESCRIPTION	DATE
97	98							approx. 4	As above; but mostly powdery.	
	99							" 3	White and cream; soft to med. hard silty shale and clay (powdery) rounded cuttings. Chert common.	
	100							" 2	As above; abundant chert ?cavings	
	101							" 2	As above	
	102							" 2	Mostly white and l.grey, soft to med. soft rarely med. hard powdery silty clay. Minor cream frags. Chert ?cavings common.	
	103							" 2	As above	
	104							" 2	Mostly cream and l.grey and white soft to med. soft and med. hard silty clay and shale. Chert ?cavings common.	
	104							" 2	As above; but abundant chert ?cavings.	
	106							" 3	As above.	
	107							" 1	As above.	
	108							" 1	As above.	
	109							" 1	As above; but also med. hard shale frags. common.	
	110							1 - 2	As above	
	111							approx. 2	As above	
	112							" 1	As above	
	113							" 1	Mostly white to very light grey, soft silty powdery clay (weathered shale) minor chert frags.	
	114							" 1	As above.	
	115							" 2	Mostly white to l.grey, soft to med. soft silty clay-shale. Minor chert	
	116							" 2	As above	
	117							" 3	As above	
	118							" 3	As above	

HOLE No.: G-2 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet	DRILLED DEPTH From ins.	DRILLED DEPTH To feet	DRILLED DEPTH To ins.	BIT	CORE RECOVERED feet	CORE RECOVERED ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	SAMPLED INTERVAL From ins.	SAMPLED INTERVAL To feet	SAMPLED INTERVAL To ins.	No.	SHAPIRO ~~CORE INDEX~~ % P_2O_5	DESCRIPTION	DATE
118		119											approx.3	Mostly as above; but minor l.brown rounded cuttings of silty clay. Trace chert.	
		120											" 3	Mostly l.brown to cream and white soft silty clay (rounded cuttings). Trace chert.	18/11/66
				Poor returns - hole cased for diamond drilling.											
120		121	9		1	9							approx.2	Mottled l.brown and l.grey (mottlings along bedding) med. soft to soft silty clay (after shale)	20/11/66
121	9	126	4		2	0							" 3	Mostly l.brown, cream and minor white silty clay (after shale). Chert cavings common especially near top and bottom of core.	
126	4	128	9		1	8							" 3	Top 3" is med. brown, soft clay. Next 1'5" light grey, cream and light brown silty clay (weathered shale). The bottom part of core is white to l.grey in colour and contains white irregular cherty masses.	
128	9	133	0		1	9							approx.1	Top 6" light brown, mottled with darker (med. brown) ?ferruginous "oolites" in silty clay (after shale) soft ?pelletal phosphate. Bottom 6" tan-brown, soft silty clay containing fine black ? manganiferous specks.	
133	0	135	0		1	9							1 - 2	Mostly light brown, cream and light grey, med. soft silty shale slightly clayey. Also slightly calcareous. Bedding flat. Chert layers (1½" thick) near top of core.	
135	0	138	6		3	5							1 - 2	Top 4" cream and l.grey silty shale. Bedding slump.	

HOLE No.: G-2

HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet	DRILLED DEPTH From ins.	DRILLED DEPTH To feet	DRILLED DEPTH To ins.	BIT	CORE RECOVERED feet	CORE RECOVERED ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	SAMPLED INTERVAL From ins.	SAMPLED INTERVAL To feet	SAMPLED INTERVAL To ins.	No.	SHAPIRO ~~CORE~~ % P_2O_5	DESCRIPTION	DATE
135	0	138	6	contd.	3	5							0 - 1	Bottom 3'1" light brown to cream mottled chert conglomerate-breccia some cobbles up to 2" diam. in a calcareous silty matrix.	
															20/11/66
				Total Depth G-2	138'6"										

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: H
STATE: Queensland COUNTY:
PARISH: HOLDING: Coolootai
LAT. LONG. CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 125' approx. 0.9 miles east of I

ROTARY DRILLING: Depth from 0 to 125
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 902' Elev.
DRILLING CONTRACTOR: GLINDEMANN & KITCHING LTD.
SPUDDED: 22/11/66
COMPLETED: 23/11/66
HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO ~~CORE~~ % P_2O_5	DESCRIPTION	DATE
0	5							0 - 1	Dark grey-brown clayey and silty loam with minor chert cobbles and pebbles.	22/11/66
	6							0 -1	Med. brown silty clay.	
	7							0 - 1	Med. brown and grey silty clay.	
	8							0 - 1	Med. brown to red-brown silty clay with abundant chert frags., cobbles and pebbles.	
	9							0 - 1	Light to med. red-brown silty clay with minor chert..	
	10							0 - 1	Mostly light to med. red-brown silty clay.	
	11							0 - 1	As above; but more silty.	
	12							0 - 1	As above.	
	13							0 - 1	As above; also med. brown hard limestone fragments and chert fragments	
	14							0 - 1	As above	
	15							0 - 1	As above; but less limestone	
	16							0 - 1	As above.	
	17							0 - 1	Mostly alluvial pebbles, cobbles, sand, silt and clay.	
	18							0 - 1	As above with chert frags. up to 1" diam.	

HOLE No.: U

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet	DRILLED DEPTH From ins.	DRILLED DEPTH To feet	DRILLED DEPTH To ins.	% P_2O_5 Analysis AMDEL	CORE RECOVERED feet	CORE RECOVERED ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	SAMPLED INTERVAL From ins.	SAMPLED INTERVAL To feet	SAMPLED INTERVAL To ins.	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
		169		0.4									< 5	As above clay content slightly greater abundance.	
		170		1.25									< 5	" " " "	
		171		1.0									< 5	" " " "	
		172		1.05									< 5	Very clayey sandstone - silty.	
		173		1.25									< 5	Note: Clay in sandstone provides P_2O_5 content.	
		174		0.5									< 5	Interbedded in this material apparently	
		175		0.5									< 5	is a pink quartzitic sandstone.	
		176		1.1									< 5	" " " "	
		177		miss.									< 5	" " " "	
		178		1.05									< 5	" " " "	
		179		0.45									< 5	" " " "	
		180		0.25									< 5	" " " "	
		181		0.3									< 5	" " " "	
		182		0.45									< 5	" " " "	
		183		.55									< 5	" " " "	
		184		0.55									< 5	" " " "	
		185		0.35									< 5	" " " "	
		186		0.35									< 5	" " " "	
		187		0.6									< 5	" " " "	
		188		0.45									< 5	" " " "	
		189		0.25									< 5	" " " "	
		190		0.25									< 5	" " " "	
		191		0.60									< 5	" " " "	
		192		0.60									< 3	" " " "	
		193		1.0									< 3	Yellow brown moist, sandy, silty clay.	
		194		0.6									< 3	" " "	
		195		0.7									< 3	" " "	
		196		0.75									< 3	" " "	
		197		0.5									< 3	" " "	

HOLE No.: U

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
	198	0.8					less	3	Yellow brown moist, sandy, silty clay.	
	199	0.6					than	3	" " "	
	200	0.4					"	3	" " "	
	201	0.95					"	3	" " "	
	202	0.75					"	3	" " "	
	203	0.80					"	3	" " "	
	204	0.95					"	3	" " "	
	205	miss.					"	3	" " "	
	206	0.75					"	3	" " "	
	207	0.55					"	3	" " "	
	208	0.55					"	3	" " "	
	209	0.5					"	3	" " "	
	210	0.4					"	3	" " "	
	211	1.6					"	3	" " "	
	212	1.4						6	" " silty clay	
	213	1.35						3	" " "	
	214	1.6						5	Yellowish-brown, very sandy clay - termed	
	215	3.2						3	a clay becuase of its "balling" action when	
	216	2.8						5	moist as it is being drilled.	
	217	3.0						3	" " " "	
	218	3.5						3	" " " "	
	219	4.1						5	" " " "	

HOLE No.: U HOLE LOGGED BY: B.W. MENZEL PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
					AMDEL*					
	220	2.80			% Fe_2O_3	% Al_2O_3	% Insol.	4	Core No. 1. Top 15" - Black, slightly sandy	
	221	3.0			4.0	8.4	68.2	5	and silty clay.	
	222			100	4.3	8.0	60.3	12	Bottom 27" Interbedded black clay and yellow	
	223				3.8	8.2	63.9	12	silty, very sandy clay. Beds of black clay	
	224				3.9	7.8	65.0	-	are approx. ½" thick & regularly alternate	
									with the approximate 1½" thick yellow clay	
									beds. Yellow clay has higher P_2O_5 content	
									approx. 12-14% and contains black, cherty	
									material as well as blebs of white opaque	
									materials. Yellow clay layers characterized	
									by their yellow, brown & white mottling.	
									Note: No samples below 221' in Core No. 1	
									because air circulation blocked off.	
	225	5.8	1 9	85	2.6	4.7	68.5	10	Core No. 2. 223'6" - 228'4" recovered 2'4"	22/11/66
	226	8.5						12	28" recovered to bottom 28" of core.	
	227	10.0			3.3	6.3	78.9	15	Yellow and brown black layered clay. Very	
	228	11.8						15	sandy, slightly silty - with white blebs	
	228'4"							18	scattered throughout and scattered black	
									chert pebbles up to 1½" throughout core.	
									No sample - air circulator system clogged.	
	229	3.5		100	3.8	8.1	61.8	20	Core 3. 228'4" - 231'1". recovered 3'4"	
									As above (apparently picked up 7" of No. 2	
									Core.	
	230	1.1			4.5	8.6	57.0	12	As above.	
	231'1"	0.95			4.9	8.5	50.0	20	As above.	
	232	19.2			4.3	5.8	40.8	20	Soft, brown, moist clay, slightly silty &	23/11/66
	233	8.0						6	sandy with small black chert pebbles.	
	234	6.2						10	As above.	
	235	5.8						6	As above.	

*(See AMDEL Report AN 1435/67)

HOLE No.: U HOLE LOGGED BY: B.W. MENZEL PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ~~XXXX~~ ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~XXXXX~~ ATTITUDE % P_2O_5	DESCRIPTION	DATE
	236	6.2						8	As above, snad and chert cavings common.	
	237	5.8						8	As above.	
	238	5.5						6	As above	
	239	5.5						8	As above.	
	240	4.8						2	As above.	
	241							2	As above.	
	242							2	As above.	
	243							2	As above.	
	244							2	As above.	
	245							3	Yellowish brown, silty, sandy clay, moist, soft cavings approx. 10% and constitute chert and clay from above with scatterings of Red siltstone particles.	
246	250								No return; water put in hole to clean up and become unstuck.	
251	257								Purple fine grained sandstone and predominantly a pink quartzitic sandstone.	
			TOTAL DEPTH 257 feet.							

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: V
STATE: Queensland COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 142 ft. approx. ¾ mile due South of Hole U.

ROTARY DRILLING: Depth from 0 to 142'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL:
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 23/11/66
COMPLETED: 24/11/66
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO CORE % P_2O_5	DESCRIPTION	DATE
0	5								Alluvium and sandstone talus ?	23/11/66
5	25								Sandstone talus ?, chert and very minor green clay.	
25	35								River gravel, clay.	
35	41								River gravel and green soft clay.	
41	48								Yellowish white, sandy, soft clay.	24/11/66
48	59								Clayey, red and white siltstone.	
59	90								Red siltstone - very sandy.	
90	137								Yellow, silty, slightly clayey, very fine grained sandstone.	
137	142								Whitish yellow, slightly silty sandstone - very cherty.	
			TOTAL DEPTH 142 ft.							

MCA. 29

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUSTRALIA LTD.

PROJECT: Mt. Isa Phosphate

HOLE No.: Whistler No. 1

STATE: Queensland COUNTY:

PARISH: HOLDING: Yetman (Yelvertoft)

LAT. LONG. CO-ORDINATES:

INCLINATION: Vertical

TOTAL DEPTH: 275' approx. 0.2 miles N.E. Whistler Water bore.

ROTARY DRILLING: Depth from 0 to 275

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL:

DRILLING CONTRACTOR: G.S.I.

SPUDDED: 21/10/66

COMPLETED: 26/10/66

HOLE LOGGED BY: R. GRASSo

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
0	5							0 - ½	Red-brown loam-soil with l.brown to cream limestone fragments.	21/10/66
	6							0 - ½	Cream med-soft weathered marly limestone	
	7							0 - ½	As above	
	8							0 - ½	Light grey to light brown hard very fine grained limestone.	
	9							0 - ½	Light brown to cream, hard fine grained limestone.	
	10							0 - ½	Light cream to light brown medium hard marly limestone & grey-brown hard, fine grained limestone	
	11							0 - ½	Cream to light brown, med-hard marly limestone.	
	12							0 - ½	Cream to light brown, med-hard marly limestone, finely interbedded with light grey-green limestone.	
	13							0 - ½	As above.	
	14							approx.½	Light brown, hard, very fine grained limestone.	
	15	Sample missed						-		
	16	(almost ½% P_2O_5)						0 - ½	Med. grey-brown, hard limestone.	
	17							0 - ½	Pink & grey med. hard limestone. (Thinly bedded layers of grey and pink)	
	18							0 - ½	As above	

MCA. 7000

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
18	19							0 - ½	Light brown to mid grey, hard very fine grained limestone. Minor amounts pink limestone.	
	20							approx.½	Very light brown to cream, very fine grained hard limestone.	
	21		(almost ½% P_2O_5)					0 - ½	As above	
	22							0 - ½	Light grey to very light green (containing brown specks) med. hard silty marl.	
	23							0 - ½	Light brown-grey, med. hard silty limestone.	
	24							0 - ½	Light brown-grey, med. hard silty marl.	
	25							0 - ½	Light grey silty marl)med-hard).	
	26							0 - ½	Light grey silty marl (med-hard) with dark grey specks.	
	27							0 - ½	As above.	
	28							0 - ½	Light grey calcareous siltstone (med-hard).	
	29							0 - ½	As above; but containing dark grey specks.	
	30							0 - ½	As above; specks may be ? carbonaceous.	
	31							0 - ½	As above.	
	32							0 - ½	As above.	
	33							0 - ½	As above.	
	34							0 - ½	Light to med. grey, med. hard marly siltstone.	
	35							0 - ½	Light grey-brown to cream med soft to med. hard marly siltstone.	
	36							0 - ½	Light grey and light brown marly siltstone.	
	37							0 - ½	As above	
	38							0 - ½	Med. grey, med. hard marly siltstone-limestone abundant dark grey "specks" (mottlings) (? Carbonaceous).	
	39							0 - ½	As above	
	40							0 - ½	Med. grey mottled with dark grey, med.hard calcilutite - marly siltstone.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
40	41							0 - ½	Med. grey with minor dark mottlings, med. hard calcilutite - marly siltstone.	
	42							0 - ½	Med. grey calcilutite-marly siltstone as above.	
	43							0 - ½	As above.	
	44							0 - ½	Med. grey, med. hard marly siltstone with minor ?carbonaceous mottlings.	
	45							0 - ½	As above; also finely micaceous.	
	46							0 - ½	As above	
	47							0 - ½	As above; marly-siltstone - calcilutite.	
	48							0 - ½	As above.	
	49							0 - ½	As above.	
	50							0 - ½	Light grey with minor darker (?carbonaceous) mottlings, med. hard, finely micaceous marly-siltstone.	
	51							0 - ½	As above; well bedded.	
	52							0 - ½	As above.	
	53							0 - ½	As above.	
	54							approx.½	Light green-brown-grey (khaki) med.hard to hard, well bedded, marly-siltstone to calcilutite.	
	55							approx.½	Light brown to l.grey,hard,very fine grained calcareous or ?dolomite shales.	
	56							approx.½	As above; may be dolomitic shaly-limestone	
	57							0 - ½	Light grey to med. grey marly siltstone. Med. hard but softer than above. Well bedded Finely micaceous.	
	58							0- ½	As above.	
	59							0 - ½	As above.	
	60							0 - ½	Light to med. grey, med. hard, well bedded marly siltstone with minor dark grey (? carbonaceous) mottlings.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
60	61							0 - ½	As above; but more dark mottlings.	
	62							0 - ½	Cream-grey slightly calcareous (or ?dolomitic) silty shales. Well bedded and slightly harder than above.	
	63							0 - ½	As above; but minor amounts light to med. brown marly shales or limestones.	
	64							approx. ½	Light grey with light brown tinge, hard to very hard, very fine grained limestone.	
	65							approx. ½	As above; but also minor amounts red-brown plastic (when wet) silty clay.	
	66							approx. ½	As above; but more clay.	
	67							0 - ½	Light brown-grey to pale green-khaki marly siltstone. Finely micaceous; also contains minor minute black grains.	
	68							0 - ½	Light grey, with minor dark grey (?carbonaceous) mottlings, med. hard marly siltstone-limestone.	
	69							0 - ½	As above; but also minor amounts brown, very fine grained limestone fragments.	
	70							0 - ½	As above; but better bedded and more darker mottlings.	
	71							0 - ½	As above; but with minor amounts of light grey siltstone	
	72							0 - ½	Med. grey with darker grey (?carbonaceous) mottlings, finely micaceous, well bedded marly siltstones - limestone.	
	73							0 - ½	As above but mostly light grey in colour.	
	74							0 - ½	As above	
	75							0 - ½	Light to med. grey (with greenish tinge) well bedded marly siltstone. Finely micaceous, med. hard.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
75	76							0 - ½	As above; but also dark grey mottlings.	
	77							0 - ½	As above.	
	78							0 - ½	As above; but also minor frags. of l.brown calcareous silty shale; well bedded, med. hard.	
	79							0 - ½	As above; but also very fine grained grey-brown limestone frags.	
	80							0 - ½	Mostly light grey-brown, hard, fine grained (? dolomitic) impure limestone.	
	81							0 - ½	Med. grey marly siltstone, light brown shaly limestone and red-brown silty clay.	
	82							0 - ½	Mostly light to med. grey calcareous and shaly siltstone, with minor dark grey mottlings. Med. hard. Also contains l.brown very fine grained hard limestone frags.	
	83							0 - ½	Light grey, med. hard calcareous, shaly siltstone.	
	84							0 - ½	As above; but with mottled areas and also minor fine black grains.	
	85							0 - ½	As above.	
	86							0 - ½	As above.	
	87							0 - ½	As above; but slightly lighter coloured.	
	88							0 - ½	As above.	
	89							0 - ½	Light to med. grey, slightly mottled (darker grey) med. hard, well bedded calcareous siltstone with abundant fine black grains.	
	90							0 - ½	Med. grey, med. hard calcareous shaly siltstone - dolomite calcilutite. Well bedded, minor darker grey (?carbonaceous) mottlings.	
	91							0 - ½	As above	
	92							0 - ½	As above; but slightly more dark grey mottlings.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
92	93							0 - ½	As above	
	94							0 - ½	As above.	
	95							0 - ½	Med. grey with slight grey-green tinge, med. hard, well bedded ?dolomitic calcilutite - shaly siltstone.	
	96							0 - ½	Mostly as above; but minor red-brown ferruginous, rounded fragments. (?cavings).	
	97							0 - ½	Med. grey, med. hard, mottled, well bedded ?dolomitic calcilutite -shaly siltstone.	
	98							0 - ½	As above.	
	99							0 - ½	Mostly as above; but also minor amounts of cream to l. brown hard very fine grained limestone.	
	100							0 - ½	Med. grey, med. hard well bedded ?dolomitic siltstone.	
	101							0 - ½	As above	
	102							0 - ½	As above	
	103							0 - ½	As above	
	104							0 - ½	As above	
	105							0 - ½	As above	
	106							0 - ½	Med. grey, med/ hard, well bedded marly calcilutite. ?carbonaceous mottlings common. Finely micaceous.	
	107							0 - ½	As above.	
	108							0 - ½	As above.	
	109							0 - ½	As above.	
	110							0 - ½	As above.	
	111							0 - ½	Mostly med.grey, med. hard shaly & silty limestone. Also minor frags. of light grey to white, hard, fine grained limestone.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO PAGE 7

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
111	112							0 - ½	Med.grey, med.hard shaly & silty limestone as above; but with minor dark grey mottlings. Minor chert fragments.	
	113							0 - ½	As above.	
	114							0 - ½	As above; but also minor cream, med.hard marly fragments.	
	115							0 - ½	As above.	
	116							0 - ½	Light to med. grey, med.hard silty & shaly limestone. Also light grey, hard fine grained limestone fragments.	
	117							0 - ½	As above; but mostly shaly & silty limestone frags. Minor green-tinged fragments.	
	118							0 - ½	Med. grey, med.hard shaly and calc. siltstone with ?carbonaceous layers (darker grey)	
	119							0 - ½	As above; some of the darker mottled areas contain fossils (striated surface).	
	120							0 - ½	As above.	
	121							0 - ½	Med. grey, med.hard calcareous shaly siltstone. Abundant fossil frags. (darker mottled areas - faint brown tinges).	
	122							0 - ½	As above.	
	123							0 - ½	Mostly as above but also about 20% frags. of light brown to cream limestone.	
	124							0 - ½	As above; but less cream limestone frags.	
	125							0 - ½	As above; but minor red-brown grains (?cavings) of rounded clay cuttings.	
	126							0 - ½	As above.	
	127							0 - ½	Mostly med.grey, med.hard calcareous shaly siltstone approaches a limestone, has slightly darker mottlings. Trace cream limestone frags.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO PAGE 8

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
127	128							0 - ½	As above.	
	129							0 - ½	As above.	
	130							0 - ½	As above.	
	131							0 - ½	Mostly as above; but also minor frags. of light brown cherty limestone.	
	132							0 - ½	As above, well bedded, approaches limestone.	
	133							0 - ½	Mainly smaller cuttings of light grey to light brown fine grained ?cherty limestone.	
	134							0 - ½	Med. grey, med.hard calcareous, shaly siltstone -limestone. Minor chert frags.	
	135		Tried Hammer Drilling					0 - ½	Mostly siltstone-limestone as above; but also about 20% light cream limestone. Also trace red-brown clay (?cavings).	
	136		(Hammer not working well) (went back to rotary drilling)					0 - ½	Med. grey, med.hard calcareous shaly siltstone approaching a limestone as above. Also slight darker mottlings.	
	137							0 - ½	As above.	
	138							0 - ½	As above.	
	139							0 - ½	As above.	
	140							0 - ½	As above.	
	141							0 - ½	As above; but a little more shaly. About 50% of cuttings calcareous and shaly siltstone as above, rest (smaller cuttings) med.grey, slightly darker grey, ?cherty limestone.	
	142							0 - ½	As above.	
	143							0 - ½	Med. grey, med. hard calcareous shaly siltstone. Contains darker grey layers (minute).	
	144							0 - ½	Mostly as above; but also contains approx. 10% of cream, hard to med.hard fine grained limestone.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
144	145							0 - ½	Mostly med.grey calcareous, shaly siltstone as above with dark grey layers.	
	146							0 - ½	As above; but more shaly (thin plates).	
	147							0 - ½	Med. grey, med. hard, calc. silty shale with darker layers approaches a shaly limestone.	
	148							0 - ½	Mostly med. grey shaly and silty limestone with minor dark grey ?carbonaceous silty shale layers (very thin).	
	149							0 - ½	Med. grey, med. hard, calcareous, shaly siltstone as above - approaches a limestone.	
	150							0 - ½	As above.	
	151							0 - ½	As above	
	152							0 - ½	Mostly as above; but more shaly. Also minor frags. of hard cream fine grained cherty limestone.	
	153							0 - ½	As above. Minor dark grey silty limestone.	
	154							0 - ½	Med. grey, med. hard, calcareous silty shale.	
	155							0 - ½	Med. grey with slight brown tinge, calcareous, shaly siltstone.	
	156							0 - ½	Med. grey, med. hard (slightly harder than above) calcareous silty shale grading to limestone.	
	157							0 - ½	As above; but minor frags., cream, hard fine grained limestone.	
	158							0 - ½	Med. grey, med. hard silty marly limestone.	
	159							0 - ½	As above; but very silty.	
	160							0 - ½	Med. grey with slight brown tinge, calcareous silty shale grading to silty and shaly limestone.	
	161							0 - ½	Mostly as above; but more brown tinged frags.	
	162							0 - ½	Med. grey, calcareous shaly siltstone. Minor brown-tinged limestone frags.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO PAGE 10

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
162	163							0 - ½	Mostly as above; minor brown tinged limestone, minor brown fine grained hard limestone.	
	164							0 - ½	Mostly as above. Minor darker mottlings.	
	165							0 - ½	Mainly siltstone as above. Minor calcareous shales grading to limestone.	
	166							0 - ½	Med. grey, med. hard shaly calcareous siltstone.	
	167							0 - ½	As above; but very shaly	
168	168							0 - ½	As above.	
	169							0 - ½	Med. grey, med. hard calcareous silty shale.	
	170							0 - ½	Med. grey, med. hard, calcareous shaly siltstone; very shaly.	
	171							0 - ½	As above - very shaly.	
	172							0 - ½	As above; but approaches a limestone.	
	173							0 - ½	Med. grey to dark grey, med. hard calcareous shaly siltstone grading to impure limestone. Minor frags. of hard f.g. l. brown limestone.	
	174		Almost ½% P_2O_5					0 - ½	As above; but more shaly.	
	175							0 - ½	Calcareous silty shale as above.	
	176							0 - ½	As above.	
	177							0 - ½	Med.grey, med.hard, calcareous silty shale.	
	178		Almost ½% P_2O_5					0 - ½	Dark grey, med. hard, slightly calcareous silty ?carbonaceous shale.	
	179							0 - ½	Dark grey to med. grey, med. hard calc. silty shale.	
	180							0 - ½	Med. grey to dark grey, very calcareous silty shale. Approaches a limestone. Minor fragments of brown tinged f.g. limestone hard ?cherty.	
	181		Almost ½% P_2O_5					0 - ½	Med. to dark grey silty and calcareous shale.	
	182		Almost ½% P_2O_5					0 - ½	As above.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO PAGE 11

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
182	183							0 - ½	As above; but some limestone fragments slightly harder than above. ?cherty.	
	184							0 - ½	As above, with cherty limestone.	
	185							0 - ½	Med. to dark grey calcareous silty shale with common amounts of ?cherty limestone fragments.	
	186							0 - ½	As above, but getting slighter harder.	
	187							0 - ½	Med. grey, med-hard to hard calcareous and silty shale. ?cherty limestone common.	
	188							0 - ½	As above.	
	189							0 - ½	As above.	
	190							0 - ½	Med. grey, med. hard (but softer than above) calcareous shaly siltstone.	
	191							0 - ½	As above.	
	192							0 - ½	Med. grey, calcareous silty shale grading to silty and marly limestone/	
	193							0 - ½	Med. grey, med. hard (softer than above) calcareous shaly siltstone.	
	194							0 - ½	As above; but approaches an impure limestone.	
	195							0 - ½	As above; but a little more shaly.	
	196							0 - ½	Med. to dark grey, med. hard calcareous silty shale.	
	197							Approx. ½	Dark grey (with brown tinge) silty & calcareous shale. Cuttings as relatively large flat frags. Minor hard ?cherty limestone frags.	
	198							Approx. ½	Dark brown-grey calcareous silty shale.	
	199							0 - ½	Dark grey (with slight brown tinge) calcareous silty shale.	
	200							0 - ½	Dark grey, med. hard (but harder than above) calcareous, silty, cherty shales.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
200	201							0 - ½	Med. to dark grey & brown calcareous silty shale grades to shaly and ?cherty limestone.	
	202							0 - ½	Dark grey calcareous silty shale; med. hard to hard.	
	203		Almost ½% P_2O_5					0 - ½	As above.	
	204							Approx. ½	As above.	
	205							0 - ½	As above.	
	206		Almost ½% P_2O_5					0 - ½	Dark grey)with slight brown tinge) med. hard calcareous silty shale.	
	207		Al most ½% P_2O_5					0 - ½	As above.	
	208		Almost ½% P_2O_5					0 - ½	As above but less shaly and more silty. Approaches a limestone in places.	
	209							0 - ½	Med. to dark grey, med. hard calcareous silty shale grades to impure limestone.	
	210							0 - ½	As above	
	211							0 - ½	Dark grey, med. hard to hard calcareous silty shale grading to silty shaly limestone.	
	212							0 - ½	As above.	
	213							0 - ½	As above.	
	214							0 - ½	As above.	
	215							0 - ½	As above.	
	216							0 - ½	As above	
	217							0 - ½	As above.	
	218							0 - ½	Dark to med. grey, med. hard to hard, calcareous silty shale grading to impure limestone.	
	219							0 - ½	As above.	
	220							0 - ½	Dark grey calcareous silty shale as above.	
	221							0 - ½	As above.	
	222							0 - ½	Dark to med. grey, med. hard calcareous shaly siltstone grading to impure limestone.	
	223							0 - ½	As above.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO PAGE

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
223	224							0 - ½	As above; but some lighter coloured frags.	
	225							0 - ½	Mostly dark grey, med. hard to hard shaly and silty limestone.	
	226	Almost ½% P_2O_5						0 - ½	As above; but also minor fragments of hard, light brown limestone.	
	227							0 - ½	As above; mostly dark grey and very shaly. Trace l. brown hard ?cherty limestone frags.	
	228							0 - ½	Dark brown-grey med. hard to hard silty and shaly limestone.	
	229							Approx. ½	As above.	
	230							Approx. ½	As above.	
	231							Approx. ½	As above.	
	232							0 - ½	As above, but approaches a siltstone.	
	233							0 - ½	Dark to med. grey, med. hard, calcareous silty shale.	
	234							0 - ½	Med. to dark grey, med. hard calcareous shaly siltstone grading to limestone.	
	235							0 - ½	As above; but also with minor frags. of cream to light brown limestone.	
	236							0 - ½	As above.	
	237							0 - ½	Dark to med. grey, med. hard, calcareous shaly limestone.	
	238							0 - ½	Dark grey (with light brown tinge) calcareous shaly siltstone grading to limestone.	
	239							0 - ½	Dark grey calcareous silty shale.	
	240							0 - ½	Dark grey (with light brown tinge) med. hard to hard carcareous silty shale, grading to limestone. Chert common.	
	241							0 - ½	As above.	
	242							0 - ½	As above. Also minor frags. light brown hard, fine grained limestone.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO PAGE 14 16

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
242	243							0 - ½	As above.	
	244							0 - ½	As above.	
	245							0 - ½	Dark to med. grey shaly & calcareous siltstone grading to limestone. Minor frags. l.brown, hard fine grained limestone.	
	246							0 - ½	As above; but with frags of cream, hard fine grained limestone.	
	247							0 - ½	As above; probably the limestone is very cherty.	
	248							0 - ½	Med. to dark grey, hard to very hard silty shaly limestone ?cherty.	
	249							0 - ½	As above; but also abundant l. brown hard fine grained limestone frags.	
	250							0 - ½	Med. to dark grey calcareous silty shale grading to limestone. Also minor amounts l.brown hard limestone fragments.	
	251							0 - ½	Dark grey calcareous shale as above but slightly softer. Minor amounts of cream hard limestone.	
	252							0 - ½	Dark grey silty and shaly limestone grading to calcareous siltstone. Minor amounts cream hard fine grained limestone.	
	253							0 - ½	Med. to dark grey shaly, silty limestone grading to shale.	
	254							0 - ½	As above, but minor dark grey-brown impure limestone.	
	255							0 - ½	As above; fairly shaly. Minor amounts of l.brown hard limestone.	
	256							0 - ½	As above; but about 10% of cuttings are brown pyritic chert fragments.	

HOLE No.: WHISTLER NO. 1 HOLE LOGGED BY: R. GRASSO PAGE 15 13

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	CORE ATTITUDE % P_2O_5	DESCRIPTION	DATE
256	257							0 - ½	Dark grey, calcareous silty shale grading to limestone. Minor fragments cream hard limestone.	
	258							0 - ½	As above.	
	259							0 - ½	As above.	
	260							0 - ½	As above.	
	261							0 - ½	As above.	
	262							0 - ½	As above, minor fragments of l.brown, hard fine grained limestone.	
	263							0 - ½	As above; but slightly less calcareous. Also minor amounts of brown chert.	
	264							0 - ½	Dark grey, med. hard to hard, slightly calcareous silty shale. Minor chert frags.	
	265							0 - ½	As above.	
	266							0 - ½	Dark grey; slightly calc. silty shale.	
	268							0 - ½	Dark grey, med. hard, calcareous, slightly silty shale.	
	269							0 - ½	As above.	
	270							0 - ½	Dark grey, med. hard to hard calcareous silty shale grading to silty limestone.	
	271							0 - ½	As above; but fairly shaly.	
	272							0 - ½	As above; but slightly harder.	
	273							0 - ½	As above.	
	274							0 - ½	As above.	
	275	Hole left overnight made a little water (first)						0 - ½	Dark grey med. hard to hard calcareous shaly siltstone. Chert common, l.brown limestone fragments common.	
	276								As above	
			T.D. Whistler No. 1 276 feet.							
			Fresh water seeped into hole overnight when at 274 feet.							

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: W.
STATE: Queensland COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 155 ft. approx 1.5 miles south Yelv. South Border Fence.

ROTARY DRILLING: Depth from 0 to 155
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 997'
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 24/11/66
COMPLETED: 25/11/66
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
0	5								Alluvium and black chert	24/11/66
5	7								Black chert.	
7	10								Cream cherty siltstone.	
10	40								No information	
40	43								White to greenish-cream siltstone	
43	50							Tr.	Very sandy in part with chert.	
50	60							<2	As above; but less chert.	
60	63							3	As above	
63	66							3	As above.	
									As above but with abundant chert.	
66	70							3	As above but less chert	
70	72							6	As above	
72	76							6	As above but with abundant chert.	
76	78							4	As above.	
78	80							6	As above. Lost circulation at 80 ft.	
80	81							2	Black chert & silty light green clay.	
	82							5	As above	
	83							4	As above	
	84							2	As above	
	85							2	As above	

HOLE No.: W. HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	SHAPIRO ~~XXXXX~~ % P_2O_5	DESCRIPTION	DATE
	86							1	As above.	
	87							1	Green & brown clay with green chert pebbles.	
	88							1	As above.	
	89							5	Brown clay pebbles and black chert pebbles	
	90							2	in pale green clay.	
	91							<1.5	As above.	
	92							<1.5	As above.	
	93							<1.5	As above.	
	94							<1.5	As above.	
94	100							<2	Cavity.	
100	104							<1	Orange & grey clayey siltstone. Chert is probably caving material.	
104	110							<1	Siltstone, orange, grey, cream clayey in part - hard. Cuttings are NOT very representative doe to above cavity catching and holding, releasing up hole cavings.	
110	125							<1	Orange, yellow, grey, siltstone with a few thin black chert interbeds.	
125	135							Tr.	As above becoming clayey from 129'	
135	155							-	Purple shale & minor (probably interbedded) clayey siltstone with minor grey interbedded shale.	
									Note: After trip at 155' to change bit; became stuck in hole, 102' from top; left bit in hole, recovered stem, abandoned hole.	
		TOTAL DEPTH - 155 ft.								

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: X
STATE: Queensland
COUNTY:
PARISH:
HOLDING:
LAT. LONG.
CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 245 ft.
2 miles East creek along border fence, & .3 miles south of fence.

ROTARY DRILLING: Depth from 0 to 245 ft.
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL:
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 25/11/66
COMPLETED: 25/11/66
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
0	7								Alluvium and sandstone, siltstone, chert floaters	
7	11								Sandstone & chert pebbles cobbles.	
11	18								Cherty, slightly sandy siltstone	
18	35								White partly silicified sandstone.	
									White clayey silty chert medium grained sandstone.	
35	40								As above; but no chert.	
40	41								Yellow limonitic silty sandstone, clayey in part.	
41	53								Pale green silty claystone - very soft, like 'soapstone'.	
53	61								Yellow claystone.	
61	156								Pink-red clayey siltstone.	
156	161								Yellowish brown siltstone, very clayey in part.	
161	174								As above.	
174	178								Yellow, silty clay.	
178	205								Creamy yellow & brown clayey siltstone.	
205	230								Greenish brown & yellowish green clayey siltstone.	

HOLE No.: X

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO CORE ~~XXXX~~ ATTITUDE ~~XXXXXX~~ % P_2O_5	DESCRIPTION	DATE
230	245								Green-brown clayey siltstone.	
			TOTAL DEPTH - 245 ft.							

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: Y
STATE: Queensland COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 196 ft. Approx. 24 m. S.W. Yelv.H.S.

ROTARY DRILLING: Depth from 0 to 196'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 848'
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 28/11/66
COMPLETED: 29/11/66
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE 28/11/66
0	20								Clayey alluvium with a few chert pebbles.	
20	35								Brown silty clay & clayey siltstone - slightly calcareous.	
35	70								Green & brown silty clay & clayey silt.	
70	80								Green, soft, silty clay.	
80	85								Green & brown slightly silty clay.	
85	95								Brown silty clay.	
95	100								Yellow, slightly calcareous clay.	
100	120								Yellow brown clayey limestone.	
120	125								Brown chert with (apparently) thin layers of clayey limestone.	
125	130								White-brown, clayey, slightly sandy, very cherty, slightly calcareous, siltstone.	
130	135								Clayey, calcareous, sandstone, great quantities chert (cavings ?)	
135	140							<2	As above.	
140	145							Tr.	As above, with white-grey, silty, slightly limey, fine grained sandstone. Cherty, clayey, slightly sandy, grey siltstone.	

McA. 29

HOLE No.: Y

HOLE LOGGED BY: B.W. MENZEL

PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
145	146	3.2						1½	Grey, slightly calcareous siltstone	
	147	3.5						5	As above.	
	148	5.0						8	As above.	
	149	6.6						6	As above.	
	150	11.7						5	As above.	
	151	6.4						4	As above with brown chert (probably cavings ?)	
	152	-						3	As above.	
	153	3.5						4	As above.	
	154	4.2						3	As above.	
	155							3	As above.	
155	156		0	0	Core No. 1					
	156							4	Core No. 2 156' -61'	
	157	2.2						4	Light brown, slightly limey silty clay with	
	158	4.5						6	a few included sand grains and chert pebbles	
	159	5.5						10	up to 2½" long recovered - probably cavings	
	160	4.0						15	but also chert pebbles probably in formation.	
	161	3.5						15	As above.	
	162	4.0						12	Yellow-brown, clayey siltstone calcareous	
	163	3.3						10	in part with numerous indigenous, brown	
	164	7.0						8	chert pebbles up to 1" in lowest diameter.	
	165	6.0						8	As above.	
	166	3.5						8	As above.	
	167	6.6						8	As above.	
	168	6.4						8	As above.	
	169	2.7						10	As above	
	170	7.3						11	As abov e.	
	171							10	Yellowish-brown silty, slightly sandy limey clay.	
	172							10	As above.	
	173							10	As above.	
	174							10	As above.	

HOLE No.: Y

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~CORE EXCLUDE~~ % P_2O_5	DESCRIPTION	DATE 29/11/66
	175							10	As above.	
	176							6	As above, but approaches clayey siltstone - limey.	
	177							6	As above.	
	178							5	As above.	
	179							4	As above.	
	180							4	As above.	
	181							4	As above.	
	182							4	As above.	
	183							4	As above.	
	184							4	As above.	
	185							5	As above.	
	186								(No samples due to cleaning up of hole	
	187								(with water.	
	188								(	
	189								(	
	190								(	
	191								(	
	192								(	
	193								(	
	194								(	
	195								(	
	196	TOTAL DEPTH.							(	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL CO. OF AUST. LTD.
PROJECT: MOUNT ISA PHOSPHATE
HOLE No.: Z
STATE: Queensland COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION: Vertical
TOTAL DEPTH: 227 ft.

ROTARY DRILLING: Depth from 0 to 227'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 873'
DRILLING CONTRACTOR: G.S.I.
SPUDDED: 29/11/66
COMPLETED: 30/11/66
HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	% P_2O_5 ~~XRFX~~ ANALYSIS AMDEL	CORE RECOVERED feet AMDEL* ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~XXXXXX~~ % P_2O_5	DESCRIPTION	DATE
			% Fe_2O_3	% Al_2O_3	% CaO	% CO_2				
0	20								Alluvium and pebbles.	29/11/66
20	50								Pinkish-red slightly clacreous very sandy, clayey siltstone.	
50	65								Whitish pink, hard clay with closely banded chert beds - very silty in places.	
65	80								White and light red mottled siltstone very clayey and in parts tends to a silty clay.	
80	100								As above with grey chert interbeds.	
100	114								Yellow, very silty clay with chert interbeds.	
114	115	6.2						2	As above.	
	116	8.3						24	Yellow approaching brown (variations) clay -	
	117	10.8	6.45	5.85	14.0	0.25		23	silty, slightly sandy with very minor	
	118	3.5						18	calcareous beds (very thin).	
	119	1.3						2	As above.	
	120	1.8						1	As above	
	121	4.0						8	As above	
	122	11.2						7	As above	
	123	15.0	6.35	3.6	21.9	0.34		20	As above	
	124	11.5						20	As above	
	125	13.5	4.15	3.95	20.8	0.36		27	As above	

MCA. 29

* (See AMDEL Report AN1771/67)

HOLE No.: Z

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ~~Mix~~ ANALYSIS AMDEL	CORE RECOVERED feet AM DEL ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	SHAPIRO ~~XORE XANALYSIS~~ % P_2O_5	DESCRIPTION	DATE
			% Fe_2O_3	% Al_2O_3	% CaO	% CO_2				
	126	8.5						16	As above	
	127	5.5						3	As above	
	128	4.4						5	As above	
	129	2.4						1	As above	
	130	1.5						2	As above	
	131	1.8						1	As above	
	132	0.75						1	As above.	
	133	1.1						1	As above	
	134	1.0						1	Asabove	
	135	2.8						1	As above	
	136	6.0						3	As above	
	137	5.3						5	As above	
	138	3.5						3	As above	
	139	3.5						3	As above	
	140	3.5						4	As above	
	141	11.7	4.7	4.3	14.8	0.34		6	As above	
	142	6.1						3	As above	
	143	3.2						4	As above	
	144	2.0						1	As above	
	145	2.0						2	As above	
	146	5.0						4	As above	
	147	2.8						1	As above	
	148	2.0						1	As above	
	149							1	As above	
	150	1.3						1	As above	
	151	1.3						1	As above	
	152	2.0						2	As above	
	153	6.9						8	As above	
	154	10.3						18	As above	
	155	12.0	1.55	4.0	16.2	0.25		6	As above	

HOLE No.: Z HOLE LOGGED BY: B.W. MENZEL PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ~~MIXX~~ ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO ~~XXXXX~~ % P_2O_5	DESCRIPTION	DATE
	156	6.6						5	As above	
	157	6.6						3	As above	
	158	5.8						4	Brown clayey, sandy siltstone tending to	
	159	2.8						1	a sandy, silty clay in part. With a few	
	160	3.5						1	brown chert bands at 171' - 173'	
	161	3.5						2	As above.	
	162	7.8						2	Asabove	
	163	4.0						2	As above	
	164	4.8						2	As above	
	165	10.4						3	As above	
	166	7.5						8	As above	
	167	8.0						7	As above	
	168	)	) No samples					)	)No samples due to lost circulation	
	169	)	)					)	)	
	170	)	)					)	)	
	171	2.6						2	As above	
	172	2.2						2	As above	
	173	1.4						2	As above	
	174	1.4						2	Golden brown clayey, slightly sandy siltstone.	
	175	2.0						5	As above	
	176	2.4						3	As above	
	177	3.3						3	As above	
	178	3.5						1	As above	
	179	4.0						2	As above	
	180	2.2						3	Light yellow, clayey, very sandy siltstone.	
	181	4.2						3	As above.	
	182	2.6						5	As above.	
	183	2.8						2	As above.	
	184	2.4						2	As above.	

HOLE No.: Z HOLE LOGGED BY: B.W. MENZEL PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	% P_2O_5 ANALYSIS AMDEL	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	SHAPIRO % P_2O_5	DESCRIPTION	DATE
	185	2.4						3	Pale yellow, clayey, silty with very fine	
	186	3.3						3	grained sandstone.	
	187	3.5						2	As above	
	188	2.2						1	As above	
	189	1.8						1	As above	
	190	1.4						3	As above	
	191	1.4						2	As above	
	192	2.2						2	As above	
	193							4	As above	
	194							3	As above	
	195							4	As above	
	196							5	As above	
	197							8	As above	
	198							15	Not logged	
	199							15	Not logged	
	200							15	Brown, ca;careous very sandy clay.	
	201							12	Not logged	
	202							12	Not logged	
	203							12	Not logged	
	204							12	Not logged	
	205							12	Not logged	
	206							-	No samples - cuttings probably sticking to	
	207							-	wet sides of hole.	
	208							-	Chert (cuttings ontained are useless -	
	209							-	are all up-hole samples - drilling is	
	210							-	obviously in solid chert).	
	211							-	As above.	

HOLE No.: Z

HOLE LOGGED BY: B.W. MENZEL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	CORE ATTITUDE	DESCRIPTION	DATE
	212							–	Cavity 212' - 216'	
	213								Lost circulation; no samples.	
	214								Apparently drilling in a sandstone or	
	215								a siltstone - however, after 10' of	
	216								drilling, still no air return at all.	
	217								Decided to abandon hole.	
	218								Apparently at total depth were in a white	
	219								clayey silt. After testing a fragment	
220	227								off bit, found it contained less than 1%	
									P_2O_5.	30/11/66
		TOTAL DEPTH - 227 ft.								

APPENDIX 3b

LITHOLOGIC LOGS

1967 DRILLING PROGRAMME

WELL-SITE GEOLOGISTS: R. GRASSO
N. MURPHY
J. L. SIMPSON
M. D. CAMPBELL

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: LC-1
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 160' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 160'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 884' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 24.4.67
COMPLETED: 24.4.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	6							<1	Red-brown ferruginous, sandy alluvium.	24.4.67
6	7							"	Purple alluvium, with a few chert fragments (broken pebbles).	
7	8							"	Brown sandy alluvium, limonitic and haematitic, with some chert and billy.	
8	20							"	Orange-red sandy alluvium, becoming siltier with depth.	
20	21							"	Orange silty sand, with small round pebbles of haematite.	
21	38							"	Orange-to-buff siltstone, haematite and limonite(more buff than orange from 25' depth).	
38	41							"	As above, but orange colour.	
41	47							"	As above, but yellow colour; a few chert fragments in 45'-46'.	
47	52							"	Cream-to-yellow siltstone.	
52	54							"	Orange siltstone with grey chert fragments (abundant in 52'-53').	
54	57							"	Purplish-white siltstone with grey chert fragments.	
57	60							"	White (perhaps purple tint) siltstone with chert fragments.	
60	64							"	Cream-to-white siltstone with few chert fragments.	
64	70							"	As above, with abundant grey and reddish-grey cherts.	

HOLE No.: LC-1 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
70	77							"	Brown-grey siltstone with grey chert fragments.	
77	81							"	Yellow-brown siltstone with grey chert fragments(& grey-brown).	
81	83							"	Khaki siltstone with brown chert fragments.	
83	84							"	Green-brown siltstone, with only a few brown cherts.	
84	85							"	Yellow-brown siltstone.	
85	87							"	Khaki siltstone with brown cherts.	
87	90							"	Yellow-brown siltstone, with brown cherts.	
90	94							"	Khaki siltstone with brown cherts.	
94	95	5.8	Phosphate					3	As above, P_2O_5 detected.	
	96	3.6						3	As above	
	97	1.9						1	As above	
	98	-						2	Buff siltstone, with abundant brown cherts.	
	99	-						1	As above	
	100	-						1	As above	
	101	1.9						1½	As above	
	102	2.3						1½	As above	
	103	9.7						5	Cream siltstone, with abundant grey and grey brown cherts.	
	104	20.9						14	As above	
	105	19.3						13	As above	
	106	16.8						12	Buff siltstone, slightly less chert.	
	107	15.7						14	As above	
	108	11.2						12	As above	
	109	9.3						10	Cream-to-buff siltstone, chert scarcer still.	
	110	6.7						6	As above	
	111	5.8						5	As above	
	112	5.8						5	Cream siltstone, some chert	
	113	6.0						6	As above	
	114	6.0						6	As above	
	115	4.2						2	As above	
	116	4.2						2	As above	

HOLE No.: LC-1 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~RECOVERY~~ SHAPIRO	DESCRIPTION	DATE
116	117	9.5						6	Slightly ~~x~~ yellow siltstone, some chert.	
	118	6.0						4	Buff-grey siltstone, with a few very small chert fragments.	
	119	2.5						4	Pale yellow siltstone, with hard white silicified fragments.	
	120	7.5						6	As above	
	121	10.9						5	As above	
	122	6.0						4	~~X~~X~~X~~X Cream siltstone, no chert.	
	123	4.8						3	As above	
	124	3.5						4	As above	
	125	5.3						3	As above	
	126	8.5						5	As above	
	127	5.3						3	Grey siltstone with some grey chert.	
	128	1.8						2	Cream-to-grey siltstone with little chert.	
	129	1.5						2	Buff siltstone with brown chert.	
	130	-						1	As above	
	131	-						<1	As above	
	132	1.3						"	Grey-buff siltstone with chert.	
	133	-						1	As above	
	134	1.5						1	As above	
	135	-						1	As above	
	136	-						1	As above	
	137	-						1	Fine-grained off-white siltstone, micaceous, with brown chert (abundant in 136'-137').	
	138	1.0						1	As above	
	139	5.1						4	As above	
	140	6.6						4	As above	
	141	3.9						5	As above	
	142	5.1						4	As above	
	143	3.7						3	Fawn siltstone with some brown chert.	
	144	2.8						2	As above	
	145	4.0						4	As above, perhaps less chert. From 149' depth to T.D. ALL SAMPLES CALCAREOUS.	

HOLE No.: LC-1 HOLE LOGGED BY: N. MURPHY PAGE 4

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
145	146	3.2						3	As above	
	147	3.2						3	As above	
	148	3.7						4	As above	
	149	4.6						5	As above	
	150	4.6						4	As above	
	151	4.0						4	Cream siltstone, with slightly more chert; sample more powdery.	
	152	3.5						4	As above, with abundant brown chert fragments.	
	153	3.0						3	As above	
	154	2.0						2	As above	
	155	2.0						1	As above	
	156	2.0						2	As above	
	157	2.0						2	As above	
	158	2.3						2	As above. Little or no chert in 157'-160'	
	159	1.9						2	As above	
	160 T.D.	2.0						2	As above. Final foot still weakly phosphatic.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: LILY CREEK 2
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 195' T.D.

ROTARY DRILLING: Depth from 0' to 195'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 890' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 28.4.67
COMPLETED: 29.4.67
HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Medium brown silty clay	28.4.67
1	2							"	As above; but very sandy.	
2	3							"	As above	
3	4							"	Medium brown, soft, friable, clayey and silty sandstone, composed of poorly sorted quartz grains in a brown clayey matrix.	
	5							"	As above	
5	10							"	As above	
10	11							"	As above; but lighter coloured.	
11	16							"	As above	
16	21							"	Medium brown, soft, friable clayey and silty sandstone, composed of poorly sorted quartz grains in a ferruginous clayey matrix.	
21	23							"	As above, but darker in colour.	
23	24							"	As above, but more red-brown colour.	
24	33							"	Mostly red-brown ferruginous stained medium grained quartz sand.	
33	35							"	As above; but silty and clayey.	
35	39							"	As above; but approaches an argillaceous silt-siltstone.	

HOLE No.: LC-2 HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
39	55							"	Red-brown, soft friable sandy siltstone, composed of iron-stained poorly sorted quartz grains in a red-brown ferruginous clayey matrix. Grinds to a clayey sand.	
55	56	Change						"	As above; but also abundant cream to light brown colour.	
56	59							"	Sandy argillaceous siltstone; as above; but lighter coloured.	
59	64							"	Cream and light brown, medium soft, poorly sorted silty and clayey sandstone. Grinds to a clayey sandy powder.	
64	72							"	As above; but lighter coloured.	
72	74.							"	As above, but slightly darker colour.	
74	81							"	Medium brown, soft friable silty and clayey sandstone. Composed of poorly sorted quartz grains in a slightly ferruginous matrix.	
81	91	Change	in colour					"	Mostly powder with minor fragments of light grey, grey, fine to medium grained friable silty and clayey sandstone. Composed of rounded poorly sorted quartz grains in a clayey matrix.	
91	100							"	As above; but also containing fragments of light grey medium grained sandstone with rare course to pebble size quartz grains.	
100	101							"	As above; but abundant quartz pebbles.	
101	106							"	Mostly light grey, cream and light brown, soft powdery clayey siltstone, composed of poorly sorted quartz silt grains, and pebbles.	
106	107							"	As above; but also abundant cherty fragments and chert.	
107	112							"	As above; but mostly cream coloured dust.	
112	118							"	Light grey, medium soft to medium hard slightly siliceous silty shale (grinds to dust) with occasional quartz grains.	

HOLE No.: LC-2 HOLE LOGGED BY: R. GRASSO PAGE # 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BH~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXX~~ SHAPIRO	DESCRIPTION	DATE
								"	As above; but abundant grey-brown chert fragments.	
118	119							"	As above	
	120							"	As above	
	121							"	As above	
	122							"	As above	
	123							"	As above; mostly light grey to cream dust (after shale or sandy shaly siltstone) with abundant grey-brown chert fragments.	
	124									
	125-134							"	As above	
	135							"	As above; but also yellow-brown soft silty shale.	
	136							"	As for 134.	
	137							"	As above	
	138							"	Mostly yellow-brown silty shale.	
	139							"	Mostly light grey to cream dust after sandy and shaly siltstone, with abundant chert fragments.	
	140							"	As above	
	141							"	As above; but also yellow-brown dust.	
	142							"	Mostly yellow-brown dust. Abundant vughy silica masses and chert.	
	143							"	As above	
	144							"	Yellow-brown, soft silty shale with chert and vughy irregular silica masses.	
	145							"	As above.	
	146	2.7	Phosphatic					9	As above	
	147	6.9						8	As above	
	148	12.7						15	Mostly yellow-brown limonitic dust, after weathered silty shale. Contains irregular vughy ~~x~~silica masses.	
	148 6	10.8						10	As above	
			CORING							29.4.67
148 6	159 6	H.F.C.H. 7.7	0" 9		Cuttings 148'6"-150			8	Mostly cream to light brown dust (silty shale) with abundant chert.	

HOLE No.: LC-2 HOLE LOGGED BY: R. GRASSO PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~CUTTINGS~~ SHAPIRO	DESCRIPTION	DATE
		6.8			Cuttings	150'-151'6"		7	Medium brown silty cherty shale.	
		12.0			"	151'6"-153		11	As above	
		12.2			"	153'-155'		14	As above	
		6.5			"	155-158'6"		8	Cream silty cherty shale.	
			CORE 148'6"-158'6"							
		Only the hard cherty parts of the core were recovered. Much of the chert is hard, dark to medium brown in colour. It is very limonitic and very vughy. Some fragments are almost entirely silica while others are very limonitic and less silicified. A few fragments of white, medium hard siltstone contain foss casts. In places pelletal phosphorite is present. Also sponge spicules. Recrystallized silica is common in the vughy irregular silica masses.								
158 6	168 6	H.F.C.H. 8.9	1" 0"		Cuttings	158'6"-161'6"		7	Cream silty shale with trace chert.	
		15.5				161'6"-164'6"		15	As above	
		4.7				164'6"-167'6"		6	As above; mostly cream soft to medium soft, shaly siltstone or silty shale. The harder cuttings are slightly silicified. Chert in minor amounts.	
		9.0				167'6"-168'6"		9	As above	
		Core fragments are mostly chert or light grey cherty siltstone. In the top part of the core there are minor fragments of medium brown porous, med. soft siltstone containing fine vughs and medium brown pelletal phosphorite. Most pieces of cream and white siltstone contain trilobite fragments.								
168 6	178	H.F.C.H. 0.1	0' 9"							
		5.1			Cuttings	168'6"-169		6	Mostly cream to l.brown dust with cream to light brown, medium soft to medium hard fragments of partly silicified silty shale with minor chert fragments.	29.4.67
		2.7				169'-170'		4	As above	
		3.0				170'-171'		4	As above	
		11.3				171'-172'		10	As above	
		4.0				172'-173'		6	As above	
		2.0				173--174'		3	As above	
		2.3				174'-175'		4	As above	
		1.8				175'-176'		3	As above	
		10.5				176'177'		14	As above	

HOLE No.: LC-2 HOLE LOGGED BY: R. GRASSO PAGE 5

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIK~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
		14.1			Cuttings	177'-178'		15	As above	
		Recovered part of core is mainly light grey partly silicified siltstone and chert and cherty siltstone. Cherty fragments are vughy.								
178	179	3.0						9	Mostly cream dust (after silty shale) and abundant cherty fragments. Some cream fragments are partly silicified shales.	
179	180	5.8						12	As above; but less chert	
	181	10.5						7	As above	
	182	8.2						6	Light to medium brown dust with minor chert and red-brown quartz grains (? cavings)	
	183	6.0						5	As above	
	184	6.9						5	Medium brown to light brown and trace of light grey medium soft to soft silty shale. Trace chert fragments.	
	185	10.8						7	Mostly light brown to cream medium soft shale. Trace chert.	
	186	11.3						7	As above	
	187	12.4						7	As above	
	188	16.5						8	As above; also minor darker brown silty shale.	
	189	13.6						8	As above	
	190	8.4						6	As above; but more chert fragments.	
	191	7.8						6	As above	
	192	7.8						6	As above; but slightly darker light brown dust (after medium soft weathered shale).	
	193	6.9						5	As above; trace chert.	
	194	4.3						5	Light brown dust with abundant chert.	
	195 T.D.	3.5						6	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: LC-3
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 162'T.D.

ROTARY DRILLING: **Depth from** 0' **to** 162'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 902' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 24.4.67
COMPLETED: 25.4.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	3							<1	Red-brown ferruginous, sandy alluvium.	24.4.67
3	5							"	As above, but less red colour.	
5	12							"	Orange-yellow, pebbly, as above; with chert from 6' depth downwards(presumably fractured pebbles).	
12	14							"	As above, but slightly redder.	
14	21							"	Red-brown pebbly, ferruginous silt.	
21	45							"	As above, but colour more orange.	
45	51							"	Buff siltstone.	
51	52							"	Buff-orange siltstone.	
52	53							"	Buff siltstone	
53	54							"	White-to-buff siltstone	
54	60							"	Buff-to-khaki siltstone	
60	61							"	Light grey siltstone, with a few angular quartz grains.	
61	64							"	As above, with grey chert fragments (abundant in 63'-64')	
64	69							"	Buff siltstone with chert fragments and abundant rounded pebbles of quartz, billy and chert.	
69	70							"	As above, but yellow-brown colour.	
70	80							"	White-to-buff siltstone with fewer rounded pebbles of quartz and chert.	
80	98							"	White siltstone with brown chert interbedded.	

HOLE No.: LC-3 HOLE LOGGED BY: N. MURPHY PAGE 2

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
98	99							"	As above, with yellow siltstone mixed.	
99	105							"	White siltstone with brown chert.	
105	108							"	As above, slightly yellow	
108	110							"	Buff siltstone with chert.	
110	112							"	Orange-buff siltstone with chert.	
112	113	12.9	Phosphate					8	Cream-to-yellow siltstone, with a little brown chert.	
									P_2O_5 below 112' depth.	
	114	11.4						6	As above	
	115	4.8						6	Cream siltstone, brown chert in 114'-115'	
	116	10.5						7	As above	
	117	7.5						4	Cream to yellow siltstone	
	118	7.0						4	As above	
	119	9.3						5	As above	
	120	6.3						4	Yellow siltstone.	
	121	5.2						4	As above	25/4/67
	122	7.8						6	As above	
	123	6.7						5	As above	
	124	8.5						6	As above	
	125	4.0						3	As above	
	126	3.1						3	As above	
	127	2.2						2	As above	
	128	6.0						4	Cream-to-yellow siltstone.	
	129	6.0						4	As above	
	130	6.7						4	As above	
	131	6.8						5	As above	
	132	8.5						7	As above	
	133	9.3						7	As above	
	134	8.7						9	As above	
	135	12.5						6	As above	
	136	16.0						12	As above	

HOLE No.: LC-3 HOLE LOGGED BY: N. MURPHY PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE STRUCTURE~~ SHAPIRO	DESCRIPTION	DATE
136	137	12.0						12	As above	
	138	12.0						10	As above	
	139	11.5						12	As above	
	140	5.9						6	Brown siltstone, with chert, (abundant below 143' depth)	
	141	6.0						5	As above	
	142	5.6						5	As above	
	143	5.9						7	As above	
	144	5.6						6	As above	
	145	4.5						4	As above	
	146	4.8						5	As above	
	147	3.8						3	As above	
	148	3.9						4	As above	
	149	5.0						4	As above	
	150	5.6						4	As above	
	151	5.4						4	As above	
	152	4.8						4	As above	
	153	5.0						3	As above, grey-brown colour	
	154	4.8						2	As above	
	155	5.0						3	Grey-buff calcareous siltstone, with less chert below 156' depth and slightly micaceous. A few chert pebbles in 159'160'. Drilling difficult after 159', with poor circulation	
	156	3.7						4	As above	
	157	1.8						2	As above	
	158	2.5						2	As above	
	159	3.2						3	As above	
	160	2.8						2	As above	
	161	2.7						3	As above	
	162 T.D.	2.0						2	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: LC-4
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 180' TD

ROTARY DRILLING: **Depth from** 0' **to** 180'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 937' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 25.4.67
COMPLETED: 25.4.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~SOIL~~ SHAPIRO	DESCRIPTION	DATE
0	2							<1	Ferruginous, pebbly alluvium (qtz.,billy,chert,haematite)	25.4.67
2	5							"	As above, finer	
5	8							"	As above, grey-brown	
8	46							"	As above, orange-red; samples becoming more powdery, but containing many small quartz grains.	
46	51							"	Yellow-buff siltstone.	
51	53							"	As above, slightly orange	
53	65							"	Grey-buff, becoming browner, siltstone with decreasing quartz pebble content.	
65	66							"	Buff siltstone	
66	67							"	Brown siltstone	
67	71							"	Grey-buff siltstone	
71	83							"	Off-white fine sandy siltstone, with small angular quartz grains.	
83	84							"	Brown and white siltstone.	
84	85							"	Brown siltstone	
85	86							"	White siltstone	
	87							"	As above	
	88							"	As above	
	89							"	As above	

HOLE No.: LC-4 HOLE LOGGED BY: N. MURPHY PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
89	90							"	As above	
	91							"	As above	
91	92							"	Brown and white siltstone	
92	98							"	White siltstone	
98	99							"	White and buff siltstone	
99	100							"	Buff siltstone	
100	101							"	Grey-buff siltstone with few quartz grains	
101	104							"	As above, buff colour	
104	109							"	Cream siltstone, occasional small quartz pebbles. Brown chert from 107'.	
109	114							"	Light yellow siltstone with few small rounded quartz pebbles; chert fragments.	
114	124							"	Cream siltstone, chert	
124	125							"	Cream-to-buff siltstone, chert.	
125	129							"	Yellow-brown siltstone, chert. Chert abundant below 125'	
129	138							"	Khaki siltstone, brown chert. Few small, angular quartz pebbles.	
138	139							"	Buff siltstone, phosphatic below 144'. Slightly calcareous below 147'. Abundant brown chert in 139'-140'.	
	140							"	As above	
	141							"	As above	
	142							"	As above	
	143							"	As above	
	144							"	As above	
	145	2.5						1	As above	
	146	3.3						2	As above	
	147	2.6						2	As above	
	148	8.2						7	As above	
	149	13.5						12	As above	

HOLE No.: LC-4 HOLE LOGGED BY: N. MURPHY PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BXD~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
149	150	13.0						11	As above	
	151	11.1						8	As above	
	152	10.6						7	As above	
	153	10.7						7	As above	
	154	11.9						8	As above	
	155	9.8						8	As above	
	156	11.9						7	As above	
	157	15.2						12	As above	
	158	15.8						12	As above	
	159	11.5						15	As above	
	160	10.9						10	As above	
	161	8.8						8	As above	
	162	7.0						5	Grey-brown siltstone	
	163	7.8						5	As above	
	164	17.8						12	As above	
	165	20.0						13	Grey-buff siltstone	
	166	19.0						12	As above	
	167	19.5						13	As above	
	168	20.3						13	As above	
	169	19.0						12	As above	
	170	16.2						13	Dark grey sandy siltstone/shale, with numerous small	
	171	13.8						11	As above (grains of quartz and chert.	
	172	10.2						10	As above	
	173	11.8						10	As above	
	174	14.8						11	As above	
	175	11.8						8	As above	
	176	12.0						10	As above	
	177	13.4						11	As above	
	178	15.3						13	As above	
	179	9.0						8	Chocolate siltstone/shale, haematite, quartz and chert.	
	180 T.D.	4.5						3	As above	

Stopped drilling when encountered poor circulation in final few feet.

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: LC-5
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 120' T.D.

ROTARY DRILLING: Depth from 0' to 120'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 848' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 25.4.67
COMPLETED: 25.4.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	AMDEL ~~XXX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE ASSAYS~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Ferruginous pebbles of billy, chert, with grey-brown sandy soil.	25.4.67
1	3							"	As above, orange-brown	
3	14							"	Purple-brown pebbly alluvium, rich in haematite.	
14	20							"	As above, light brown colour.	
20	21							"	Cream and brown sandy silt, with small grains of quartz, chert, haematite.	
21	23							"	As above, brown colour.	
23	31							"	Cream-to-grey sandy siltstone.	
31	32							"	As above, grey colour. P_2O_5 below 33'.	
	33							"	As above	
	34	1.0						1	As above	
	35	-						1	As above	
	36	-						1	White siltstone	
	37	-						1	As above	
	38	5.8						1	As above	
	39	4.0						5	As above	
	40	3.6						4	As above	
	41	2.1						1	As above	
	42	2.5						1	As above	

HOLE No.: LC-5 HOLE LOGGED BY: N. MURPHY PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~XXXX CORE XXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
42	43	-						1	As above	
	44	3.8						5	As above	
	45	11.5						11	As above	
	46	7.4						11	As above	
	47	3.6						3	As above	
	48	13.4						12	Cream siltstone	
	49	28.5						12	Yellow siltstone	
	50	27.4						20	As above	
	51	13.2						12	Cream siltstone	
	52	24.2						20	As above	
	53	23.1						20	As above	
	54	21.0						20	As above	
	55	19.5						20	As above	
	56	4.0						2	Light grey siltstone, with chert	
	57	2.0						2	As above	
	58	2.0						2	Yellow siltstone	
	59	2.0						2	Grey siltstone	
	60	3.4						2	Yellow siltstone	
	61	1.6						2	As above	
	62	-						2	Cream siltstone, with much clear chert.	
	63	-						2	Brown siltstone, with chert	
	64	-						2	Quartz sand, buff colour; many rounded quartz grains.	
	65	-						2	Grey quartz sand.	
	66	0.6						2	As above	
	67	1.5						2	As above	
	68	2.6						3	As above	
	69	3.7						3	As above	
	70	-						5	Grey-brown sand	
	71	1.9						1	Buff sand	
	72	-						2	As above	

HOLE No.: LC-5 HOLE LOGGED BY: N. MURPHY PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	amdel ~~BTK~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
72	73	-						1	Yellow-cream sand, siltier than above	
	74	-						1	As above	
	75	-						1	Cream siltstone, only a few rounded quartz pebbles; some white chert fragments.	
	76	0.3						<1	As above	
	77							<1	As above	
	78							"	As above	
	79							"	As above	
	80							"	As above	
	81							1	As above	
	82							<1	As above	
	83							"	As above	
	84							"	Cream-grey siltstone, few quartz pebbles.	
	85							"	Purple siltstone/shale	
	86 1 120 T.D.							"	As above	
									Stopped drilling in nil-phosphatic purple shales.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: LC-6
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 200' T.D.

ROTARY DRILLING: **Depth from** 0' to 200'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 861' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 25.4.67
COMPLETED: 26.4.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	5							<1	Ferruginous, pebbly alluvium	25.4.67
5	9							"	As above, brown, no quartz	
9	37							"	Cream-to-white siltstone, with haematite and limonite. (From 20' on - 26.4.67)	
37	39							"	As above, pale yellow	
39	46							"	White siltstones, with occasional chert fragments.	
46	48							"	As above, orange-brown colour. 47'-48' calcareous.	
48	50							"	As above, cream colour	
50	53							"	Yellow-brown and white siltstones, chert.	
53	54							"	Cream siltstones, chert	
54	55							"	Brown and cream siltstones, chert.	
55	56							"	Cream siltstone, chert.	
56	58							"	Brown and cream siltstones, chert.	
58	60							"	White and cream siltstones, chert.	
60	65							"	Yellow and cream siltstones, chert.	
65	66							"	Cream siltstones, chert.	
66	71							"	Cream-to-yellow siltstones, chert.	
71	73							"	White and cream siltstones, chert.	
73	74							"	Yellow and white siltstones, chert.	
74	77							"	Cream and white siltstones, chert.	

HOLE No.: LC-6 HOLE LOGGED BY: N. MURPHY PAGE 2

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE TEXTURE~~ SHAPIRO	DESCRIPTION	DATE
77	86							"	White-to-cream siltstones, chert	
86	88							"	Brown-to-buff siltstones, chert.	
88	89							"	Cream siltstones, chert	
89	110							"	White siltstones, chert	
110	111							"	Cream siltstones, chert	
111	113							"	White siltstones, chert	
113	114							"	Cream siltstones, chert	
114	118							"	White-to-cream siltstones, chert	
118	120							"	Cream siltstones, chert	
120	125							"	White siltstones, chert	
125	128							"	Light yellow siltstones, chert	
128	14 9							"	White-to-cream siltstones, chert	
149	151							"	Light grey siltstones, more chert.	
151	152							"	Cream siltstones, chert	
152	154							"	Light grey siltstones.	
154	181							"	Cream-to-white siltstones.	
181	183							"	Cream siltstones.	
183	185							"	White siltstones.	
185	186							"	Cream siltstones.	
186	187							"	Yellow-buff siltstones.	
187	194							"	Buff siltstones.	
194	197							"	Cream siltstones.	
197	200 T.D.							"	Cream-to-buff siltstones; ? billy or silicified siltstone in 197'-198'.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: LC-7
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 160' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 160'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 890' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 28.4.67
COMPLETED: 28.4.67
HOLE LOGGED BY: R. GRASSO & M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	~~CORE ATTITUDE~~	DESCRIPTION (0'-80' - R. GRASSO; 80'-160' M. CAMPBELL)	DATE
0	2							<1	Red-bn. sand & loam w/cherty (duricrust) frags.	28.4.67
	3				Major △			"	As above, but also lt. gy. to cream chert frags.	
	4							"	Red-brown, med. hard s.s. w/rounded, poorly sorted quartz gns.; chert abundant; w/lt.gy. & cream, med. soft siltstone frags. abundant.	
	5							"	As above	
	6							"	Cream, very hard, recrystallised grains, lt.gy.partly silicified, hard shale frags., and red-brown s.s.	
	7							"	As above	
	8							"	As above (put in conductor pipe - mostly caved in red-bn. sand and loam cream and lt.gy.,partly silicified shale frags. red-brown, clay common, chert common.	
	9							"	As above	
	10							"	Mostly caved-in red-bn. sand and loam w/cream and lt.gy., partly ~~xx~~ silicified shale frags.	
	11				Minor(?) △			"	Mostly cherty shale, as above and chert	
	12							"	Red-bn.,med.hd.,fine gn. to med.gn. Ferruginous s.s.	
	13							"	As above; s.s. is also lt.gy. in places.	
	14							"	As above	

HOLE No.: LC-7 HOLE LOGGED BY: R. GRASSO & M. CAMPBELL PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
14	15							"	As above	
	16							"	As above, but also abundant lt.gy.clay-soil,w/red-bn. streaks of silty shale.	
	17							"	As above	
	18							"	As above, w/abundant red-bn.soft weathered, silty sandstone.	
	19							"	Cream, lt.gy. & red-bn. (mottled and streaky) soft to med. soft, silty shale w/occ.quartz and gns.	
	20							"	As above	
	21							"	Mostly flesh coloured, med. gn.,soft to med.hd.s.s.	
	22							"	As above	
	23							"	As above, but more argillaceous	
	24							"	Cream to lt.bn.,silty, fn.gn.sand. Minor hard s.s. frags.	
25	28							"	As above	
	29							"	Mostly lt.gy., med. soft silty shale. Very finely micaceous; w/red-bn. streaks.	
	30							"	As above	
	31							"	As above	
	32							"	Mostly cream to lt.gy. soft to med. hard shale.	
	33							"	As above, but also w/hd.,lt. to med. gy. partly silicified shale.	
	34							"	As above	
	35							"	As above, gy. to lt. bn.,cherty frags. abund.	
	36							"	Cream to lt.gy. soft to hd., fine to med.gn.soft sandstone.	
	37							"	Mostly cream to lt.gy., med. to fn.gn. well rounded sand.	
	38-40							"	As above	
	41							"	As above, but s.s. abund.	
	42							"	As above	
	43							"	As above, but mostly sand.	
	44							"	As above	
	45							"	As above; but more argillaceous.	

HOLE No.: LC-7 HOLE LOGGED BY: R. GRASSO & M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE AXHOLE~~ SHAPIRO	DESCRIPTION	DATE
45	46							"	As above	
	47							"	As above	
	48							"	Cream to lt.gy.,soft to hard, sl.silicifed shales.	
	49							"	As above, but slightly more sandy.	
	50							"	As above, but silty.	
	51							"	Mostly lt.gy. to lt. cream quartz, silty fine sand w/minor shale.	
	52							"	As above	
	53							"	As above, harder frags., silt. & fine sand becoming soft semi-friable argillaceous and silty sandstone.	
	54 -57							"	As above	
	58							"	As above, but more argillaceous.	
	59							"	As above	
	60							"	As above, but also lt.gn.-gy.soft shale.	
	61							"	As above	
	62							"	As above, but silty.	
	63							"	As above, but grading to a siltstone;	
	64							"	Lt.gy.,argillaceous and sandy silt after soft siltstone.	
	65							"	As above	
	66							"	As above, but more argillaceous.	
	67							"	Lt.gy. to lt.cream argillaceous and sandy silt after soft siltstone.	
	68							"	As above	
	69							"	As above	
	70							"	Lt. gy. w/minor lt.gn. soft shale-silt.	
	71							"	As above, also red-bn. in places.	
	72							"	Lt.gn., lt.gy and red-bn.(streaky) soft shale.	
	73							"	As above,but mostly lt.gn.-gy.	
	74							"	As above; but also red-bn. streaks.	
	75							"	Mostly lt.bn. to med.gy.,well-bedded cherty shales ~~w/soft gy. shale also common.~~	

HOLE No.: LC-7 HOLE LOGGED BY: R. GRASSO & M. CAMPBELL PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
75	76							"	Mostly fine to med. gns.,well rounded quartz sand. w/cherty shale frags.	
	77							"	As above, cherty frags.	
	78							"	As above	
	79							"	As above, silty	
	80				Major			"	As above, lt.gy. & faint gn. tinge, w/soft to med.hd., silty shale and fine gn. quartz, sand gns.	
	81							"	Sandstone (quartzite ?), silty, bn. to lt. orange, w/silty shale frags. chert very minor.	
82	84							"	As above	
	85							"	As above, becoming more silty, chert increasing.	
	86							"	As above	
	87							"	As above	
	88							"	As above, w/chert increasing, uniform otherwise.	
	89							"	As above	
	90							"	As above	
	91							"	As above	
	92							"	As above, becoming lt. gy. to white, very fine gned. silty s.s.	
	93							"	As above	
	94							"	As above	
	95				Minor			"	As above, becoming more silty, bn. chert becoming very abund., Mn (dendritic).	
	96							"	As above, becoming lt. khaki	
	97							"	As above	
	98							"	As above	
	99							"	As above, w/chert increasing	
	100							"	As above,w/bl. chert to ~35%.	
	101				Major			"	As above, w/frags. of white, fn.gn.s.s.,chert decreasing.	
	102							"	Lms.,dolomitic, XI,silty,w/wh.s.s. frags., chert nearly wanting.	

HOLE No.: LC-7 HOLE LOGGED BY: R. GRASSO & M. CAMPBELL PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
102	103							"	As above, w/chert increasing.	
	104							"	As above, w/increasing two var. chert (1) lt.bn. (2) bl.	
	105							"	As above, still only slightly calc.	
	106							"	As above	
	107							"	As above	
	108							"	As above	
	109							"	As above, chert minor.	
	110							"	As above	
	111							"	As above, w/chert increasing, becoming lt. purple.	
	112							"	As above	
	113							"	~~As above, chert 30-35%~~	
	114				Minor			"	As above, purple becoming darker, chert very abund.	
	115							"	As above, but great decrease in chert, change to lt. khaki w/frags. of purple (?) s.s.	
	116							"	As above, extremely powdery sample	
	117							"	As above, but w/two var. chert - r.b. & bl. V.A.	
	118				Major		-		As above, becoming a lt.bn., fine gn. calc. sandstone w/frags. of dolo. lms.	
	119						-		As above, chert still 20-30%	
	120						-		As above, becoming more calc.	
	121						-		As above	
	122						V.St.		As above	
	123						"		As above, chert still 20-30%	
	124						"		As above	
	125						"		As above	
	126						"		As above	
	127						"		As above, w/lt.gy.var.chert increasing.	
	128						"		As above	
	129						"		As above	

HOLE No.: LC-7 HOLE LOGGED BY: R. GRASSO & M. CAMPBELL PAGE 6

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP No. SHAPIRO	CORE ATTITUDE	DESCRIPTION	DATE
129	130						"		As above	
	131						"		As above, becoming slightly more calc., w/frags. of blue to lt.gy., non-calc. shale.	
	132				Major		"		As above, w/increasing frags. of lt.gy. to lt.bn. s.s.	
	133						"		As above, becoming a less silty, but sandy and cherty dolomitic lms. w/frags. of bn.s.s. and white silty shale.	
	134						"		As above, less silty - chert wanting.	
	135						"		As above, w/frags. of micro-XI carbonate (lms),also w/frags. of bn. s.s.(med.gn.)siliceous shale.	
136	140						"		As above	
	141						"		As above,becoming more silty w/two var.chert,w/frags. of lt.khaki.	
	142						"		As above, chert decreasing.	
	143						"		As above	
	144						"		As above, w/increasing qtz.gn.,well-rounded and limonitic staining (?).	
	145						"		As above, w/more sandy	
	146						"		As above,w/lt.rd. to lt.pk.lms.,abundant s.s.	
	147						"		As above,w/red, irregular streaks of lms. in s.s.	
148	153						"		As above	
	154						"		As above, still gy.,hard to hard,sandy,cherty dolomitic XI Lms. w/ sil. frags. of bn. shale.	
	155-160 T.D.						"		As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: LC-8
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 140' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 140'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 855' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 27.4.67
COMPLETED: 27.4.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	21							<1	Pebbly, conglomeratic unconsolidated alluvium.	27.4.67
21	61							"	Siltstone with abundant black and pale brown chert interbeds. White-to-cream colour, some pink tinted, with haematite. Partly silicified.	
61	63							"	Grey siltstones, less chert.	
63	68							"	White to light grey siltstones, little or no chert.	
68	75							"	As above	
75	77							"	As above, brown-grey colour.	
77	82							"	As above, cream colour	
82	83							"	Yellowish siltstone.	
83	87							"	Cream-grey siltstones.	
87	88							"	Grey-brown siltstones.	
88	91							"	Cream-grey siltstones.	
91	93							"	Yellow-brown siltstones.	
93	94							"	Pale yellow siltstones.	
94	95							"	White siltstones.	
95	103							"	Light grey siltstones.	
103	106							"	Light grey siltstones.	
106	111							"	Cream-grey siltstones. 106'-108' with abundant chert fragments.	
111	115							"	Cream siltstone.s	

HOLE No.: LC-8 HOLE LOGGED BY: N. MURPHY PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~AXTURE~~ SHAPIRO	DESCRIPTION	DATE
115	117							"	Light yellow-gray siltstones.	
117	118							"	Yellow siltstones.	
118	138							"	Buff siltstones, with chert; limonitic.	
138	140 T.D.							"	Buff siltstone/shale with small rounded quartz pebbles.	
									Losing circulation from 116' downwards.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK No.1
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 90' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 90'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1008.5'
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 14.4.67
COMPLETED: 14.4.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Deep red, alluvium. Ferruginous qtz. grains, loosely consolidated, also large ferruginous pebbles.	14.4.67
	2							"	As above, only a higher % of large ferruginous grains and pebbles. Large grains well rounded.	
	3							"	As above; high % of large pebbles; some concretionary and paler in colour.	
	4							"	Red brown; very sandy material; a few rounded Fe pebbles.	
	5							"	As above	
	6							"	As above	
	7							"	As above; ferruginous sand; large pebbles rare or absent.	
	8							"	As above	
	9							"	As above, becoming pwodery. Sand very fine grained.	
	10							"	Yellow brown, becoming limonitic and silty, some gossanous sandy siltstone.	
	11							"	Yellow brown, siltstone ferruginous and limonitic. Sample still contains a high % of sand.	
	12							"	As above	
	13							"	As above	
	14							"	Grey brown, siltstone as above. Numerous chert nodules and fra Rare ironstone nodules.	

HOLE No.: SC-1 HOLE LOGGED BY: JOHN SIMPSON PAGE 2

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD CORE ~~ATTITUDE~~ SHAPTRO	DESCRIPTION	DATE
14	15							"	As above, mottled siltstone becoming common. Some siltstone very vughy and contain 2% mineralization.	
	16							"	As above, siltstone becoming very limonitic and rarely vughy. Chert frags. common.	
	17							"	Cream-white, limonitic and sil. siltstone and banded chert.	
	18							"	Creamy red (red due to Fe staining on some grains) fine grained siltstone and silty shale, limonitic in part and med. hard. Chert rare.	
	19							"	As above, only creamier in colour.	
	20							"	As above	
	21							"	Cream silty shale as above but containing many small ferruginous pebbles. Chert present but rare.	
	22							"	As above, some shale frags. Fe stained and limonitic. Chert becoming common.	
	23							"	As above, chert common.	
	24							"	As above, shale and siltstone hard and silicified. Chert dominant.	
	25							"	Cream; bedded hard sil. shale and chert.	
	26							"	Cream, both shale and siltstone common, chert banded in deep red and grey.	
	27							"	As above, siltstone limonitic in part	
	28							"	As above	
	29							"	As above	
	30							"	As above; shale softer and becoming silty. Chert common	
	31							"	As above; bedded hard sil. shale becoming common again	
	32							"	As above	
	33							"	As above	
	34							"	As above	
	35							"	Cream; med. hard sil. shales and silty shale, chert common but not dominent.	

HOLE No.: SC-1 HOLE LOGGED BY: JOHN SIMPSON PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~&~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
35	36							"	As above	
	37							"	As above	
	38							"	As above, yellowish tinge (limonitic) in the silty shale. Hard sil. shale rare.	
	39							"	Creamy-yellow; shales - soft, med. soft and limonitic. Chert common.	
	40							"	Chert rarer than above.	
	41							"	Cream yellow, soft silty shales, limonitic, rare chert	
	42							"	As above	
	43							"	As above	
	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	Colour as above, shales becoming harder and less limonitic, some having definite bedding; chert common.	
	48							"	As above	
	49		Phosphate					2	As above, shales limonitic in part.	
	50	4.6						5	As above, shales softer, ferruginous, clayey. Chert common.	
	51	4.6						5	As above, chert dominant.	
	52	5.5						3	Cream yellow, shales - soft, med. soft, ferruginous and limonitic. Chert (dark grey) common.	
	53	3.7						4	Yellow brown, limonitic siltstone and shale, very vughy in places; chert abundant.	
	54	3.6						3	As above	
	55	4.6						3	Light to med. brown, and light grey mottled silty shale with fossil frags. ?as inclusions. Chert common.	
	56	2.4						4	As above	
	57	3.0						5	As above	
	58	3.1						5	As above, but lighter brown in colour. Slightly ocherous shale and silty shale (vughy in places) Chert common. Drusy qtz. common in places.	

HOLE No.: SC-1 HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ATTITUDE SHAPIRO	DESCRIPTION	DATE
58	59	6.1						5	As above	
	60	13.2						8-10	As above	
	61	12.5						10	As above	
	62	15.3						8	As above	
	63	14.2						12	As above	
	64	10.2						10	As above	
	65	8.8						6	As above	
	66	7.3						7	As above	
	67	5.8						4	As above, but much more chert present.	
	68	4.6						2	Cream to light brown, silty shale, soft, friable rarely hard and sil. Chert abundant.	
	69	3.8						2	Mostly cream to light grey, powdery silty shale with slight silicification in places otherwise powdery with common to abundant amounts of chert frags.	
	70	3.6						2	As above	
	71	3.8						2	As above	
	72	4.2						2	As above	
	73	3.7						2	As above	
	74	4.8						2	As above	
	75	5.5						3	As above	
	76	4.2						3	As above	
	77	4.6						2	As above	
	78	3.6						2	As above	
	79	3.4						3	As above	
	80	2.4						2	As above	
	81							1	Light brown silty shale with med. hard fine grained carbonate frags. Chert abundant.	
	82							1	As above	
	83							>1	As above	
	84							>1	Contaminated samples of carbonate frags.	

HOLE No.: SC-1 HOLE LOGGED BY: JOHN SIMPSON PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE AXITUDE~~ SHAPIRO	DESCRIPTION	DATE
84	85							"	As above	
	86							<1	As above	
	87							"	As above	
	88							"	As above	
	89							"	As above	
	90 T.D.							"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA PTY. LTD.,
PROJECT: Undilla Basin Phosphate
HOLE No.: SC-2
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 157' t.d.

ROTARY DRILLING: **Depth from** 0' **to** 157'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1010.9' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 14.4.67
COMPLETED: 15.4.67
HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Medium brown, fine grained ferruginous qtz. grains unconsolidated sand, alluvium	14.4.67
	2							"	As above, with larger ironstone pebbles, some well rounded - alluvium	
	3							"	As above	
	4							"	As above	
	5							"	Yellow brown, sandy, but some siltstone. Abundant ironstone pebbles.	
	6							"	Yellow brown; limonitic and Mn ? clayey siltstone ironstone pebbles small and rare.	
	7							"	Pale buff, secondary carbonate common plus clayey limonitic siltstone as above.	
	8							"	Colour as above, little or no 2° $CaCO_3$ clayey siltstones and small quantity of sand present.	
	9							"	As above	
	10							"	As above, Mn? staining in parts.	
	11							"	As above, limonitic clayey siltstone mottled yellow, white & grey.	
	12							"	As above	
	13							"	As above	
	14							"	As above, ferruginous in part	
	15							"	As above	

HOLE No.: SC-2 HOLE LOGGED BY: J. SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ATTITUDE SHAPIRO	DESCRIPTION	DATE
15	16							"	Red brown ferruginous siltstone, small amounts mottled siltstone (soft).	
	17							"	As above	
	18							"	As above	
	19							"	As above	
	20							"	As above	
	21							"	As above	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	As above, some fragments contain grey sandy material & ferruginous qtz. grains.	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above, some fragments contain vugs of 2° material.	
	31							"	Pale red brown, siltstones becoming sandy in part; also grey fine grained sandstones, with smaller quantities of ferruginous grains.	
	32							"	Yellow-red brown, ferruginous siltstone grains coated with limonitic material (powdery).	
	33							"	Buff colour, limonitic vughy siltstone, little Fe(red) material	
	34							"	As above	
	35							"	As above, but containing some grey siltstone & trace chert(very dark grey)	
	36							"	As above	
	37							"	As above	
	38							"	As above	
	39							"	As above, plus small amount of sil. siltstone(med. hard & trace chert).	

HOLE No.: SC-2 HOLE LOGGED BY: J. SIMPSON PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
39	40							"	Buff colour, hard sil. siltstone & shale, high % dark grey chert.	
	41							"	Yellow-red, powdery siltstone (red, limonitic and hard siliceous) abundant chert.	
	42							"	As above, only mainly yellow colour, more chert less ferruginous material.	
	43	5.6	Phosphate					3	Medium grey, limonitic and ferruginous frags some Mn? staining and common chert.	
	44	3.3						3	Grey yellow, as above, heavy Mn? staining in parts. Also some pale grey clayey siltstone nodules and frags.	
	45	3.7						4	As above	
	46	2.5						3	Buff colour, limonitic siltstones and grey clayey siltstones, some chert.	
	47	5.0						4	As above, less chert	
	48	5.6						4	Creamy yellow, limonitic siltstones, mottled clayey siltstones and soft grey siltstones.	
	49	6.3						4	As above, rarely Manganiferous?	
	50	6.4						4	As above	
	51	3.4						3	As above only some sil. siltstone and trace chert.	
	52	3.4						3	As above, chert absent	
	53	5.6						3	As above	
	54	5.3						3	As above	
	55	5.0						4	As above, Mn? in part	
	56	5.0						5	As above	
	57	5.6						4	As above	
	58	5.6						4	As above	
	59	5.6						6	As above	
	60	5.6						6	As above	
	61	5.6						5	Cream yellow grey, siltstones (sandy in places) otherwise as above Mn? absent.	
	62	5.6						4	As above	

HOLE No.: SC-2 HOLE LOGGED BY: J. SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
62	63	5.3						6	As above	
	64	5.6						5	As above	
	65	5.6						5	As above	
	66	5.6						5	As above	
	67	7.2						6	As above	
	68	4.2						2	More yellowish in colour, limonitic and Mn?, trace chert, limonitic siltstone, vughy in places.	
	69	2.2						2	Med. grey ~~and~~ abundance of chert (dark grey) plus clayey siltstone (limonitic) and some ferruginous material in these fragments.	
	70	4.7						2	As above, chert becoming rare	
	71	4.7						4	As above, chert rare but present	
	72	4.7						3	Med. grey, dolomitic limestone(hard crystalline)dark grey to black) also kaolinitic and ferruginous frags,chert rare.	
	73	2.6						3	As above, only paler in colour.	
	74	3.6						3	As above, kaolinite and ferruginous material absent, limestone common, chert common,also hard sil.siltstone.	
	75	3.6						2	As above	
	76	3.0						3	As above	
	77	2.6						1	Med. grey, both dark and light coloured limestone, and rare siltstone.	
	78							1	Creamy yellow, pale limestone dominant,siltstone common.	
	79							1	As above	
	80							1-2	As above	
	81							1	As above, chert abundant	
	82							1-2	As above, chert and dark limestone abundant,pale limestone rare	
	83							1	As above, pale limestone becoming more common.	
	84							1	As above, pale $CaCO_3$ dominant.	
	85							1	As above	
	86							1	Buff colour, pale coloured limestone, limonitic siltstone common, chert present in small amounts (prob. cavings?)	

HOLE No.: SC-2 HOLE LOGGED BY: J. SIMPSON PAGE 5

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~OX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~X~~ SHAPIRO	DESCRIPTION	DATE
86	87	2.7						1	As above	
	88	6.0						3	As above, more yellow in colour	
	89							2	As above	
	90		Continued in redrilled hole					3	As above	
	91							1	Creamy yellow to yellow brown med.hard limonitic sil. siltstones and limonitic cherts. Chert very common. Also grey med.soft siltstone(limonitic and ferruginous in part). Chert nodules common. Rare dark and pale pink limestone (caving?)	
	92							1	As above	
	93							1	As above	
	94							1	As above	
	95							1	As above	
	96							1	As above	
	97							1	As above	
	98							1	As above	
	99							1	As above	
	100							1	As above	
	101							1	As above	
	102							1	As above	
	103							1	As above	
	104							1	Pale yellow grey, grey med. soft siltstone(less limonitic material) chert common, limestone(bituminous) fragments abundant (cavings?)	
	105							1-2	As above	
	106	3.0						1-2	As above	
	107							1-2	As above	
	108							1	As above	
	109							1	Cream, light grey med. hard sil. siltstones(limonitic in part) dark brown chert nodules common.	

HOLE No.: SC-2 HOLE LOGGED BY: J. SIMPSON PAGE 6

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~DH~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE AZIMUTH~~ SHAPIRO	DESCRIPTION	DATE
109	110							1	As above	
	111							1-2	As above	
	112							2-3	As above	
	113							1	As above	
	114							1-2	As above	
	115							1	As above	
	116							1	Cream colour dolomitic limestone(hard pale pink: Fizzes very slowly) also grey siltst.(sil. in part)plus common chert but rarer than above.	
	117							1	As above	
	118							1	As above	
	119							1	As above	
	120							1	As above	
	121							1	As above	
	122							1	Pale pink dolomitic slightly phosphatic limestone.	
	123							1	As above	
	124							1	As above	
	125							1	As above	
	126							<1	As above	
	127							"	As above	
	128							"	As above	
	129							"	As above	
	130							"	As above	
	131							"	As above	
	132							"	As above	
	133							"	As above	
	134							"	As above	
	135							"	As above	
	136							"	As above	
	137							"	As above	

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ANNULUS~~ = SHAPIRO	DESCRIPTION	DATE
137	138							"	As above	
	139							"	As above	
	140							"	As above	
	141							"	As above, some Fe qtz. grains present but rare.	
	142							"	As above	
	143							"	As above	
	144							"	As above	
	145							"	As above	
	146							"	As above	
	147							"	Colour change (more yellowish). As above. Dolomitic limestone Fe qtz. grs. becoming common. Colourless chert (chalcedony?) present. Small ferruginous qtz. grains throughout interval.	
	148							"	As above	
	149							"	As above	
	150							"	As above	
	151							"	As above	
	152							"	As above	
	153							"	As above	
	154							"	Creamy grey ; grey calcareous fine grained sandstone, plus dol. limestone, ferruginous grains and some limonitic material, contains numerous well rounded qtz. grains. 155' sample	
	155							"	As above	
	156							"	As above	
	157 T.D.							"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC-3
STATE: QUEENSLAND **COUNTY:**
PARISH: " **HOLDING:**
LAT. " **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 120' T.D.

ROTARY DRILLING: Depth from 0' to 120'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 1028.0' ELEVATION.
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 16.4.67
COMPLETED: 16.4.67
HOLE LOGGED BY: JOHN STMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE METHODS~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red brown, unconsolidated qtz.grains, very ferrugenous plus rounded ironstone pebbles. alluvium.	
	2							"	As above	
	3							"	As above	
	4							"	As above	
	5							"	As above, no iron pebbles, loose sand, trace siltstone and trace secondary carbonate.	
	6							"	As above	
	7							"	As above	
	8							"	As above	
	9							"	As above	
	10							"	As above	
	11							"	Ferruginous siltstone; carbonate rare but present.	
	12							"	As above	
	13							"	As above	
	14							"	Pale grey, ferruginous siltstone (slightly limonitic)	
	15							"	As above	
	16							"	As above	
	17							"	As above	

HOLE No.: SC-3 HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXX~~= SHAPIRO	DESCRIPTION	DATE
17	18							"	Pink-white fine grained sandstones and silts, all loosely consolidated siltstone ferruginous in places (med. soft sandstone, contains loose grains.	
	19							"	As above	
	20							"	As above	
	21							"	As above	
	22							"	As above	
	23							"	As above, but deeper yellow orange (limonitic)	
	24							"	As above	
	25							"	As above, but medium grey	
	26							"	As above	
	27							"	As above	
	28							"	As above, but limonitic (yellow)	
	29							"	As above	
	30							"	Light grey, sand and silt, loose, powdery	
	31							"	As above	
	32							"	As above	
	33							"	As above	
	34							"	As above	
	35							"	Pale red orange sand and silt.	
	36							"	As above	
	37							"	As above	
	38							"	As above	
	39							"	As above	
	40							"	As above	
41	120 T.D.							"	Cream to light grey fine sand and silt. very powdery, containing well rounded quartz grains. Some beds have yellowish tinge due to limonitic material.	
									No P_2O_5 shows in hole. Hole not deep enough.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK NO.4 AND SHERRIN CREEK 4-X
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 131'2" T.D.

ROTARY DRILLING: **Depth from** 0' **to** 131'2"
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1026.9" ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 17.4.67
COMPLETED: 9.6.67
HOLE LOGGED BY: J. SIMPSON & R. GRASSO & N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							1	Red brown alluvium quartzose ferruginous, loosly consolidated.	17.4.67
	2							"	As above	
	3							"	As above	
	4							"	As above	
	5							"	As above	
	6							"	As above	
	7							"	Brown grey, ferruginous siltstone and fine grained sandstone. Some kunkar (secondary $CaCO_3$)	
	8							"	As above	
	9							"	As above	
	10							"	As above	
	11							"	As above	
	12							"	White, mauve, light grey sandstones fine to med. grained.	
	13							"	As above	
	14							"	As above	
	15							"	As above	
	16							"	As above	
	17							"	As above	

HOLE No.: SC-4 HOLE LOGGED BY: JOHN SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ATTITUDE ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
29	48		REDRILLED HOLE					<1	Poorly sorted white silty sand, limonitic, with some haematite grains, rounded and angular quartz pebbles common.	23.4.67
49	54							"	As above, with abundant rounded quartz pebbles	
	55							"	Buff sandy silt, with haematite and quartz.	
55	62							"	Creamy silt with rounded and angular quartz pebbles.	
63	65							"	As above, with chert interbeds and some very large quartz pebbles in addition to the ones above.	
	66							"	Yellow, limonitic clayey siltstone	
	67							"	~~Creamy clayey siltstone~~	
	68							"	Yellowish silt with chert fragments and rounded quartz.	
69	80							"	Grey-to-white grit, poorly sorted, large quartz and chert pebbles; some interbedded chert.	
81	82							"	Creamy, slighly limonitic sandy siltstone, with smaller quartz and chert pebbles than above	
83	86							"	Grey-to-white gritty ? siltstone with qtz. and chert pebbles. ~~Some interbedded brown chert in 85'-86' samples.~~	
87	94							"	Whitish gritty silt as above, with interbedded brown chert. less qtz. pebbles below 87'.	
	95							"	As above	
	96		Phosphate					"	As above	
	97	1.1						3	Yellow, limonitic siltstone with interbedded brown chert.	
	98	5.8						7	As above, cream colours, with occasional qtz. pebbles and some haematite.	
	99	16.0						12	As above	
	100	26.5						20+	As above	
	101	20.9						20	As above	
	102	26.0						20+	As above	
	103	20.7						20	As above	
	104	14.1						13	As above	
	105	17.0						15	As above	

HOLE No.: SC-4 HOLE LOGGED BY: JOHN SIMPSON AND NEIL MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~XRT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~XRDE~~ ~~ATTITUDE~~ XXXXXX SHAPIRO	DESCRIPTION	DATE
					Acid soluble					
105	106	15.7			Fe_2O_3 Al_2O_3	CaO CO_2		20	Brown-to-buff siltstone with chert.	
	107	20.4						20	As above	
	108	18.5						17	Light brown sandy silt, with clear qtz. grains and haematite.	
	109	16.5						20	As above	
	110	9.3						12	As above	
	111	7.5						9	As above	
	112	8.5						8	As above	
	113	10.0						10	As above	
	114	7.0						10	As above	
	115	6.0						6	As above	
	116	8.5						10	As above	
	117	5.8						9	As above	
	118	4.1						6	As above	
	119	2.7						4	As above	
	120							6	As above	
									Circulation poor in last 10' or so. Drilling stopped in phosphatic zone.	
114	120	4.3	1' 0"	CORING (R. GRASSO)					Top 3" light brown to khaki-brown clayey and sandy silt. Next 6" light brown, medium hard, phosphatic limestone. Bottom 3" light-brown-grey soft, friable silty and clayey sandstone. Grinds to silty sand.	29.5.67
				NEW HOLE SC-4						
0	101			OPEN HOLE						
101	103	0.45 / 19.2	0' 8 1/4" / 10052 4"		0.81	1.5 27.3 0.64			Top 4" chert fragments. Bottom 4" grey sandy silt.	
103	105 4	8.4	1' 4"						Top 9" chert gragments. Next 5" medium grey sandy and clayey silt. Bottom 2" Med. grey sandy silt and chert.	
105 4	108 3	2.2	0'3"						Chert and semi-friable and semi-hard sandy limestone. Slightly phosphatic.	
108 3	110 9	3.0	0 10"						Mostly light cream to white friable sandy silt. Top Top part of core contains chert.	31/5/67

DRILLED DEPTH From feet	ins.	To feet	ins.	BIT	CORE RECOVERED feet	ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	ins.	To feet	ins.	No.	Field ~~CORE ATTITUDE~~ Shapiro	DESCRIPTION	DATE
110	9	112	11	1.75	9"									Mostly light grey poorly sorted sands, silts and pebbles.	
112	11	118	0	1.5	2"		(Three runs)							Mostly chert and fine sandy silt.	
								SHERRIN CREEK NO.4X (R. GRASSO)							
0		2											<1	Red-brown ferruginous sand and soil.	7.6.67
2		3											"	As above; but also "buck-shot" gravel.	
3		5											"	Red-brown sands.	
5		6											"	Red-brown, soft to medium soft poorly sorted ferruginous argillaceous and silty sandstone. Composed of poorly sorted subrounded quartz sand and silt grains in a red-brown matrix.	
6		12											"	Mostly mottle cream, light grey and red-brown medium soft ferruginous argillaceous and silty sandstone. Composed of poorly sorted quartz grains in a clayey and silty matrix.	
12		17											"	Light grey, cream and light brown, medium soft sandy and argillaceous siltstone - grades to a fine sandstone.	
17		21											"	Cream to light brown and light grey medium soft, semi friable clayey and silty, fine grained sandstone.	
21		26											"	Mostly light grey with minor "ferruginous" red-brown, medium soft, semi friable, silty and clayey medium grained sandstone. Approaching a siltstone in places.	
26		31											"	Mostly light grey, medium soft semi friable sandy and clayey siltstone approaching a very fine clayey and silty sandstone.	
31		35											"	Light grey siltstone-sandstone as above, but with trace of pebbles up to half-an-inch diameter.	
35		65												Mostly light grey to cream argillaceous sandstone. Friable, very pebbly in places, with pebbles up to ¼" diameter.	

HOLE No.: SC-4 and SC-4X

HOLE LOGGED BY: J:SIMPSON,N.MURPHY & R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT AMDEL SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
65	80							"	Mostly light grey and cream, soft, friable, fine grained sandstone with trace of pebble size grains.	
80	83							"	Light grey, soft, friable, fine grained silty and argillaceous sandstone with trace of pebble size grains.	
83	87			Chert Pebbles				"	Mostly light grey to cream, poorly sorted sand, pebble and gravel. Composed of quartz and chert sand, and pebbles up to 1" diameter. (Chert fragments often have some rounded sides).	
87	97							"	Cream to light grey, medium soft to medium hard silty shale. Abundant chert fragments and quartz grains and pebbles. (some cavings)	
97	98							1-2	As above	
98	98 4							1	As above	
98 4	99 4	0.6	0' 6"					1	Top 5" - Mostly brown (minor grey) chert fragments and chert and quartzite pebbles up to 1" diameter. Bottom 1" light grey, well bedded medium hard argillaceous siltstone. Very slighly partly silicified in places.	
				CORING BY SPECIAL HAMMER CORING BARREL						
99 4	100 4	0.6	1' 0"	(about half could be cavings)				3	Top 4" - Chert fragments and cream pulverised clayey siltstone. Middle 6" Mostly chert fragments and light grey and minor cream, partly silicified siltstone fragments. Bottom 2" Mostly chert and partly silicified light grey siltstone.	
100 4	101 4	1.2	1' 0"				Missed sample		Top 4" Mostly clayey pulverised siltstone and chert fragments compacted and "cemented" by the little water which was used during coring. Bottom 8" Mostly interbedded brown chert lenses and partly silicified light grey to cream argillaceous siltstone.	8/6/67
101 4	102 4	5.8	10"	Also collected 2" of ? cavings				4	Top 2" Cavings. Bottom 10" mostly light grey argillaceous partly silicified siltstone (hard in places) also brown chert lens up to half an inch thick.	

HOLE No.: SC-4 and SC-4X

HOLE LOGGED BY: J. SIMPSON, N. MURPHY & R. GRASSO

DRILLED DEPTH From feet	ins.	To feet	ins.	BIT	CORE RECOVERED feet	ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	ins.	To feet	ins.	No.	FIELD SHAPIRO	DESCRIPTION	DATE
								Acid soluble Fe_2O_3	Al_2O_3	CaO	CO_2				
102	4	104	1	4.1	1'	9"							16	Top 9" Brown chert fragments and pulverised light grey to cream siltstone, compacted and "cemented" with water. Next ½" Light brown, medium hard pelletal phosphorite with minor green ? variscite coatings. Next 9½" Interbedded brown banded chert and light grey medium hard partly silicified siltstone. Bottom 2" Mostly light grey, medium hard to medium soft sandy and argillaceous siltstone with phosphorite pellets and fossil cast.	
104	1	105	10	9.1	1'	2"							18	Top 3" Mostly brown chert and minor hard light brown ~~pelletal phosphorite and also~~ light grey, medium hard to hard partly silicified sandy siltstone. Bottom 11" Mostly chert and light brown argillaceous siltstone (much ? cavings) with trace pelletal phosphorite (brown).	
105	10	107	2	16.0	1'	4"	10078	0.93	2.45	23.2	0.61		25	Top 8" Mostly light grey very friable silty sandstone. Also chert fragments (? partly cavings). Bottom 8" Light grey, soft friable silty and argillaceous sandstone.	
107	2	108	6	12.7	1'	4"	10079	0.91	1.9	18.1	0.47		25	Top 7" Light grey to cream very friable silty and argillaceous sandstone and chert fragments compacted with the water used during coring (? partly cavings). Next 7" Light grey to cream, soft friable silty sandstone as above, and brown and light grey chert fragments. Bottom 2" Grey chert (massive)	
108	6	110	8	5.3	1'	3"							25	Top 4" Mostly chert fragments. Next 5" Pulverised, light grey to cream sandy siltstone and chert fragments. Next 4" Grey and brown chert fragments. Bottom 2" Cream, soft sandy siltstone and chert fragments.	

HOLE No.: SC-4 and SC-4X

HOLE LOGGED BY: J. SIMPSON, N. MURPHY & R. GRASSO

DRILLED DEPTH From feet	ins.	To feet	ins.	BIT	CORE RECOVERED feet	ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	ins.	To feet	ins.	No.	FIELD CORE ATTITUDE SHAPIRO	DESCRIPTION	DATE
110	8	112	0	13.3	1'	3"		(good core)					20-25	Top 3" Mainly chert fragments with minor cream to light grey sandy siltstone. Next 6" Mottled cream and light brown soft, friable sandy and clayey siltstone. Abundant chert (? from above). ~~Next 4" As above; but brown colour is darker;~~ (almost tobacco-brown). Also mottlings of light grey to cream siltstone. Chert common. Bottom 2" Mostly light grey soft, friable silty and argillaceous sandstone. Abundant grey chert fragments.	
							→ 10081	Acid soluble Fe_2O_3	Al_2O_3	CaO	CO_2				
								1.75	2.85	19.6	0.58				
112	0	113	0				Adjustment in Depths Driller and measured depth.								
														No samples	9/6/67
113	0	115	0	4.5	0'	5"							10-15	Top 4" Mostly khaki silty sand and chert fragments. Bottom 1" Grey chert.	
115	2	117	0	2.0	1'	0"							6	Top 2" Grey chert. Next 6" Mostly chert fragments and khaki silty and argillaceous sands, compacted and slightly wet from the small amounts of water used in coring. Next 2" Mostly grey chert (larger fragments than above). Bottom 2" Khaki and brown silty and argillaceous friable sandstone. The brown is less friable and more limonitic.	
117	0	118	8	1.9	0	7½"							5	Top 3" Mostly chert fragments and silty and clayey khaki sand. (the sand coats the chert frags. - gets stuck to the chert with the water). Next 3" Mostly brown and grey chert (larger fragments). Bottom 1½" Cream soft very friable silty and clayey sandstone.	
118	8	120	3	1.95	1	2"	Could be considerable ? cavings						5	Most of core is a mixture of chert fragments and cream to light brown (khaki-brown) silty and clayey sand ground from a very friable sandstone. The bottom ½" is a friable sandstone.	
120	3	125	6	1.65	2	2"	Retractor barrel used						5	Mostly cream, soft, friable limestone (? dolomitic calcarenite) with a ½" chert lens near the top of the core.	

HOLE No.: SC4 & SC-4X

HOLE LOGGED BY: j. simpson, N. Murphy & R. Grasso

DRILLED DEPTH From feet	DRILLED DEPTH From ins.	DRILLED DEPTH To feet	DRILLED DEPTH To ins.	BIT	CORE RECOVERED feet	CORE RECOVERED ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	SAMPLED INTERVAL From ins.	SAMPLED INTERVAL To feet	SAMPLED INTERVAL To ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
125	6	128	6	1·4	2	0							2-3	Top 1'10" Mostly cream to medium brown and tobacco brown, soft uncolsolidated calcareous and limonitic sandy silt. Bottom 2" Light grey clayey and CALCAREOUS SILT.	
128	6	131	2	T.D. 1·6	1	6							2-3	Top 5" Cream, soft friable ? dolomitic calcarenite. Next 4" Tobacco brown calcarenite. Composedof finely divided, soft cyrstals of carbonate probably weathered carbonate rock. Next 8" Light grey, cream and brown soft silty calcarenite. Limonitic in places. Bottom 1" Brown, hard to medium hard crystalline limestone. Vughy in minor places.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC-5
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 80' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 80'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1038.7' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 16.4.67
COMPLETED: 3.5.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Medium to dark brown, clayey and sandy soil	16.4.67
	2							"	As above	
	3							"	As above	
	4							"	As above	
	5							"	Orange brown sand, fine grained rounded sand grains	
	6							"	As above	
	7							"	As above	
	8							"	As above	
	9							"	As above	
	10							"	As above	
	11							"	As above	
	12							"	As above	
	13							"	As above	
	14							"	As above	
	15							"	As above	
	16							"	As above	
	17							"	As above	
	18							"	As above	
	19							"	As above	
	20							"	Light grey, reddish tinge, med. hard sandstone	

HOLE No.: SC-5 **HOLE LOGGED BY:** J. SIMPSON **PAGE** 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
20	21							"	As above	
	22		On this first hole a twist off occurred at 25'. Another hole was drilled within 10' of this hole.					"	As above	
	23							"	As above	
	24							"	As above	
	25							"	Orange red to grey, hard sil. sandstone(ferruginous), some billy and chert, billy grey; chert limonitic; sandstone orange colour as above, sandstone becoming coarser grained to pebble sized, chert rare, qtz. common.	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above	
	31							"	As above	
	32							"	Pale grey, med.hard siltstone and hard sandstone, grains sometimes pebble sized, well rounded and clear. Tertiary sand infil? Siltstone rarely ferruginous and limonitic in part, rare chert (but present)	
	32							"	As above	
	33							"	As above	
	34							"	As above	
	35							"	As above	
	36							"	As above	
	37							"	As above	
	38							"	As above	
	39							"	As above	
	40							"	As above	
	41							"	As above	
	42							"	As above	
	43							"	As above	

HOLE No.: SC-5 HOLE LOGGED BY: JOHN SIMPSON PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO"	DESCRIPTION	DATE
43	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51							"	As above	
	52							"	As above	
	53							"	As above	
	54							"	As above	
	55							"	As above	
	56							"	Grey sand, fine grained, clean, sub-rounded, loose, unconsolidated beach sand ? 100% fine to med grained SAND	
56	65							"	As above	
65	80 T.D.							"	As above, but wet	
									Hole caved badly at 80', and had to be abandoned.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC-5A
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:** 2½M South of 5
INCLINATION:
TOTAL DEPTH: 80' TD.

ROTARY DRILLING: **Depth from** 0' **to** 80'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1058.4' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 5.5.67
COMPLETED: 5.5.67
HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red brown alluvium; ferruginous qtz. sand, loose unconsolidated very silty, plus abundant chert pebbles.	
	2							"	Yellow brown, gossanous siltstone, soft with numerous qtz. grains embedded in the siltstone matrix, plus pebbles and frags; light grey quartzite and chert and rare red brown chert.	
	3							"	As above	
	4							"	As above	
	5							"	Yellow brown, sandy siltstone as above, with abundant chert (grey) and ironstone pebbles; siltstone very limonitic	
	6							"	Colour as above only lighter, limonitic and ferruginous sandy siltstone, fairly loose; abundant quartzite and chert	
	7							"	As above	
	8							"	As above	
	9							"	Yellow grey, billy, plus siltstone as above, grey chert almost dominant.	
	10							"	Yellow orange, loose limonitic and ferruginous silt. rare qtz. grains, some hard billy; abundant quartzite & chert.	
	11							"	As above	
	12							"	As above	

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HOLE No.: SC-5A HOLE LOGGED BY: J. SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE APPROX~~ SHAPIRO	DESCRIPTION	DATE
12	13							"	Grey with orange tinge, med.soft limonitic and ferruginous siltstone and hard ferruginous siltstone, abundant grey chert.	
	14							"	Colour grey-orange but paler than above, more limonitic siltstone as above, but less chert	
	15							"	As above	
	16							"	Sand; colour - yellow grey with occasional orange tinge; loose, unconsolidated, sand qtz. grains, med.to coarse, ferruginous in part, well round; comparable to Tertiary infil? in previous holes ? Chert always present, but never abundant.	
	17							"	As above	
	18							"	As above	
	19							"	As above	
	20							"	As above	
	21							"	As above	
	22							"	Yellow grey, limonitic and ferruginous, very fine grained (silty) sandstone with sparse larger qtz. grains, chert abundant.	
	23							"	Grey; grey chert almost TOTAL SAMPLE, limonitic and Fe silty sandstone, some hard light grey sil.siltstone.	
	24							"	As above, the med. hard sil.siltstone becoming dominant. Chert again almost all of the sample.	
	25		Slightly phosphatic					"	As above	
	26							"	As above	
	27							"	As above	
	28		Some samples show slight colour when large amounts of chips are treated.					"	As above, chert dominant, hard sil.siltstone limonitic in places. In 28' sample large well rounded qtz. pebbles are common.	
	29							"	As above	

HOLE No.: SC-5A HOLE LOGGED BY: J.SIMPSON PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXXXX~~ ATTITUDE SHAPIRO	DESCRIPTION	DATE
29	30							"	As above	
	31							"	As above	
	32							"	As above	
	33							"	As above	
	34							"	Pale grey brown, chert still common but far less abundant than before; mainly soft kaolinitic siltstone (pale grey)	
	35							"	Pale grey, med.hard sil. siltstone with abundant chert.	
	36							"	As above	
	37							"	Yellow orange, loose sandy siltstone with some medium grains of qtz. Abundant hard sil.siltstone and chert.	
	38							"	Bluish grey, blue due to blue grey chert, abundant hd.sil.siltstone	
	39							"	As above	
	40							"	As above	
	41							"	Med.grey with pale yellow tinge, soft highly limonitic siltstones (almost a claystone) plus hard sil.siltstone and abundant grey chert.	
	42			Phosphate good colour				3	As above	
	43	15.6					WET	15	As above	
	44	13.4					"	10	Yellow grey, med.soft lim. & Fe siltstone (wet) plus abund.chert.	
	45	3.0					"	5	Powdery mauve grey, limonitic siltstone as above. Chert common but not abundant.	
	46	0.9					"	1	Yellow, med.soft limonitic siltstone. Chert rare.	
	47	0.5					"	<1	Red brown, med.soft siltstone as above, only highly ferruginous. Chert rare.	
	48						"	"	Mustard colour, loose silt and soft siltstone, highly ferruginous and limonitic	
	49	0.2					"	"	Yellow to bright mustard colour, loose, friable, wet sandy siltstone, med.grained qtz. grains? Chert absent. Powdery sample.	

HOLE No.: SC-5A HOLE LOGGED BY: J. SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE X~~ ATTITUDE SHAPIRO	DESCRIPTION	DATE
49	50						WET	"	As above, only more consolidated and limonitic siltstone abund.	
	51						"	"	As above, limonitic mottled (yellow & white)siltstone.	
	52						"	"	Deep grey-brown, soft highly limonitic gossanous siltstone, and chert rare	
	53						"	"	Mustard Colour, as above, only loose and sandy & highly limonitic	
	54						"	"	Pale grey-brown, loose SAND med.grains(rare coarse) clean, (caving,) wet.	
	55							"	As above	
	56							"	As above	
	57	0.6	Good colour again					"	As above	
	58							"	As above	
	59							"	As above	
	60							"	Yellow, limonitic siltstone (powdery)	
	61							"	Yellowish brown to mauve, med. hard shale, limonitic in places, also richly coloured mauve in places. Chert common but not abundant.	
	62							"	As above	
	63							"	As above	
	64							"	As above	
	65							"	As above	
	66							"	As above	
	67							"	Pale yellow, med.hard sil.silty shale, homogenously limonitic, common chert.	
	68							"	Hard mauve red, banded chert	
	69							"	As above	
	70							"	Pale grey yellow, med. soft shaly limonitic siltstone, bedding present (silty shale)	
	71							"	As above	
	72							"	Deep grey-brown, earthy, wet siltstone rarely limonitic, plus some harder sil. siltstone. No chert.	

HOLE No.: SC-5A HOLE LOGGED BY: J. SIMPSON PAGE 5

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
72	73							"	Red brown, hard banded chert	
	74							"	As above	
	75							"	Mauve, hard mauve shales and shaly siltstones, beginning rich purple at 80' Proterozoic??	
	76							"	As above	
	77							"	As above	
	78							"	As above	
	79							"	As above	
	80 T.D.							"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK 5B
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 159' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 159'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1047.6' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 6.5.67
COMPLETED: 7.5.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE ASSAYS~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Dark brown, earthy, clayey, bentonitic?, (clay pan), siltstone with some quartz grains (rare)	6.5.67
	2							"	As above	
	3							"	As above	
	4							"	Pale yellow grey, mainly limonitic siltstone with some medium sized quartz grains. Abundant clear white crystalline mineral probably gypsum, also numerous small buckshot sized limonitic and ferruginous concretions, very abundant in 20' sample.	
	5							"	As above	
	6							"	As above	
	7							"	As above	
	8							"	As above	
	9							"	As above	
	10							"	As above	
	11							"	As above	
	12							"	As above	
	13							"	As above	
	14							"	As above	
	15							"	As above	

HOLE No.: sc-5B HOLE LOGGED BY: J. SIMPSON PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
15	16							"	As above	
	17							"	As above	
	18							"	As above	
	19							"	As above	
	20							"	Abundant small concretions (see above)	
	21							"	Pale yellow brown, sandy limonitic and ferruginous siltstone (mottled) also containing few coarse quartz grains; rare concretionary pebbles.	
	22							"	As above	
	23							"	As above	
	24							"	Red brown, highly ferruginous and limonitic sandy siltstone; also pale grey med. soft siltstone.	
	25							"	As above	
	26							"	As above	
	27							"	As above	
	28							"	Greyey orange, as above only containing less ferruginous material.	
	29							"	Yellow brown, mottled limonitic (rarely ferruginous) siltstone containing very coarse quartz grains.	
	30							"	As above	
	31							"	Colour as above, siltstone as above, but containing hard billy (pale yellow) and common grey brown chert.	
	32							"	As above, less limonitic and therefore paler than above	
	33							"	Pale yellow grey, hard sandy limonitic siltstone. Chert rare.	
	34							"	Pale yellow grey, medium soft limonitic siltstone with loose coarse grains of quartz. Quartz angular to sub-rounded (med. grain angular; coarse grain sub-rounded)	
	35							"	As above	
	36							"	As above	

HOLE No.: SC-5B HOLE LOGGED BY: JOHN SIMPSON PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
36	37							"	As above	
	38							"	As above	
	39							"	As above, but yellow due to higher limonite.	
	40							"	Mainly pale grey, becoming much more powdery than above, loose, unconsolidated siltstone (or very fine grained sand), but always containing sub-rounded coarse quartz grains.	
	41							"	As above	
	42							"	As above	
	43							"	As above	
	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51							"	As above	
	52							"	As above	
	53							"	As above	
	54							"	As above	
	55							"	As above	
	56							"	As above	
	57							"	As above	
	58							"	As above	
	59							"	As above	
	60							"	As above, also contains some well rounded very coarse (pebbles) quartz.	
	61							"	Pale grey; dominantly pale grey siltstone, streaky limonitic, plus common hard sil.siltstone & abundant coarse ~~grained quartz grains.~~	

HOLE No.: SC-5B HOLE LOGGED BY: j. simpson PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ASTHURE~~ SHAPIRO	DESCRIPTION	DATE
61	62							"	Pale grey, med. soft limonitic siltstone (mottled) rare brown chert, quartz grains becoming rare.	
	63							"	As above	
	64							"	As above	
	65							"	Pale grey as above, but main constituent rare med. hard sil. siltstone (non limonitic) some med. quarts grains, and common chert.	
	66							"	As above, sil. siltstone but more abundant brown sharp frags. chert (yellow brown)	
	67							"	Pale grey siltstone becoming softer and less siliceous. Chert abundant but not as much as in 66' sample. Siltstone very sandy.	
	68							"	As above	
	69							"	As above	
	70							"	Pale freckled grey, mainly med. soft sandy siltstone, limonitic in places; also some sil. siltstone. Abundant mauve and grey chert and well rounded pebbles of opaline material.	
	71				phosphate			"	Pale grey siltstone as above, only sample contains more sharp frags of brown chert. Siltstones limonitic and moist becoming plastic.	
	72	5.3						3	As above	
	73	5.3						3	Main phosphatic zone. Pale grey, siltstone, med. hard, sil. inplaces but usually med. hard and sandy. Sand grains held in a matrix of siltstone. Some limonitic soft siltstone (plastic when wet). Chert common to abundant but never dominant (brown to mauve grey). Some coarse quartz grains.	
	74	21.2						15	As above	
	75	14.8						15	As above	

HOLE No.: SC-5B HOLE LOGGED BY: J. SIMPSON PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
75	76	13.7						14	As above	
	77	7.2						6	As above	
	78	5.3						3	As above	
	79	4.9						3	As above	
	80	8.0						10	As above	
	81	8.9						10	As above	
	82	7.8						8	As above	
	83	3.5						4	As above	
	84	5.0						5	As above	
	85	4.9						5	As above	
	86	7.3						9	As above	
	87	8.2						9	As above	
	88	10.4						11	As above	
	89	10.0						10	As above	
	90	3.0						4	Pale yellow, limonitic ? fine grained sand; loose, unconsolidated(silty in places) moist grains angular to sub-angular. Abundant grey chert.	
	91	3.9						4	As above	
	92	5.0						5	Pale grey with yellowish tinge (less limonitic and much finer grained than above, actually a siltstone; loose and friable. Chert present but rare.	
	93	3.6						4	As above	
	94	1.7						3	Pale grey, loose, unconsolidated sand (fine grained) some limonitic consolidated siltstone; chert rare. Also some coarse grains of quartz.	
	95	2.7						3	As above	
	96	2.3						2	As above	
	97	2.6						4	As above, more yellow in colour (more limonitic material)	
	98	2.5						2	Pale grey yellowish tinge, mainly limonitic very fine grained sandstone and siltstone. Chert common but not abundant.	

HOLE No.: SC-5B HOLE LOGGED BY: J. SIMPSON PAGE 6

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MIX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ARTIFACT~~ SHAPIRO	DESCRIPTION	DATE
98	99	2.0						3	As above	
	100	1.8						2	As above	
	101	2.5						3	As above	
	102	2.2						2	As above	
	103	2.0						3	Some soft siltstone as above but first signs of calcareous siltstone (phosphatic). Chert still present but rare.	
	104	1.5						2	As above	
	105	2.6						3	As above	
	106	1.2						2	As above	
	107	1.2						2	Large frags calcareous siltstone, med. hard (slow drilling)	
	108	1.3						2	As above	
	109							2	As above	
	110							2	As above	
	111							3	Cavity 6" (small sample) chert virtually absent.	
	112							2	As above	
	113	1.4						2	Samples becoming very powdery	
	114							2	As above	
	115							2	As above	
	116							1-2	Pale cream grey = sometimes orange tinge. Quartzose carbonate material.	7/5/67
	117							1	As above	
	118							"	As above	
	119							"	As above	
	120							"	As above	
	121							"	As above	
	122							"	As above	
	123							"	As above	
	124							"	As above	
	125							"	Samples becomeing more powdery.	

HOLE No.: SC-5B HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
125	126							"	Cavity 6"	
	127							"	Calcareous material becoming harder	
	128							"	As above	
	129		Shapiros begin dropping off but carbonate					"	As above	
	130		still phosphatic.					"	As above	
	131							"	As above	
	132							"	As above	
	133							1	As above	
	134							1	As above	
	135							1	As above	
	136							<1	As above	
	137							"	As above	
137	150							"	As above	
	151							"	As above	
	152							"	Calcareous siltstone.	
	153							"	Very quartzose (caving ?)	
	154							"	Grains of quartz angular	
	155		2" cavity lost circulation completely					"	(see core)	
	156							"	"	
	157 Began coring							"	Core No. 1 SC-5B 4 bags each 6"	
	158							"	As above	
	159 T.D.		Recovered 100% core					"		

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC-6
STATE: QUEENSLAND COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION:
TOTAL DEPTH: 180'

ROTARY DRILLING: Depth from 0' to 88'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 1041'6"
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 5.5.67
COMPLETED: 5.5.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	CORE ATTITUDE	DESCRIPTION	DATE
0	1							<1	Red brown, ferruginous qtz. grains.	5.5.67
								"	Loose, unconsolidated; grains well rounded	
	2							"	As above	
	3							"	As above	
	4							"	As above	
	5							"	As above	
	6							"	As above	
	7							"	As above	
	8							"	As above	
	9							"	As above	
	10							"	As above	
	11							"	As above	
	12							"	As above	
	13							"	Pale grey, fine grained slightly limonitic and ferruginous sandstone becoming coarse at 21 feet	
	14							"	As above	
	15							"	As above	
	16							"	As above	
	17							"	As above	

HOLE No.: SC-6 HOLE LOGGED BY: JOHN SIMPSON PAGE 2

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD XXXX XXXXXX SHAPIRO	DESCRIPTION	DATE
17	18							<1	Reddish grey (grey with red tinge) fine grained sandstone with abundant coarse qtz. grains.	5.5.67
	19							"	As above	
	20							"	As above	
	21							"	As above	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	As above	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above	
	31							"	Light grey, fine grained sandstone. Many coarse grains but fewer than above.	
	32							"	As above	
	33							"	As above	
	34							"	As above	
40	41		Redrilled hole					"	Cream grey with orange tinge, sandstone; med. to coarse grains sand, ferruginous in part giving rise to orange colour. Clean loose sand grains well rounded to sub-rounded.	
	42							"	As above	
	43							"	As above	
	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	As above	

HOLE No.: SC-6 HOLE LOGGED BY: JOHN SIMPSON PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~XXXX~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
48			49					< 1	As above	5.5.69
			50					"	As above	
			51					"	As above	
			52					"	As above	
			53					"	As above	
			54					"	Orange colour as above only becoming much coarser -	
									even pebble sized qtz. well rounded; also rounded	
									chert (grey) pebbles and frags.	
			55					"	As above	
			56					"	As above	
			57					"	Grey yellow, as above only containing large frags.	
									of hard sil. siltstone. Chert still common	
			58					"	As above	
			59					"	As above	
			60					"	Light grey, sandstone, loose unconsolidated grains,	
									med. grained; rarely coarse or very coarse. Sub-	
									angular (less rounded than above) also abundant	
									frags hard sil siltstone and sharp hard chert	
									(frags very splintery) particularly abundant in	
									lower hole	
			61					"	As above	
			62					"	As above	
			63					"	As above	
			64					"	As above	
			65					"	As above	
			66					"	As above	
			67					"	As above	
			68					"	As above	
			69					"	As above	
			70					"	As above	

HOLE No.: SC-6 HOLE LOGGED BY: JOHN SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BH~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
70	71							< 1	As above	5.5.67
	72							"	As above	
	73							"	As above	
	74							"	As above	
	75							"	As above	
	76							"	As above	
	77							"	As above	
	78							"	As above	
	79							"	As above	
	80							"	As above only becoming brown and grey colour	
	81							"	As above	
	82							"	As above	
	83							"	As above	
	84							"	As above	
	85							"	As above	
	86	.8	Phosphate					1	Phosphate high in powder	
	87	1.5						2	Hole caving badly, high sand contamination	
	88	1.9	T.D.					3	Hole perhaps not deep enough for good P_2O_5 Section	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC-7
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 170' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 170'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1057.9'
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 4.5.67
COMPLETED: 4.5.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red brown ironstone pebbles + ferruginous qtz. grains (medium to coarse) gossanous and limonitic	4.5.67
	2							"	Red brown, sandy siltstone, med. to coarse grains of sand, very limonitic and ferruginous. Med. soft, unconsolidated	
	3							"	As above	
	4							"	As above	
	5							"	As above	
	6							"	Red brown, mainly sandy siltstone, very ferruginous and limonitic, loose unconsolidated; trace grey siltstone? alluvium??	
	7							"	As above	
	8							"	As above	
	9							"	As above	
	10							"	As above	
	11							"	As above	
	12							"	As above	
	13							"	As above	
	14							"	As above	
	15							"	As above	

HOLE No.: SC-7 HOLE LOGGED BY: JOHN SIMPSON PAGE 2

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
15	16							"	As above	
	17							"	As above	
	18							"	As above	
	19							"	As above	
	20							"	As above	
	21							"	Orange brown, silty sandstone (ferruginous) med. to coarse grs. sand embedded in siltstone matrix, higher % of limonite and grey siltstone than above. Rarely jointed.	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	As above	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above	
	31							"	As above	
	32							"	As above	
	33							"	Yellow, limonitic and ferruginous siltstone (mottled) siltstone med. soft, unconsolidated. Some fine grained qtz. grains in the siltstone.	
	34							"	As above	
	35							"	Yellow grey, hard sil. siltstone and yellow grey billy, plus some soft limonitic siltstone as above.	
	36							"	Yellow brown, mainly hard sil. siltstone which tends to a shale and breaks into bedding planes. Trace billy (caving). Rare soft limonitic siltstone. Abundant brown and grey chert.	
	36							"	As above	

HOLE No.: SC-7 HOLE LOGGED BY: JOHN SIMPSON PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
36	37							"	As above	
	38							"	As above	
	39							"	As above	
	40							"	As above, pinkish tinge, sample dominantly hard sil. shale. No chert	
	41							"	Yellow grey-cream, hard sil. siltstone and abundant chert. Trace limonitic med. soft siltstone.	
	42							"	As above	
	43							"	As above	
	44							"	As above	
	45							"	As above	
	46							"	Mauve grey, hard to med. hard sil. siltstone and abundant chert. No limonitic material.	
	47							"	Pale cream grey, very powdery, mainly med hard sil. siltstone, and shale and med. soft ferruginous and limonitic (mottled) siltstone. Chert present in all samples but never common or abundant. Ferruginous material mainly in soft siltstone along minute joint planes.	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51							"	As above	
	52							"	As above	
	53							"	As above	
	54							"	As above	
	55							"	As above	
	56							"	As above	
	57							"	As above	
	58							"	As above	
	59							"	As above	

HOLE No.: SC-7 HOLE LOGGED BY: JOHN SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
59	60							"	As above	
	61							"	As above	
	62							"	As above	
	63							"	As above	
	64							"	As above	
	65							"	As above	
	66							"	As above	
	66							"	As above	
	67							"	As above	
	68							"	As above	
	69							"	As above	
	70			Phosphate				2-3	Pale grey with slight creamytinge. Med.Soft limonitic siltstone enclosing rare med. coarse qtz. grains. Some sil.siltstone and chert. More chert than above, but not common. Very powdery.	
	71							1-2	As above	
	72							<1	Sample very powdery, med.soft light grey siltstone chert Dominant (dark grey) not phosphatic	
	73	0.9						"	As above	
	74							1-2	As above	
	75							1	Pale grey, very powdery, chert abundant but not dominant. Abundant sil.hard siltstone. No limonitic or ferruginous material. Phosphatic.	
	76							1-2	As above	
	77	1.3						2	As above	
	78	1.7						2	As above	
	79							2-3	As above	
	80	2.9						2-3	As above	
	81							2-3	As above	
	82	3.9						2-3	As above	

HOLE No.: SC-7 HOLE LOGGED BY: JOHN SIMPSON PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
82	83							1-2	As above, only darker in colour. chert and sil.siltstone dominant, but increasing med.soft grey siltstone.	
	84							1-2	Grey with a definite mauve tinge. Clear to opaque, hard crystalline quartzite; med.soft mottled ferruginous siltstone; med. hard grey sil. siltstone.	
									Non limonitic or ferruginous. Common dark grey chert.	
	85							1-2	As above	
	86	2.7						2-3	Pale grey, mainly med. soft ferruginous and limonitic (mottled) siltstone, also sil.siltstone and abundant chert. Quartzite (cavings/). Trace black mineral	
									(Manganese?)	
	87							2-3	As above	
	88	3.3						2-3	As above	
	89							2-3	As above, but assoc. with limonite	
	90	0.7						1	As above, more limonite and calcareous siltstone	
	91							1	Med. grey, slightly crystalline fine grained calcareous siltstone and limestone, but also sil. siltstone and soft mottled siltstone. Chert common.	
	92							1	~~Med. grey brownish tinge, mainly calcareous med. hard crystalline~~ siltstone. Chert common (dark grey)	
	93							<1	As above	
	94							"	Mauve tinge but otherwise as above (due to some ironstone pebbles)	
	95							"	Grey, brown, mauve, calcareous siltstone, not yet a pure limestone, abundant chert and common ferruginous material.	
	96							"	As above	
	97							"	As above	
	98							"	As above	
	99							"	As above	
	100							"	As above	

HOLE No.: SC-7 HOLE LOGGED BY: JOHN SIMPSON PAGE 6

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	~~ANDEL BY~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
100	101							"	As above	
	102							"	As above	
	103							"	As above	
	104							"	As above	
	105							"	As above	
	106							"	As above	
	107							"	Yellow brown, med. soft limonitic siltstone, calcareous in part, powdery, and chert present but not common.	
	108							"	As above, grey brown in colour.	
	109							1	Colour as above, hard sil. siltstone, powdery sample.	
	110							<1	Darker in colour, mottled sandy limonitic siltstone. Chert rare.	
	111							"	Colour as above, mauve shales rare, otherwise as above.	
	112							"	Grey with a mauve tinge mainly siltstone with definite minute bedding, med. hard. (bedding colourful)	
	113							"	As above	
	114							"	As above	
	115							"	As above	
	116							"	As above	
	117							"	Deeper mauve colour, bedded siltstone and shale. Chert present but very rare.	
	118							"	As above	
	119							"	As above	
	120							"	As above	
	121							"	As above	
	122							"	As above	
	123							"	As above	
	124							"	As above	
	125							"Med.	grey to yellow mustard, med. hard siltstones and shale. Non calcareous non phosphatic; med. hard but not definitely bedded as above. Limonitic. Chert present but rare.	

HOLE No.: SC-7 HOLE LOGGED BY: JOHN SIMPSON PAGE 57

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~XSHX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ANNODE~~ SHAPIRO	DESCRIPTION	DATE
125	126							"	As above	
	127							"	As above	
	128							"	As above	
	129							"	As above	
	130							"	As above	
	131							"	As above	
	132							"	As above	
	133							"	As above	
	134							"	As above	
	135							"	As above	
	136							"	As above	
	137							"	Med. grey; brown, shales and siltstone non bedded, med. hard, siliceous.	
	138							"	As above	
	139							"	As above	
	140							"	As above	
	141							"	As above	
	142							"	As above	
	143							"	As above	
	144							"	As above	
	145							"	As above	
	146							"	As above	
	147							"	As above	
	148							"	As above	
	149							"	As above	
	150							"	As above	
	151							"	As above	
	152							"	As above	
	153							"	As above	
	154							"	As above	

HOLE No.: SC-7 HOLE LOGGED BY: JOHN SIMPSON PAGE 8

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
154	155							"	As above	
	156							"	As above	
	157							"	As above	
	158							"	As above, only becoming deep purple shale. PROTEROZOIC ?	
	159							"	As above	
	160							"	As above	
	161							"	As above	
	162							"	As above	
	163							"	As above	
	164							"	As above	
	165							"	As above	
	166							"	As above	
	167							"	As above	
	168							"	As above	
	169							"	As above	
	170 T.D.							"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LIMITED
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC-9
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 92' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 92'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1003.4' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED:
COMPLETED:
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red brown, alluvium, limonitic and ferruginous pebbles and loose, unconsolidated qtz. grains.	
	2							"	Pale red brown, alluvium, ferruginous material as above loose unconsolidated.	
	3							"	Pale mauve red, siltstone, limonitic and ferruginous	
	4							"	As above	
	5							"	Pale pink-grey siltstone, ferruginous staining, siltstone, limonitic in part; ferruginous in part.	
	6							"	As above	
	7							"	As above, slightly lighter in colour	
	8							"	Cream-grey, light grey fine grained siltstone (ferruginous and limonitic) powdery, ferruginous staining on frags. some harder sil. siltstone.	
	9							"	As above	
	10							"	As above	
	11							"	As above, chert (dark grey-brown) abundant	
	12							"	As above, chert absent or trace, ferruginous staining common.	
	13							"	Light grey, fine grained siliceous siltstone and shale, ferruginous staining common, chert absent.	
	14							"	As above	

HOLE No.: SC-9 HOLE LOGGED BY: JOHN SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD SHAPIRO	DESCRIPTION	DATE
14	15							"	As above	
	16							"	As above	
	17							"	As above	
	18							"	As above	
	19							"	As above	
	20							"	As above, chert present in small quantities (nodular)	
	21							"	As above	
	22							"	As above, limonitic material common	
	23							"	As above, limonitic material rarer	
	24							"	As above	
	25							"	As above	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above	
	31							"	As above	
	32							"	As above	
	33							"	As above	
	34							"	Limonitic material becoming common again, but still as above	
	35							"	As above siltstones (med.soft) and some sll.siltstones and shale (fairly hard and brittle).	
	36							"	As above	
	37							"	As above	
	38							"	As above	
	39							"	As above	
	40							"	As above	
	41							"	Creamy-grey, siltstones(soft) as above, limonitic material common giving yellow colour.	
	42				Phosphatic			Approx. ½	As above	

HOLE No.: SC-9 HOLE LOGGED BY: JOHN SIMPSON PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
42	43							~½	As above	
	44							1	As above, chert abundant	
	45							1	As above	
	46							½	As above, also abundant limonite	
	47							½	As above	
	48							½	As above	
	49							½	As above	
	50							½	As above	
	51							½	As above	
	52							1	Yellow, soft siltstone, very limonitic. Also med. grey siltstones with limonitic inclusions, hard sil. siltstones; shales rare; chert rare.	
	53							1	As above	
	54							1	As above	
	55							1	Colour change pale grey siltstone limonite rare, rare dark grey chert.	
	56							1	As above, limonite more abundant to give yellowish colour	
	57							<1	Yellow brown, mottled limonitic(yellow grey white siltstones and soft clayey shales, chert common, but not abundant.	
	58							"	As above, deeper brown in colour.	
	59							"	Yellow brown(mustard) abundant chert, limonitic nodules, grey siltstone med. hard, whole sample abundantly limonitic.	
	60							"	Colour change pale yellow grey siltstones, abundant chert and limonite, some sil. siltstones med. hard.	
	61							"	As above	
	62							"	Siltstones as above, abundant chert. Colour varies slightly due to percentage changes of limonitic material.	
	63							"	As above	
	64							"	As above	
	65							"	As above	

HOLE No.: SC-9 HOLE LOGGED BY: J. SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
65	66							"	As above	
	67							"	As above	
	68							"	As above	
	69							"	As above	
	70							"	As above Lost circulation but regained it.	
	71							"	Fine grained, sandy siltstone, siliceous in part; abundant yellow brown fine grained chert fragments; also trace carbonitic material. (Samples fine due to slower drilling)	
	72							"	As above	
	73							"	As above	
	74							"	As above	
	75							"	As above	
	76							"	As above	
	77							"	As above	
	78							"	As above	
	79							"	As above	
	80							"	As above	
	81							"	As above	
	82							"	As above	
	83							"	As above, samples becoming more yellowish due to higher limonitic content.	
	84							~1	As above	
	85							<1	As above	
	86							"	As above	
	87							"	As above	
	88							"	As above	
	89							"	As above	
	90								Sandstone, fine grained well rounded qtz. grains.	
	91								As above	
	92 T.D.								As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PROJECT: UNDILLA BASIN PHOSPHATE

HOLE No.: SHERRIN CREEK 9A

STATE: QUEENSLAND **COUNTY:**

PARISH: **HOLDING:**

LAT. **LONG.** **CO-ORDINATES:**

INCLINATION:

TOTAL DEPTH: 115' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 115'

DIAMOND CORE DRILLING: **Depth from** **to**

DRILLING: **Depth from** **to**

GROUND LEVEL: 1003.7' ELEVATION

DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.

SPUDDED: 16.4.67

COMPLETED: 16.4.67

HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red brown, alluvium, ferruginous loose unconsolidated quartz grains, very sandy.	16.4.67
	2.							"	As above	
	3							"	As above	
	4							"	As above, paler in colour, some loose unconsolidated siltstone.	
	5							"	Pale pink-grey, 2° carbonate material (kankar) plus some ferruginous siltstone.	
	6							"	As above, sample becoming more silty.	
	7							"	Pale pink-grey; med. grey med. hard siltstone (quartzose) and ferruginous in part.	
	8							"	As above, siltstone becoming sandy in places to form a fine to med. grained sandstone with a few coarse grains of quartz.	
	9							"	As above	
	10							"	As above	
	11							"	As above	
	12							"	As above	
	13							"	As above	

HOLE No.: SC-9A HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
13	14							"	As above, but contains frags of solid quartz.	
	15							"	As above, fine sandstone abundant.	
	16							"	No colour change; med. coarse grained sandstone with a fine grained calcareous cement in places. The finer fractions have a non calc. cement. Ferruginous staining still common.	
	17							"	As above	
	18							"	As above; chert present but rare. Sandstone becoming very fine grained.	
	19							"	As above	
	20							"	As above; some siliceous siltstone, dolomitic limestone abundant; sandstone rare, chert rare.	
	21							"	Grey yellow, fine grained limonitic and ferruginous siltstone and shale; med. soft and grey in colour. No chert. No sandstone. No limestone.	
	22							"	Light grey, as above, less limonitic but still ferruginous	
	23							"	As above, siltstone becoming silicified.	
	24							"	As above, chert present.	
	25							"	As above, chert becoming more common.	
	26							"	Pale grey, siltstones both sil. and non sil., very little limonitic material; still ferruginous in places. Chert common.	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above	
	31							"	As above	
	32							"	As above	
	33							"	As above	

HOLE No.: SC-9a HOLE LOGGED BY: J. SIMPSON PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
33	34							"	As above; hard shale becoming common (rarely limonitic and ferruginous) chert present but not common.	
	35							"	As above	
	36							"	As above	
	37							"	As above	
	38							"	As above	
	39							"	As above	
	40							"	As above	
	41							"	Light grey, more powdery than above. Med. soft siltstone andrare hard shale; chert present in all samples but never abundant or dominant.	
	42							"	As above	
	43							"	As above	
	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51							"	As above	
	52							"	As above	
	53							"	As above	
	54							"	As above	
	55							"	As above	
	56							"	As above	
	57							"	As above	
	58							"	As above	
	59							"	Pale yellow grey, as above only more limonitic material.	
	60							"	As above	

HOLE No.: SC-9A HOLE LOGGED BY: J. SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
60	61							"As above, very powdery		
	62							"	As above, more limonitic	
	63							"	Yellow brown or buff colour; pale grey siltstone (med. soft and powdery) abundant chert.	
	64							"	As above, only grey in colour	
	65		Phosphate					"	Pale grey with yellow tinge, mainly med. soft slightly limonitic clayey siltstone (rarely ferruginous). Chert makes up a high percentage of the samples	
	66							3	As above	
	67							1	As above	
	68							2	As above	
	69							1-2	As above	
	70							3	As above	
	71							1	As above	
	72							2	Bright yellow orange colour, (due to high limonite) otherwise as above.	
	73							<1	Pale grey, med. soft siltstones but hard sil. siltstones and shale becoming common. Chert always abundant.	
	74							"	As above; only siltstone and shale (med. hard)(silicified) now dominant.	
	75							"	A s above	
	76							"	As above	
	77							"	As above	
	78							"	As above	
	79							1	As above	
	80							2	As above	
	81	3.5						3	As above	
	82	3.8						5	As above	
	83	4.9						3	As above	
	84	4.4						5	As above	

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BOX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
84	85	2.8						2	As above	
	86							2	As above, chert becoming rarer, but still common.	
	87							1-2	As above	
	88							1	As above	
	89							"	As above	
	90		Lost circulation but regained it. Driller					"	As above	
	91		going slow, therefore samples very fine.					"	Light grey, mainly soft siltstone but some med. hard sil. siltstone and shale. Chert present but rare.	
	92							"	As above	
	93							"	As above, limonitic in part; mainly siltst. & shale & small chert frags.	
	94							"	As above	
	95							"	As above	
	96							"	Cream grey, siltstone (limonitic) plus chert samples very powdery.	
	97							"	As above	
	98							"	As above	
	99							"	As above	
	100							"	As above	
	101							"	As above	
	102							"	As above	
	103							"	As above	
	104							"	Cream grey, hard sil. siltstone and shale, limonitic frags. and small amounts of chert.	
	105							"	As above	
	106							"	As above	
	107							"	As above	
	108							"	As above	
	109							"	As above	
	110							"	Pale yellow; increase in limonite. All samples contain small amounts of well rounded, clear quartz grains.	

BASEMENT ??

HOLE No.: sc-9a HOLE LOGGED BY: J. SIMPSON PAGE 6

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
110	111							"	As above	
	112							"	As above	
	113							"	As above	
	114							"	As above	
	115 T.D.							"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK 10
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 134' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 134'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1023.5' ELEVATION
DRILLING CONTRACTOR: ~~XXXXXX~~ AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 17.4.67
COMPLETED: 13.5.67
HOLE LOGGED BY: J. SIMPSON & B. FITZPATRICK

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red brown, ferruginous, alluvium, coarse sand, well rounded grains with ironstone pebbles.	17.4.67
	2							"	As above	
	3							"	As above	
	4							"	As above	
	5							"	As above	
	6							"	As above	
	7							"	Yellowish brown with red tinge. Mainly ferruginous and limonitic siltstone, also very fine sand, loose, unconsolidated.	
	8							"	As above	
	9							"	As above	
	10							"	Mainly yellow brown and pale red quartzite with varying amounts of ferruginous and limonitic siltstone - very sandy in places.	
	11							"	As above	
	12							"	As above	
	13							"	As above	
	14							"	As above	
	15							"	As above	

HOLE No.: SC-10 HOLE LOGGED BY: J. SIMPSON & B. FITZPATRICK

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
15	16							"	As above, only more ferruginous and limonitic. Siltstone present.	
	17							"	yellow grey, sandy siltstone (limonitic and ferruginous) small amounts of chert.	
	18							"	Pale cream yellow, sandy siltstone (limonitic and (ferruginous) vughy in places, also pale grey siltstone and chert common.	
	19							"	Colour as above, grey siltstone (limonitic but not ferruginous) also pale purple banded chert common.	
	20							"	Cream. Pale grey yellow limonitic siltstone. Chert common.	
	21							"	Pale grey, as above, less chert, siltstone becoming hard and silicified, rare ferruginous staining.	
	22							"	~~XXXXXXXX~~ Pale grey, mainly light grey siltstone soft to medium soft (rarely silicified) with small but varying amounts of limonitic material. Chert rare but present in nearly all samples.	
	23							"	As above	
	24							"	As above	
	25							"	As above	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above	
	31							"	As above	
	32							"	As above	
	33							"	As above	
	34							"	As above	
	35							"	As above, powdery	
	36							"	As above	

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~STRUCTURE~~ SHAPIRO	DESCRIPTION	DATE
36	37							"	As above	
	38							"	As above	
	39							"	As above	
	40							"	As above	
	41							"	As above	
	42							"	As above'	
	43	3.5		Phosphate				"	As above	
	44	6.6								
	45	7.8						8-9	As above, siltstone more silicified than before (med. hard) also abundant grey chert.	
	46	1.85							As above	
	47	1.95						1-2	As above	
	48	2.4							Pale grey; siltstone, soft and powdery; as well as rare hard silicified siltstones and shales. Chert abundant.	
	49	1.75						~2	As above	
	50	2.8							As above	
	51	4.4						~3	As above	
	52	6.8							As above	
	53	12.9						>10	As above	
	54	8.3							Creamy yellow, med. soft limonitic siltstone and shale, chert present but never abundant or dominant. Also small quantities of sil. siltstone (always limonitic)	
	55	5.8						3-4	As above	
	56	2.0							As above	
	57	2.8						1-2	As above	
	58	2.6							As above	
	59	2.2						1-2	As above	
	60	13.1						10-15	As above	
	61	19.0						15-20	As above	
	62	24.0						20	As above	

HOLE No.: SC-10 HOLE LOGGED BY: J. SIMPSON & B. FITZPATRICK

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE STRUCTURE~~ SHAPIRO	DESCRIPTION	DATE
62	63	18.2						20	As above	
	64	16.0						15-20	As above	
	65	10.9						10	As above	
	66	5.9						5	Cream-grey, chert dominant, ferruginous and limonitic siltstone and shale common.	
	67	5.9						6	As above	
	68	4.0						4	As above	
	69	3.3						4	As above	
	70	2.6						4	As above	
	71	2.6						4	As above	
	72	2.4						3-4	As above	
	73	2.6						3-4	As above	
	74	2.7						3-4	As above	
	75	2.8						2-3	As above	
	76	3.0						3-4	As above, reddish in colour, very ferruginous and mottled siltstone (soft) and shale (med. soft) also limonitic siltstone dominantly siliceous material - mult.coloured cherts , etc.	
	77	2.8						2-3	As above, only more ferruginous.	
	78	8.5						9	Pale grey brown siltstone ferruginous in part, very silliceous.	
	79	2.2						3	Pale cream yellow dolomitic limestone (hard)	
	80	1.5						2	As above	
	81	1.8						2	More yellow than above, siltstone (limonitic) trace carbonate.	
	82	1.5						3	As above	
	83	1.4	Lost circulation but regained it.					3	As above	
	84	-	Redrilled hole						All phosphatic 2-3% limestone. Cream yellow, sometimes with a pinkish tinge. Hard dolomitic crystalline limestone. Samples very powdery in places. Trace brown chert, numberous small cavities.	12/5/67

HOLE No.: SC-10 HOLE LOGGED BY: J. SIMPSON & B. FITZPATRICK PAGE 5

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ ~~MINERALOGY~~ SHAPIRO	DESCRIPTION	DATE
84	85	1.8							As above	
	86	2.4							As above	
	87	2.3							As above	
	88	1.6							As above	
	89	1.4							As above	
	90	1.3							As above	
	91	1.8							As above	
	92	1.7							As above	
	93	1.5							As above	
	94	1.5							As above	
	95	1.2							As above	
	96							1	As above	
	97							2	As above	
	98							1	As above	
	99							2	As above	
	100							3	As above	
	101							3	As above	13/5/67
	102							1	As above	
	103							1	As above	
	104							2	As above	
	105							1	As above	
	106							1	As above	
	107							1	As above	
	108							2	Med. grey brown, calcareous soft, grey, siltstone slightly limonitic in part. Abundant brown and grey chert, also hard dolomitic limestone as above (caving?)	
	109							2	As above	
	110							1½	As above	
	111							1	As above	
	112							1	As above	

HOLE No.: SC-10 HOLE LOGGED BY: j. simpson & B. Fitzpatrick PAGE 6

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
112	113							3	As above	
	114							2	Cream yellow, mainly calcareous siltstone. Chert decreasing in abundance, limestone increasing, samples powdery.	
									(Thin stringers of hard and soft calcareous material; this inference is reached by drilling rates - slow-fast-slow-fast, etc.)	
	115							2	As above	
	116							2	As above	
	117							1½	As above	
	118							1½	As above	
	119							1½	As above	
	120							1½	As above	
	121							1½	As above	
	122							1½	As above	
	123							2	As above	
	124							<1	Mauve colour, fine ferruginous calcareous siltstone, chert abundant.	
	125							"	As above	
	126							1½	As above	
	127							1½	Calcareous crystalline siltstones and abundant brown chert, down to T.D. 134'.	
	128							1½	As above	
	129							1½	As above	
	130							1½	As above	
130	133							1½	As above	
	134 T.D.							5	As above	
				CORES(B. FITZPATRICK)						
0	27 0								Previously drilled. See log by Simpson	2/5/67
27 0	30' 0		3 0	100			Core 1		Cream to very light grey sandy siltstone. Irregular jointing, poorly developed c̄ iron staining on	

HOLE No.: SC-10 **HOLE LOGGED BY:** J. SIMPSON & B. FITZPATRICK **PAGE**

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
						Core	1 (ctd.)		joint planes. Quartz grains common, rounded to sub-rounded; waxy sheen on rock, may be due to compaction during coring. Some fine grained dark to black quartz grains.	
30 0	33 1		3 1	100			Core 2		Light grey, slightly sandy siltstone, iron staining on poorly developed joint planes, rock friable, poorly consolidated, some small vughs c secondary calcite. Some very fine grains of Mn.	
		38'1"-39'1" 0.5								
		39'1"-41'1" 0.25								
33 1	39 1		6 0	100			Core 3		As above; iron staining and vughs more common; core friable. Some black irregular Mn grains on joints.	
		41'1"-42'1" 0.3								
		42'1"-43'1" 1.7								
39 1	44 10		4 7	80			Core 4		As above. Black specks Mn seen. Core lost probably chert in bottom 1'2". Oxidised iron rich zones harder.	
		43'1"-44'10" 0.55								
44 10	48 6	0.75	3 4	90			Core 5		Light grey sandy siltstone c iron staining common on joints and in small vughs (secondary). Bottom .6" dense black chert. Rounded and sub-rounded quartz grains rare. Mn on joint planes. (Sample Bag 1 Top, etc.)	
48' 6	51 9	1.0	1 10	56			Core 6		Light cream slightly sandy siltstone with iron staining common. Bottom 8" solid black chert. Small vughs and solution channels common; with associated iron staining.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.,
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC-11
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 106' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 106'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1021.3' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTOR PTY. LTD.
SPUDDED: 17.4.67
COMPLETED: 21.4.67
HOLE LOGGED BY: JOHN SIMPSON & BRIAN FITZPATRICK

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red Brown, ferruginous quartzose siltstone (rounded grain quartz) alluvium, loosely consolidated	
	2							"	As above	
	3							"	As above	
	4							"	As above	
	5							"	As above	
	6							"	As above	
	7							"	As above	
	8							"	As above	
	9							"	As above	
	10							"	As above	
	11							"	As above	
	12							"	As above	
	13							"	Medium brown to red, ferruginous pebbles common; unconsolidated, tertiary infil ? fine to medium grained limonitic and ferruginous sandstone.	
	14							"	As above	
	15							"	As above	
	16							"	As above	
	17							"	As above	

HOLE No.: SC-11 HOLE LOGGED BY: J. SIMPSON & B. FITZPATRICK PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
17	18							"	As above	
	19							"	As above	
	20							"	As above	
	21							"	As above	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	As above	
	26							"	Cream yellow; sandstone, some coarse grains, well rounded. Silty in places, limonitic and ferruginous pebbles.	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above	
	31							"	Mauve. Some sandstone as above, mainly yellowish quartzite (hard) with subangular quartz. grains.	
	32							"	as above	
	33							"	As above, but yellowish in colour, limonitic in part	
	34							"	Pale grey-cream sandstone (coarse grained) large single well rounded quartz grains abundant	
	35							"	As above	
	36							"	As above	
	37							"	Pale pink siltstone wth qtz. pebbles and grains, rounded to sub-rounded. Chert Fragments at 38' to 39'	21.4.67
	38							"	As above	
	39							"	As above	
	40							"	Darker pink-brown sandy siltstone with chert fragments and fine-grained rounded qtz. grains (perhaps contamination from above)	
	41							"	As above	

HOLE No.: SC-11 HOLE LOGGED BY: J. SIMPSON & B. FITZPATRICK

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XXX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~XXX CORE XXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
41	42							"	As above	
	43							"	White to cream sandy siltstone c rounded qtz. grains and chert fragments. Becomes very light greenish colour 48'-52'	
	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51							"	As above	
	52							"	As above	
	53	3.2	Phosphate					~1	Creamy white siltstone	
	54	7.8						6-7	As above	
	55	3.3						5	White siltstone with dark grey-black chert	
	56	1.0						<1	As above	
	57	1.65						1	As above	
	58	3.6						4	As above	
	59	0.55						<1	As above	
	60	0.40						"	As above	
	61	0.40						"	Light grey cherty siltstone; phosphatic chert abundant.	
	62	0.35						"	As above	
	63	0.35						"	As above	
	64	0.40						"	As above, with some pebbles of silicified siltstone	
	65	5.6						5	As above	
	66	1.1						<1	As above	
	67	0.65						"	As above	
	68	0.45						"	As above	
	69	0.45						"	As above	

HOLE No.: SC-11 HOLE LOGGED BY: J. SIMPSON & B. FITZPATRICK PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~INDEX~~ SHAPIRO	DESCRIPTION	DATE
69	70	0.25						"	As above	
	71	0.45						"	As above	
	72	0.95						"	As above	
	73	0.95						~1	As above	
	74	1.5						1-2	Creamy siltstone c chert interbeds	
	75							3-4	As above	
	76	7.5						6-7	As above	
	77	22.3						~25	Creamy siltstone, without chert	
	78	27.8						~25	As above	
	79	17.8						~15	As above	
	80	22.8						~20	As above	
	81	19.8						15-20	As above, with chert fragments	
	82	11.9						~10	As above	
	83	5.0						~6	Siltstone c abundant rounded quartz grains & chert fragments	
	84	6.8						~7	As above	
	85	7.5						~7	As above	
	86	7.0						~7	Light creamy yellow calc-siltstone with thin chert interbeds. Still mildly phosphatic at base.	
									93' - 106' chert becomes more common	
									100' - 106' yellow-buff calc-siltstone	
	87	4.2						~6	As above	
	88	3.6						6	As above	
	89	2.8						4	As above	
	90	1.5						2	As above	
	91	2.7						<1 *	As above *No shapiros done below 90'	
	92	2.2						<1	As above	
	93	2.3						"	As above	
	94	2.8						"	As above	
	95	2.4						"	As above	
	96	2.4						"	As above	

HOLE No.: SC=11 HOLE LOGGED BY: J. SIMPSON & B. FITZPATRICK

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~DIX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
96	97	2.8						"	As above	
	98	2.6						"	As above	
	99	2.2						"	As above	
	100	2.1						"	As above	
	101	7.0						"	As above	
	102	2.3						"	As above	
	103	1.85						"	As above	
	104	2.1						"	As above	
	105	1.65						"	As above	
	106 T.D.	1.45						"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: K UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK 12
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 140' T.D.

ROTARY DRILLING: Depth from 0' to 140'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 1028.6' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 18.4.67
COMPLETED: 18.4.67
HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~XXXX~~ SHAPIRO	DESCRIPTION	DATE
-0	1							1	Red brown, becoming paler in colour towards bottom section; alluvium, well rounded quartz grains,	18.4.67
									(med. to coarse grains) loosely consolidated.	
1	24							"	As above	
	25							"	As above, only more consolidated and silty, limonitic in part, but still sandy.	
	26							"	Buff colour; mainly siltstone with med. to coarse sand grains in the siltstone matrix, ferruginous and limonitic (streaky)	
	27							"	As above (many) ferruginous (ironstone) pebbles.	
	28							"	As above, only lighter in colour. More limonitic than ferruginous.	
	29							"	As above, dominantly pale grey limonitic siltstone with abundant quartz grains.	
	30							"	As above	
	31							"	As above	
	32							"	As above	
	33							"	Pale grey, mauve tinge; mainly pale grey limonitic and ferruginous (in part) siltstone with abundant rounded quartz grains in the siltstone matrix.	

HOLE No.: SC-12 HOLE LOGGED BY: J. SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
33	34							"	As above	
	35							"	As above	
	36							"	As above	
	37							"	As above, only orange tinge due to more ferruginous	
									material. Sandy siltstone becoming hard and	
									siliceous at 40' to form a billy.	
	38							"	As above	
	39							"	As above	
	40							"	As above	
	41							"	As above	
	42							"	As above, but sample dominantly sand.	
	43							"	As above	
	44							"	Grey with mauve tinge, dominantly hard billy with	
									abundant qtz. Quartz breaks out to give coarse	
									grained sand, well rounded in part.	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51							"	Colour change (subtle) pale grey. Quartz rich, med.	
									hard billy becoming solid, silicified and very	
									hard in 57' sample.	
	52							"	As above	
	53							"	As above	
	54							"	As above	
	55							"	As above	
	56							"	As above	
	57							"	As above	

HOLE No.: SC-12 HOLE LOGGED BY: J. SIMPSON PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD CORE ~~ANNULUS~~ SHAPIRO	DESCRIPTION	DATE
57	58							"	As above	
	59							"	As above, only slight reddish tinge, abundant dark grey chert and hard sil. siltstone.	
	60							"	As above	
	61							"	Light grey with reddish tinge, abundant chert and hard sil. siltstone; billy absent.	
	62							"	As above	
	63							"	As above	
	64							"	As above	
	65							"	As above	
	66							"	Light grey, med. soft to med. hard, light grey siltstone and very fine grained sandstone (powdery) chert present but never abundant; slightly limonitic in part.	
	67							"	As above	
	68							"	As above	
	69							"	As above	
	70							"	As above	
	71							"	As above	
	72							"	As above	
	73							"	As above	
	74							"	As above	
	75							"	As above	
	76							"	As above	
	77							"	As above	
	78							"	As above	
	79							"	As above	
	80							"	As above	
	81							"	As above	
	82							"	As above	
	83							"	As above	

HOLE No.: SC-12 HOLE LOGGED BY: J. SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
83	84							"	As above	
	85							"	Colour change: Med. grey (earthy) mainly grey limonitic siltstone with some chert and a few large quartz pebbles (? conglomerate).	
	86							"	As above	
	87							"	As above, more yellowish, limonitic soft grey siltstone.	
	88							"	Greyish yellow, powder, kaolinitic, light grey siltstone. Chert absent.	
	89							"	Yellow brown (mustard) limonitic grey siltstone.	
	90							"	As above, darker in colour, kaolinitic.	
	91							"	Light grey brown in colour, med. to light grey siltstone, limonitic in part, chert abundant. Also some med. hard siliceous siltstone.	
	93							"	As above	
	94							"	Light grey, powdery siltstone limonitic in part. Chert always present but rare.	
	95							"	As above	
	96							"	As above	
	97							"	As above	
	98							"	As above	
	99							"	As above	
	100							"	As above	
	101							"	As above	
	102							"	As above	
	103							"	As above	
	104							"	As above	
	105							"	As above	
	106							"	As above	
	107							"	As above	
	108							"	As above	

HOLE No.: sc-12 HOLE LOGGED BY: J. SIMPSON PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
108	109							"	As Above	
	110							"	As above	
	111							"	As above	
	112							"	As above	
	113	3.6		Phosphate				"	As above	
	114	5.8						2-3	Grey (darker than above) lithology as above, only containing some dark grey modular material, ferruginous (rarely), chert abundant in 118' sample)	
	115	13.6						~20	As above	
	116	13.3						~20	As above	
	117	21.6						25-30	As above	
	118	21.0						~30	As above	
	119	14.1						~16	Grey, chert abundant, (dark grey, brown) some limonitic pebbles and med. hard sil. siltstone.	
	120	7.3						~5	As above	
	121	3.7						~3	As above	
	122	5.8						~5	As above	
	123	4.3						~4	As above	
	124	7.5						~4	As above	
	125	8.7						~4	As above	
	126	9.3						~4	Dark grey, WET. Multi-coloured cherts (dendritic). Limonitic grey siltstones and dark grey nodules and ferruginous pebbles.	
	127	13.6						~12	As above (dryer)	
	128	7.5						~5	Light to med. grey, sil. siltstone + abundant chert, limonitic in part, comparable to 122'-125' interval.	
	129	4.2						~3	As above	
	130	5.3	Lost circulation but regained it.					~3	As above	
	131	6.0						~4	As above	
	132	5.4						~4	Sample fine grain, mainly chert, siltstone and sil. siltstone. Some mottled dendritic chert.	

HOLE No.: SC-12 HOLE LOGGED BY: J. SIMPSON PAGE 6

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~DIP~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE AZIMUTH~~ SHAPIRO	DESCRIPTION	DATE
132]	133	4.8						3-4	Lost circulation and became stuck in hole. Pulled out with difficulty.	
	134	6.8						3	133'-140' drilled with no return of samples.	
134	140 T.D.								140.' - Again became stuck in hole and pulled out with difficulty.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK 13
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 105' T.D.

ROTARY DRILLING: Depth from 0' to 105'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 1013.2' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 18.4.67
COMPLETED: 18.4.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Yellow brown, sand, loose, unconsolidated qtz. grains	18.4.67
	2							"	As above	
	3							"	Medium grey, as above	
	4							"	Red brown, mainly ironstone pebbles, highly ferruginous and ? manganiferous.	
	5							"	As above, greyer in colour	
	6							"	As above, sandy	
	7							"	Yellow brown, siltstone with coarse grained qtz.grains in siltstone matrix, highly ferruginous & slightly limonitic.	
	8							"	As above	
	9							"	As above, but more limonitic	
	10							"	Yellow brown; creamy in places. Mainly siltstone, with a silty matrix enclosing coarse grains of quartz. 16' and 17' samples slightly cherty. Very limonitic and rarely ferruginous.	
	11							"	As above	
	12							"	As above	
	13							"	As above	
	14							"	As above	

HOLE No.: SC-13 HOLE LOGGED BY: JOHN SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
14	15							"	As above	
	16							"	As above	
	17							"	As above	
	18							"	Creamy yellow, mainly siliceous siltstone; limonitic	
									and ferruginous, rare chert, some siltstone as	
									above.	
	19							"	As above	
	20							"	As above	
	21							"	Pale grey yellow, mainly sil. siltstone as above with	
									small amounts of chert. Limonitic commonly, but	
									rarely ferruginous. Also some medium soft siltstone(grey)	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	As above	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above, but more limonitic	
	31							"	As above	
	32							"	Pale grey, medium soft siltstone with common sil.siltstone.	
									Chert present but scarce to rare; siltstone limonitic	
									in places, giving yellowish tinge - never ferruginous.	
									Very powdery.	
	33							"	As above	
	34							"	As above	
	35							"	As above	
	36							"	As above	
	37							"	As above	

HOLE No.: SC-13 HOLE LOGGED BY: J. SIMPSON PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~STRUCTURE~~ SHAPIRO	DESCRIPTION	DATE
37	38							"	As above	
	39							"	As above	
	40							"	As above	
	41							"	As above	
	42							"	As above	
	43							"	As above	
	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51							"	As above	
	52							"	As above	
	53							"	As above	
	54							"	As above	
	55							"	As above	
	56							"	As above	
	57							"	As above	
	58							"	As above	
	59							"	As above	
	60							"	As above	
	61							"	As above	
	62							"	As above	
	63							"	As above	
	64							"	As above	
	65							"	As above	
	66							"	As above	
	67							"	As above, only more sil. siltstone & chert, still very powdery.	

HOLE No.: SC-13 HOLE LOGGED BY: J. SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BH~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XHXMDS~~ SHAPIRO	DESCRIPTION	DATE
67	68							"	As above	
	69							"	Cream yellow, medium soft limonitic siltstone and sil.	
									siltstone, chert common but not abundant.	
	70		Phosphate					"	Light greyish yellow, sil.siltstone and chert nodules	
									common; powdery, also soft grey siltstone common.	
	71							"	As above	
	72							"	Yellow brown, as above,only highly limonitic.	
	73							~2	As above	
	74							< 1	Light grey powdery abundant sil.siltstone and round	
									marble sized chert nodules and pebbles.	
	75							"	As above	
	76							"	As above	
	77							"	As above	
	78							"	As above	
	79							"	As above	
	80							—1	As above	
	81							1	As above	
	82							1	As above	
	83	5.2						3-4	Cream yellow, abundant chert, mainly med.soft limonitic siltstone.	
	84							4	As above	
	85	4.3						2-3	As above	
	86							1-2	Yellow brown (mustard) med.soft limonitic siltstone.Chert common.	
	87							1-2	As above	
	88							2	As above	
	89							2-3	As above	
	90							2-3	As above	
	91							4-5	Cream yellow (lighter colour than above),med.soft	
									limonitic siltstone as above;also sil.limonitic siltstone	
									(med. hard) abundant grey chert	
	92	7.0						4-5	As above	

HOLE No.: SC-13 HOLE LOGGED BY: J. SIMPSON PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
92	93							3-4	As above	
	94							2-3	Pale yellow grey dolomitic limestone med.hard, very	
									powdery, also common grey brown chert.	
	95							1	As above	
	96							<1	As above	
	97							"	Yellow cream to darker mustard, siliceous siltstone	
									(limonitic) ferruginous pebbles in 100'. abundant chert.	
	98							"	As above	
	99							"	As above	
	100							"	As above	
	101							"	Pale pink dolomitic limestone	
	102							"	As above	
	103							"	Cavity - lost circulation but regained it momentarily	
									before losing it permanently.	
	104							"		
	105 T.D.									

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK NO.14
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 220' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 220'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1049.1' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 20.4.67
COMPLETED: 20.4.67
HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red brown, quartz grains, loose, unconsolidated plus large pebbles of ironstone and ferruginous quartzitic material.	
	2							"	As above	
	3							"	As above	
	4							"	As above	
	5							"	As above	
	6							"	As above	
	7							"	As above	
	8							"	Yellow brown with a reddish tinge; yellowish billy (with angular quartz grains) also ferruginous ironstone giving reddish colour.	
	9							"	As above	
	10							"	As above	
	11							"	As above	
	12							"	As above	
	13							"	As above	
	14							"	As above	
	15							"	As above	
	16							"	As above	

HOLE No.: SC-14 HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE STRUCTURE~~ SHAPIRO	DESCRIPTION	DATE
16	17							"	Cream grey with reddish tinge, grey siltstone sandy in places, billy also present plus iron rich quartzites; ironstone common.	
	18							"	As above; pale cream, grey, plus bluish opaline chert.	
	19							"	As above	
	20							"	As above	
	21							"	Yellow brown, mainly med. soft limonitic grey siltstone (ferruginous in part) also quartzitic; abundant chert as above (opaline)	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	Creamy grey, mainly grey siltstone (shaly in part), limonitic and rarely ferruginous. Opaline chert abundant.	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above	
	31							"	As above	
	32							"	As above	
	33							"	As above	
	34							"	Colour as above, only chert rarer and siltstone becoming a med. hard splintery shale; samples becoming powdery.	
	35							"	As above	
	36							"	As above	
	37							"	As above	
	38							"	As above	

HOLE No.: SC-14 HOLE LOGGED BY: J. SIMPSON PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
38	39							"	As above	
	40							"	As above	
	41							"	Cream grey (very powdery) chert rare but present (probably cavings) med. hard sil. shale, slightly ferruginous in part.	
	43							"	As above	
	44							"	Cream grey (extremely powdery) med.soft grey siltstone (clayey in part).Chert absent. Rarely ferruginous.	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51							"	Mauve; 1 foot of mauve siltstone; finely bedded thin beds of limonitic ferruginous material, soft and powdery.	
	52							"	Light grey (powdery) med. soft grey siltstone clayey in part (particularly 60' sample), rarely limonitic and ferruginous. Chert absent.	
	53							"	As above	
	54							"	As above	
	55							"	As above	
	56							"	As above	
	57							"	As above	
	58							"	As above	
	59							"	As above	
	60							"	As above	
	61							"	As above, ~~xx~~ some sil. shale present.	
	62							"	As above	
	63							"	Pale grey & mauve; siltstone (grey) as above, secondary Fe along minute joints giving mauve colour.	

HOLE No.: SC-14 HOLE LOGGED BY: J. SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
63	64							"	Varying in colour, usually cream yellow to mustard, soft limonitic siltstone (clayey in part) various degrees of colour varying as to percentage of limonite. ~~Very marked with an X~~ Deepest coloured samples marked with an X.	
	65							"	As above	
	66							"	As above	
	67							"	As above	
	68							"	As above	
	69							"	As above	
	70							"	As above	
	71							"	As above	
	72							"	As above	
	73							" X	As above	
	74							" X	As above	
	75							"	As above	
	76							"	As above	
	77							" X	As above	
	78							"	Cream grey powdery siltstone rare small pebbles (some well rounded) of quartzite, but mainly med. grey med. soft siltstone and shale.	
	79							"	As above	
	80							"	As above	
	81							"	As above	
	82							"	As above	
	83							"	As above	
	84							"	As above	
	85							"	As above	
	86							"	As above	
	87							"	As above	

HOLE No.: SC-14 HOLE LOGGED BY: J. SIMPSON PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
87	88							"	As above	
	89							"	As above	
	90							"	As above	
	91							"	Cream grey; sometimes with yellow tinge dueto limonite, mainly med. soft siltstone with some sil. siltstone and shale, some samples limonitic and rarely ferruginous, chert (opaline) abundant).	
	92							"	As above	
	93							"	As above	
	94							"	As above	
	95							"	As above	
	96							"	As above	
	97							"	As above	
	98							"	As above	
	99							"	As above	
	100							"	As above	
	101							"	As above	
	102							"	As above	
102	129							"	Pale grey (whitish) some powdery siltstone (loose and unconsolidated) but mainly clear quartzite, hard, siliceous (compacted clear quartz grains.)	
129	134							"	Colour as above, quartzite absent. Pale to med. grey, med. soft siltstone rarely silicified, rarely ferruginous.	
134	142							"	Mauve colour (due to Fe); otherwise as above.	
142	145							"	Cream yellow, med. soft limonitic siltstones, fine bedding visible in places. Rarely ferruginous. Chert & quartzite absent.	
145	220 T.D.							"	146' to T.D.220' mauve grey, brown, finely bedded siltstones (med. soft to med. hard) and shales. ? PROTEROZOIC	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PROJECT: UNDILLA BASIN PHOSPHATE

HOLE No.: SC-15

STATE: QUEENSLAND **COUNTY:**

PARISH: **HOLDING:**

LAT. **LONG.** **CO-ORDINATES:**

INCLINATION:

TOTAL DEPTH: 101' T.D.

ROTARY DRILLING: Depth from 0' to 101'

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL: 1021.9'

DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.

SPUDDED: 23.4.67

COMPLETED: 23.4.67

HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~XXXX~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red-brown, ferruginous, sandy alluvium	23.4.67
	2							"	As above	
	3							"	As above	
	4							"	As above, light brown colour	
	5							"	Buff sandy silt, with a few angular and rounded qtz. pebbles.	
	6							"	As above	
	7							"	As above	
	8							"	Orange-to-buff sandy silt w/qtz. and ironstone pebbles.	
	9							"	As above	
	10							"	Light buff sandy siltstone w/abundant angular qtz. pebbles(10'-13' perhaps slightly pink colour ?)	
	11							"	As above	
	12							"	As above	
	13							"	As above	
	14							"	Cream-to-orange siltstone with abundant angular & rounded qtz. pebbles, particularly in 15'-16'	
	15							"	As above	
	16							"	As above	
	17							"	As above, with chert.	

HOLE No.: SC-15 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
17	18							"	White siltstone, clayey in part (i.e. "balled"), w/only a few small angular qtz. grains & some rounded haematite pebbles.	
	19							"	As above, with small rose-qtz. grains (angular) and scarcely any haematite.	
	20							"	As for 17'-18'	
	21							"	White "balled" siltstone w/small angular qtz. grains and haematite pebbles.	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	As above	
	26							"	Slightly yellowish, sandy siltstone w/abundant small qtz. grains (pink, clear and smoky; angular & rounded).	
	27							"	As above	
	28							"	As above, but slightly pink in colour & with abundant qtz. - rose qtz. common	
	29							"	Grey-white sandy siltstone, with much qtz.	
	30							"	Creamy, fine siltst. w/much qtz. (white & smoky)	
	31							"	Yellowish, limonite siltst. w/rounded qtz. pebbles & a few chert fragments (? broken chert pebbles)	
	32							"	As above	
	33							"	Slightly yellow silt with a few small rounded qtz. pebbles & some chert fragments.	
	34							"	Pale yellow (? pink tinted) limonitic siltstone with chert & rounded qtz. pebbles.	
	35							"	As above	
	36							"	As above	
	37							"	As above	
	38							"	As above	

HOLE No.: SC-15 HOLE LOGGED BY: N. MURPHY PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	~~EX~~	CORE, RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~EXREX~~ SHAPIRO	DESCRIPTION	DATE
38	39							"	White siltstone w/haematite pebbles & small rounded qtz.pebbles.	
	40							"	Pale yellow-to-buff (? pink tinted)siltst.w/haematite pebbles.	
	41							"	As above,w/small angular qtz.grains & chert(perhaps chert pebbles?)	
	42							"	Yellow limonitic siltst.w/few small,rounded qtz. grains.	
	43							"	Pale yellow limonitic siltst. & few small qtz. grains.	
	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	As above, but less yellow.	
	48							"	Pinkish silty sand w/haematite grains & occasional qtz. pebbles.	
	49							"	Yellow & white silty sand w/limonite & haematite, & occasional qtz. pebbles.	
	50							"	As above	
	51							"	Buff-to-white siltstone.	
	52							"	As above	
	53							"	As above	
	54							"	As above	
	55							"	As above	
	56							"	Whitish siltstone.	
	57							"	Asabove	
	58							"	As above	
	59							"	As above	
	60							"	As above, with dark grey & brown cherts, some haematite	
	61							"	As above	
	62		Trace P_2O_5 (62'-64') No Shapiro's done					? "	As above w/ abundant chert.	
	63							"	As above	
	64							"	As above	
	65							"	As above	
	66							"	As above	
	67							"	Yellow siltstone with haematite pebbles, plus chert (cavings?)	

HOLE No.: SC-15 HOLE LOGGED BY: N. MURPHY PAGE 4

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BH~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ATTITUDE SHAPIRO	DESCRIPTION	DATE
67	68	0.3						<1	Pale yellow siltstone w/chert, haematite and limonite	
	69							1	As above	
	70	2.1						1	As above	
	71							1½	Grey siltstone w/chert(interbedded and/or pebbles),	
									plus haematite pebbles.	
	72	18.7						20	Cream and grey-buff siltstone w/chert interbeds.	
	73	29.7						≥20	As above	
	74	28.1						"	As above	
	75	29.2						"	As above	
	76	28.1						"	Brown siltstone	
	77	25.5						"	Khaki siltstone	
	78	30.7						"	Light brown siltstone	
	79	28.7						"	As above	
	80	27.6						"	As above	
	81	20.0						"	Greyish siltstone with grey chert	
	82	25.5						"	-"- siltstone with grey chert	
	83	19.7						"	Khaki siltstone with brown chert	
	84	20.9						"	As above	
	85	11.6						15	As above	
	86	4.8						10	Brown sand, fine-grained, silty;w/brown chert & haematite	
	87	4.4						10	As above	
	88								No samples - cavity	
	89								As above	
	90	3.0						5	Yellow sandy calcareous siltstone w/small chert	
									fragments(drilled through several 3"cavities from 89')	
	91	3.0						4	As above	
	92	2.8						4	As above	
	93	2.3						3	As above	
	94	1.95						2	As above, with small quartz, chert and haematite grains.	
	95	1.35						2	As above	

HOLE No.: SC-15 HOLE LOGGED BY: N. MURPHY PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XRX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~XCORE XMINUS~~ SHAPIRO	DESCRIPTION	DATE
95	96	1.55						2	As above	
	97							3	As above	
	98	2.5						2	As above	
	99	3.7						6	As above	
	100							4	As above	
	101 T.D.	2.0						5	As above.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.,
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK 15X(REDRILLED HOLE FOR CORING APPROX. 65 FEET
STATE: QUEENSLAND **COUNTY:** SOUTH WEST OF SC-15)
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 104'5" T.D.

ROTARY DRILLING: **Depth from** 0' **to** 104!5"
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1021.9' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 2.6.67
COMPLETED: 6.6.67
HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD SHAPIRO	DESCRIPTION	DATE
0	3							<1	Red brown loam, soil and sand	2/6/67
3	4							"	Red brown, ferruginous buck-shot gravel.	
4	6		Samples missed							
6	7							"	Cream and light brown, poorly sorted sand and silt. Pebbly in places.	
7	8							"	Light brown silt and fine sand.	
8	9							"	Medium brown poorly sorted silt and sand.	
9	10							"	Cream and medium to light brown sandy siltstone and fine argillaceous sand.	
10	11							"	Medium to light brown soft, friable weathered sandy and clayey siltstone.	
11	12							"	Light brown, soft, friable weathered clayey and sandy siltstone.	
12	13							"	As above	
13	14							"	As above	
14	15							"	Medium brown, soft, ferruginous clay and sandy siltstone; pebbly in places. More argillaceous than previous.	
15	16							"	Cream to light brown, soft clayey sandy and pebbly siltstone.	

HOLE No.: SC-15X HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
16	17							"	As above, but with poorly sorted sand.	
17	18							"	As above, but more sandy.	
18	19							"	Mostly cream and light brown sandy and argillaceous siltstone with common quartz sand and pebbles.	
19	20							"	Cream to light grey, soft silty shale? bentonitic in places.	
20	22							"	Cream to light brown very fine quartz sand and silt, with minor mottledred-brown and cream vughy fine quartz sandstone-siltstone.	
22	43							"	Mostly cream, light grey, soft to medium soft ? bentonitic shale, silty in minor places.	
43	45							"	Cream, very coarse to pebbly and silty poorly sorted quartz sand.	
45	49							"	Mostly light brown , cream and light grey soft ? bentonitic shale.	
49	59							"	Very light brown, unconsolidated mostly fine grained quartz sand and silt with minor coarse and pebbly quartz grains.	
59	60							"	Mostly light grey, medium soft ? bentonitic shale.	
60	68							"	Light grey, medium soft shaly siltstone.	
68	70							"	As above; but light brown colour.	
70	75							"	Mostly cream and light grey argillaceous, soft, friable quartz siltstone; finely sandy at 74'.	
75	76							"	As above; but also pebble size quartz grains.	
76	78							"	Light brown, soft shale and siltstone with poorly sorted quartz grains up to pebble size grains.	
78	81							"	Mostly cream, poorly sorted argillaceous siltstone and sandstone with quartz grains and pebbles.	
81	83	*Chert						"	As above; but grey coloured. Also minor amounts of brown and grey chert.	
83	84	* Phosphatic						3	Cream and light brown clayey siltstone and very friable sandstone with quartz grains (up to pebble size).	

HOLE No.: SC-15X HOLE LOGGED BY: R. GRASSO PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL BIT SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	SAMPLED INTERVAL To feet	Acid soluble Fe_2O_3	Acid soluble Al_2O_3	Acid soluble CaO	Acid soluble CO_2	No.	FIELD CORE ~~AMDEL~~ SHAPIRO	DESCRIPTION	DATE
84	85 2											15	Cream to light grey, soft phosphatic clayey siltstone with fine pelletal phosphorite grains.	
85	86		1 4									5	Mostly cream to light grey and rare light brown soft very friable poorly sorted silty and argillaceous quartz sandstone, with abundant quartz pebbles; especially near the bottom of the core. Trace dark chert fragments near bottom of core.	
		7.8												
	87											6	As above	
	88											11	As above	
88	89		1 6	10093	0.54	3.85	19.6	0.42				12	Mostly light grey soft, very friable poorly sorted silty and argillaceous quartz sandstone with abundant quartz pebbles and trace of dark chert fragments near bottom of core.	
		13.6												
	90											8	As above	
90	91		1 1									8	As above; but top part of core contains a chert lens approximately 1"thick.	
		9.1												
	92											20+	As above	
92	94 6	20.1	1 4	10095	0.93	2.9	30.7	3.30 (92-93')				20+	Top 4" Light grey, soft, very friable silty and argillaceous sandstone as above; but only trace of pebble size quartz grains. Next 4" Mainly chert fragments. Next 7" Mostly light grey, soft very friable sandy and argillaceous siltstone grading to silty and argillaceous siltstone. Only trace pebble size quartz grains. Bottom 1"Brown, cream and light grey, well bedded, soft (but the brown members are slightly harder) friable sandy and argillaceous siltstone with medium brown calcareous member. Bedding appears to be flat.	
								(93-94')				20+		
								(94-94½')				18		
94 6	96 6	18.2	1 6	10096	0.74	3.5	28.8	4.37 (94½-95½')				20	Top 2" Cream and light brown, soft friable (but a little less friable than previous) silty, porous clean	
								(95½-96½')				20		

HOLE No.: SC-15X HOLE LOGGED BY: R. GRASSO PAGE 4

DRILLED DEPTH From feet	DRILLED DEPTH From ins.	DRILLED DEPTH To feet	DRILLED DEPTH To ins.	BIT	CORE RECOVERED feet	CORE RECOVERED ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	SAMPLED INTERVAL From ins.	SAMPLED INTERVAL To feet	SAMPLED INTERVAL To ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
~~XX~~	~~X~~	~~XX~~	~~X~~	~~XXX~~.	~~X~~									calcarenite. Bottom 1'4" Mostly light grey, soft very friable silty and argillaceous poorly sorted sandstone, containing minor to common amounts of coarse to fine pebble size quartz grains. Fresh tree roots were noted at the bottom of core.	
96	6	97	9	T.D. 1.0	1	2				(96½-97½')		17		Top 1" BROWN-grey chert. Bottom 1'1" Cream to light and medium brown, hard vughy crystalline limestone.	
										(97½-		8			

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK 15Y (45 FEET WEST OF SC-15)
STATE: QUEENSLAND COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION:
TOTAL DEPTH: 100' T.D.

ROTARY DRILLING: Depth from 0' to 100'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 1021.9' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 6.6.67
COMPLETED: 7.6.67
HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	20								Not logged	6.6.67
20	25							<1	Mostly light pink-brown, coarse to very coarse and pebbly sand. 20 to 22 is almost gravel with rounded pebbles.	
25	27							"	Cream to light grey pebbly sand composed of sub-rounded and rounded quartz grains and pebbles.	
27	29							"	Mostly light grey and red-brown mottled silty shale. Minor quartz sand grains.	
29	36							"	Mostly salmon-pink poorly sorted quartz sand with friable sandstone with silt and up to pebble size quartz grains.	
36	41							"	Light cream silty poorly sorted sand. Mostly silt to fine grained with up to pebble size grains.	
41	46							"	Light grey to cream, mostly friable argillaceous siltstone. Sandy in minor places.	
46	47							"	Light grey and light brown mottled silty shale.	
47	48							"	Salmon-pink medium to fine grained quartz sand.	
48	50							"	Light grey, soft friable argillaceous siltstone.	
50	51							"	Cream to light brown silty sand.	
51	52							"	Tobacco-brown, silty sand.	
52	58							"	Light grey, soft friable argillaceous siltstone.	

DRILLED DEPTH From feet	DRILLED DEPTH From ins.	DRILLED DEPTH To feet	DRILLED DEPTH To ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet	CORE RECOVERED ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	SAMPLED INTERVAL From ins.	SAMPLED INTERVAL To feet	SAMPLED INTERVAL To ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
58		59			Phosphatic								2	As above	
59		68											<1	Mostly light grey, soft semi-friable argillaceous siltstone.	
68		75		*Chert	from 68 feet								"	Siltstone, as above; but also abundant brown and grey chert.	
75		79											"	Cream to light grey, soft to medium soft argillaceous siltstone and abundant brown and grey chert.	
79		82			Phosphatic							(79-80')	1	Mostly cream to light brown soft to medium soft silty	
								Acid soluble				(80-81')	1-2	shale to shaly siltstone. Abundant chert.	
								Fe_2O_3	Al_2O_3	CaO	CO_2	(81-82')			
					CORED BELOW 82 FEET										
82		85		16.3	1	4	10091	0.45	2.35	23.0	0.36	(82-83')	5	Top 3" Mainly dark grey and brown chert fragments.	
												(83-84')	25+	Bottom 1'1" Light grey, soft very friable	
												(84-85')	25+	argillaceous and silty sandstone.	
85		87		30.2	1	10	10089	0.64	1.95	41.9	0.80	(85-86')	25+	Top 1" Chert fragments. Probably cavings.	7/6/67
												(86-87')	25+	Bottom 1'9" Light grey to cream and light brown,	
														soft very friable argillaceous siltstone.	
87		88	8	21.9		10	10090	3.8	1.25	27.0	0.60	(87-88')	25+	Top 3" Brown and grey chert fragments. Bottom 7" Light	
												(88-88'8")	10	grey and medium brown soft friable argillaceous and	
														slightly sandy siltstone. The brown material is	
														slightly less friable. Sharp contact between brown and light	
														grey siltstone in some core fragments. Drilling	
														very slow and core barrel damaged at end of run.	
														Chert members at bottom were not picked up by barrel.	
88	8	92		Not cored				Reamed				(88-89')	18	Mostly tobacco-brown limonitic sandy and argillaceous	
												(89-90')	10	siltstone with minor small cuttings of chert.	
												(90-91)	12		
												(91-92')	18		
92		94			0	0	Cored					(92-93')	=18	No recovery but cuttings are of tobacco-brown limonitic	
												(93-94')	25+	siltstone as above	
94		95			Drilling - not coring								20	Tobacco-brown soft limonitic siltstone. Trace of	
														quartz graisn.	

HOLE No.: SC-15Y HOLE LOGGED BY: R. GRASSO PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE~~ ~~STRUCTURE~~ SHAPIRO	DESCRIPTION	DATE
95	96			Drilling is rough				15	As above; also light grey, soft, friable argillaceous and sandy siltstone which becomes coated with limonitic dust during drilling.	
	97							15	Tobacco-brown coated siltstone as above and also medium hard ferruginous fragments. Trace of small chert fragments. Quartz grains common.	
	98							15	Mostly fine tobacco-brown limonitic coated cuttings of light grey, soft, friable sandy siltstone and tobacco-brown medium hard ferruginous fragments. Also poorly sorted quartz grains are common and trace of small chert cuttings.	
	99							15	As above	
	100							15-20	As above	
			At 100 feet hole caving badly could not keep hole clean long enough to add next 20 foot steam.							

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PROJECT: UNDILLA BASIN PHOSPHATE

HOLE No.: SHERRIN CREEK ~~15Y~~ 15Z

STATE: QUEENSLAND COUNTY:

PARISH: HOLDING:

LAT. LONG. CO-ORDINATES:

INCLINATION:

TOTAL DEPTH: 104'5" T.D.

ROTARY DRILLING: Depth from 0' to 104'5"

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL: 1021.9' ELEVATION

DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.

SPUDDED: 31.5.67

COMPLETED: 1.6.67

HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet	ins.	to feet	ins.	BIT AMDEL % P_2O_5	CORE RECOVERED feet	ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet	ins.	To feet	ins.	No.	FIELD ~~CORE~~ ~~ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
								Acid soluble Fe_2O_3	Al_2O_3	CaO	CO_2				
0		90	9		Open hole										31.5.67
90	8	93	2	1.0		6								Mostly chert fragments and minor white silty phosphatic sandstone.	
93	2	95	8		1	4								Top 2" Chert. Middle 2" Tobacco-brown dark limonitic argillaceous siltstone. Croe shows contact between brown siltstone and white to light grey siltstone below. Bottom 11" White to light grey soft silty and argillaceous fine siltstone.	
95	8	98	2	9.1 / 13.2	0	10	10040 Top 10041 Bot.	3.8	2.5	20.1	1.90			Light grey soft friable silty and argillaceous sandstone. Chert at top.	
98	2	99	8	7.1	1	6		Part of core may have been from previous cut.						Top 11" Light brown argillaceous siltstone. Middle 4" Chert. Bottom 3" Cream and light grey and white phosphatic argillaceous siltstone.	1.6.67
99	8	101	11	7.9	1	0								Top 4" Cream to light grey, soft unconsolidated argillaceous silt. Next 4" Brown chert. Bottom 4" Cream and light brown hard vughy crystalline phosphatic limestone.	
101	11	104	5			0		No recovery						Limestone chips.	

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FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC-16
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: ~~K~~ 106' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 106'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1020.6'Elevation
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 21.4.67
COMPLETED: 21.4.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red-brown ferruginous sandy alluvium, unconsolidated, with various sizes of ironstone and quartzose pebbles.	21.4.67
	2							"	As above	
	3							"	As above	
	4							"	As above	
	5							"	As above	
	6							"	As above	
	7							"	As above	
	8							"	As above	
	9							"	As above, but lighter brown colour; few dk.grey chert frags.	
	10							"	Buff siltstone, w/abundant dk.grey & lt.brn.chert frags.	
	11							"	As above	
	12							"	Cream to light buff siltstone w/chert fragments.	
	13							"	As above	
	14							"	As above	
	15							"	Cream siltstone with chert interbeds.	
	16							"	As above	
	17							"	As above	
	18							"	As above	
	19							"	As above	

HOLE No.: SC-16 HOLE LOGGED BY: N. MURPHY PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ATTITUDE SHAPIRO	DESCRIPTION	DATE
19	20							"	As above	
	21							"	As above	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	As above	
	26							"	As above	
	27							"	As above, with abundant chert	
	28							"	As above	
	29							"	Cream siltstone with very little chert	
	30							"	As above	
	31							"	White to cream siltstone; no chert	
	32							"	Light buff and white siltstone; no chert	
	33							"	As above	
	34							"	Cream siltstone; no chert	
	35							"	As above	
	36							"	Cream siltstone with minor chert	
	37							"	As above	
	38							"	As above	
	39							"	As above	
	40							"	As above	
	41							"	Light yellowish-cream siltstone with minor chert.	
	42							"	Cream siltstone, slightly limonitic	
	43							"	As above	
	44							"	Cream siltstone, with few chert fragments.	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	Cream siltstone, with no chert.	
	49							"	As above	

HOLE No.: SC.16 HOLE LOGGED BY: N. MURPHY PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~AUTHOR~~ SHAPIRO	DESCRIPTION	DATE
49	50							"	Cream siltstone, w/minor chert fragments	
	51							"	As above	
	52							"	As above	
	53							"	As above	
	54							"	Cream siltstone with abundant chert	
	55							"	As above	
	56							"	As above	
	57							"	Orange-buff siltstone, with chert	
	58							"	Cream siltstone, with few chert fragments	
	59							"	As above	
	60	1.15	Phosphate					1-2	As above	
	61	0.80						<1	As above	
	62	11.8						7-8	As above	
	63	8.0						5-6	As above	
	64	6.8						5	As above	
	65	4.5						5	As above	
	66	11.5						12	Light grey-brown siltstone, with minor chert	
	67	20.5						15	As above	
	68	25.3						15	As above	
	69	18.0						12	Creamy-grey siltstone	
	70	16.5						8	Creamy siltstone, with clayey pellets	
	71	12.5						7	As above	
	72	5.6						5	Calcareous creamy siltstone, with chert	
	73	5.6						5	Calcareous creamy siltstone, with chert interbeds	
	74	3.2						3-4	As above	
	75	2.4						2½	As above	
	76							2	As above	
	77	1.85						3	As above	
	78	1.55						2	As above	
	79	1.35						2	As above	

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXX~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
79	80	1.45						2	As above	
	81	3.3						3-4	As above	
	82	3.3						3-4	As above	
	83	2.6						2½	As above	
	84	2.5						2½	As above	
	85	1.7						2½	As above	
	86	1.35						2	As above	
	87	1.5						2	As above	
	88	1.35						2	As above	
	89	3.4						4-5	As above	
	90	3.3						4-5	As above	
	91	2.6						3	As above	
	92	3.2						4-5	As above	
	93	3.2						4	As above	
	94	2.8						4	As above	
	95	1.8						<1	As above	
	96	1.65						<1 *	As above (* No shapiros below 94')	
	97	1.2						"	As above	
	98	1.2						"	As above	
	99	1.35						"	As above	
	100	1.65						"	As above	
	101	1.75						"	As above	
	102	1.7						"	As above	
	103	1.55						"	As above	
	104	1.3						"	Dolomitic limestone, with chert interbeds.	
	105	2.5						"	As above	
	106	1.65 T.D.						"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PROJECT: UNDILLA BASIN PHOSPHATE

HOLE No.: SC-17

STATE: QUEENSLAND **COUNTY:**

PARISH: **HOLDING:**

LAT. **LONG.** **CO-ORDINATES:**

INCLINATION:

TOTAL DEPTH: 120' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 120'

DIAMOND CORE DRILLING: **Depth from** **to**

DRILLING: **Depth from** **to**

GROUND LEVEL: 1026.2' Elevation

DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.

SPUDDED: 22.4.67

COMPLETED: 22/4/67

HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD SHAPIRO	DESCRIPTION	DATE
0	1							<1	Dark red-brown, ferruginous, sandy alluvium - becoming lighter brown colour towards bottom of interval.	
	2							"	As above	
	3							"	As above	
	4							"	As above	
	5							"	As above	
	6							"	As above	
	7							"	As above	
	8							"	As above	
	9							"	As above	
	10							"	As above	
	11							"	As above	
	12							"	As above	
	13							"	As above	
	14							"	As above	
	15							"	As above	
	16							"	As above	
	17							"	As above	
	18							"	As above	
	19							"	As above	

HOLE No.: SC-17 HOLE LOGGED BY: N. MURPHY PAGE 2

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD CODE SHAPIRO	DESCRIPTION	DATE
19	20							"	As above	
	21							"	Light red-brown pebbly, laterised sandstone	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	As above	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	Light buff siltstone with few small rounded ironstone pebbles and small quartz grains	
	31							"	As above	
	32							"	As above	
	33							"	As above	
	34							"	As above	
	35							"	As above	
	36							"	As above	
	37							"	As above	
	38							"	Creamy-white to buff siltstone (? Tertiary) with abundant rounded quartz grains and ? haematite specks.	
	39							"	As above	
	40							"	As above	
	41							"	As above	
	42							"	As above	
	43							"	As above	
	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	As above	

HOLE No.: SC-17 HOLE LOGGED BY: N. MURPHY PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
47	48							"	As above	
	49							"	Creamy siltstone with rounded quartz pebbles	
	50							"	As above	
	51							"	As above	
	52							"	As above	
	53							"	As above	
	54							"	As above	
	55							"	As above	
	56							"	As above	
	57							"	As above	
	58							"	As above	
	59							"	Cream to buff siltstone with rounded quartz grains	
	60							"	As above	
	61							"	As above	
	62							"	As above	
	63							"	Cream siltstone with rounded quartz	
	64							"	As above	
	65							"	As above	
	66							"	As above	
	67							"	As above	
	68							"	As above	
	69							"	As above	
	70							"	As above	
	71							"	As above	
	72							"	As above	
	73							"	As above	
	74							"	As above	
	75							"	As above	
	76							"	As above	
	77							"	As above	

HOLE No.: SC-17 HOLE LOGGED BY: N. MURPHY PAGE 5

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~##~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
77	78							"	As above	
	79							"	As above	
	80							"	As above	
	81							"	As above	
	82							"	As above	
	83							"	As above	
	84							"	As above	
	85							"	Sandy siltstone, off-white colour, with chert pebbles in addition to quartz pebbles.	
	86							"	As above	
	87							"	As above	
	88							"	As above	
	89							"	As above	
	90							"	As above	
	91							"	Quartz sand, with rose quartz, clear quartz & chert pebbles.	
	92							"	As above	
	93	2.9			Phosphate			5	Light grey siltstone with quartz pebbles and chert interbeds	
	94	9.7						10	As above	
	95	11.8						15	As above	
	96	16.5						15	As above	
	97	14.8						10	As above, with quartz pebbles particularly abundant	
	98	13.6						10	As above	
	99	7.8						7	As above	
	100	9.8						6	As above	
	101							6	As above	
	102	3.4						4	As above	
	103	2.0						4	As above	
	104	1.25						3	As above	
	105	3.2						4	As above	
	106	8.0						9	As above	

HOLE No.: SC-17 HOLE LOGGED BY: N. MURPHY PAGE 6

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~XCORE XATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
106	107	8.3						10	As above	
107	108	8.5						9	As above, with no obvious change in lithology except for calcareous content. But drilling became more difficult below 107', and chert abundant. Rock possibly silty limestone or marl, with chert interbeds. Below 107' samples became larger, suggesting caving.	
	109	1.15						2	As above	
	110	0.85						1	As above	
	111	0.85						<1	As above	
	112	0.90						"	As above	
	113							"	As above	
	114							"	As above	
	115							2	As above	
	116							2	As above	
	117								As above	
	118								As above	
	119								As above	
	120								As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC-18
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 154' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 154'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1025.3' ELEVATION
DRILLING CONTRACTOR: ~~XXXXXX~~ AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 22.4.67
COMPLETED: 22.4.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	9							< 1	Ferruginous sandy alluvium, red-brown colour.	22.4.67
9	21							"	Orange-brown alluvium, becoming siltier.	
21	41							"	Light orange-brown siltstone with few small qtz. grains	
41	51							"	Yellowish siltstone with few small ironstone grains and occasional qtz. grains.	
51	53							"	Slightly pink-white siltstone with some chert and occasional rounded qtz.grains & some small angular qtz.grains.	
53	66							"	White siltstone with occasional rounded qtz.grains	
66	74							"	White sandy siltstone with angular qtz.grains,a few rounded - these grains(angular and rounded)much smaller than the qtz. pebbles observed in S.C.17.	
74	85							"	White siltstone with slightly higher qtz. pebble content.	
85	99							"	White siltstone with very few qtz. pebbles.	
99	103							"	Light grey siltstone with a few angular chert fragments in 99'-100'	
103	121							"	Grey marly calcareous siltstone.	
121	126							"	Grey marl, as above, but less calcareous	
126	130							"	Grey marl, more calcareous than above	
130	131							"	Light grey siltstone with a few chert fragments.	

HOLE No.: SC-18 HOLE LOGGED BY: N. MURPHY PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XRT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~XRD~~ ~~XRF~~ ~~XRDIFF~~ SHAPIRO	DESCRIPTION	DATE
131	132	4.3			Phosphate			3-4	Light grey-brown siltstone with grey and brown chert interbeds.	
	133	2.8						3-4	As above	
	134	0.45						1	Creamy siltstone, with little or no chert, & slightly calcareous.	
	135	0.45						1	As above	
	136	0.50						1	As above	
	137	1.55						2	Wet limonitic and haematitic sandy siltstone, calcareous, with chert interbeds.	
	138	2.9						3-4	As above	
	139	2.9						3-4	As above	
	140	3.3						3-4	As above	
	141	3.5						3-4	As above	
	142	3.8						3-4	As above	
	143	2.7						2½	As above	
	144	2.1						2-3	As above	
	145	2.1						2-3	As above	
	146	2.9						2-3	Dry calcareous sand, with limestone, brown chert, qtz. grains and haematite grains.	
	147							2-3	As above with chert interbeds	
	148	2.4						2-3	As above	
	149	2.5						2-3	As above	
	150	3.0						2	Sandy as for 145'-146' interval, buff colour	
	151	1.85						2	As above	
	152	0.6							Buff colour, calcareous siltstone with chert interbeds. No Shapiros done, but P_2O_5 still evident in spot-tests.	
	153	0.4							As above	
	154 T.D.								As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LIMITED
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC-19
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 125' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 125'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1035.2' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 6.5.67
COMPLETED: 6.5.67
HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE AZIMUTH~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red brown, alluvium, silty sandstone, med.grained qtz. grains embedded in a fine ferruginous silt.; moist.	6.5.67
	2							"	As above only more brown, frags. clayey and highly ferruginous.	
	3							"	As above	
	4							"	As above	
	5							"	As above	
	6							"	As above	
	7							"	Red brown, loose unconsolidated silt and frags. as above. Also some pale grey siltstone coming in.	
	8							"	As above	
	9							"	As above	
	10							"	As above	
	11							"	Red brown with grey siltstone frags. Siltstone limonitic and ferruginous, but sandy ferruginous siltstone still dominant (siltstone:-mottled yellow grey red)	
	12							"	As above	
	13							"	As above	
	14							"	As above	

HOLE No.: SC-19 HOLE LOGGED BY: J. SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
14	15							"	As above	
	16							"	As above	
	17							"	As above	
	18							"	As above	
	19							"	As above	
	20							"	Orange yellow grey, mainly mottled siltstone, sandy in places, qtz. grains well rounded.	
	21							"	Orange red, ferruginous siltstone, med.soft with ironstone frags. and trace siltstone as above	
	22							"	As above	
	23							"	Orange yellow, mainly hard silicified sandstone poorly sorted, highly ferruginous and limonitic. Some frags. of hard sandstone approaching billy.	
	24							"	As above	
	25							"	As above	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above	
	31							"	As above	
	32							"	As above	
	33							"	Pale yellow grey; loose silt, and sandy siltstone fairly highly limonitic, few coarse to very coarse sand qtz. grains; first chert - common but not abundant.	
	34							"	Grey brown - orange tinge; hard unsorted sil.sandstone plus some very coarse loose grains. Chert present in all but rare; trace large frags. quartzite.	
	35							"	As above	
	36							"	As above	

HOLE No.: SC-19 HOLE LOGGED BY: J. SIMPSON PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ANNULUS~~ SHAPIRO	DESCRIPTION	DATE
36	37							"	As above	
	38							"	As above	
	39							"	As above	
	40							"	As above	
	41							"	Pale grey, hard unsorted sandstone, quartz grains	
									embedded in a silty matrix becoming more	
									unconsolidated at 50'. Chert absent. The hard	
									sandstone is slightly limonitic and ferruginous.	
	42							"	As above	
	43							"	As above	
	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51							"	Pale grey, mainly med. hard unsorted sandstone as	
									above but containing high percentage large coarse	
									qtz. grains, well rounded. Comparable to Tertiary	
									infil.?	
	52							"	As above	
	53							"	As above	
	54							"	As above	
	55							"	As above	
	56							"	As above	
	57							"	As above	
	58							"	As above	
	59							"	As above, but siltier	

HOLE No.: SC-19 HOLE LOGGED BY: JOHN SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
59	60							"	Pale grey, med.soft to med.hard grey siltstone very powdery, very slightly limonitic and rarely ferrugenous, trace coarse grains of qtz.(probable cavings) chert absent.	
	61							"	As above	
	62							"	As above	
	63							"	As above	
	64							"	As above	
	65							"	As above	
	66							"	As above	
	67							"	As above	
	68							"	As above	
	69							"	As above	
	70							"	As above	
	71							"	As above	
	72							"	As above	
	73							"	As above, with more orange tinge due to higher percentage ferrugenous material; also chert present (grey and brown), but not abundant.	
	74							"	As above	
	75							"	Pale grey, mainly light grey siltstone with some fine quartz grains in it. Also abundant chert (grey). Thin stringer of pale green waxy shale ? (moist and plastic)	
	76							"	As above	
	77							"	As above	
	78							"	As above only chert more abundant (brown grey waxy shale absent), siltstone as above, dominant. Also sil. siltstone common.	
	79							"	As above	
	80							"	As above	

HOLE No.: SC-19 HOLE LOGGED BY: J. SIMPSON PAGE 5

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
80	81							"	Pale grey, hard sil.siltstone dominant. Brown and grey chert common, soft siltstone rare.	
	82							"	As above	
	83							"	As above	
	84							"	As above	
	85							"	As above	
	86	2.3	Phosphate					¶	Blue grey; bluish tinge due to dark grey blue chert. Also hard pale grey sil. siltstone.	
	87							1-2	As above, only containing a thin limonitic siltstone stringer which is also phosphatic. Common jointed iron stained sil. siltstone.	
	88							1	Pale grey sil. siltstone, limonitic in places; brown & grey chert present but rare.	
	89	0.8	Phosphate shows still common but only faint colour obtained from large amount of chips.					1	As above	
	90							<1	As above	
	91							"	Light grey, hard sil. siltstone as above; dendritic dark grey and black chert common, also paler colour chert common.	
	92							"	As above	
	93							"	As above only grey to yellow dendritic chert dominant also sil. siltstone less hard than above.	
	94							"	As above, very colourful with speckled chert.	
	95							"	Chert as above dominant. Yellow,orange,grey,some chert appears opaline.	
	96							"	As above	
	97							"	As above only less chert than above, sil.siltstone, also dendritic in places and drusy quartz.	
	98							"	Mainly med.hard to med.soft siltstone slightly limonitic in places. Chert becoming less common.	
	99							"	As above	

HOLE No.: SC-19 HOLE LOGGED BY: J. SIMPSON PAGE 6

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
99	100							"	As above	
	101							"	Pale yellow grey, limonitic siltstone and silt powdery, no chert	
	102							"	As above	
	103							"	As above	
	104							"	As above	
	105							"	As above	
	106							"	Mauve, hard mauve shales, chert present but rare (proterozoic?)	
	107							"	As above	
	108							"	As above	
	109							"	As above	
	110							"	As above	
	111							"	As above	
	112							"	As above	
	113							"	As above	
	114							"	As above	
	115							"	As above	
	116							"	As above	
	117							"	As above	
	118							"	As above	
	119							"	Grey green hard silty shales	
	120							"	As above	
	121							"	As above	
	122							"	As above	
	123							"	As above	
	124							"	As above	
	125							"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK NO.20
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 82' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 82'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1041.0' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 8.5.67
COMPLETED: 8.5.67
HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE~~ ~~ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Dark brown, clayey siltstone with rare flecks of ferruginous material.	8/5/67
	2							"	As above	
	3							"	As above'	
	4							"	As above	
	5							"	As above becooming more sandy and yellow (limonitic)	
									Yellow grey (orange tinge), limonitic (mottled)	
									sandy siltstone, some ferruginous material	
									comparable to SC-5B top 20' trace gypsum?	
	6							"	As above	
	7							"	As above	
	8							"	Red brown, mottled, highly ferruginous sandy siltstone.	
	9							"	As above	
	10							"	As above	
	11							"	As above	
	12							"	As above	
	13							"	As above	
	14							"	As above	
	15							"	As above, only becoming lighter in colour and more yellowish due to higher % of limonite.	

HOLE No.: SC-20 HOLE LOGGED BY: J. SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
15	16							"	As above	
	17							"	As above	
	18							"	As above	
	19							"	Red brown, highly ferruginous sandy siltstone; rare limonitic material.	
	20							"	As above	
	21							"	Various shades of red brown, lighter in places. Mainly ferruginous grey sandy siltstone more sandy near 40' quartz grains becoming coarse near 45'. Varying amounts of ferruginous material always giving samples red brown colour. (22' sample calcareous siltstone).	
21	54							"	As above	
	55							"	As above, trace chert.	
	56							"	Red brown, mottled limonitic (rare) and ferruginous siltstone, sandy in places; siltstone becoming harder, perhaps silicified. Abundant dark grey chert.	
	57							"	As above, only more yellowish, very streaky and mottled limonitic (common) and ferruginous(rare) siltstone, clayey rather than sandy. Chert rarer than above.	
	58							"	As above	
	59							"	As above	
	60							"	Yellow grey; light grey siltstone, sandy (fine grained) in places,clayey, limonitic flecks in some frags.	
	61							"	Red brown, flecked and streaky siltstone minutely slickensided in places (?) clayey,streaks of black substance? jointed in places and joint planes coated with ferruginous staining.	
	62							"	Yellow brown, mottled streaky highly limonitic siltstone; chert rare.	

HOLE No.: SC-20 HOLE LOGGED BY: J. SIMPSON PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~MXX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~XXXX CORE ASSAYER~~ SHAPIRO	DESCRIPTION	DATE
62	63		Phosphate					3	Mustard brown; clayey, streaky, med. hard siltstone highly limonitic also med. soft pale grey siltstone.	
	64	4.5						5	Mustard colour; very powdery, mustard coloured siltstone, very flecked and mottled, some secondary mineral (resembling zeolite)	
	65							4	Yellow brown, streaky limonitic siltstone comparable to 63' sample. Chert common. Siltstone containing few large quartz grains.	
	66							2	As above, high % chert, Fe staining on some chert frags, mainly limonitic siltstone.	
	67							4	Common pale grey siltstone and chert.	
	68							<1	As above	
	69							"	Pale pinky mauve, mainly fine grained crystalline limestone (dolomitic) also rare to common frags siltstone and chert (cavings?) Common small cavities.	
69	75							"	As above	
	76							1	As above	
	77							1	High % of calcareous material as above, but also high % of waxy pale green grey shale (easily fractured) which is low phosphatic. Dark grey chert quite common.	
77	81							"	As above	
	82 T.D.								Mainly dolomitic limestone as above, % siltstone and shale low. Limestone here appears fractured and coated with ferruginous materail.	
									1' cavity - lost circulation - used water to attempt to gain circulation - NOT successful.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK NO.21
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 60' T.D. 2ME of SC5B

ROTARY DRILLING: **Depth from** 0' **to** 60'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1043.9' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 8/5/67
COMPLETED: 8/5/67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	~~BIT~~	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE IDENTIFICATION~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Brown, Clayey siltstone, containing rare angular quartz grains (med. to coarse)	8/5/67
	2							"	As above	
3	15							"	Red brown, alluvium, highly ferruginous siltstone with quartz grains imbedded in a silty matrix. Becoming limonitic at 11' but still dominantly ferruginous to 16'.	
	16							"	Yellowish grey, limonitic sandy siltstone containing rare quartz grains (coarse) and well rounded chert pebbles.	
	17							"	As above	
	18							"	As above	
	19							"	As above	
	20							"	As above, also med. hard sil. billy present in small amounts.	
21	38							"	Pale grey, rarely limonitic siltstone; powdery, with med. to very coarse grained well rounded quartz grains (Tertiary infil ?) also rare small rounded chert pebbles.	
	39							"	Pale grey, slightly limonitic siltstone, with rare med.qtz.grains,embedded in siltstone matrix,med.soft(slightly) abundant dark grey chert.	

HOLE No.: SC21 HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BH~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
								"	As above	
39	40							"	As above	
	41									
	42							"	As above	
	43							"	Pale yellow grey, med. soft, plastic (moist), limonitic siltstone and rare chert, few large well rounded opaline pebbles.	
	44							"	Med. grey, limonitic, soft siltstone (limonitic in mottled character)	
	45		Phosphate					2	As above	
	46	10.5						10	As above	
	47	6.5						7	Deeper grey than above; siltstone, very limonitic and streaky with an almost black substance; otherwise as above.	
	48	2.9						2	Pale pink grey, hard dolomitic limestone, rare siltstone as above (cavings)	
49	54							<1	As above	
	55							"	Pale grey, limonitic and ferruginous mottled and streaky siltstone, almost a very fine grained sandstone.	
	56							"	As above	
	57							"	Dolomitic limestone as above, very powdery.	
	58							"	As above	
	59							"	As above	
	60 T.D.							"	As above	

HOLE No.: SC-22 HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORK~~ ~~AXMUDE~~ SHAPIRO	DESCRIPTION	DATE
33	34							"	As above	
	35							"	As above	
	36							"	As above	
	37							"	Colour as above; sand as above, but containing high % of pebble sized well rounded qtz. & chert pebbles. River Gravel? also common frags. bedded sil. siltst. white (Fossiliferous) agnostid trilobites.	
	38							"	As above	
	39							"	Mainly sand & sandstone as above, but pebbles & higher % of sil. siltstone and chert (pebbles)	
	40							"	Sand, but more sil. siltst., pale grey, med. hard brittle.	
	41							"	Pale grey, med. hard sil. silstone, slightly limonitic, also common well rounded qtz. grains up to pebble size.	
	42							"	As above	
	43							"	As above	
	44							"	As above	
	45							"	As above	
	46							"	As above	
	47							"	As above	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51		Phosphate					"	As above, only becoming more sandy, more limonitic and more ferruginous. Pale grey, siltst. coated with a heavy limonitic powder also qtz. grains (caving)	
	52	1.45						3	As above	
	53	3.2						2	Med. grey, limonitic & ferruginous, fine grained sandst. & med. hd., slightly calc., also med. hd. sil. siltstone & chert pebbles & frags.; coarse qtz. grains (prob. caving)	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC22
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:** I M W. of 5
INCLINATION: 90° T.D.
TOTAL DEPTH:

ROTARY DRILLING: Depth from 0' to 90'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 1031.0' Elevation
DRILLING CONTRACTOR:
SPUDDED: 9.5.67
COMPLETED: 9.5.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ ~~ALTITUDE~~ SHAPIRO	DESCRIPTION	DATE
0	4							<1	Dark brown, clayey siltstone with rare medium to coarse grained quartz grains	9.5.67
	5							"	A s above only contaminated by small percentage of red-brown alluvium (silt.)	
	6							"	Red brown,sandy siltst.,very ferruginous,trace limonite, med.hard, may be very slightly silicified.	
	7							"	Red-grey, mainly red-brown alluvium as above,but sample contaminated pale grey med.hard fine grains & sandstone.	
	8							"	Pale grey with reddish tinge, med.hard fine to med. grained sandstone(poorly sorted);grain notwell rounded partly silicified;ferruginous in places, rare rounded chert pebbles.	
	9							"	As above	
	10							"	Colour as above, sandstone more sil., tending to a billy, also high % of well rounded qtz.grains(coarse to pebble size).	
	11							"	Pale grey,faint orange red tinge; med.soft to med.hd.sandy siltst. with a white clayey matrix,some frags.showing ferruginous staining,rare chert pebbles(small)but abundant well-rounded qtz.grains(med.to coarse,rare pebble size- Tertiary infil?)	

HOLE No.: SC-22 HOLE LOGGED BY: J.SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
11	12							"	As above	
	13							"	As above	
	14							"	As above	
	15							"	As above	
	16							"	As above	
	17							"	As above	
	18							"	As above	
	19							"	As above, only sandst. becoming more siltier & more well sorted, also becoming less consolidated & friable & paler in colour. Abundant well rounded coarse qtz. grains. Extremely rare chert grains.	
	20							"	As above	
	21							"	As above	
	22							"	As above	
	23							"	As above	
	24							"	Pale grey, fine siltst. (almost a shale in places) faintly limonitic, shales ? snap (brittle in small blocks). No coarse grains of qtz. No chert.	
	25							"	As above	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							"	As above	
	30							"	As above	
	31							"	As above	
	32							"	As above only becoming sandier.	
	33							"	Pale grey reddish tinge. Fine to med. grained sandst., white clayey cement, fairly consolidated, but breaking down to a loose fine grained sand, common ferruginous mat. on the frags, & common well-rounded qtz. pebbles, rare sil. siltstone (caving?)	

HOLE No.: SC-22 HOLE LOGGED BY: J. SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XRK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTRUBS~~ SHAPIRO	DESCRIPTION	DATE
53	54	3.8						3	Pale yellow brown,med.hd.silstone as above(heavily limonitic) abundant pebbles of chert &qtz.,well-rounded.	
	55	2.3						5	Pale yellow grey,calcareous med.hd.crystalline siltst. slightly limonitic and always phosphate.Also chert & qtz.pebbles,(well rounded) becoming rarer.	
	56	1.8						2	As above	
	57							1	As above	
	58							1	As above	
	59							1	As above	
	60	1.9						4	As above	
	61	3.0						6	As above	
	62	1.4						5	As above	
	63						Good chip	2	Yellow brown,calcareous siltstone fairly highly calc., rare well rounded chert & qtz. pebbles.	
	64						Good chip	<1	As above	
	~~65~~							"	Pale grey, highly calc.crystalline siltst.(limonitic)almost a limest.	
	66							"	As above	
	67							1	Pale grey,calcareous siltstone as above,but also a high % of hd.sil.(non calc.) light grey shale & med.soft limonitic shale.	
	68							1	Med. grey,cal.siltstone,med.hard shale,sil.siltstone and pale green waxy frags.(Compare SC-19)bentonitic.	
	69							<1	Med.grey,mainly med.soft to med.hd., sil.siltstone & shale, little calc.material,pebbles of chert & qtz.common.Cavings?	
	70							"	Pale yellow grey,mainly calc.med.hd.siltst.faintly limonitic/	
	71							"	As above	
	72							"	Creamy grey,mainly calc.siltst.as above,but also sil.siltst. (hard pale grey becoming sandy in places), common small pebbles, abundant chert frags.	
	73							"	As above, without abundant chert frags.	

HOLE No.: SC-22 HOLE LOGGED BY: J. SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XYMOSE~~ SHAPIRO	DESCRIPTION	DATE
73	74							"	As above	
	75							3	As above	
	76	3.0						2	Yellow-brown, calcareous siltstone as above; also fine grained slightly calcareous sandstone (med. hard) few frags. chert, trace oolitic phosphorite.	
	77							5	Cream yellow, highly calcareous siltstone (almost limestone) hard crystalline plus common brittle limonitic shale. Rare chert.	
	78							4	As above	
	79							2	As above	
	80							<1	As above	
	81							"	As above	
	82							"	As above	
	83							"	As above	
	84							1	As above	
	85							1	Mustard yellow, calcareous limonitic siltstone.	
	86							<1	As above	
	87							"	Pale pink, hard dolomitic limestone very slightly phosphatic, numerous small cavities.	
	88							"	As above	
	89							"	As above	
	90 T.D.							"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK NO.23
STATE: QUEENSLAND COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION:
TOTAL DEPTH: 60'T.D.

ROTARY DRILLING: Depth from 0' to 60'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 1028.0' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY.LTD.
SPUDDED: 11.5.67
COMPLETED: 11.5.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	10							<1	Red brown, alluvium, ferruginous coarse and fine sand grains, loose, unconsolidated, and chert pebbles well rounded.	11.5.67
10	19							"	~~Red orange, fine sand, with aboundant ferruginous~~ gravel to pebble size; quartz grains, loose unconsolidated, gravel, sub angular to angular grains, also frags. of unsorted sandstone, fine to coarse grained.	
20	38							"	Pale pink, fine sand (ferruginous) and frags of fine grained sandstone (poorly sorted) abundant gravel (sub-angular quartz and chert pebbles, rare but present).	
38	60 T.D.							"	Pale pink-grey; unconsolidated loose sand and fine grained sandstone frags, rare chert pebbles, sand slightly ferruginous also common gravel sized quartz grains.	
									HOLE CAVING AND NO P_2O_5 SHOWS TO T.D.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PROJECT: UNDILLA BASIN PHOSPHATE

HOLE No.: SC-24

STATE: QUEENSLAND **COUNTY:**

PARISH: **HOLDING:**

LAT. **LONG.** **CO-ORDINATES:**

INCLINATION:

TOTAL DEPTH: 100' T.D.

ROTARY DRILLING: Depth from 0' to 100'

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL: 1055.3' Elevation

DRILLING CONTRACTOR:

SPUDDED: 11/5/67

COMPLETED: 11/5/67

HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	~~BIT~~	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	4							<1	Dark Grey, Clayey silst.with rare qtz.grains(clay pan)	11.5.67
4	19							"	Yellow brown,limonitic and ferruginous siltstone common qtz. grains,gossanous in parts, also common med. hard ironstone(medium brown in colour(mainly limonitic)	
20	33							"	Pale red brown, ferruginous sandy siltstone limonitic in part (flecked with limonite)mainly loose and friable, trace chert in the form of broken pebbles, common ferruginous qtz.(med. to coarse grains)	
34	38							"	Cream to pale grey, mainly limonitic sandy siltstone, flecked limonitic and ferruginous.common qtz. grains.	
38	43							"	Yellow brown, limonitic siltstone, gossanous as above.	
44	100 T.D.							"	Pale cream, yellow, mauve and green shales. Green shale medium hard, but others mostly soft and powdery, heavily limonitic in places (proterozoic?)	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK 25
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 120' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 120'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1053.2' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 12.5.67
COMPLETED: 12.5.67
HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Deep red brown, clayey siltstone with med. quartz grains; clayey alluvium.	
	2							"	As above	
2	20							"	Red brown, loose siltstone with med. grained quartz embedded in the silty matrix loose, firable, unconsolidated, alluvium, highly ferruginous and commonly limonitic near the surface.	
20	21							"	Yellow brown, sandy limonitic siltstone, med. hard, plus trace chert frags. probably pebbles, siltstone mottled in places (yellow grey, brown).	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	As above, plus abundant hard yellow cream billy, common chert (med. grey)	
	26							"	As above	
	27							"	Pale cream yellow, hard sil. siltstone and billy, abundant chert.	
	28							"	As above	
	29							"	As above	

HOLE No.: SC-25 HOLE LOGGED BY: ~~XX~~ J. SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XXX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
29	30							"	As above	
	31							"	As above	
32	~~XX~~ 47							"	Pale grey to white, med. hard to hard sil. siltstone and shale. Samples very powdery, rare med. grey chert.	
48	51							"	Samples extremely powdery. As above, chert becoming more common but still not abundant siltstone and shale becoming deeper in colour and siltstone tending to a definite shale, but (sil. siltstone) still abundant, but becoming med. soft.	
51	57							"	As above, powdery, white to light grey med. soft siltstone and shale.	
	58		Phosphate					1½	As above, only slightly creamier in colour, mainly hard sil. siltstone and chert.	
	59	7.0						5	As above	
59	68							<1	Pale grey, med. hard to hard sil. siltstone and shale with abundant grey and brown chert; cherts almost dominant.	
	69							"	As above, some shales and siltstones appear fractured and jointed with Fe staining on the joints.	
	70							2	As above	
	71							1½	As above	
	72							1½	As above	
	73							<1	As above	
	74							"	As above	
	75							1½	As above	
	76							1½	As above	
	77							2	Pale grey, med. soft siltstone, fine powdery kaolinitic, chert rare but present.	
	78							1½	Bright yellow mustard, soft powdery, richly limonitic silsstone ~~(very fine grained tending to a shale).~~	

HOLE No.: SC25 HOLE LOGGED BY: J. SIMPSON PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
78	79							1½	As above	
79	96							<1	Pale pinkish brown, med. grained loose sand but med. hard to drill and therefore consolidated, grains free, very well rounded. Sand grains appear to be frosted in part. Sand is not clean. There are abundant ferruginous grains.	
	97							"	Colour as above, a 1-foot siltstone stringer in the sandy siltstone slightly phosphatic pale grey but richly flecked with limonitic material.	
97	102							"	Sand, as above 80-96.	
102	120 T.D.							"	Bright yellow to mauve, very powdery fine siltstones and shale, med. soft to med. hard. Highly limonitic to 117 where green and purple shales predominate PROTEROZOIC ?	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK NO. 26
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 90' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 90'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1009.0' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 14.5.67
COMPLETED: 14.5.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~XXX CORE XXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red brown, ferruginous, loose sandy siltstone, alluvium 14/5/67 plus ferruginous rounded pebbles up to ¼" in diameter (ironstone pebbles).	
	2							"	As above	
	3							"	As above	
	4							"	Pale red brown, ferruginous sandy siltstone, loose, unconsolidated, rarely limonitic, very sandy in places, ironstone pebbles lacking.	
	5							"	As above	
	6							"	As above	
	7							"	As above	
	8							"	As above	
	9							"	As above, mauve colour, very ferruginous fine grained sandstone and siltstone.	
	10							"	Deep brown, coarse frags of dark grey chert and bedded sil. siltstone pebbles (agnostid trilobite common) chert in the form of large pebbles, also large well rounded quartz pebbles, bedded siltstone limonite.	
	11							"	As above	

HOLE No.: SC-26 HOLE LOGGED BY: J. SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
11	12							"	Deep yellow brown, mainly limonitic ironstone; black lustrous mineral (prob. haematite) - red brown streak, sparkles, abundant limonitic powder on ~~xxxxx~~ ironstone frags.	
12	18							"	As above	
19	22							"	Bright mustard colour, richly limonitic clayey siltstone, med. soft, plus almost black chert and ironstone as above.	
23	26							"	Yellow brown but paler in colour than above; abundant ironstone pebbles but dominantly med. soft limonitic siltstone, rare quartz grains embedded in it and rarely ferruginous (mottled appearance).	
27	30							"	Pale grey, med. soft clayey siltstone, trace chert, siltstone slightly limonitic and sandy in places, also med. hard sil. siltstone.	
31	40							"	Pale grey, mainly med. hard sil. siltstone, finely bedded and fossiliferous (agnostids) also med. soft clayey limonitic siltstone becoming rare after 33' abundant brown chert (dominant at 35')	
41	51							"	Pale grey becoming powdery, mainly med. hard sil. bedded siltstone and rare shale (splitting along definite planes) brown chert always present but always rare and absent 46-49 and 53-57.	
51	60							"	As above, samples very powdery, chert (brown; becoming common at 59' but decreasing to rare at 60'	
	61							"	As above, but siltstone becoming softer and no bedding can be discerned, rare chert, powdery samples.	
	62							"	As above	
	63							"	Pale cream grey, limonitic siltstone with very faint bedding, also rare flecks of ferruginous material chert absent.	

HOLE No.: SC-26 HOLE LOGGED BY: JOHN SIMPSON PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~STRUCTURE~~ SHAPIRO	DESCRIPTION	DATE
63	64		Phosphate					5	As above	
	65							5	As above	
	66							3	As above	
	67	12.6						10	As above	
	68	9.2						8	Light brown, richly limonitic siltstone, finely bedded, micro ooliths???? chert absent.	
	69	1.4						<1	Bright mustard orange, richly limonitic siltstone, clayey (ochre), limonite in thin bands interbedded with pale grey siltstone (low phosphtatic).	
	70							1	As above	
	71							2	As above	
	72							2	As above	
	73	11.9						8	Pale yellow brown, limonitic med. soft siltstone as above, plus hard sil.sandstone ? with vughy quartz.	
	74	11.4						9	As above	
	75	11.4						17	As above	
	76	27.8						>20	Pale to med. grey, mainly powdery siltstone, limonitic in places, containing very rare chert and some dark grey oolitic material ? gossanous? particularly noteable in 77' sample and may be correlated with high P_2O_5 value in that sample.	
	77	28.5						>20	As above	
	78	17.9						15	As above	
	79	13.5						10	As above	
	80	8.7						8	As above	
	81	5.0						6	As above	
	82	9.2						10	Deep grey brown, darker in colour than above, dark grey finely bedded siltstone, rarely limonitic in places, also abundant chert (dark grey); also hard sil.pale grey mat.	
	83	11.0						10	As above	

HOLE No.: SC.26 HOLE LOGGED BY: J. SIMPSON PAGE 23 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
83	84	6.6						5	As above	
	85	5.0						4	As above	
	86	3.8						3	Pale pink, hard crystalline limestone (phosphatic) fizzes well in acid, dolomitic??	
	87	3.6						3	As above	
	88	2.3						2	As above	
	89	1.5						1	As above	
	90 T.D.	1.5						1	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREED NO.27
STATE: QUEENSLAND COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION:
TOTAL DEPTH: 123' T.D.

ROTARY DRILLING: Depth from 0' to 123'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 1018.8' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 14.5.67
COMPLETED: 16.5.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ASSAYER~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red brown, alluvium, loose unconsolidated ferruginous and limonitic siltstone and sandstone, also large ironstone pebbles.	14.5.67
	2							"	As above	
	3							"	As above	
	4							"	Brown with reddish tinge, richly limonitic and ferruginous sandy siltstone, large frags of ironstone.	
	5							"	As above	
	6							"	As above	
	7							"	As above	
	8							"	As above	
	9							"	As above	
	10							"	Red brown, ferruginous and limonitic siltstone and sandstone, with a high % of coarse to very coarse quartz grains.	
	11							"	As above	
	12							"	Asabove	
	13							"	Red to orange, fine ferruginous sand with an abundance of very coarse quartz grains; almost a gravel.	
	14							"	As above	

HOLE No.: SC-27 HOLE LOGGED BY: J. SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~XXX CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
14	15							"	As above	
	16							"	As above	
	17							"	As above	
	18							"	As above	
	19							"	Orange grey, ferruginous loose fine sand, also clayey siltstone with coarse quartz grains embedded in the clayey matrix. Large quartz pebbles (well rounded). Large rounded chert pebbles and frags; rare hard sil. siltstone frags.	
19	25							"	As above	
	26							"	UNCHANGING UNIFORM LITHOLOGY Pale grey, med. hard sil. siltstone fine bedding present in the frags; ferruginous and limonitic material in definite bands, (very faintly limonitic and ferruginous) chert present in all samples but very rare. At 47' bedding becomes less visible and sample became less limonitic and ferruginous.	
26	59							"	As above	
	60							"	Samples very powdery, pale grey with very faint cream yellow tinge, siltstone (kaolinitic) with rare traces of limonite and ferruginous material. Rare chert (dark grey). Siltstone showing no bedding and becoming softer (less silicified).	
60	79							"	As above	
	80	4.8	Phosphatic					1	As above	
	81	7.3						4	As above	
	82	12.8						13	As above	
	83	20.8						20	Pale yellow, soft limonitic siltstone. Chert absent or very rare.	
	84	18.7						15	As above	

HOLE No.: SC-27 HOLE LOGGED BY: J. SIMPSON PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
84	85	20.3						20	As above	
	86	15.2						15	As above	
	87	9.1						5	As above	
	88	11.9						8	As above	
	89	24.4						17	As above	
	90	17.1						10	As above	
			15/5/67 NO DRILLING							
	91	---	Began drilling at 90'					5	Cream to pale grey, soft powdery slightly limonitic and rarely ferruginous siltstone, rare dark grey chert.	16.5.67
	92	3.7						4	Pale grey, soft siltstone as above; also hard sil. siltstone and shale becoming common; dark grey chert common but not abundant. Samples less powdery and harder to drill.	
	93	5.7						6	As above	
	94	3.0						4	As above	
	95	2.4						4	As above	
	96	2.8						5	As above	
	97	2.4						4	As above	
	98	3.3						5	As above	
	99	5.2						7	As above	
	100	3.0						6	Pale grey, mainly hard sil. siltstone and grey brown chert; chert becoming very common to abundant.	
	101	2.3						4	As above	
	102	2.3						5	As above	
	103	2.3						2-3	As above	
	104	2.5						2-3	As above	
	105	3.7						2-3	As above	
	106	1.75						1-2	Grey brown, some soft limonitic siltstone (very slightly calcareous) but mainly sil. siltstone and abundant chert as above.	

HOLE No.: SC-27 HOLE LOGGED BY: J. SIMPSON PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
106	107							1-2	Yellow brown, slightly calcareous limonitic siltstone and chert (chert decreasing in abundance).	
	108							1-2	As above	
	109							1-2	Pale yellow very slight pinkish tinge limestone and calcareous siltstone, chert rare.	
	110							1-2	As above	
	111							2-3	As above	
	112							1-2	As above	
	113							1-2	As above	
	114							1-2	As above	
	115							1	As above	
	116							1-2	As above	
	117							<1	As above	
	118							"	As above	
	119							"	As above	
	120							"	As above	
	121							"	Limestone as above, but becoming more silty chert more common.	
	122		2' cavity		Lost circulation					
	123 T.D.									

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK No.28
STATE: QUEENSLAND COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION:
TOTAL DEPTH: 140' T.D.

ROTARY DRILLING: Depth from 0' to 140'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 1017.2' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 21.5.67
COMPLETED: 22.5.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	6							<1	Red-brown, sandy alluvium with pebbles of ironstone, chert and quartz.	21.5.67
6	13							"	Orange-coloured, alluvium as above.	
13	17							"	As above, yellowish	
17	20							"	Cream to light buff, silicified (and/or cemented with ferruginous material) sandy siltstone with chert pebbles and haematite ? pebbles.	
20	23							"	Siltstone as above, with abundant sandy haematite ? pebbles ("pebbles" perhaps balled ferruginous layers?)	
23	26							"	Whiter siltstone, not silicified; less sandy, more clayey; with fewer haematite ? pebbles.	
26	29							"	As above, slightly orange colour (due to flecks of haematite?)	
29	40							"	Grey-white siltstone with haematite? pebbles and siltstone chips containing some yellow and brown ferruginous staining.	
40	67							"	Whitish siltstone; Fe content decreasing, although occasional flakes of haematite ? and ferruginous pebbles evident. Some chips quite hard, possible silica-cemented. All this interval is sandy;	

HOLE No.: SC-28 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
~~XX~~	~~XX~~								siltstone with both rounded and angular quartz grains, also occasional small rounded chert pebbles.	
									Quartz pebbles become more abundant below 52'.	
									63-67' sl. pink due incr. haematite?	
67	68							"	Pink-white siltstone as above, but with abundant silicified chips.	
68	72							"	Pink-white siltstone, with chips of silicified siltstone; also abundant large rounded and angular quartz pebbles.	
72	76							"	More powdery samples of siltstone with large quartz pebbles. Less pink due to decr. haematite ? content.	
76-	82							"	Quartz sand, white, fine-grained mainly, with angular rounded quartz pebbles. Small silt content.	
									At 82' had circulation problem due to caving. Continued drilling with mud, although no suitable sampling device was available, in the hope of both checking lithology and detecting P_2O_5.	
									Some footage was lost in establishing circulation with mud, but the following log comments on the observed changes in lithology and the detection of P205. Wet samples were subsequently obtained and bagged for possible phosphate determination.	
82	100								Quartz sand as above.	
100	113								Whitish siltstone without chert.	
113	114								As above, with thin chert horizon.	
114	115		115 or 116					5	Whitish, phosphatic, siltstone.	
115	116								No sample	
116	118		?117					4	Samples of siltstone with grey-black chert, and large quartz pebbles.	
			118					3		
118	121		120					1		
			121					<1		

HOLE No.: SC-28 HOLE LOGGED BY: N. MURPHY PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
121	122		122					"	Apparently non-phosphatic siltstone with quartz pebbles and some chert.	
			123					"		
			124					"		
			125					"		
			126					"		
127	128		127					1	Siltstone, much chert phosphatic	
			128					2-3		
128	129		129					8	As above	
129	130		130					7	As above with few chips of fine "soapy" claystone with chert and siltstone.	
130	131		131					8	As above	
			132					6		
			133					2-3		
			134					1-2		
			135					1		
			136					1-2		
			137					1		
			138					1		
			139					1		
	140 T.D.		140					1	Lost circulation completely (no return of mud whatsoever)	
									Samples from 122' to 140' poor, and probably not representative. Values are not reliable, samples are poor and consist mainly of chert.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SHERRIN CREEK 29
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:** BARKLY DOWNS
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 76'T.D.

ROTARY DRILLING: Depth from 0' to 76'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 1031.6' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 23.5.67
COMPLETED: 23.5.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	14							<1	Red-brown, ferruginous sandy alluvium	23.5.67
14	18							"	Pinkish silty sand with large, rounded quartz pebbles.	
18	20							"	Yellow-pink, as above.	
20	28							"	As above, but siltier; quartz pebbles not so large as before, but still abundant.	
28	41							"	Yellow-to-white, with pink, silty sand, many quartz pebbles, some chert pebbles.	
41	47							"	As above, whitish colour, with abundant, very large quartz and chert pebbles.	
47	60							"	Yellowish quartz sand, with pebbles as above.	
	76'T.D. No circulation after 60' No P_2O_5 to T.D. 76'									

McA. 29

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PROJECT: UNDILLA BASIN PHOSPHATE

HOLE No.: SHERRIN CREEK NO. 30

STATE: QUEENSLAND COUNTY:

PARISH: HOLDING:

LAT. LONG. CO-ORDINATES:

INCLINATION:

TOTAL DEPTH: 120' T.D.

ROTARY DRILLING: Depth from 0' to 120'

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL: 1039.1' ELEVATION

DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.

SPUDDED: 23.5.67

COMPLETED: 23.5.67

HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	15							<1	Red-brown, sandy alluvium; with pebbles of quartz and chert.	23.5.67
15	29							"	Pink, sandy ferruginous siltstone containing quartz pebbles (particularly abundant in interbed 26'-29')	
29	32							"	Yellow-pink sandy siltstone, with quartz pebbles.	
32	35							"	Slightly pink-cream, as above, with some haematite? cement.	
35	40							"	Pink, silty quartz sand; with quartz pebbles.	
40	46							"	As above, yellow colour.	
46	53							"	Cream-to-yellow silty sand, with a few quartz pebbles (up to ¼" diameter in 52'-53').	
53	54							"	Yellow silt/sand	
54	57							"	Yellow sandy siltstone.	
57	61							"	Cream-to-yellow as above, with grey-brown chert. Some silicification evident.	
61	67							"	As above, slightly pink colour (haematite grains?) Much silicification (giving good chips & little powder).	
67	71							"	Yellow siltstone; little or no chert, no silicification (but some limonitic cementation).	

McA. 29

HOLE No.: SC30 HOLE LOGGED BY: N. MURPHY PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~XXXXX~~ SHAPIRO	DESCRIPTION	DATE
71	75							"	~~White siltstone; no chert; no silicification.~~	
75	76	8.1' (76') P_2O_5						8	As above	
	77	11.8						12	As above	
	78	10.2						10	As above	
	79	2.8						8	White quartz sand, some silt.	
	80	4.2						8	As above	
	81	4.5						8	As above	
	82	8.1						11	As above, becoming siltier.	
	83	13.0						17	As above	
	84	15.8						18	As above	
	85	17.2						12	As above	
	86	11.2						12	As above	
	87	12.8						20	White sandy silt, some chert, some silicification	
	88	11.0						20	As above	
	89	10.8						12	White, slighly sandy silt and siltstone; with a little chert and some silicification (also common ferruginous cementing).	
	90	13.5						18	As above	
	91	17.6						20+	As above	
	92	16.5						20	As above	
	93	13.5						20	As above	
	94	12.5						16	As above	
	95	9.8						12	As above, slightly more chert than above.	
	96	7.8						12	As above	
	97	7.8						14	As above	
	98	7.8						10	As above	
	99	7.8						10	As above	
	100	8.8						10	As above	
	101	9.1						10	As above, creamy colour, with very fine chert fragments (slivers rather than usual chunky chips).	

HOLE No.: SC30 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
101	102	9.1						14	As above	
	103	10.0						14	As above	
	104	10.0						12	As above	
	105	9.2						12	As above	
	106	9.6						12	As above	
	107	10.5						10	As above	
	108	8.4						8	As above	
	109	4.1						8	As above, but without chert; becoming sandier (haematite ? grains as well as quartz).	
	110	4.5						8	As above	
	111	3.3						8	Yellow-pink sandier silt than above.	
	112	2.8						2-3	As above	
	113	3.3						3	As above	
	114	2.8						3	As above	
	115	2.0						1-2	Yellowish, ~~xxxxx~~ slightly sandy silt, with occasional chert slivers.	
	116							2	As above	
	117							1-2	As above	
	118							1-2	As above	
	119							1	Yellow silt with a few chert slivers	
	120 T.D.							1	As above	
									~~DRILLING STOPPED BECAUSE HOLE CAVED.~~	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PROJECT: UNDILLA BASIN PHOSPHATE

HOLE No.: SC-31

STATE: QUEENSLAND **COUNTY:**

PARISH: **HOLDING:** MAY DOWNS

LAT. **LONG.** **CO-ORDINATES:**

INCLINATION:

TOTAL DEPTH: 100' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 100'

DIAMOND CORE DRILLING: **Depth from** **to**

DRILLING: **Depth from** **to**

GROUND LEVEL: 1007.2' Elev.

DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS LTD.

SPUDDED: 22/5/67

COMPLETED: 22/5/67

HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	Field ~~CORE~~ ATTITUDE Shapiro	DESCRIPTION	DATE
0"	3'							<1	Rd.-bn. ferruginous sandy alluvium with small pebbles	22/5/67
									pebbles of qtz. and ironstone.	
	4							"	As above, w/wh/silst. & weathered chert pebbles.	
	5							"	As above, yellow-bn.; less chert	
	6							"	Wh.siltst. w/rd. & yellow Fe staining on bedding planes	
									& joints.Ch.decr. Siltst.partly silicified(assoc.	
									w/ch. beds)	
	7							"	As above	
	8							"	As above	
	9							"	As above	
	10							"	As above	
									(Samples in interval 1'-7' slightly calcareous)	
	11							"	As above,without ch.,no silicification detectable	
	12							"	As above	
	13							"	As above	
	14							"	As above	
	15							"	As above, w/chert	
	16							"	As above	
	17							"	As above,w/abund.chert	
	18							"	Yellowish siltst.w/rare ch.frg.	

HOLE No.: SC31 HOLE LOGGED BY: N. MURPHY PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
18	19							"	As above	
	20							"	As above (but no chert)	
									(many hard siltst.chips in all above samples observed	
									to be cemented with limonite)	
	21							"	Yellowish siltst.,much limonite & some haematite staining.	
	22							"	As above - yellow-cream	
	23							"	As above, white	
	24							"	As above,w/a little grey-bn.chert.	
	25							"	As above	
	26							"	As above	
	27							"	As above, without chert	
	28							"	As above	
	29							"	As above	
	30							"	As above, with some chert	
	31							"	As above	
	32							"	As above	
	33							"	As above	
	34							"	As above	
	35							"	As above, cream colour	
	36							"	As above, slightly yellow; without chert	
	37							"	Cream siltst.; without chert	
	38							"	As above	
	39							"	White, partly silicified siltst.,; no chert	
	40							"	As above	
	41							"	As above, some brown chert	
	42							"	As above	
	43							"	As above	
	44							"	As above	
	45							"	As above	
	46							"	As above	

HOLE No.: SC31 HOLE LOGGED BY: N. MURPHY PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BH~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
46	47							"	As above, without chert; slight silicification	
	48							"	As above	
	49							"	As above	
	50							"	As above	
	51							"	As above	
	52				Phosphate			"	As above, white to cream	
	53							"	As above, yellow; some chert	
	54	13.9						10	As above, cream	
	55	21.4						15	As above; without chert	
	56	8.6						7	Cream-yellow silt; with chert	
	57	3.8						5	As above	
	58	6.9						5	Yellow silt, with chert	
	59	6.0						5	As above	
	60	7.0						5	As above	
	61	6.9						5	As above, slightly calcareous	
	62	5.0						6	As above	
	63	11.0						10	Grey (?grey-green) siltst., calcareous	
	64	13.0						12	As above	
	65	13.0						14	As above	
	66	10.5						12	As above	
	67	5.2						4	White calcareous siltstone	
	68	2.7						3	As above	
	69	2.7						3	As above	
	70	5.0						5	As above	
	71	4.1						4	As above	
	72	4.1						4	As above	
	73	6.1						5	As above	
	74	3.2						4	As above	
	75	4.5						5.	As above	
	76	5.0						4	As above	

HOLE No.: SC31 HOLE LOGGED BY: N. MURPHY PAGE 4

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
76	77	4.1						4	As above, partly silicified, calcareous	
	78	4.1						4	As above	
	79	2.9						3	As above, with chert, slightly calcareous	
	80	3.6						4	Cream(as above) with chert; sl.calc.	
	81	2.8						4	As above	
	82	2.8						3	As above	
	83	3.6						4	As above	
	84	2.8						3	As above	
	85	3.6						3	As above	
	86	3.8						4	As above	
	87	4.5						4	Yellowish,as above; sl. calc.	
	88	4.2						3	As above	
	89	4.5						3	As above	
	90	4.8						3-4	As above	
	91	4.5						3-4	As above	
	92	3.8						3	As above	
	93	4.0						3	As above,cream-yellow colour,with very small chert content (?thin lenses), sl.calc.	
	94	4.8						3	As above but more calcareous.	
	95	3.1						2	As above	
	96	2.7						1-2	As above	
	97	2.0						1-2	As above	
	98							1-2	As above	
	99							1-2	As above	
	100 T.D.							1-2	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: SC32
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 180' TD

ROTARY DRILLING: **Depth from** 0' **to** 180'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 1024.1' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 24.5.67
COMPLETED: 25.5.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE INDEX~~ SHAPIRO	DESCRIPTION	DATE
0	7							<1	Red-brown, ferruginous, sandy alluvium.	24.5.67
7	8							"	Buff-brown,as above	
8	13							"	Buff-yellow sandy, pebbly silt with many pebbles of quartz, chert and ironstone.	
13	14							"	Red-yellow as above	
14	16							"	Yellowish silty sand, as above	
16	18							"	Pink, as above	
18	20							"	Pink-yellow, as above	
20	21							"	~~As~~ Same red-brown ferruginous sand, also yellow silty sand as above; pebbles rather smaller.	
21	24							"	Yellow silty sand.	
25	28							"	Creamy sandy silt; pebbles fewer.	
28	40							"	Cream-to=white silty with only a few pebbles (now mainly quartz) and much yellow-brown ferruginous material. Specks of haematite? common. This interval is only slightly sandy.	
40	46							"	White, as above	
46	48							"	Slightly yellow, as above	
48	54							"	White, as above	
54	59							"	Yellow-buff and white siltstone.	

HOLE No.: SC32 HOLE LOGGED BY: N. MURPHY PAGE

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
59	60							"	Pink siltstone.	
60	69							"	Yellowish-orange siltstone.	
69	76							"	Cream-to-white siltstone	
76	80							"	Pink=yellow silt and siltstone, sandy in places.	
80	81							"	Pink-yellow sand; increased pebble content.	
81	83							"	As above; with abundant rounded quartz pebbles.	
83	97							"	As above, pebbles less abundant.	
97	111							"	As above, whiter colour	
111	112							"	White silty sand.	
112	120							"	White and pink pebbly sands.	
120	127							"	White; siltier sand than above; less pebbly than above.	
127	134		Phosphatic at 127					5	White silt and siltstone; (132'-134' pebbles contain quartz).	
134	135							4-5	Phosphatic white siltstone, with pebbles of quartz.	
134	136	4.8						1	As above, bu t calcareous.	
	137							<1	As above	
	138							"	Cream limestone, also pebbly silt and sand (perhaps cavings?)	
	139							"	As above	
	140							"	As above	
	141		Drilling slowed down considerably					"	Mainly pebbly sands (cavings?) with limestone.	
	142							"	Limestone and quartz pebbles.	
	143							"	As above	
	144							"	Limestone and brown chert, with quartz pebbles (pebble content decreasing) and siltstone - occasional recovery of sandy and ferruginous siltstone chips (calcareous).	
143	160							"	As above	
160	161							1	Limestone and calcareous sand/silt	25.5.67
	162							1	As above	
	163							1	As above	

HOLE No.: SC32 HOLE LOGGED BY: N. MURPHY PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
163	164							1	As above	
	165							<1	As above	
	166							"	As above	
166	180							"	As above	
									Drilling stopped due to blockage at bottom of hole preventing insertion of further drill pipe.	
									Drilling very slow (rock bit) from 141'.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: BARKLY DOWNS NO.1
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 200' T.D.

ROTARY DRILLING: Depth from 0' to 200'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL:
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 1.5.67
COMPLETED: 1.5/67
HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ ~~ASSAYS~~ SHAPIRO	DESCRIPTION	DATE
0	14							<1	Red-brown, medium grained, iron-stained fairly well sorted quartz sand.	1/5/67
14	17							"	As above; but minor fragments of quartzite alluvial pebbles. Also light grey and brown, soft friable, ferruginous clayey sandstone.	
17	22							"	As above; but slightly more sandstone.	
22	25							"	As above; fragments are of light grey and ferruginous medium brown, soft friable argillaceous sandstone which grinds to sand. Slightly lighter coloured, also more sandstone chips.	
25	26							"	As above; but still lighter coloured (light pink-brown to flesh coloured).	
26	27							"	As above; the sandstone is composed of fairly well sorted subrounded quartz grains in an argillaceous and ferruginous (where red-brown) matrix.	
27	32							"	As above; also mottled light grey and flesh coloured.	
32	42							"	As above; but lighter coloured, also less sandy. Almost a weathered shaly siltstone. Slightly darker coloured - 33-34'.	
42	47							"	Light grey and flesh coloured weathered silty shale.	

HOLE No.: BARKLY DOWNS NO. 1 **HOLE LOGGED BY:** R. GRASSO **PAGE**

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD SHAPIRO	DESCRIPTION	DATE
47	62							"	Light grey to flesh coloured weathered silty shale which grinds to a powder and minor shale fragments. Light grey and less pink at 53-54 feet.	
62	67							"	As above but sandy and more silty.	
67	68							"	As above; but mostly light grey shaly siltstone. Sandy in places.	
68	75							"	Flesh or salmon coloured powder from friable argillaceous siltstone (sandy in places).	
75	82							"	Mostly light grey, soft powdery silty shale. (Light salmon coloured at 77-78 feet).	
82	86							"	Light grey to faint salmon coloured argillaceous siltstone; grinds to a powder.	
86	103							"	Salmon light mauve and light grey and cream soft weathered silty shale and shaly siltstone. Finely sandy in places.	
103	107							"	Salmon to cream-brown argillaceous powdery siltstone.	
107	114							"	Light grey to pale cream weathered argillaceous siltstone.	
114	118							"	Darker grey soft weathered silty shale. Ferruginous in places.	
118	121							"	Cream silty shale as above; but more silty.	
121	123							"	Mauve coloured, ferruginous soft silty shale.	
123	124							"	As above; but mottled mauve and light grey.	
124	125							"	As above; but less mauve.	
125	127							"	Medium grey to mauve, soft weathered silty shale.	
127	129							"	Cream to light brown shales as above; but more silty.	
129	130							"	As above; but slightly darker cream.	
130	131							"	As above; but slighly mauve tinge to the light brown.	
131	132							"	As above; but cream.	
132	135							"	Light brown and purple, finely bedded soft slightly silty shale.	

HOLE No.: BARKLY DOWNS NO.ONE HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
135	136							"	Medium brown, soft weathered shale.	
136	140							"	Light to medium brown, soft weathered shale.	
140	143							"	Mostly light to medium grey, mauve and light brown, soft weathered shales.	
143	153							"	As above; but ? bentonite shales.	
153	160							"	Mostly light brown-grey, powdery argillaceous quartz siltstone. Finely sandy in places. Limonitic brown at 156-157 feet.	
160	164							"	Very light mauve-grey powdery silty shale.	
164	165							"	As above; but cream coloured.	
165	166							"	As above; but light grey coloured.	
166	168							"	Cream and light to medium grey slightly silty shale.	
168	175							"	Cream, soft weathered powdery shale.	
175	178	Harder - rough drilling						"	As above; but also abundant medium grey chert and minor fine grained "quartzitic" fragments.	
178	182							"	As above; but mostly cream dust with cherty fragments.	
182	183							"	Light mauve-brown dust (shales) and chert fragments.	
183	184							"	As above; but cream coloured dust.	
184	187							"	Cream to light brown soft weathered shale with cherty fragments.	
187	191							"	Limonite yellow shale as above with abundant cherty fragments.	
191	194							"	As above; also yellow-brown medium soft to medium hard silty shale.	
194	198							"	Light brown to light salmon-cream soft weathered shale with abundant chert fragments.	
198	200 T.D.							"	Light grey soft weathered shales and abundant chert fragments and red-brown ferruginous quartz silt and sand grains.	
		Reached capacity of rig (no more drill pipe on rig) Total depth 200 feet. THE SECTION IS Cambrian. It is possible that a phosphatic horizon may be present below 200 feet.							NOTE: The presence of chert would seem to indicate that	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: BI-A
STATE: QUEENSLAND
COUNTY:
PARISH:
HOLDING: COOLOOTAI
LAT. **LONG.**
CO-ORDINATES: 25 ft. NW of B
INCLINATION:
TOTAL DEPTH: 105' T.D.

ROTARY DRILLING: Depth from 0' to 105'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 840' Elev.
DRILLING CONTRACTOR: AUSTRAL GEOPROSPECTORS PTY. LTD.
SPUDDED: 4/5/67
COMPLETED: 4/5/67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	AMDEL SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP SHAPIRO	FIELD SHAPIRO	DESCRIPTION	DATE
0	1						T	< 1	Soil-loam; rd.-bn clay-silt, w/chert frags(bl.)non calc.	4/5/67
	2						T	< 1	As above;w/lt.gy.to wh.frags of siltstone,minor frags of chert (bl)	
	3						T	< 1	As above;w/frags of wh.& lt.gn. siltst.,non calc.w/ch.minor	
	4						T	< 1	As above,w/frags of thinly varigated dendritic shales,non-calc.	
	5						T	< 1	As above;w/incr.of wh.siltstone frags.	
	6				4 (?)		T	< 1	As above	
	7						T	< 1	As above,siltst.becoming a bn.,cherty,siliceous shale.	
	8						T	< 1	As above;w/soil material minor & increasing ch.(bl)	
	9						T	< 1	As above,becoming lter.rd.w/increasing wh.siltst.,more ferruginous,w/wh.chert frags.minor.	
	10						T	< 1	As above;w/very minor frags. of dolo(?) lms,w/decr. wh.silst. and ch. very abundant.	
	11						T	< 1	As above	
	12						T	< 1	As above	
	13						T	< 1	As above	
	14						T	< 1	As above	
Missed 15 & 16 during casing attempts									----	
	17						SI >	< 1	As above, w/bl.ch.-40%	
	18						SI	1	As above,w/bl.ch.-50%,w/wh.siltst.becoming softer,still lt.rd. colour to gross sample.	

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XX~~. SHAPIRO	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
18	19						SI>	1	As above;w/molted,dk.bn.siltst.-shale increasing.	
	20						SI>	1	As above,w/two var.chert -root beer,bn. & bl.	
	21						SI>	1	As above,w/three var.ch.-r-b,bl. & wh.	
	22						SI>	1	As above	
	23						SI>	< 1	As above	
	24						SI	< 1	As above,becoming more silty, still lt.red-bn.colour.	
	25						SI	< 1	As above	
	26	7.4					>>	4	As above, very silty, non-calc., very fine rd.-bn.colour	
									w/minor qtz. as fine-fragmental grains	
	27	6.0					"	7	As above;w/very small white x's - non calc.(?)	
	28	6.2					"	7	As above;w/ch(bl.) decreasing rapidly	
	29	6.2				MINOR (?)	"	7	As above	
	30	5.6					"	8	As above,w/incr. lt.kaki, siliceous & cherty shale, w/	
									two var. qtz.(?)(but not thought to be ch.)i.e.white &clear(fract.)	
	31	4.7					"	5	As above	
	32	4.2					"	4	As above	
	33	5.1					"	6	As above, becoming sl.calc.,w/two var.ch.(R.B. & bl.)	
	34	6.4					"	7	As above	
	35	7.2					"	7	As above, becoming dendritic, ch.minor	
	36	6.4					"	7	As above	
	37	6.8					"	7	As above,w/small x's of off-wh. to lt.gn.(?)	
	38	6.4					"	5	As above, lt.red-bn.colour still prevalent	
	39	6.0					"	5	As above,w/qtz.gns.of uniform size w/small x's wh.mineral	
									(noncalc.,w/o texture of chert...a silicate(?)	
	40	5.1					SI<	4	As above,w/incr.soft to med. soft dk.rd.siltst.-claystt.,	
									sl.calc w/frags of med.hd.Lms.frags minor.Field shapiro	
									on red silt-clay at about 2% P_2O_5	
	41	4.0					SI<	4	As above	
	42						SI<		As above	
	43-44-45 Missed sample during casing attempts									

HOLE No.: BI-A

HOLE LOGGED BY: M. D. Campbell

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XX~~ SHAPIRO	FIELD ~~CORE~~ ~~XXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
45	46						SI<		As above,w/small,uniform size wh.soft (or weathered mineral or matrix of red.bn.clay silt - abund.bl. & bn. chert.	
	47	1.7					SI<	2	As above, becoming more calc.	
	48	1.9					"	2	As above, becoming darker red.	
	49	3.1					"	3	As above, becoming a bn., soft shale,w/red clay minerals, chert(bl.) abund.; w/minor frags. of lt.gy. Lms.	
	50	1.8				Major(?) △	"	2	As above	
	51	1.5				Major(?) △		3	Siltst.-shale, lt.kaki;w/abund. frags.of above red-bn. clay silt; chert abund.(bl.)	
	52	1.1					"	1-2	Lms, lt.bn.,sl.dolomitic,dendritic,sl.molted texture;w/small calcite & qtz. x's, ch.abund. (Comparable to lower Lms. at C-4 & C-5 differing only with amt.of ch.present - more here than C-4 & C-5.	
	53	1.35					"	1-2	As above	
	54	1.2					"	3	As above, becoming more heavily Fe stained along observed bedding planes.	
	55	.8					"	1-2	As above; w/sl.Fe staining	
	56	.8					"	1-2	As above.	
	57	.9					>	Increase(?) 1-2	As above, w/lt.gy.Lms.frags(Xl) and red-or.frags. of calc.phosphatic clay,incr. chert.	
	58						"	1-2	As above.	
	59					Major △	"	1-2	As above, becoming dark brown w/incr.bn.shale/w incr.bl.chert.	
	60						"	1-2	Shale,bn.to red,w/LMS frags, soft & mottled.	
	61					Major △	"	1-2	As above,w/red-bn.silty shale major,w/chert(b)	
	62						<	1-2	Lms,lt.bn.sl.dolomitic,dendritic(As at 52 feet above) w/minor lt. gy.Lms.	
	63						"	1-2	As above,w/frags.of consolidated material of very small uniform calcite x's in amatrix of clay (red).	
	64						"	1-2	As above,w/two var.Lms.but,w/addition of third var. of dk.bn.,dolomitic,Xl. Chert (bl.) decreasing.	

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~RX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~XX~~ No. SHAPIRO	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
64	65						"	1-2	As above	
	66						"	1-2	As above, still w/ferruginous clay-like frags. of wh. mineral inclusions; w/two var.ch, r.b. & bl. - dk.	
						Major			bn. Lms. wanting.	
	67						"	1-2	Lms. finer grained than above, more calcareous, w/incr. frags. of white, non calc. siltst.	
	68						"	1-2	As above, w/frags. of Fe stained, finely XI sandstone w/carbonate matrix, w/bn.ch. (Sample taken of cylindrical organic (?) piece) Hyolithes sp.?	
	69	2.7					"	3	As above, chert 25%	
	70	3.4					"	3	As above	
	71	2.4					"	3	As above	
	72	3.7					"	3	As above, chert 10%	
	73	3.6					"	4	As above, Fe stained sandstone (?) (qtz. x clusters) wanting.	
	74	3.5					"	3	As above	
	75	2.8					"	3	As above, becoming more silty	
	76	2.1					"	2	As above	
	77	1.3					"	<1	As above	
	78	1.7					"	"	As above	
	79	1.7				Major	"	1	As above	
	80						"	<1	Lms, dk.bn., siliceous, very calc, w/bn.chert 25%, very dendritic and partly mottled.	
	81						"	"	As above	
	82						"	"	As above	
	83						"	1	As above	
	84						"	<1	As above	
	85						"	"	As above, w/occ.frags. of dk. bn., med.hd.siltstone	
	86						"	"	As above	
	87						"	"	As above, becoming very silty.	

HOLE No.: B1-A HOLE LOGGED BY: M. D. CAMPBELL PAGE 5

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
87	88						"	"	As above, chert 10% (bn.var.)	
	89	Core-24					"	"	As above	
	90-105T.D.	Core 20							Losing circulation w/no samples returned (Core (ram) taken from ~ 104' to 105')	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: B-6
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 45' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 45'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 844 ' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 22.4.67
COMPLETED: 22.4.67
HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Mostly chert and cherty floaters with minor brown soil.	22/4/67
	2							"	As above; but more cherty.	
	3							"	Mostly chert and cream and light brown medium soft to medium hard silty shale; partly silicified in places.	
	4							"	Light grey (with pink tinge) medium soft weathered silty shale. Less chert than above.	
	5							"	As above, but more chert.	
	6							"	As above; but also cream, well bedded silty shale.	
	7							"	Mostly light grey and cream (with pink tinge), medium soft to soft weathered silty shale. Trace of chert.	
	8							"	As above; but mostly red-brown colour. Also more chert.	
	9							"	Mostly light grey-cream, well bedded medium soft weathered silty shale. Trace of chert ? cavings.	
	10							"	As above; but mostly light grey. More chert ? cavings.	
	11							"	As above	
	12							"	As above	
	13							"	As above, but with pink tinge.	
	14							"	As above, but mostly light grey.	
	15							"	As above.	
	16							"	As above, but mostly light red-brown.	

HOLE No.: B-6 HOLE LOGGED BY: R. GRASSO PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	~~CORE STRUCTURE~~	DESCRIPTION	DATE
16	17							"	As above	
	18							"	Mostly light grey and light brown medium soft, weathered silty shale as above.	
	19							"	As above	
	20							"	As above	
	21							"	As above, but very powdery.	
	22							"	As above, but less red-brown colour, mostly light grey.	
	23							"	As above	
	24							"	As above	
	25							"	As above	
	26							"	As above, but with thinly bedded red-brown streaks.	
	27							"	As above, but very powdery.	
	28							"	As above	
	29							"	As above	
	30							"	As above, but cream in places.	
	31							"	As above	
	32							"	As above	
	33							"	As above	
	34	19.9						10	Mostly cream dust. Minor light grey coloured fragments contain white phosphorite "oolites".	
	35	5.8						3	Light to medium brown (limonitic yellow) medium soft silty shale. Also light grey to very pale green-grey silty shale with minor very fine phosphorite oolitic grains.	
35	35 8	4.6	0 6	75%				5	Medium brown (limonitic colour) very finely micaceous, talcose silty shale. Trace of finely oolitic phosphorite.	
35 8	37	3.7						3	Medium brown (limonitic colour) medium soft silty shale.	
	38	3.7						2	As above, but abundant chert.	
	39	3.8						2	Mostly chert fragments and light to medium brown powdery silty shale.	

HOLE No.: B-6 HOLE LOGGED BY: R. GRASSO PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
39	40	10.0						8	As above, but soft.	
	41	13.6						15+	As above	
	42	10.0						10	As above, but also trace of soft ? phosphorite oolitic pellets.	
			Driller one foot out - Depth should be 41 feet.							
	42A	9.5		Harder drilling				10	Mostly light brown dust with minor amountsof light ~~XX~~ grey and cream medium soft silty shale. Trace of chert fragments.	
	43	4.0		Hard drilling				6	Mostly light brown dust with white to light grey chert fragments and light brown ? dolomitic carbonate and limestone.	
	44	6.4		Hard drilling				7	As above, but abundant fine chert cuttings. Carbonate grains in places are white and transparent resembling quartz.	
	45 T.D.	5.6		Hard drilling				6	As above, but very hard drilling.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: B-7
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 85' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 85'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 852' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 23.4.67
COMPLETED: 24.4.67
HOLE LOGGED BY: R. GRASSO & M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP SHAPIRO	FIELD CORE SHAPIRO	1' to 32' logged by R.G., 33' to 85' by MC. DESCRIPTION	DATE
0	1				Major △			<1	Clay, red-brown, sandy, with limonitic fragments.	23.4.67
	2							"	Lms., Xline, light to med., bn. hard to med.hard w/trace chert.	
	3							"	As above, with chert and cherty shale.	
	4							"	As above, w/cherty shale, med. hard and well bedded.	
	5				Major △			"	Lms. & shale, silty, soft, well bedded, lt.bn.,w/chert.	
	6							"	As above.	
	7				Major △			"	As above	
	8							"	As above, w/lt.bn. to lt.gy.Xl. Lms.(then beds [⅛"])	
	9	—						"	Lms.,v.silty, platy, lt.red-bn., med.hard (or v.calc. sil.siltstone).	
	10							"	As above, but mostly light bn.-calc. siltstone to silty lms.	
	11							"	As above	
	12							"	As above	
	13							"	As above	
	14							"	As above	
	15							"	As above	
	16							"	As above, but mostly lt.bn., platy,calc.siltstone to silty lm.s	
	17							"	As above, but mostly lt. gy. to lt. bn.	
	18						7	~1	As above	
	19							"	As above	

HOLE No.: B-7 HOLE LOGGED BY: R. GRASSO & M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ATTITUDE ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
19	20				Major △			"	As above	
	21							"	Lms., silty, platy, med.hd., lt.gy. to cream w/chert.	
	22							"	As above, but w/less chert.	
	23							"	As above, but also slightly darker brown, less chert.	
	24							"	As above	
	25							"	As above	
	26	0.3						1-2	As above	
	27	0.6						1-2	As above	
	28	1.9						1-2	As above	
	29							~1	As above, but also minor med.bn.Xl. hd.lms.(good Xs)	
	30							"	As above	
	31	1.4						1	As above	
	32				Major △			2	As above	
	33	1.1						2	Lms., gy to wh. becoming less silty.	
	34	0.9						2	As above, but becoming cream to bn. and less silty.	
	35							~1	As above, but light tan (khaki), siliceous.	24.4.67
	36							1	As above, but becoming harder & major chert.	
									~~(Coring attempt from 35' to 36' using 10' core barrel - Recovered 1 foot)~~	
	37	0.6			Major △			<1	As above	
	38							"	Shale, siltstone, very siliceous w/chert frags., khaki	
	39	0.9						"	As above, but major chert (bl. to gy).	
	40	1.0						2	As above	
	41							~2	As above, w/minor shale-siltstone.	
	42							"	As above, w/lms. frags. lt.bn.w/large Xls. of calcite & Quartz.	
	43							~1	As above	
	44				Major △			"	As above	
	45	2.0						~2	As above	
	46							~3	As above, w/shale-siltstone frags.	
	47	3.6					77	~5	As above, w/ abundant chert.	

HOLE No.: B-7 HOLE LOGGED BY: R. GRASSO & M. CAMPBELL PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIPP SHAPIRO	FIELD SHAPIRO	DESCRIPTION	DATE
47	48	4.0						"	As above, w/less chert and less lms. frags.	
	49	5.8						~7	As above, w/even less chert, still calc.	
	50	4.0			Major			~5	As above, but becoming cream to orange khaki	
	51	4.0						~3	As above	
	52	5.0						~10	As above	
	53	4.0						~7	As above	
	54	4.5.3						~8	As above	
	55	5.3						~7	As above	
	56	4.5						~6	As above	
	57	4.0						~5	As above	
	58	3.1						~5	As above	
	59	3.1						~5	As above	
	60	3.3					<	~3	As above	
	61	2.6						~4	As above	
	62-66	2.9(62')						~3	See core (up to 10% P_2O_5 in places). Losing circulation, Coring attempt w/5' core barrel (1½ feet recovery) little circulation left.	
	67	3.0						~3	As above, but sample size fine	
	68							~4	As above	
	69						>	~6	As above	
	70							~5	As above	
71	78								Sample taken of doubtful origin since all are extremely uniform lithologically and of extremely fine dust.	
79	85 T.D.								Stopped retaining sample - only very small quantity being recovered and of doubtful origin, but shapiro's suggested ~5%.	
									Attempted to deepen hole for logging purposes next morning, but could not reach within 30 ft. of previous hole T.D. due to probable caving. B.Fitzpatrick called further attempts off.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: B-8
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: ~~XXXXXXX~~. 126'T.D.

ROTARY DRILLING: Depth from 0' to 126'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 862' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 26.4.67
COMPLETED: 26.4.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
0	1	Hammer	tool					-	Shale-siltstone frags; calc.,w/minor chert, thinly bedded, lt. to med. lt. khaki colour, platy.	26.4.67
	2							-	As above	
	3							-	As above	
	4							-	As above	
	5							-	As above; w/chert almost wanting	
	6							-	As above	
	7							-	As above; w/very small quartz (?) or Calcite Xs.	
	8							-	As above, becoming platy.	
	9				Minor (?)			-	As above	
	10							-	As above	
	11							-	As above, w/first observed appearance of manganese along bedding planes (?)	
	12				Minor (?)			-	As above; w/increasing chert.	
	13							-	As above; w/first observ.app. of lms.(Bm.Xl),w/chert	
	14							-	As above	
	15							-	As above	
	16	HT						-	As above; w/Lms(same frags, and chert (bl.)	
	17							-	As above, shale still platy.	
	18							-	As above; chert minor.	

HOLE No.: B-8 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CONK~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
18	19							-	As above	
	20							-"	As above; w/increasing Lms(same)frags.,chert minor	
	21							-	As above; becoming Lt. khaki colour.	
	22							-	As above	
	23							-	As above, chert minor	
	24							-	As above	
	25							-	As above, w/lms (same-bn) increasing to 25% and shale-siltstone, thinly bedded, 60% and chert.	
	26							-	Lms; (bn.) 50% w/shale-siltstone, as above (40%) w/chert-Lms. & shale thinly bedded.	
	27							-	As above, w/shale increasing to ~60%	
	28							-	As above	
	29							-	As above, chert minor	
	30							-	As above	
	31	HT						-	As above, chert minor	
	32							-	As above	
	33							-	As above, w/increasing Lms. & chert frags.	
	34							-	As above, shale-siltstone (60%) Lms(bn.) 30% and chert 10%	
	35							-	As above	
	36							-	Shale-siltstone, very siliceous, only slightly calcareous, chert minor and lms. very minor.	
	37							-	As above, still lt.khaki colour, still platy.	
	38				Minor △			-	As above	
	39				Minor △			-	As above	
	40							-	As above, becoming lt. gy, minor chert.	
	41							-	As above, becoming dk. khaki, chert almost wanting.	
	42							-	As above	
	43							-	As above	
	44							-	As above	
	45							-	As above, chert now minor	

HOLE No.: B-8 HOLE LOGGED BY: M. CAMPBELL PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
45	46							-	As above	
	47							-	As above	
	48	HT						I-	As above	
	~~49~~				Minor △			I-	As above	
	50							I-	As above; becoming more calc. & lt.gy., lms.frags.minor	
	51	0.9						2	As above, lms.frags., sandy (quartz and calcite(?))	
	52				Major △			I	As above; increasing lms. frags.	
	53	2.9						3	Lms., sandy (Quartz.?), silty, uniform, visable calcite Xs.	
	54	3.1						4	As above, (? calcarenite)	
	55	2.9						3	As above	
	56	2.7						3	As above; w/increasing chert among otherwise uniform lithology.	
	57	2.0						3	As above, chert minor.	
	58	1.7						5	As above, w/very minor shale-siltstone(cavings?)	
	59	1.3						1	As above, w/chert greatly increased	
	60	1.0						1	As above, w/lt.gy. shale-silt.minor.	
	61	0.9							As above, w/first show of two variety chert - root beer brown and translucent grey.	
	62	1.3							As above, calc.	
	63	1.5						3	As above (sample taken - large chip).	
	64	0.9 H.T.						2	As above, w/root beer chert	
	65	1.0						2	As above, w/increasing lt. grey to bl., translucent chert.	
	66	1.0						2	As above, calc.	
	67	1.3						2	As above	
	68	1.3						2	As above	
	69	1.2						2	As above; w/two var. cherts back (see above)	
	70	1.1						2	As above, still calc.	
	71	1.0						2	As above, w/root beer chert wanting, gy. to bl. minor	
	72							3	As above, becoming more siliceous (increasing quarts ?)	
	73	2.2						3	As above, still a sandy (?), bn. to orange Lms. w/occasional shaly frags(very minor)	

HOLE No.: ~~77~~ B-8 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XXX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~XXXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
73	74							5	As above	
	75	2.2						2	As above (cavities, small and reducing circulation)	
	76							4	As above	
	77							4	As above	
	78							5	As above	
	79	2.3	H.T.					6	As above	
	80	3.3						6	As above	
	81	2.4						5	As above, w/gy. to bl. var. increasing	
	82	2.0						5	As above	
	83	2.3						3	As above	
	84	2.0						3	As above	
	85	1.4						3	As above, very uniform lithology	
	86	2.0						3	As above	
	87	3.8						5	As above, w/less chert (bl. var., R.B. wanting)	
	88	2.4						5	As above, becoming less calcareous and more siliceous	
	89	2.3						4	As above, (Drilling Speed in this lithology 15 ft./hr.)	
	90	2.7						3	As above	
	91	3.0						3	As above, very minor chert	
	92	3.5						3	As above, w/gy. to bl. translucent chert containing spicules (?) or shards (?) (sample taken)	
	93	6.3					>>	6	As above	
	94	5.4	H.T.					5	As above, w/chert minor	
	95	6.3						6	As above	
	96	6.7						6	As above; only slightly calcareous-spiculites (?) (sample taken).	
	97	6.0						6	As above	
	98	-						8	As above	
	99	5.8						7	As above	
	100	8.5						9	As above, w/abundant chert w/spiculites (?) (sample taken) - chert gy. to bl., translucent var.	

HOLE No.: B-8 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
100	101	5.6	H.T.					7	As above	
	102	6.7						8	As above	
	103	4.4						5	As above, chert minor	
	104	3.6						5	As above	
	105	4.7						4	As above	
	106	4.9						5	As above	
	107	4.4						6	As above	
	108	6.0						8	As above	
	109	6.3	H.T.		Major			9	As above (cavities 1' to 2')	
	110	5.6						6	As above	
	111	6.5						8	Shale-siltstone, w/above Lms. frags., spiculite (?) chert as above (sample taken)	
	112	9.2						9	As above	
	113	9.6						9	As above, w/spiculite (?) chert wanting.	
	114	7.2						6	As above, very soft, chert increasing	
	115	5.4	Rock Bit					13	As above	
	116	3.5						5	As above, chert major	
	117	4.0						7	As above	
	118	4.9						5	As above, chert decreasing	
	119	3.8						6	As above	
	120	3.8			Major (?)			6	As above	
	121	3.5						5	As above, but becoming slightly manganiferous along thin bedding (?) planes, shales variegated w/lms. (above) frags., v.calc.	
	122	2.3					<	3	As above	
	123	2.7						4	As above, but becoming very calcareous w/incr.# bn. to orange, sandy lms. (as above).	
	124	2.5						5	As above, siliceous(?)	
	125	2.9						6	As above, (losing circulation)	
	126 T.D.	3.6						6	As above, w/lms.(above) increasing.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: B-9
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 140' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 140'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: ' 866' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 24.4.67
COMPLETED: 24.4.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP	FIELD SHAPIRO	DESCRIPTION	DATE
0	3				Major		-		Alluvium, calc., red-bn. w/chert	24.4.67
	4						-		As above, w/Lms. & chert frags.	
	5						-		Shale-siltstone, lt.-khaki, calc. w/chert and lms. frags (wh.XI).	
	6						-		As above	
	7				Major		-		Shale-siltstone, becoming darker & khaki, softer, w/chert & lms.	
	8						-		Lms, wh. to off-wh. w/less ch. but abund. shale frags.	
	9				Major		-		Lms, silty, thinly bedded, wh/sh.-silt. interbedding.	
	10						-		Shale-limestone, v.silty, platy w/chert and limonitic frags.	
	11				Minor		-		As above, but/w/pink to rd-bn.shale-silt interbeds.	
	12						-		Shale-limestone, dark khaki w/some chert.	
	13						-		As above, w/increasing ch.,calc.(still)	
	14				Minor		-		As above, w/pink to rd-bn.shale-siltstone.	
	15						-		As above, w/Mn(?) in ½" to 1/16" beds.	
	16						-		As above,w/less pink variety - major khaki	
	17						-		As above, w/sample damp.	
	18						-		As above,w/sh-silt.becoming harder ,w/chert	
	19						-		As above, w/khaki variety returning w/thinly bedded lms.	

HOLE No.: B-9 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP	FIELD SHAPIRO	DESCRIPTION	DATE
19	20						-		As above, w/minor pinkish colour and lms.(XI) frags.	
	21						-		As above, w/thin bedded shale-silt.(orange to khaki)	
	22						-		As above/w/increasing chert	
	23						-		As above	
	24						-		As above, w/even more chert	
	25						-		As above	
	26						-		As above, but w/minor frags. of white lms.(XI).	
	27				Major (?) △		-		As above, but w/colour from off-white to white.	
	28						-		Shale, siliceous, lt.khaki colour, calc., minor chert.	
	29						-		As above, w/Mn(?) CO_3 thin beds, i.e.($\frac{1}{16}$" and larger approx.)	
	30						-		As above, very minor chert.	
	31				Minor △		-		As above	
	32						-		As above,w/shale-siltstone becoming even more siliceous	
	33						-		As above, w/purple siltstone-shale as minor.	
	34						-		As above, w/chert increasing in abundance.	
	35				Minor △		-		As above, with chert becoming major & colour becoming lt.gy.	
	36						-		As above, w/rd.-bn. shale-siltstone & major chert.	
37	37				Minor △		-		As above, but colour of material of two varieties, lt.bn.&purple.	
	38				Minor △		-		As above, i.e.shale-silt.,calc.,but khaki to off-wh.w/chert.	
	39						-		As above, but purple and rd.-bn.shale-siltstone w/chert.	
	40				Minor △		-		As above,w/still abundant chert.	
	41						-		As above but colour to white,still calc. & shale.	
	42						-		As above, but shale-siltstone lt.khaki, minor white.	
	43						-		As above, but no white frags of 41'.	
	44						-		As above	
	45						-		As above	
	46				Minor △		-		As above	
	47						-		As above	
	48						-		As above, but coating colour △ to light grey,two varieties i.e. bn. & lt.gy. w/chert.	

HOLE No.: B-9 HOLE LOGGED BY: M. CAMPBELL PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP No.	FIELD CORE STRUCTURE SHAPIRO	DESCRIPTION	DATE
48	49						-		As above, but w/lt.gy & khaki, siliceous shale-silt.	
	50						-		As above, but predominantly khaki colour, and even more siliceous.	
					Minor △					
	51						-		As above	
	52						-		As above, but w/lt.gy. and Khaki shale-siltstone w/Mn. along bedding planes.	
	53						-		As above, but w/bn.to bl.chert increasing - lt.gy.major.	
	54						-		As above, w/increasing chert	
	55				Major △		-		As above, sample damp w/chert	
	56						-		As above, w/two colours of shale-siltstone, bn. & lt.gy.	
	57				Minor △		-		Lms., silty, thin bedded w/khaki shale-silt. & chert.	
	58						-		As above	
	59						-		As above, but shale-silt. increasing, minor lms.	
	60						-		As above	
	61						-		As above	
	62						-		As above	
	63				Minor △		-		As above	
	64				Minor △		-		As above, but purple shale-silt. minor	
	65						-		As above	
	66						-		As above, but becoming of multi-coloured thin beds of soft shale-minor chert.	
	67						-		As above	
	68						-		As above, thin beds of soft shale, but khaki major very minor chert.	
	69						-		As above	
	70						-		As above	
	71						-		As above	
	72				Minor △		-		As above	
	73						-		As above, but △ to Lt. gy. w/chert	
	74				Minor △		-		As above	

HOLE No.: B-9 HOLE LOGGED BY: M. CAMPBELL PAGE

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP	FIELD SHAPIRO	DESCRIPTION	DATE
74	75						-		As above, but △ to khaki - still uniform lithology.	
	76						-		As above, darker khaki colour minor chert	
	77						-		As above, but even darker colour - very minor chert	
	78				Minor △		-		As above, very siliceous	
	79						-		As above, but △ to lt.gy.	
	80						T		As above, but becoming purple colour - very minor chert.	
	81						T		As above	
	82						T		As above	
	83						"		As above	
	84						"		As above	
	85						"		As above, but becoming khaki colour shale-siltstone as above	
	86						"		As above	
	87						"		As above	
	88				Minor △		"		As above, but becoming lt.gy. - no other lithology change.	
	89						"		As above	
	90						"		As above, sample still calc. w/minor chert.	
	91				Minor △		"		As above	
	92						"		As above, w/khaki colour returning.	
	93						"		As above, almost all khaki shale-silt.w/chert.	
	94				Minor △		"		As above	
	95						"		As above - but colour △ to lt. gn.	
	96						"		As above - still shale-siltstone, calc.minor chert.	
	97				Major △			<1	As above	
	98							"	Limestone, lt.khaki, sandy, calc.w/small Xs of Calcite & Qtz.	
	99							"	As above, w/minor chert	
	100						>	1	As above, calcarenitic (?)	
	101	1.6						"	As above, w/increasing chert	
	102							"	As above	
	103							"	As above	
	104							"	As above	

HOLE No.: B-9 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XRS.~~	FIELD ~~CORK ASTHURE~~ SHAPIRO	DESCRIPTION	DATE
104	105							1	As above	
	106							1	As above	
	107							1	As above	
	108							2	As above, but becoming more silty.	
	109	1.7						2	As above	
	110							2	As above	
	111	2.5						4	As above	
	112	3.8						7	As above	
	113	2.9						6	As above	
	114	4.5						7	As above	
	115	4.7						8	As above, but w/slight colour change to darker khaki	
	116	3.8						8	As above	
	117	3.8						7	As above	
	118	3.5						6	As above, but w/increasing lms. frags.	
	119	3.5						5	As above	
	120	3.5						7	As above	
	121	2.1						5	As above	
	122	1.9						4	As above, w/increasing chert and lms. frags, as thin beds(?)	
	123	2.2						5	As above, less lms. frags.	
	124	2.3						4	As above	
	125	3.5						5	As above	
	126	5.0						7	As above	
	127	8.7						6	As above	
	128	6.7			Minor △			7	As above, i.e. sandy silty, calc.shale-siltstone-less lms.	
	129	6.6						10	As above, becoming more lt.gy.,calcarenitic (?) lms. frags. and chert.	
	130	6.6						8	As above	
	131	9.0						10	As above	
	132	7.1						8	As above	
	133	6.3						9	As above	

HOLE No.: B-9 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
133	134	6.1			Minor			9	As above	
	135	7.0						9	As above, but increasing lt.khaki colour material.	
	136	6.8						9	As above	
	137	6.8						8	As above	
	138	5.8						9	As above	
	139	5.3						8	As above (losing circulation)	
	140 T.D.	5.0						7	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: C-3
STATE: QUEENSLAND COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION:
TOTAL DEPTH: 42' T.D.

ROTARY DRILLING: Depth from 0' to 42'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 865' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 27.4.67
COMPLETED: 27.4.67
HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP SHAPIRO	FIELD SHAPIRO	DESCRIPTION	DATE
0	1	HT					-		Lms. frags., bn.,siliceous, partly silty	27.4.67
	2						-		As above	
	3						-		As above, becoming more silty.	
	4						-		As above, chert wanting	
	5						-		As above, w/bedding not readily seen in shale-siltstone fraction, calc.	
	6				Major		-		As above, chert wanting	
	7						-		As above, w/increasing thinly bedded shale-siltstone.	
	8						-		Shale-siltstone, thinly bedded, khaki, calc., platy(?)	
	9						-		As above, w/lms.frags.	
9	16						-		As above	
	17	HT					-		As above	
	18						-		As above, w/Mn-dendrite-increasing	
	19						Trace	<1	As above, w/increasing chert and Mn.	
	20						"	"	As above, becoming siliceous w/chert bedded along finely bedded shale.	
	21						"	"	As above	
	22						"	"	As above, w/small Xs of Mn - v. minor	
	23 & 24								Missed Sample	
	25				Major		"	"	As above	

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HOLE No.: C-3 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~NGX~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
25	26	3.8					<	6	As above, w/colour to lt.gy., increasing lms.frags,chert minor.	
	27							1	Lms.,silty,lt.gy.,XI, chert minor, siliceous	
	28	1.3						2	As above	
	29	0.9						2	As above, w/lt.bn. to orange lms.frags.	
	30	2.0			Minor			2	As above, w/Mn & chert	
	31							2	As above, becoming sandy and more silty.	
	32	1.6						2	Lms.,silty, lt.bn.,w/sandy shale siliceous	
	33						<	1-2	As above,w/two varieties of lms.,v.lt.gy.&sandy,lt.bn.toor,ch.minor.	
	34							1-2	As above, w/lt.gy.lms.increasing,other var. as minor	
	35							1-2	As above,w/two variety chert; rootbeer and gy.tobl.,translucent.	
	36	0.5						1-2	As above, w/lms.(orange var) increasing,more siliceous,chert minor.	
	37				Minor			1-2	As above,w/lms(lt.gy.) increasing,chert minor.	
	38	0.9						1-2	As above , w/lms.becoming dark khaki to orange,chert wanting	
	39							1-2	As above,w/Mn, chert greatly increased	
	40							1-2	As above, w/Mn, chert ~30%	
	41							1-2	As above, orange to lt.bn.lms,~~wx~~ some frags of calcarenite w/abundant chert very silty, Mn mineral minor, (Cavities, losing circulation)	
	42 T.D.	1.9						2	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: C-4
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 166' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 166'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 885' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 27.4.67
COMPLETED: 27.4.67
HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	AMDEL ~~BX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~XRD~~ SHAPIRO	FIELD ~~CODE ATTITUDE XXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	1						-		Soil-loam, dk.bn.,calc.w/bn.Xl. lms.frags. & bl.chert	27.4.67
	2						-		Shale, calc.,dk.bn.,w/lms. and soil - bl.chert minor.	
	3						-		Lms.,frags.w/bn.shale frags and bn.soil, chert minor,	
									all light khaki to med. khaki (all above thin beds).	
	4						-		As above, becoming soft and silty,w/chert v. minor	
	5				Major		-		As above, becoming a shale, dark bn., siliceous and	
									calc. w/above Lms.frags. - chert v. minor.	
	6						-		Shale, platy, very calc., but thin bedding observed,	
									slightly siliceous w/small Xs of calcite - chert minor.	
	7						-		As above, w/very minor red-bn. shale, calc. chert	
									v. minor, lt.gy.colour	
	8						-		As above, still w/lms.frags.	
	9						-		As above, becoming more thinly bedded	
	10						-		As above	
	11						-		As above	
	12						-		As above, w/ red. var.shale - still siliceous and not v.silty.	
	13						-		As above	
	14						-		As above, becoming slightly dendritic	
	15						-		As above	
	16						=		As above	

HOLE No.: C-4 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XIX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XIX~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
16	17				Minor		-		As above	
	18						-		As above, becoming more silty and softer w/colour change from lt.gy. to lt.khaki	
	19						-		As above, increasing chert (bl.var.) to minor	
	20						-		As above, w/bedding thickness becoming 2x.	
	21				Major (?)		-		As above	
	22						-		Shale, silty, med. soft, colour as above, w/above	
					Minor				med.bn.siliceous shale frags w/frags. of lt.bn.	
									Lms. and chert (bl.) not platy.	
	23						T		As above, colour only (?) to red & gn. among bn.	
	24						T		As above, chert wanting	
	25						T		As above, w/red.var.major w/minor gn. & bn. w/bn.Lms.	
									frags. - no chert	
	26						T		As above, w/shales of equal distribution	
	27						T		As above, dendritic throughout	
	28						T		As above, still calcareous	
	29						T		As above, partly platy.	
	30						T		As above, red. var. still major	
	31						T		As above, w/all var. uniformly siliceous	
	32						T		As above	
	33						T		As above, becoming softer and more silty chert still wanting.	
	34						T		As above	
	35				Minor		T		As above, becoming even more silty.	
	36						T		As above, bn. var. predominating w/red & gn. as minor.	
	37						T	As above		
	38						~I		As above	
	39						"	As above		
	40						"		As above, w/chert increasing (bl.var.)	
	41						"		As above, very soft and silty chert>.	
	42	9.5		PHOSPHATIC			>	9	As above, w/no observed lithologic Δ.	

HOLE No.: C-4 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
42	43	13.5						10	As above	
	44	10.9						10	As above, w/bn.lms. & cream lms. var. chert minor	
	45	7.5			Major			8	As above, w/increasing chert (bl.), manganiferous, w/lms. frags of micro-oolites (?) - only slightly calc.	
	46	1.15					<	1	As above, w/> bn. to or. lms. frags., Mn.	
	47							1	As above, w/bn. to lt.gy., siliceous shale frags.	
	48	1.35						1	As above, becoming lt. gy. to lt. khaki.	
	49							1	As above, w/XI lms. frags. (above) partly siliceous, chert nearly wanting.	
	50	1.05						1	As above, > chert (bl.)	
	51							1	As above	
	52								As above, w/two var. chert, root-beer and lt.gy., becoming more silty.	
	53								As above, but w/very thin shaly interbedding.	
	54								As above, but lms. & shale becoming slightly limonitic - still two var. chert.	
	55							1	As above, chert very minor	
	56	0.5						1	As above (Drilling speed ~12 ft./hr.w/rock bit)	
	57							1	As above	
	58							1	As above	
	59							1	As above	1/5/67
	60							1	As above, chert very minor	
	61	0.8						1	As above	
	62							1	As above	
	63							1	As above	
	64							1	As above, chert v. minor.	
	65							1	As above (w.lms.becoming more lt.gy.and contains white inclusions, i.e. spicules (?), > bn. shale, siliceous and slightly manganiferous (dendritic).	
	66	0.9						2	As above, ~~becoming~~ becoming more silty w/ > frags. of non. ~~calc. shale, chert wanting.~~	

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
66	67							1	As above, w/frags. of white chert (?) w/red inclusions of ~1/32" long.	
	68	1.1						1	As above, chert (bn.) becoming minor	
	69	1.1						1	As above	
	70	1.0						1	As above	
	71	1.1						1	As above	
	72	1.3						1	As above	
	73	2.1					>	2%	As above/w/no observed lithologic△	
	74	2.2						1	As above	
	75	3.3						1	As above	
	76	3.9						4	As above/w/white var. chert >	
	77	3.8						3	As above	
	78	2.3						2	As above	
	79	2.8						3	As above	
	80	2.0						2	As above	
	81	2.5						3	As above	
	82	3.0						2	As above	
	83	2.4						2	As above	
	84	2.2					<	1	As above	
	85	2.5						1	As above	
	86	1.9						3	Asabove	
	87	3.6					>	7	As above	
	88	6.3						9	As above, becoming more silty w/< in lms; w/micro-oolites(?) in Lms., and shale frags. chert still v.minor w/dark bn. var.w/spiculites(?)	
	89	8.1						6	As above	
	90	6.3			Major(?) △			8	As above	
	91	6.3						9	As above, w/~~MX~~ minor frags. of bn.dolo.lms.containing spiculites (?), chert wanting.	
	92	6.3						9	Lms.dolomitic, decrease in silt,oolites still observable,but ~~becoming less XX~~ frequent.	

HOLE No.: C-4 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
92	93	4.5						6	As above, w/decreasing frags. of dolo.(?) lms.	
	94	7.6						9	As above, chert still wanting.	
	95	5.8						5	As above	
	96	5.1						6	As above	
	97	5.1						5	As above	
	98	4.3						4	As above	
	99	7.6						8	As above	
	100	6.5						7	As above, i.e. lt. to v.lt. khaki, bn.dolomitic lms. w/calc. frags. of bn.shale, chert still wanting.	
	101	5.3						4	As above	
	102	4.0						4	As above	
	103	4.3						6	As above	
	104	3.8						4	As above	
	105	4.0						5	As above	
	106							4	As above	
	107	4.3						4	As above	
	108							4	As above	
	109							4	As above, w/lms. becoming more dolomitic w/dark bn. shale (softer) more calc.-chert wanting.	
	110	4.3						5	As above, becoming more dendritic	
	111	4.5						5	As above (Drilling rate 22 ft./hr. - hammer tool)	
	112							4	As above	
	113							6	As above	
	114	3.5			Minor(?)			4	As above	
	115						<	1	As above (quartz and calcite Xs)	
	116							1	As above	
	117	2.4						2	As above, w/dendrites increasing	
	118							4	As above, w/small, clear calcite Xs	
	119							2	As above	
	120	1.3						1	As above, NOTE: Over last 10 feet micro-drilling rate suggests 6" to 8" beds of dolo.lms.and 4" to 5" beds of much softer (silty) beds of more calc.silt.	

HOLE No.: C-4 HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~XX~~ SHAPIRO	FIELD CORE ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
120	121							1	As above	
	122							1	As above	
	123							1	As above, w/decrease in silty material.	
	125				Minor (?)			2	As above	
	126				△			2	As above, becoming darker khaki w/rounded to well-rounded quartz gns. among XI lms.(above)	
	127							2	As above	
	128							1	As above, w/very minor chert.	
	129				Minor (?)			1	As above	
	130				△			1	As above, w/1st appearance of lt.gy.non-calc. material - probably chert or dolomitic limestone.	
	131							1	As above	
	132							1	As above	
	133							1	As above	
	134							1	As above, w/lt.gy.chert (dolomitic limestone) decreasing > in white chert (?) or perhaps another silicate (?)	
	135							1	As above	
	136							1	As above	
	137							1	As above	
	138							1	As above, w/colour change in lms. to darker bn., decrease further of lt.gy.chert or quartz.	
	139-141							1	As above	
	142							2	As above	
	143-144							1	As above	
	145							2	As above	
	146							1	As above, w/frags of calc. bn., sl.siliceous shale.	
	147 through 166 T.D.	1.6					Core @ 6%		Cavity - took core in bottom of cavity w/stem & coupling (ram core)	
	166 T.D.CORE 6.5									
									CORE: Silty, calc., w/chert and sand frags.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: C-5
STATE: QUEENSLAND COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION:
TOTAL DEPTH: 185' T.D.

ROTARY DRILLING: Depth from 0' to 185'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 894' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 7.5.67
COMPLETED: 7.5.67
HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP SHAPIRO	FIELD SHAPIRO	DESCRIPTION	DATE
0	1						-		Soil, bn., calc. w/lms.(bn.XI) frags.-bl.chert minor.	7/5/67
	2						-		Lms., bn. XI, very siliceous, dendritic,w/gy. & bn. chert abundant.	
	3						-		As above	
	4						-		As above	
	5						-		As above	
	6				Minor (?) △		-		As above	
	7						-		As above, becoming silty and red-bn. in colour	
	8						-		As above, chert minor	
	9						-		As above	
	10				Major △		-		As above	
	11						-		Shale, silty, calc., slightly siliceous, thinly bedded platy, w/Xs of calcite (clear), chert wanting	
	12-14						-		As above	
	15				Minor △		-		As above, w/silty, red-to=bn. to lt.gy.shales	
	16						-		As above	
	17				Minor △		-		As above, becoming lt. khaki colour	
	18						-		As above, becoming lt. gy. colour	
	19				Major(?) △		-		As above	
	20						-		As above, becoming more thickly bedded, to lt.khaki colour	

HOLE No.: C-5 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
20	21				Minor △		-		As above	
	22						-		As above	
	23				Minor △		-		As above, becoming red.-bn. shales, calc.	
	24						-		As above, lt.bn. shale.	
	25						-		As above, w/finely alternating bn., red-bn.,calc. shales, chert wanting, dendritic.	
26	28						-		As above	
	29						-		As above, becoming very silty.	
	30						-		As above	
	31						-		As above, chert wanting	
32	38						-		As above	
	39						-		As above, w/lt.gy.Lms.frags., chert wanting	
	40						-		As above	
	41-43						-		As above	
	44						-		As above, w/colour var. from lt.khaki to dk.khaki to lt.gy.shales.	
	45-47						-		As above	
	48						-		As above, shales becoming v. impure Lms. of the same colour; assuming XI structure, but still very silty and bedded can bedded can be seen as being very discrete, chert wanting.	
	49				Major △		-		As above	
	50						-		As above	
	51						-		Shale, slightly calc., bn. to dk. khaki, silty, dendritic, chert wanting.	
52	58						-		As above	
	59						-		As above, chert minor	
	60						-		As above	
	61						-		As above,lighter khaki colour	
62	63						-		As above	

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~NO~~ SHAPIRO	FIELD ~~CORE XXXXX~~ SHAPIRO	DESCRIPTION	DATE
63	64						-		As above, w/frags. of red shale	
	65						-		As above	
	66						-		As above	
	67						-		As above (Drilling Rate ~25ft./hr.)	
68	69						-		As above	
	70						-		As above, becoming a red shale, w/minor bn. to bl.chert.	
	71						-		As above	
	72						-		As above, becoming more siliceous	
73	78						-		As above	
	79						-		As above, w/lms.(bn. to lt.or.) frags. minor.	
	80				Major		-		As above/w/abundant lms. frags., chert minor	
	81							1-2	As above	
	82							1-2	Lms., oolitic, bn. to light orange,w/minor frags . of bn. shale.	
	83	4.5					>	6	As above, calcarenitic (?)	
	84	10.3						12	As above	
	85	4.3						11	As above, becoming dendritic, chert still minor.	
	86	5.6						8	As above	
	87	1.9						2	As above	
	88	0.9					<	1-2	As above, becoming more Xl and less oolitic (?)	
	89							1-2	As above, becoming a more siliceous Lms.	
	90							1-2	As above, chert increasing slightly.	
	91	0.7						1-2	As above, chert wanting	
	92							1-2	As above	
	93							1-2	As above, still dendritic	
	94	0.9						1-2	As above	
	95							1-2	As above	
	96							2	As above, becoming darker bn. w/frags. of lt.gy.Lms. w/frags. of bn.siliceous shale & w/occ.dk.rd.-bn. limonitic frags.	

HOLE No.: C-5 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~GH~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
96	97							1-2	As above	
	98							1-2	As above, w/increasing frags. of lt.gy.lms.	
	99							1-2	As above	
	100							1-2	As above, w/chert (bn. w/white inclusions)	
	101							1-2	As above	
	102							2	As above, w/spiculites (?), w/chert increasing and w/minor bn. shale frags.	
	103							1-2	As above,w/calcite Xs (small and clear)	
	104							1-2	As above	
	105							1-2	As above	
	106	0.8						1-2	As above, chert decreasing	
	107							1-2	As above	
	108							1-2	As above	
	109	1.4						2	As above	
	110							2	As above, w/two var.lms., dk.bn. & lt.gy.chert v.minor	
	111							1-2	As above	
	112							1-2	As above	
	113							1-2	As above, becoming softer (less siliceous) w/occ.oolites.	
	114							1-2	As above	
	115							1-2	As above	
	116	0.9						1-2	As above	
	117							1-2	As above	
	118							1-2	As above	
	119	3.6					>	5	As above, becoming macro-oolitic(?),gy.lms.minor,chert v.minor	
	120	3.5						4	As above,w/white,non-calc. H = >5 material - probably chert (or other silicate ?) w/small red streaks.	
	121	3.7						3	As above	
	122	5.3						6	As above	
	123	2.0						3	As above	
	124	1.5						2	As above	

HOLE No.: C-5 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XX~~ SHAPIRO	FIELD ~~XCORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
124	125	3.0						3	As above, becoming more silty, still oolitic(?)	
	126	4.5						5	As above	
	127	2.5						3	As above	
	128	2.8						4	As above	
	129	2.0						2	As above	
	130	2.1						3	As above	
	131	3.8						4	As above	
	132	7.2			Minor(?)			8	As above, very silty differing appreciably from above.	
	133	8.8						10	As above	
	134	8.2						10	As above	
	135	6.8						8	As above, w/lms.assuming mottled texture.	
	136	6.5						9	As above, chert v.minor, still w/white	
	137	5.8						9	As above, red streaked material.	
	138	6.5						9	As above	
	140	7.4						9	As above	
	141	4.5						6	As above	
	142	5.3						8	As above	
	143	6.3						8	As above	
	144	8.1						9	As above	
	145	5.3						6	As above	
	146	3.2						6	As above	
	147	4.4						5	As above	
	148	3.1						7	As above	
	149	5.5						6	As above	
	150	4.2						7	As above	
	151	3.4						7	As above	
	152	4.2						7	As above	
	153	6.6						4	As above, w/frags. of lt.gy.lms., chert wanting.	
	154	3.4						4	As above, ~~MX~~ becoming limonitic.	
	155	3.6						4	As above, texture still mottled.	

HOLE No.: C-5 HOLE LOGGED BY: M. CAMPBELL PAGE 6

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BK~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~BK~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
155	156	4.2						3	As above	
	157	2.5						3	As above	
	158	2.8						3	As above, becoming more shaly and soft, but still as above	
	159	2.4						<1	As above	
	160	.5						1-2	As above	
	161	1.6						2-3	As above	
	162	3.1						<1	As above	
	163							2	As above, becoming lt.bn. & less silty.	
	164							1-2	As above	
	165							1-2	As above	
	166							1-2	As above	
	167							1-2	As above	
	168							1-2	As above	
	169	1.0						1-2	As above	
	170							<1	As above	
	171						<<	1	As above	
	172							<1	As above	
	173							<1	As above	
	174							1	As above	
	175							<1	As above, w/chert (bl.) increasing.	
	176							<1	As above	
	177							<1	As above, w/white chert (?) increasing (w/inclusions)	
	178							<1	As above, w/increase in limonitic frags.	
	179							<1	As above, w/two variety lms. + lt. gy. & bn.	
	180							<1	As above, w/chert as bn.(dk.) very minor	
	181							<1	As above	
	182							<1	As above	
	183							1-2	As above	
	184							<1	As above becoming darker khaki, w/increasing shaly and silty frags, chert still very minor.	
	185 T.D.							<1	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PROJECT: UNDILLA BASIN PHOSPHATE

HOLE No.: D-TREE 4A

STATE: QUEENSLAND **COUNTY:**

PARISH: **HOLDING:**

LAT. **LONG.** **CO-ORDINATES:**

INCLINATION:

TOTAL DEPTH: 91' T.D.

ROTARY DRILLING: Depth from 0' to 91'

DIAMOND CORE DRILLING: Depth from to

DRILLING: Depth from to

GROUND LEVEL: 875' ELEVATION

DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.

SPUDDED: 8.5.67

COMPLETED: 8.5.67

HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP SHAPIRO	FIELD SHAPIRO	DESCRIPTION	DATE
0	1						-		Soil-loam; clayey, Rd.-bn., w/minor rounded chert (bl) frags.,calc.	8.5.67
	2						-		As above	
	3						-		As above	
	4						-		As above, becoming dk. khaki, w/frags. of dk.bn., rounded, XI lms. & bn., soft siltstone.	
	5						-		As above, w/decreasing above frags.	
	6						-		As above, approaching a soft shale, becoming more consolidated, and manganiferous or ferruginous.	
	7						-		As above	
	8						-		As above, w/frags. of white, non-calc.siltstone chert v.minor.	
	9						-		As above, w/frags. of bn., multicoloured , soft shale.	
	10				Major(?)		-		As above	
	11						-		Shale, soft, calc., w/rd.-bn.inclusions, med.bn.,w/rounded chert frags (bl.)(weathered shale ?)	
	12						-		As above	
	13						-		As above	
	14						-		As above	
	15						-		As above, becoming harder.	

HOLE No.: D-Tree 4A HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP No. SHAPIRO	FIELD ~~CORE~~ ~~MIXTURE~~ SHAPIRO	DESCRIPTION	DATE
15	16						-		As above	
	17						-		As above, w/ frags. of white, non-calc. siltstone.	
	18						-		As above, clayey and soft, w/frags of med.hd., lt.bn. shale.	
	19				Major		-		As above, w/rounded frags of lt. gy., Lms. w/bl. & bn. chert.	
	20						-		Gravel, variety of rounded, non-calc., wh. to lt.gy. soft siltstone, rounded chert frags (bl.) w/minor frags of lms.(lt.gy.) w/v.minor purple, v.soft, siltstone or shale.	
	21						-		As above	
	22, 23	Missed samples during casing							---	
24	24						-		Siltstone, white, med. hd., non-calc.w/major frags. of rounded bl.-bn. chert.	
	25						-		~~As above~~	
	26						-		As above, decrease in chert	
	27				Major		-		~~As above~~	
	28						-		Siltstone-shale, lt.bn.,med.hd.,non-calc.,chert minor	
	29						-		As above	
	30						-		As above	
	31								As above	
	32-60				Minor(?)				Siltstone, med.-soft, lt.gy., chert wanting, but alternating to 60 ft. in colour only, otherwise v.uniform lithology.	
	61				Major		-		Shale, lt.bn., w/bl.chert ~30%, med.hd.slightly dendritic w/frags. of above.	
	62						-		As above	
	63						-		As above	
	64						-		As above	
	65						-		As above	

HOLE No.: D-TREE 4A HOLE LOGGED BY: M. CAMPBELL PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP No. SHAPIRO	FIELD ~~CORE~~ ATTITUDE SHAPIRO	DESCRIPTION	DATE
65	~~65~~				Minor (?)		>		As above	
	67						"		As above, becoming lt.gy. to off-white, chert decreasing	
	68						"		" ", becoming very silty, w/minor above.	
	69						"		As above, chert (bl.) at ~10%	
69	76						"		As above	
76	80								As above	
	81						"		As above, w/two var. chert, i.e. rootbeer and bl.	
	82						"		As above	
	83		Losing circulation and caving badly				"		As above	
	84						"		As above	
	85				Major		"		As above	
	86						"		Sand, unconsolidated, w/v.silty matrix and abundant chert (bn.), non-calc., lt.gray to lt.khaki or lt.green.	
	87-88								As above, Core	
	89-91 T.D.								As above, Core	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: D-TREE 5
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 91' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 91'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 893' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 6.5.67
COMPLETED: 6.5.67
HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
0	1	HT						<1	Soil-loam,rd.-bn.w/chert(bl.) & pebbles of white,hd. slightly calc.siltstone.	6.5.67
	2							"	As above, w/lt.yel.,siliceous,v.calc.siltstone frags. (rounded); also w/minor frags. of lt.purple,soft siltstone.	
	3				Major(?)			"	As above	
	4							"	X Shale,dk.bn.,v.calc.&hd.,; w/frags.of lt.purple siltstone, frags.of lt.bn.,silty Lms., & abund. chert (bl.&wh.varieties),sl.limonitic and dendritic	
	5							"	~~As above,w/frags.of white chert, ferrug.staining along bedding plans of bn.shale-chert (bl.&wh.) minor~~	
	6							"	As above	
	7							"	As above, frags.becoming platy, but of med.thickness.	
	8							"	As above	
	9							"	As above, w/chert v.minor	
	10							"	As above	
	11							"	As above, becoming more calc.	
	12							"	As above, chert wanting	
	13							"	As above, becoming v.silty - but lg.frags.med.hard	
	14							"	As above	
14	17							"	As above	

HOLE No.: D-TREE 5 **HOLE LOGGED BY:** M. CAMPBELL **PAGE**

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XX~~ SHAPIRO	FIELD ~~CORE XTRUDER~~ SHAPIRO	DESCRIPTION	DATE
17	18							"	As above, chert (bl.&wh.) v.minor	
18	20							"	As above	
	21							"	As above; w/minor frags. of lt.gy.Lms.-sil.	
21	23							"	As above	
	24							"	As above, increasing frags. of lt.gy.lms.	
	25							"	As above	
	26							"	As above-	
	27							"	As above, still a dk.bn.shale, but w/lt.gy.Lms.Xl,silty; chert(bl.) v.minor	
27	29							"	As above	
	30				Minor			"	As above	
	31				Minor (?)		T	"	Siltstone, lt.gn.,soft,v.calc.w/frags.of above lms. and shale, chert wanting	
	32						"	"	As above, but.lt.bn.	
	33						"	"	As above, but.lt.gn.(as above),frags.of ferrug.material.	
	34-36						"	"	As above	
	37						"	"	As above, becoming hard	
	38						"	"	As above	
	39				Major		"	"	As above	
	40						"	"	Shale, dk.bn.,manganiferous(?),v.minor chert; soft thinly bedded, calc.	
	41				Minor(?)		"	"	As above	
	42				~~Minor(?)~~		"	"	Shale-siltstone,soft,lt.khaki,chert wanting	
	43						"	"	As above	
43	47						"	"	As above	
	48				Minor(?)		"	"	As above, becoming hard.	A
	49						"	"	Shale-siltstone,sl.~~xx~~calc.,soft,lt.gy.-lt.pink w/chert very minor (bl.) med.soft.	
	50						"	"	As above	
50	54						"	"	As above	

HOLE No.: D-TREE # 5 HOLE LOGGED BY: M. D. CAMPBELL PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
54	55				Minor △		"	"	As above, becoming v.hard.	
	56						"	"	As above	
	57						"	"	As above, but w/colour △ to lt.khaki, ferrug.	
	58				Major △		"	"	As above, chert (bl.) increasing, sl.calc.	
	59						"	"	Shale, lt.to med.brown, hd., dendritic w/abund.chert(bl.)	
59	61				Minor (?) △		"	"	As above	
	62						"	"	As above, w/chert (bl) thinly ▪ interbedded ▪/shale (as above	
	63						"	"	As above, non-calc.	
	64						"	"	As above, chert v.abund.	
	65				Minor △		"	"	As above	
	66						>	"	As above, becoming dker.khaki	
	67	3.7					"	8	As above, becoming dk.bn.	
	68	6.6					"	6	Shale-siltstone, very soft, clayey, w/hder, rounded, lt.bn.shale frags.w/minor chert (bl.)	
	69	2.9					"	2	As above, w/increasing lt.bn. & lt.gn., silty shale	
	70	2.1					"	1	As above	
	71						"	<1	As above, chert increasing (bl.)	
	72						"	"	As above	
	73						"	"	As above, chert abund.	
	74						"	"	As above, w/increasing frags. of lt.gn.shale-silt.	
	75						"	"	As above	
	76						"	"	As above, w/minor frags of lt.gy.Dolomitic lms.	
	77						"	"	As above	
	78						"	"	~~As above, w/increasing frags. of above Dolomitic lms.~~	
	79				Major △		"	"	As above	
	80						<	"	Lms., lt.gy., dolomitic, chert remaining uniformly abund., massive (non XI) w/minor frags. of dendritic, lt.bn. & lt.gy., shales, med.hd.	
	81						"	"	As above	
	82						"	"	As above	

HOLE No.: D-TREE 5 HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~NS.~~ SHAPIRO	FIELD ~~CORE NOS.~~ SHAPIRO	DESCRIPTION	DATE
82	83						"	"	As above, chert abundant.	
	84	2.7			Major		"	2	As above	
	85	3.0					"	3	As above	
	86		Caving badly no samples						Silt, unconsolidated, lt.gn. to lt.gy.-sl.calc.minor quartz gns.(well rounded & clear) chert wanting.	
87	91 T.D.									
									Similar material to that found in DT-4A	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: D-TREE 5A
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:** Approx. 200 yds.SE D-Tree 5
INCLINATION:
TOTAL DEPTH: 102'T.D.

ROTARY DRILLING: **Depth from** 0' **to** 102'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 896' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 23.5.67
COMPLETED: 23.5.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~Xtc.~~ SHAPIRO	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1	RB					X		Soil, rd.-bn.,w/minor frags. of wh., non-calc.med.hd. siltstone; w/chert (bn.) abund; haematitic and numerous rounded frags. of above.	23.5.67
	2						X		As above	
	3						X		As above	
	4						X		As above, becoming sl.calc.	
	5						X		As above	
	6				Minor △		X		As above	
	7						X		As above, becoming a gravel w/< in above soil. Colour △ to lt.bn.; >frags. of above wh.siltstone, sl.calc.	
	8				Major △		X		Siltstone, wh. to v.lt.gy.,non-calc. to sl.calc.w/chert ~~chert~~ frags (not as above) var.-R.B.; sandy but no quartz observed, med. soft.	
	9-10-11-12 (missed while setting casing)									
	13						X		As above, w/multicoloured and banded siltstone, i.e., lt.gy.,bn.,pink,lt.gn.;chert wanting.	
	14						X		As above	
14	19						X		As above	
	20						X		As above, still lt.gy.w/variations as above	

HOLE No.: D-TREE 5A HOLE LOGGED BY: M. D. CAMPBELL PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
20	38						X		As above	
	39						X		As above, becoming a darker,"clean",siltstone,dk.purple	
	40						X		As above, back to a dk.gy.	
40	47						X	As above		
	48						X		As above, becoming rd.-bn.(light)	
48	52						X		As above	
	53						X		As above, dk.rd.-bn.	
	54						X		As above	
	55						X		As above,back to lt.gy.	
55	58						X		As above	
	59						X		As above, lt.bn.	
59	71						X		As above	
	72						X		As above, becoming siliceous, still no chert	
	73						X		As above	
	74						X		As above	
	75						X		As above, dk.bn.	
	76						X		As above, back to dk.gy.	
	77						X		As above	
	78						X		As above	
	79						X		As above, chert v. minor, bl. & bn.var.	
	80						X		As above, > bl.chert, bn.~	
	81						X		As above, becoming more siliceous w/> bl.chert~20%	
	82						X		As above, white chert appears as v.minor	
	83						X		As above	
	84						X		As above	
	85				Minor (?)		X		As above,w/equal abundance of soft and harder siltstone	
	86				Δ		X	<1	As above,w lt.gy.to dk.gy.siltstone still major	
	87	8.0					>	9	As above,w/dk.bn.,spiculitic chert abund.,no other change.	
	88	3.1					"	2	As above, lt.khaki colour Δ only, P_2O_5 material non-calc.	
	89	2.7					"	2	As above, w/> frags. of hd.lt.bn.,shale or hd.siltstone,non-calc.	

HOLE No.: D-TREE 5A **HOLE LOGGED BY:** M. D. CAMPBELL **PAGE**

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~NO.~~ SHAPIRO	FIELD ~~CORE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
89	90	2.0					"	2	As above	
	91	0.9					"	1=2	As above, w/2 to 3 variety siltstone-shale frags.	
	92	2.2					"	1-2	As above, chert still abundant, i.e. bn.var., bl.var. minor	
	93	1.4					"	2	As above	
	94	2.0					"	1-2	As above, only slight colour variation	
	95	1.6					"	1-2	As above	
	96	1.4					"	1-2	As above	
	97						"	1-2	As above	
	98						"	1-2	As above	
	99						"	1-2	As above	
	100	2.8					"	2	As above	
	101						"	2	As above, losing circulation and sample becoming mixed	
	102 T.D.	2.2					"	2	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: D-TREE 5B
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:** Approx. 200 yds. NE of D-Tree 5
INCLINATION:
TOTAL DEPTH: 100'T.D.

ROTARY DRILLING: Depth from 0' to 100'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 886' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 23.5.67
COMPLETED: 23.5.67
HOLE LOGGED BY: M.D.CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	AMDEL ~~XRF~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~XRD~~ SHAPIRO	FIELD ~~SOMS XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	3						X		Soil, lt.rd.-bn.sl-calc,chert absent.	23.5.67
	4						X		As above, w/frags. of white, hd.,siltstone & v.minor bl.chert, frags.	
	5						X		As above, w/rounded frags. of chert & siltstone (above) soft and hd.var.	
	6						X		As above,becoming a finer soil w/rounded frags. of Fe material.	
6	14						X		As above	
	15				Minor (?)		X		As above	
	16						X		As above, becoming a v.fine,sandy(?) material and becoming a dark red.	
16	22						X		As above	
	23				Major		X		As above	
	24						X		Siltstone, wh.to lt.gy.,dendritic,med.soft v.sl.calc. w/chert (bl.)v.minor	
	25				Major		X		As above, becoming lt.khaki and becoming softer.	
	26						X		Shale, lt.khaki,calc. med.hd.,chert(bl.)v.minor,v.thinly bedded	
26	30						X		As above	
	31						X		As above, chert (bl.)>	
	32						X		As above	

HOLE No.: D-TREE 5B HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XX~~. SHAPIRO	FIELD ~~XCORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
32	33						"		As above, chert ~20% (bl.)	
	34-36						"		As above	
	37						"		As above, becoming softer w/colour variations of gn., yel.,bn. & red.	
37	41						"		As above	
	42						"		As above, began taking samples early on basis of appearance of ~~XXXXX~~ cherty shale/	
	43						"		As above	
	44						"		As above, chert < & shale becoming softer	
	45						"		As above	
	46						"		As above	
	47						"		As above, tending toward a soft siltstone	
	48						"		As above	
	49						"		As above	
	50						"		As above	
	51				Major (?)		"		As above	
	52						"		Siltstone, v.soft, calc.,w/frags. of above harder shale as above, colour varies, w/chert wanting	
52	62						"		As above	
	63				Major(?)		"		Shale,lt.gy.to lt.bn.,becoming harder than above and bedding now seen as very thin.	
63	68						"		As above	
	69						"		As above, w/Fe(?) staining on bedding planes.	
	70						"		As above, minor red shale frags.: soft, non-calc. ~20%	
	71						"		As above	
	72						"		As above, w/small calcite Xs-(contains minor % P_2O_5)	
	73						"		As above	
	74						"		As above, chert (bn.)	
	75						"		As above	
	76						"		As above	

HOLE No.: D-TREE 5B HOLE LOGGED BY: M. D. CAMPBELL PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
76	77						"		As above, w/large Xs. of 2nd. calcite (⅛"), clear, angular frags. w/some Xs and veinlets cutting bn. chert. Also milky calcite aggregates w/red material (Fe) as matrix (Seen in B-1A and H-2 and elsewhere (?)	
77	80						"		As above	
	81						"	<1	As above	
	82						>	1	As above, still a lt.khaki, silty, calc., shale, w/2 var. calcite, i.e. clear XI and milky aggregates as above; chert abund., bn.var.(w/spiculites (?) or small white inclusions - but no other lithologic change.	
	83	8.2					"	10	As above	
	84	8.0					"	10	As above	
	85	9.6					"	8	As above	
	86	4.2					"	3	As above	
	87	2.8					<	1-2	As above, no observed lithologic change	
	88						"	1-2	As above	
	89						"	1-2	As above	
89	96						"	<1	As above	
	97				Minor(?)		"	"	As above	
	98						"	"	As above, becoming very soft, fine, lt.yellow, sandy sl.calc. chert<.	
	99						"	"	Asabove	
	100 T.D.						"	"	Caving badly, abandoned.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: D-TREE 5C
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:** Approx. 200 yds. SW of D-Tree 5
INCLINATION:
TOTAL DEPTH: 114' T.D.

ROTARY DRILLING: Depth from ** 0' to 114'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 893' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 24.5.67
COMPLETED: 24.5.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP SHAPIRO	FIELD ~~CORE~~ ~~ALTITUDE~~ SHAPIRO	DESCRIPTION	DATE
0	12	RB			Minor (?)		X		Soil, red-bn.,sl.calc., w/frags of chert (bl.) and white,hd., siltstone (rounded)	24.5.67
	13						X		As above, becoming lighter red-brn.	
	14						X		As above	
	15						X		As above/with > white, sl. calc., rounded siltstone.	
	16						X		As above, w/ variations in siltstone of colour and hardness, still rounded, chert <	
	17						X		As above, chert almost wanting	
	18						X		As above, chert almost wanting	
	19						X		As above	
	20						X		As above	
	21						X		As above, becoming a "cleaner" one variety, soft siltstone, lt. gy., non calc. as minor	
	23						X		As above, w/ > siltstone	
	24						X		As above	
	25						X		As above	
	26						X		As above	
	27						X		As above	
	28				Major		X		As above	
	29						X		Siltstone,lt.khaki to lt.gy.,soft,sl.calc.to non calc.w/fine variations in colour, chert still v. minor (bl.)	

McA. 29

HOLE No.: D-TREE 5C HOLE LOGGED BY: M. CAMPBELL PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP No. SHAPIRO	FIELD ~~CORE~~ ~~XXXXX~~ SHAPIRO	DESCRIPTION	DATE
29	30						X		As above	
	31						X		As above	
	32						X		As above	
	33						X		As above	
	34						X		As above	
	35						X		As above, chert (bl.) v.minor (bl.)	
	36						X		As above	
	37						X		As above, w/v. minor 2nd var.hd.siltstone (bn.)	
	38						X		As above	
	39						X		As above	
	40						X		As above	
	41						X		As above	
	42						X		As above	
	43						X		As above	
	44						X		As above	
	45						X		As above	
	46						X		As above	
	47						X		As above	
	48						X		As above	
	49						X		As above, uniform lithology	
	50						X		As above	
	51						X		As above	
	52						X		As above	
	53						X		As above	
	54						X		As above	
	55						X		As above	
	56						X		As above	
	57						X		As above	
	58						X		As above	
	59						X		As above, sl.> chert (bl.)	

HOLE No.: D-TREE 5C HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIK~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~XRD~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
59	60						X		As above	
60	85						X		As above	
	86						X		As above, becoming darker and harder (dk.gy & dk.bn.var.)	
	87						X		As above	
	88						X		As above	
	89						X		As above	
	90						X		As above	
	91						X		As above	
	92						X		As above	
	93				Major △		X		As above, w/1st. definite chert bed and small gns. of qtz.	
	94						X		Shale, siliceous, bn., v.silty, chert (bl. & bn.) abundant; w/frags of wh., hd., shale-siltstone (not as above)	
	95						X		As above	
	96						X		As above	
	97						X		As above	
	98						X		As above	
	99						X		As above	
	100						X	<1	As above, w/> Xs of small calcite	
	101				Minor (?) △		X	"	As above	
	102	4.3					>	3-4	As above, colour △ to dk. khaki from above lt. gy., and > dk. bn. shale, non-calc., chert (bn).w/spiculites(?) or white inclusions.	
	103	6.5					"	5	As above	
	104	2.5					"	4	As above, becoming very fine &"sandy", sl. calc.	
	105	4.9					"	3	As above, losing circulation and caving samples felt to be not representative.	
	106								As above (missed), calcarenitic (?)	
	107	4.9						4	As above	
	108								(Missed)	
	109						"	<1	As above	

HOLE No.: D-TREE 5C HOLE LOGGED BY: M. CAMPBELL PAGE 4

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
109	110								(missed)	
	111						"	"	As above	
	112								(Missed)	
	113						"	~1	As above	
	114 T.D.								(Missed)	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: D-TREE 7
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 157' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 157'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 871' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 9.5.67
COMPLETED: 9.5.67
HOLE LOGGED BY: M. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	AMBEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~No.~~ SHAPIRO	FIELD ~~DIP~~ ~~AZIMUTH~~ ~~XXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	1						-		Soil, dk.bn.,w/rounded frags of white, non-calc.	9.5.67
									siltstone,w/chert (bl.) v.minor	
	2						-		As above, becoming dk.-rd.,w/chert sl.increasing.	
	3						-		As above, w/rounded Mn or Fe frags.w/wh. to lt.purple	
									and red, chalky siltstone.	
	4						-		As above	
	5						-		As above, w/> frags. of above siltstone and chert (bl.)	
	6				Minor(?)		-		As above, ~~x~~ still w/rounded frags. of above.	
	7						Sl>		As above, but assuming more powdery appearance, chert as above.	
	8-12						"		As above	
	13						"		As above,w/frags. of Xl.lms.,lt.bn. to lt.or. (as appears	
									in outcrop near well-site - N-W	
	14						"		As above	
	15						"		As above	
	16						"		As above, still w/rounded chert pebbles and Lms.frags.	
	17	2.1					"		As above	
	18	2.3				~3%	>>		As above	
	19	2.6					"		As above	
	20	2.5					"		As above, becoming v. silty, almost sandy,w/chert	
									~20%(bl.var.) becoming lter.red-bn.	

HOLE No.: D-TREE 7 HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BH~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~NO.~~ SHAPIRO	FIELD ~~CORE STRUCTURE~~ SHAPIRO	DESCRIPTION	DATE
20	21	3.2					"		As above, w/frags of red, silty quartz aggregates - coarse grained - as seen in BI-A well(") w/phosphatic limonitic, vughy, clayey "siltstone" (?).	
	22	3.4					"		As above	
	23	3.0					"		As above,w/rd.bn.,soft,sl.calc.,siltstone,w/bl.mineral spotted throughout and w/also a wh.mineral 9clay mineral(?)); w/chert (bl.)	
	24	2.7					>>		As above	
	25	1.9							As above,w/> bl.chert	
	26	1.8							As above	
	27	1.8							As above	
	28	2.5							As above	
	29	1.6			Minor △				As above	
	30	2.2							As above, becoming lt.bn.,chert (bl.) abund.	
	31	2.0							As above	
	32	1.9			Major △				As above	
	33	0.6							Lms., silty, lt.bn.-lt.orange,w/chert frags and rd.-bn.,soft-siltstone.	
	34				Major △				As above	
	35								Siltstone & lms.(above lms.) w/above rd.-bn.siltstone (above) w/chert (bl.) abund.	
	36	1.3							As above	
	37	1.7					<		As above	
	38	1.4					"		As above	
	39	1.2			Minor △		"		As above, becoming a clearer lms.,(above),but still interbedding w/above siltstone,rd.-bn.,to lt.bn. soft siltstone.	
	40	0.9					"		As above	
	41	0.7					"		As above	
41	45						"		As above	

HOLE No.: D-TREE 7 HOLE LOGGED BY: M.D.Campbell

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XRF~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XRD~~ SHAPIRO	FIELD ~~XRD~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
45	46				Major △		"		As above	
	47						"		Lms., (as Lms.above),w/chert abund.,silty,sandy (impure lms.)w/oolites(?) in silty shale(bn.) frags.	
47	53						"		As above	
	54						SI >		As above	
	55						"		As above, v.uniform	
	56						"		As above	
	57						<		As above	
	58						"		As above	
	59						"		As above	
	60-71				Minor(?) △		"		As above	
	72	1.1			"		"		As above	
	73	1.1			"		"		As above	
	74	0.8			"		"		As above	
	75-77				"		"		As above	
	78						"		As above, becoming off white to lt.gy.	
	79						"		As above	
	80				Minor(?) △		"		As above	
	81	0.4			"		"		As above	
	82	0.5			"		"		As above	
	83	0.6			"		"		As above	
	84-86				"		"		As above	
	87	1.3			"		"		As above	
	88				Minor(?) △		"		As above, becoming lt.bn. to lt. orange.	
	89	0.6					<		As above, becoming off-white, no other change observed.	
	90-91						"		As above	
	92	0.8					"		As above	
	93						"		As above	
	94	0.9					"		As above	
	95-106						"		As above	

HOLE No.: D-TREE 7 HOLE LOGGED BY: M. D. CAMPBELL PAGE 4

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~DST~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~XD.~~ SHAPIRO	FIELD ~~XDXK ATTITUDE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
106	107	0.7					"		As above	
107	111						"		As above	
	112						"		As above, becoming more silty, chert decreasing.	
112	115						"		As above	
	116						"		As above, chert increasing slightly.	
	117				(?) Minor				As above, w/minor frags. of dk.gy.lms.-two var.pres.	
	118						"		As above, increasing dk.gy.lms., > chert (bl.)	
	119								As above	
	120								As above, w/dk.bn.,hd.shale frags. minor, & occ. rd.-bn.,hd.calc.shale, chert > bl. & bn.	
	121-124								As above	
	125				Major		"		As above	
	126						"		Lms.,dk.gy.to lt.black,w/abundant chert (bl.) & frags. of above.	
	127-136				Major(?)		"		As above	
	137						"		Ferruginous frags.,partially limonitic,w/minor frags. of bl. & bn. & wh. chert w/above frags.	
	138						"		As above	
	139				Major		"		As above, lms., lt.bn. to lt.khaki, very silty - not sandy - w/chert(bl.) abund.	
	140-147								Struck water - lost samples after 147'	
	148-154								Core	
	155-156								Core	
	157								Core	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: D-TREE 7A
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 180 T.D.

ROTARY DRILLING: Depth from 0' to 180'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 910' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 11.5.67
COMPLETED: 11.5.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	AMDEL ~~BT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~NO~~ SHAPIRO	FIELD ~~CODE~~ ~~ASSAYER~~ SHAPIRO	DESCRIPTION	DATE
0	2	1.8	HT BIT				St.Ph.	1	Chert, bl. & bn.var.,w/rd.-bn. soil material w/minor Lms. frags. (wh.,dendritic & v.hd.)	11.5.67
	3	1.9					>	1	Lms., wh.Xl,w/frags. of rd.-bn.,weathered lms.w/chert (bl.) v.abund.	
	4						"	1	As above, becoming lt.bn. to lt.orange, sandy and silty, w/rd.-bl.,RB, & white cherts abund.	
	5						"	1	As above	
	6						"	1	As above	
	7						"	2	As above	
	8						"	2	As above	
	9						"	1	As above,w/frags. of dk. or lms. - micro-oolite (?)	
	10						"	2	As above, decreasing dk. or. var.lms.	
	11						"	2	As above	
	12						"	2	As above	
	13						"	1	As above	
	14						"	4	As above	
	15						"	2	As above	
	16						"	4	As above	
	17						"	2	As above	
	18						"	3	As above,w/increasing frags. of clay, chert v.minor	

HOLE No.: D-Tree 7A HOLE LOGGED BY: M. D. CAMPBELL PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
							"	2	As above	
18	19						"	1	As above, decreasing lt. or lms.var. & increasing dk.or.var., becoming more silty and chert >	
	20						"	2	As above	
	21						"	6	As above	
	22	4.0					"	8	As above, w/ > frags. of dk.or.lms.w/lt.or.var.v.minor, chert (bl.&bn.) v.abund.	
	23	7.3.					>>			
							"	10	As above	
	24	10.0					"	3	As above	
	25	3.5					"	4	As above	
	26	2.0					>>>	7	As above, w/chert (bn.) w/white inclusions -spiculites (?)	
	27	3.9					"	10	As above, becoming "mottled"w/rd.-or.inclusions (?) in above dk. or. lms. - oblitic (?)	
	28	6.8								
							"	10	As above	
	29	6.9					"	10	As above, becoming very dendritic - w/colour △ to lt.gy. v.abund.bn.,spiculitic(?) chert only sl.calcareous & more silty w/minor frags.of hd.,thinly bedded,bn.shale.	
	30	5.8								
							"	7	As above	
	31	4.0					"	12	As above	
	32	8.0					"	4	As above	
	33	3.0					"	15	As above	
	34	10.4					"	15	As above	
	35	15.2					"	15	As above	
	36	13.8					"	10	As above	
	37	8.7					"	8	As above	
	38	5.8					"	5	As above	
	39	2.7			Major △		"	2	As above	
	40	1.7					>	7	~~Siltstone~~-shale, bn.,v.hd.w/minor rd.-bn.soft siltstone, chert v.abund.,sl.calc.,mottled appearance, possibly micro-oolitic w/frags. of above lms.(interbedding.	
	41	4.0								
	42	6.0					"	8	As above	

HOLE No.: D-Tree 7A

HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~XX~~ SHAPIRO	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
~~XX~~ 42	43	5.0					"	10	As above	
	44	3.3					"	7	As above	
	45	3.5					"	7	As above	
	46	3.3					"	5	As above	
	47	2.6					"	3	As above	
	48	2.3					"	3	As above	
	49	2.0					"	3	As above	
	50						"	2	As above, w/chert still v.abund.	
	51						<	1	As above	
	52						"	1	As above, becoming more silty	
	53						"	1	As above	
	54						"	1	As above	
	55						"	1	As above, w/v.minor frags of lt.gy.,v.calc.& silty lms.	
	56				Major		"	1	As above,	
	57						"	1	Lms.,lt.gy.to white, as above, above siltstone shale minor chert still v. abund.	
	58						"	1	As above	
	59						"	1	As above	
	60						"	"	As above	
	61						"	"	As above	
	62				Minor (?)		"	"	As above	
	63						>	2	Lms., lt. bn. to lt. or., sandy, chert ~20% bl.var.	
	64						"	2	As above, dendritic (sl.), med. to sl.calcareous	
	65-69						"	<1	As above	
	70						<	"	As above	
	71-73						"	"	As above	
	74						"	"	As above, w/v.minor frags. of off-white to lt.khaki siltstone.	
	75						"	"	As above, chert decreasing	
	76						"	"	As above	

HOLE No.: D-TREE 7A HOLE LOGGED BY: M. D. CAMPBELL PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XR~~ SHAPIRO	FIELD ~~CORE XRD~~ SHAPIRO	DESCRIPTION	DATE
76	77						"	"	As above	
	78				Major		"	1	As above	
	79				△		"	1	As above	
	80						"	1	Siltstone,shale, or very silty limestone, v.thinly bedded and v.silty.	
	81						"	<1	As above	
	82						<<	"	As above	
82	96						"	"	As above	
	97						"	3	As above	
	98						"	<1	As above	
	99						"	2	As above	
	100						"	<1	As above	
	101	5.9					>>	8	As above	
	102						"	4	As above, becoming more silty.	
	103						"	3	As above	
	104						"	2	As above	
	105						<<	<1	As above	
106	111						"	"	As above	
	112						"	"	As above, becoming a lt.orang lms.,v.calc.	
	113						"	1	As above	
	114						"	1	As above	
	115				Minor		"	1	As above	
	116				△		"	<1	Lms.,gy.non XL,v.silty, but less silty than above, chert still minor.	
	117						"	"	As above, w/abund.frags of above siltstone-shale.	
	118						"	"	As above	
	119				- -△-?- -		"	"	As above	
	120						"	"	As above, w/50% Rd.-bn.soft clayey material.	
	121						"	1	As above	
	122				- -△?- -		"	1	As above, above rd.-bn.material wanting, chert minor.	

HOLE No.: D-TREE 7A

HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~DK~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~DK~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
122	123						"	<1	As above	
123	139						"	"	As above	
	140						"	"	As above, chert increasing to abund.bn.&bl.var.	
140	144						"	"	As above	
	145		Hole logged from 146' to 180 T.D. by B. Fitzpatrick				"	"	~~As above~~	
	146						"	"	Grey crypto XL, lms.,phosphatic,dk.bn.gy.chert common in thin beds.	13.5/67
	147						"	"	As above	
147	149						"	"	As above	
	150						"	"	As above, dk.bn.chert abund.,weakly phosphatic	
	151						"	"	As above	
151	154							"	As above	
	155						"	"	As above, some lt.gy.siltstone lenses from 164'	
	156						"	"	As above, nil P_2O_5	
156	164				Minor(?)		"	"	~~As above~~	
	165						"	"	As above	
	166							"	As above, lt.salmon pink,silty Lms.w/hd.gy.silty lms. lenses, partly sandy, hd.chert wanting	
167	171							"	As above	
	172							"	As above, at 172' a cave, kelly dropped 3' Lost circulation - T.D. 180' No samples from 172' to 180'	
	180' T.D.								NOTE: WAter moved up hole 40' from cave.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: D-TREE 9
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 132'6" T.D.

ROTARY DRILLING: Depth from 0' to 132'6"
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 864' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 12.5.67
COMPLETED: 12.5.67
HOLE LOGGED BY: B. FITZPATRICK

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	AMDEL ~~SHAPIRO~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE ATTRIBUTE~~ SHAPIRO	DESCRIPTION	DATE
0	5								Black-brown clay and soil.	12.5.67
6	20								Red-brown clay, sandy in part. Pebbles common from 10'	
20	23								Sands and gravel.	
24	35								As above	
36	40		Phosphate						Sandy siltstone	
40	43		Core Attempt N.L. Recovery							
43	46								Brown-yellow sandy phosphatic siltstone c̄ thin chert bands, ferruginous fine gr.sandstone grs. not rounded, dendritic manganese seen, slightly calcareous. Poorly phosphatic.	
46	47 9		Nil Recovery							
47 9	50 9		Core attempt - recovery 6"						Weathered grey, yellow to reddish (~~RED~~ iron stained) and white siliceous phosphatic siltstone. Sandy in part, chert common, brown to black in 1" bands, white translucent in very thin bands, iron stained, vughy.	
		7.3								
		4.8								
		3.2								
50 9	52 9		Core attempt - recovery 6"						As above	
52 9	55		Nil Recovery							
55	56								Light creamy brown, slightly calcareous phosphatic siltstone c̄ chert; some hard white silicified siltstone c̄ iron staining.	

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
56	59								As above, chert abundant, phosphatic, iron stained.	
59	62	5.0							As above, slightly calcareous, chert thin bedded, phosphatic.	
		4.0								
62	64	4.8							Dark red-brown sandy siltstone c̄ chert, iron rich, chert less common, phosphatic, non-calcareous.	
		4.8								
		4.8								
		5.0								
64	67	7.3							Light brown and dark chocolate brown siltstone c̄ some chert, phosphatic, slightly sandy, chert in thin transparent stringers and coarser bedded dark grey lenses though not abundant.	
		10.1								
		11.7								
67	69								As above, chert more common, contains ? spicules. Abundant fine white grains or pellets of phosphate or chert.	
69	71	12.4							As above, lighter coloured, less chert, phosphatic, non-calcareous, creamy colour stained with Fe	
		11.0								
		11.4								
		6.6								
71	74	10.1							Dark chocolate brown c̄ interbedded creamy siltstone, white chert in paper thin beds.	
		16.6								
		7.8								
		9.8								
74	79	7.3							As above, large chips chert abundant, colour of siltstone varies from red-brown to light greenish cream siltstone.	
		3.9								
		3.9								
		5.2								
		8.7								
79	85	8.7							As above, some red-brown and almost black siltstone, chert with spicules abundant, phosphatic, very fine grained white ? pellets or chert grains.	
		5.2								
		5.0,7.0,5.9,3.2								

HOLE No.: D-Tree 9 HOLE LOGGED BY: M. CAMPBELL PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE CATCHER~~ SHAPIRO	DESCRIPTION	DATE
85	90	4.8 3.0							As above, light brown specular chert common, some silicified white siltstone ~~c~~ specules or ? shards. Mainly red-brown to dark brown-black non-calcareous siltstone.	
90	95	6.4, 6.5, 5.9, 7.4, 5.9, 5.4							Darker coloured grey brown, very finely bedded siltstone, abundant chert faintly calcareous, interbeds of red-brown siltstone. At 94' mainly red brown siltstone, small white grs. or pellets common, less chert.	
95	97	4.9, 4.2, 4.5, 3.4, 2.7, 2.9							As above; very small white pellets or grains of ? Phosphate or chert common, mainly dark brown siltstone with thin interveds of silicified white sandstone (fine gr.) which is iron stained on joints.	
97	100	4.0, 5.1, 4.9, 4.5							Mainly red-brown some creamy ? pelletal siltstone (? black pelletal shapes seen), chert common. Extremely plastic in texture, becomes wet at 98'.	
100	106								As above, chert rare at 100'-101', common from 102'; thin beds fine grained white sandstone which is phosphatic.	
106	108	4.3, 4.3, 2.7, 2.2							Very dark brown to almost black weathered plastic phosphatic siltstone; abundant fine white grains, chert rare, chips of fine gr. white sandstone partly dissolve in shapiro solution giving phosphate reaction.	
108	109	—							Siltstone becomes lighter in colour, red-brown with creamy interbeds, some chert.	
109	114								Light creamy to greenish siltstone, phosphatic with few chert lenses; dark red-bn. at 112', without chert.	
114	115								Light grey calcareous silty limestone, phosphatic, very fine grained, thin chert.	
115	121								Dense fine grained, crystalline phosphatic limestone. Chert abundant at 117'. At 118' the limestone becomes a light creamy brown in colour, chert still common to abund.	

HOLE No.: D-TREE 9 HOLE LOGGED BY: MR. B. FITZPATRICK

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD CORE DESCRIPTION SHAPIRO	DESCRIPTION	DATE
~~XXX~~121	124								Mainly red brown and creamy yellow phosphatic siltstone c thin limestone lenses (or cavings?) and chert. Slightly calcareous. Limestone chips show small vughs c secondary calcite crystals. Dendritic manganese on joints.	
124	126								As above, chips of white silicified hard phosphatic siltstone common; chert abundant, faintly calcareous.	
126	128								Darker brown and red-brown phosphatic siltstone interbedded with white hard phosphatic siltstone and chert lenses. Slightly calcareous, poorly phosphatic.	
128	131								As above c abundant chert, water increasing.	
131	132 6	T.D.							Mainly dark brown ~~xx~~ siltstone c hard white silicified siltstone and chert interbeds, calcareous weakly phosphatic.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: D-TREE 11
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 120' T.D.

ROTARY DRILLING: Depth from 0' to 120'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 859' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 28.5.67
COMPLETED: 30.5.67
HOLE LOGGED BY: B. FITZPATRICK

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
0	5								Red-brown soil.	28.5.67
5	10								As above c pebbles.	
10	22								Coarse river gravel.	
22	26								As above	
26	27								Some pebbles of weathered greenish siltstone, non-phosphatic.	
27	38								Pebble beds with clays, gravel.	
38	45								Creamy brown, weathered, silicified siltstone. At 42" slightly darker, finely bedded (1/16"), iron stained on joints, non-phosphatic.	
45	48 10		Core (1) Recovery 6"						Silicified creamy siltstone, thin bedded, chert at 47' becoming common with depth, interbedded with soft yellow brown siltstone non-phosphatic.	
	49 8½		Actual measured depth							
50	53								Interbeds creamy white silicified siltstone and light brown siltstone with abundant dark brown chert iron staining common.	
53	54								Light salmon pink and cream, silicified, non-calcareous, non-phosphatic, chert common.	
54	55								Becoming darker brown, yellow, much less white silicified siltstone, less chert.	

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HOLE No.: D-TREE II

HOLE LOGGED BY: B. FITZPATRICK PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
55	56		Phosphate					<1	Dark chert more common, colour as above, phosphatic.	
									Light brown yellow siltstone.	
56	57							1½	Chert abundant, phosphatic, non-calcareous.	
57	58							1½	Large chips abundant dark chert, some white silicified	
									siltstone, mainly light yellow brown reddish	
									siltstone phosphatic.	
58	59	2.2						2	As above	
59	60	2.9						1-2	More reddish brown, as above, more iron rich.	
60	61	3.3						4	As above	
61	62	8.7						12	As above, lighter coloured, less red iron rich siltstones.	
62	63	11.0						14	As above, iron content down, good phosphate	
63	64	11.4						6	As above, more reddish brown interbeds, abundant chert	
64	65	6.3						7	As above	
65	66	9.6						12	As above; finely bedded, some very thin black bands.	
									Non-calcareous.	
66	67	5.6						5	As above	
67	68	12.0						15	As above, still non-calcareous, phosphatic	
68	69	18.6						20	As above, coarse black chert and thin white transparent	
									chert common to abundant.	
69	70	21.0						20	Less chert, softer, otherwise as above	
70	71	18.4						20	~~XXXXXXXXX~~ As above, reddish-yellow mottled, phosphatic.	
71	72	20.0						20	As above, white curd forming in shapiro solution.	
72	73	18.6						20	As above	
73	74	6.8						16	As above	
74	75	5.2						12	Mainly reddish brown siltstone yellowish mottled with	
									abundant chert, phosphatic, weathered.	
75	76	9.1						14	As above, abundant chert	
76	77	7.3						14	As above, non-calcareous	
77	78	6.5						10	As above	
78	79	7.3						12	As above	

HOLE No.: D-TREE 11 **HOLE LOGGED BY:** B. FITZPATRICK **PAGE**

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
79	80	4.0						5	As above	
80	81							1	Mainly lighter coloured, creamy brown and grey phosphatic siltstone c̄ less chert, some red brown siltstone; non-calcareous, less phosphate.	
81	82							1	As above	
82	83							1-2	Abundant chert, as above, increase in P_2O_5 content.	
83	84							1-2	As above, still non-calcareous	
84	85							1-2	As above, weakly phosphatic, chert abundant, slightly lighter in colour.	
85	86							2	Mainly reddish brown phosphatic siltstone, some yellow-grey. Chert common.	
86	87	2.3						4	As above, some hard white silicified sandy lenses, chert common, weakly phosphatic, chert abundant.	
87	88							<1	Light brown to red brown vari-coloured siltstone c̄ abundant chert, phosphatic, very finely bedded.	
88	89							2	Light ~~&~~ grey brown phosphatic siltstone c̄ chert	
89	90							1-2	As above, abundant chert, becoming calcareous.	
90	91							1	Vari-coloured greenish-grey-brown in part calcareous phosphatic siltstone c̄ abundant chert.	
91	92							3	As above, calcareous in very thin white stringers, maybe secondary calcite.	
92	93	3.1						3	Mainly grey and red brown and vari-coloured iron stained siltstone, phosphatic, non-calcareous.	
93	94							2-3	As above, faintly calcareous.	
94	95							2	Dark brown and light creamy grey and mottled siltstone; one thin hard silicified white siltstone, chert abundant, faintly calcareous.	
95	96							3-4	As above, chert c̄ abundant specules or shards?	
96	97							1-2	Mainly yellowish greenish grey siltstone. Little interbedded chert, fainly calcareous, weakly phosphate.	

HOLE No.: D-TREE 11 HOLE LOGGED BY: B. FITZPATRICK PAGE

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
97	98							1-2	As above, again the calcareous material is thin white stringers of ? secondary calcite, finely bedded.	
98	99							1-2	As above, thin white siliceous siltstones beds, faintly calcareous, phosphatic.	
99	100							1-2	Dark brown and greenish grey vari-coloured siltstone, slightly calcareous, definite sponge specules in abundant chert, weakly phosphatic. Black soft mineral (? Mn) present again in dark brown siltstone.	
101	102							1-2	Dark brown plastic, faintly calc. siltstone, becoming phosphatic, little chert.	
102	~~XXX~~ 103							2	As above, slightly calcareous, little chert, very dark, plastic.	
103	104							2	As above	
104	105							1-2	As above, some light yellow brown siltstone, very little chert. More calcareous.	
105	106							<1	As above, small chips of limestone, no chert	
106	107							1	Interbedded thin limestone lenses with dark brown phosphatic siltstone.	
107	108							<1	As above, very little chert.	
108	109							"	Hard thin bedded creamy crystalline limestone, phosphatic, contamination of red brown siltstone, no chert, mildly phosphatic.	
109	110							"	As above, dense, hard.	
110	111							1-2	As above	
111	112							1-2	As above	
112	113							<1	As above	
113	114							"	As above	
114	115							"	Interbeds of limestone, white hard crystalline, and red brown calcareous siltstone. Phosphatic. Mainly red-brown siltstone.	

HOLE No.: D-TREE 11 HOLE LOGGED BY: B. FITZPATRICK PAGE 5

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~XIX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
115	116							<1	Calcareous red brown phosphatic siltstone, no chert.	
116	117							"	As above, ~~XX~~ weakly phosphatic.	
117	118							"	As above, very plastic	
118	119							"	As above	
119	120 T.D.							1-2	As above, has become too wet to drill in plastic siltstone, still calcareous, weakly phosphatic.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: D-TREE 13
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: ~~XXXXXXXX~~ 181' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 181'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 878' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 18.5.67
COMPLETED: 19.5.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	3							<1	White siltstone, silicified siltstone and chert pebbles, with ferruginous bands (surface pebble cover), with weathered siltstone and chert below.	18.5.67
3	7							"	Yellowish siltstone, partly silicified and calcareous, with ferruginous bands (noticeable on flat surfaces of chips); also chert.	
7	8							"	Buff-khaki ferruginous siltstone, slightly calcareous, with chert.	
8	11							"	Yellow-cream siltstone, not appreciable calcareous.	
11	12							"	Pinkish-brown siltstone	
12	14							"	As above, yellow colour	
14	15		Phosphate					1	Yellow, slightly calcareous phosphatic siltstone with chert.	
	16							6	As above	
	17	3.0						10	As above (Future references to siltstones in	
	18	4.6						11	As above this log include ferruginous	
	19	3.7						10	As above constituents limonite and haematite)	
	20	4.6						12	As above	
	21		Partial loss in circulation					8	As above, slightly browner. Marked drop in circulation - only fractional sample recovery ensued to 24'. Samples only slighly calcareous. ~~to 24'~~	

HOLE No.: D-TREE 13 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BIT~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~AXXXXXX~~ SHAPIRO	DESCRIPTION	DATE
21	22							10	As above, brown colour	
	23							10	As above	
	24	12.7						11	As above	
	25							Missing	Sample not recovered owing to reaming and casing of hole when at depth 24'.	
	26							2-3	Brown-buff siltstone with limestone and chert, silt being ferruginous - haematite and limonite.	
	27							1-2	Cream limestone with chert	
	28							2	As above, with calcareous silt	
	29							1-2	As above, with ferruginous flakes of siltstone. Chert absent or sparse.	
	30							1-2	As above	
	31							1-2	As above	
	32							1	As above	
	33							1	As above	
	34							1	As above	
	35							1-2	As above	
	36							1	As above	
	37							1	As above	
	38							1	As above	
	39							1-2	As above	
	40							<1	As above	
	41							2	As above	
	42							<1	As above	
	43							"	As above	
	44							2	As above	
	45							1-2	As above	
	46	1.2						2	As above, yellower - siltier	
	47							1-2	Cream limestone with silt.	
	48							1-2	As above	

HOLE No.: D-TREE 13 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~NK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
48	49							1-2	As above	
	50							2-3	As above	
	51							1-2	As above	
	52	3.7						3-4	As above	
	53							2-3	As above	
	54							3-4	As above	
	55							1-2	As above, with chert	
	56							1-2	As above	
	57							1-2	As above	
	58							1-2	As above	
	59							2	As above	
	60	2.5						3-4	As above, but with less chert	
	61							3-4	As above	
	62							3-4	As above	
	63							1-2	As above	
	64							1-2	As above	
	65							1-2	As above, with more yellow-brown calc.silt.	
	66							1-2	As above	
	67							2	As above,with less brown silt.	
	68							1-2	As above	
	69	2.8						2-3	As above, plus chert	
	70							2-3	As above	
	71							2	As above	
	72							2	As above	
	73							1-2	As above	
	74							2	As above, without chert	
	75							1-2	As above	
	76							1-2	As above	
	77							1-2	As above	
	78							1-2	As above	

HOLE No.: D-TREE 13 HOLE LOGGED BY: N. MURPHY PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BH~~ ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
78	79							1-2	As above	
	80							2	As above	
	81							1-2	As above	
	82							2	As above	
	83							2-3	As above	
	84							3-4	As above	
	85							3-4	As above	
	86							1	As above	19.5.67
	87							1-2	As above, but without chert. Limestone chips appreciably smaller throughout this interval.	
	88							2-3	As above	
	89							2-3	As above	
	90							1	As above	
	91							1	As above	
	92							1-2	As above	
	93							1-2	As above	
	94							1	As above	
	95							<1	As above	
	96							"	As above	
	97							"	As above	
	98							"	As above	
	99	1.7						1-2	As above	
	100							<1	As above	
	101							"	As above with some white chert	
	102							"	Yellow silt with limestone	
	103							1	As above	
	104							1-2	As above	
	105							1-2	As above	
	106							1	As above, fawn colour	
	107							1	Cream limestone, with a little silt.	

HOLE No.: D-TREE 13 HOLE LOGGED BY: N. MURPHY PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	FIELD ~~CORE ASSAYER~~ SHAPIRO	DESCRIPTION	DATE
107	108							<1	As above	
	109							"	As above	
	110							"	As above	
	111							"	As above	
	112							1	Yellow, siltier samples, with usual limestone chips. Only occasionally was a chip of silt recovered (as opposed to dust), and these were observed to contain calcite crystals. Samples generally low in phosphate and always calcareous.	
	113							1	As above	
	114							<1	As above	
	115							1	As above	
	116							<1	As above	
	117							"	As above	
	118							"	As above	
118	125							"	As above	
125	131							"	Cream coloured limestone	
131	135							"	Yellow-brown silt with limestone	
	136							1	As above	
	137							1-2	As above	
	138							1	As above	
	139							1	Browner, but as above	
	140							<1	As above	
	141-143							"	Yellow silt with limestone	
	144							1	As above	
144	147							<1	As above	
147	150							<1	As above, with slight colour variations from cream to yellow.	
	151							1-2	As above	
	152							<1	As above	
	153							"	As above	

HOLE No.: D-TREE 13 HOLE LOGGED BY: N. MURPHY PAGE 6

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	No.	~~CORE~~ ~~AXIMUM~~	DESCRIPTION	DATE
153	154							"	As above	
	155							1-2	As above	
	156							<1	As above	
	157							1-2	As above	
	158							1-2	As above	
	159							<1	As above	
159	164							"	As above	
	165							1	As above	
165	170							<1	As above	
170	176							"	As above, samples from 171' to 176' being slightly damp.	
176	180 T.D.								No ~~samp~~ samples recovered; bit dropped through 4' cavity.	
	181 T.D.								No sample recovered, owing to lost circulation.	
									Hole abandoned at 181' T.D. owing to lost circulation.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: E-5
STATE: QUEENSLAND COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION:
TOTAL DEPTH: 44' T.D.

ROTARY DRILLING: Depth from 0' to 44'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 854' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 16.5.67
COMPLETED: 16.5.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE ATTITUDE XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Grey soil and silty alluvium	16.5.67
1	6							"	Red-brown silty alluvium	
6	7		Phosphate					"	Pinkish-grey, ferruginous silt. and limestone; P_2O_5	
7	8							"	As above, yellow-brown	
	9							"	As above	
	10							"	Buff-pink silty and limestone, c much haematite	
	11							"	As above	
	12							"	Yellow silt and limestone, markedly limonitic	
	13							2	As above	
	14	3.3						2-3	Yellow calcareous siltstone (? marl), limonitic; without limestone chips.	
	15							1-2	~~As above; with limestone chips and brown chert.~~	
	16	2.9						3	Yellow-buff calcareous silt with much chert; also haematite and limonite.	
	17							2	As above	
	18	XXX						1-2	Cream limestone (?dolomite) with haematite staining on chips. Less chert than above.	
	19							1-2	As above	
	20							1	As above, with more chert. "Vughy" limestone chips. Haematite-rich silt.	

HOLE No.: E-5 HOLE LOGGED BY: N. MURPHY PAGE

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~COREX~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
20	21							<1	As above	
	22							"	As above	
	23							"	As above	
	24								Missing) Samples unobtainable owing to the use of water to help clear badly caving hole.	
	25							"	As above	
	26							1	Limestone and chert	
	27							1	As above	
	28							1	As above	
	29							1-2	Pink-buff, haematitic siltstone, with chert; much less ~~ck~~ calcareous (i.e. less effervescence in Shapiro)	
	30							<1	As above, but ~~xxxx~~ very pink colour; limestone, chert.	
	31							1-2	As above	
	32	4.0						3-4	As above, brown colour; some limonite also.	
	33							2	As above; calcite ~~xx~~ cleavage fragments seen; haematite	
	34	3.6						3-4	As above	
	35	3.6						4	Pinkish-buff; as above	
	36							1-2	Buff-to-brown, as above	
	37							2	As above	
	38							1	Pinkish-buff, as above	
	39							<1	As above, hole caving; circulation poor.	
	40							1-2	As above	
	41							1-2	As above	
	42							1-2	As above	
	43							3-4	As above	
	44 T.D.	2.9						3-4	Buff-pink, dusty sample containing caved material.	
									Hole abandoned due to lost circulation.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: E-6
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:** Half a mile West of E and E-2
INCLINATION:
TOTAL DEPTH: 186'6" T.D.

ROTARY DRILLING: Depth from 0' to 186'6"
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 871' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 16.5.67
COMPLETED: 18.5.67
HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	~~XX~~	FIELD ~~XXXX~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Flaggy pebbles of calcareous shale and siliceous shale; also chert pebbles. Brown soil.	16.5.67
	2							"	Purple, ferruginous calcareous silt, slightly phosphatic (trace only)(P_2O_5 continuing below)	
	3							"	Brown, ferruginous silt with "chalky" limestone.	
	4								Cream, "chalky" limestone.	
	5							"	Grey-brown limestone; also cream-buff limestone with black dendrites.	
	6							"	Grey-brown and cream limestone c̄ limonitic silt.	
	7							"	As above, but yellow colour	
	8							"	Yellow-grey limestone/silt.	
8	11							"	As above	
	12							"	As above, c̄ grey-brown chert	
	13							"	Grey limestone c chert	
	14							"	As above, cream colour	
	15							"	Cream-grey; as above - no chert observed.	
	16							"	As above, with limonitic calcareous silt/shale	
	17							"	As above	
	18	2.3						4-5	Cream limestone (? with calcareous siltstone or marl) with limonitic, fissile shale (calcareous).	

HOLE No.: E-6 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~DCK~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
18	19	3.9						2-3	As above	
	20							<1	White-to-cream; as above. Occasional milk-white chert (? quartz) fragment.	
	21							"	As above	
	22							"	As above	
	23							"	As above	
	24							"	As above	
	25							"	As above	
	26							"	As above	
	27							"	As above	
	28							"	As above	
	29							2-3	As above	
	~~30~~							1	As above	
	31	3.4						3	As above	
	32	2.0						3	As above	
	33							1-2	As above, perhaps c̄ increased quantity of yellow siltstone/shale	
	34							<1	As above, with some brown-grey chert fragments.	
	35							"	As above	
	36							"	As above, with more limonitic, calc. siltstone/shale.	
	37							1	As above, some limestone fragments having quite red streaks and spots.	
	38							1	Yellowish-cream fissile limonitic shale (calc.) with limestone.	
	39							<1	As above	
	40							"	As above, with less limonitic ? marl.	
	41							"	As above, c̄ some calcite	
	42							1	As above	
	43	1.8						1	As above	
	44							<1	As above	
	45							"	As above	

HOLE No.: E-6 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XIX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~XCOREX XATTITUDEX~~ SHAPIRO	DESCRIPTION	DATE
45	46							"	Yellow-cream sample containing white limestone, a small fraction of yellowish siltstone, and some chert. Some limestone chips with MnO_2 dendrites (common throughout in limestones in this hole).	17.5.67
	47	1.6						1-2	As above	
	48							<1	As above	
	49							1	As above	
	50							1	As above	
	51							<1	As above; perhaps with more chert.	
	52							"	Browner specimen, containing ferruginous, calcareous sandy silt (some quartz grains); also limestone and chert (much chert).	
	53							"	As above	
	54							"	As above	
	55							"	Cream coloured sample - limestone, less silt than above	
	56							"	As above	
	57							"	As above	
	58							"	As above	
	59	2.8						2	As above, perhaps less chert	
	60							<1	As above	
	61							1-2	As above	
	62							1	As above	
	63							<1	As above	
	64							1	As above	
	65	1.5						1-2	As above	
	66							1	As above	
	67							1-2	As above	
	68							1-2	As above	
	69							1	As above	
	70							1	Browner; as above, plus more ferruginous siltstone.	

HOLE No.: E-6 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXX~~ SHAPIRO	DESCRIPTION	DATE
70	71	1.0						1-2	As above	
	72							1-2	Limestones of various hues (dark grey to black with red streaks, also white-cream) with chert.	
	73							1	As above	
	74							2	As above, with less dark limestones. Proportions of chert and occurrences of dendrites fluctuate within this interval (73'-91')	
	75							1-2	As above	
	76							2-3	As above	
	77							1	As above	
	78							1-2	As above	
	79	2.3						1-2	As above	
	80	6.6						5	As above	
	81							3	As above	
	82							2	As above	
	83							1-2	As above	
	84							2	As above	
	85	2.3						2-3	As above	
	86	3.8						4-5	As above	
	87	1.7						2	As above	
	88							2	As above	
	89	1.6						1-2	As above	
	90							N.S.		
	91	2.8						1-2	As above	
	92							2	As above, with much brown chert.	
	93							1-2	As above, with less chert - but samples consistently chertier than earlier.	
	94							2	As above	
	95							2	As above	
	96							1-2	As above	

HOLE No.: E-6 HOLE LOGGED BY: N. MURPHY

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~OIL~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
96	97							1-2	As above	
	98							1-2	As above	
	99							2	As above	
	100							2	As above	
	101							1	As above	
	102							1-2	As above	
	103							1	As above	
	104	1.6						1-2	As above	
	105							1-2	As above, with less chert	
	106							1-2	As above	
	107	2.3						2-3	As above, but chert absent or sparse	
	108	2.0						2-3	As above	
	109							2-3	As above	
	110	3.4						1-2	As above	
	111							1-2	As above	
	112							1-2	As above	
	113							2-3	As above	
	114							2-3	As above	
	115							3-4	As above	
	116	5.4						8	As above	
	117							3-4	As above	
	118							1	As above	
	119							1-2	As above	
	120							<1	As above	
	121							"	As above	
	122							"	As above	
	123							"	As above	
	124							"	As above	
	125							"	As above	
	126							"	As above	

HOLE No.: E-6 HOLE LOGGED BY: N. MURPHY PAGE 6

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
126	127							"	As above	
	128							"	As above	
	129							"	As above	
	130							1-2	As above	
	131							1	As above	
	132							<1	As above	
	133							"	As above	
	134							"	As above	
	135							1	Browner sample; limestone with calc. silt.	
	136							<1	Off-white sample containing some dark grey limestone	
	137							"	As above	
	138							"	Yellow calcareous siltstone with limestone.	
	139							"	As above	
	140							"	As above	
	141							1-2	As above	
	142							1-2	As above	
	143							1	As above	
	144							1-2	As above	
	145	4.8						5	As above	
	146	7.3						5-6	Yellow-buff calc. silt with dark brown chert.	
	147							1	As above	
	148							<1	As above	
	149							"	Cream limestone, no chert	
	150							"	As above	
	151							"	As above	
	152							"	As above	
	153							"	Buff-yellow calcareous, ferruginous silt with chert.	
	154							"	As above	
	155							"	As above	
	156							"	As above	

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
156	157							"	As above	
	158							"	As above	
	159							1-2	As above	
	160	3.0						1-2	As above	
	161							1-2	As above	
	162							1	As above	
	163							<1	As above	
	164							"	Cream limestone	
	165							"	As above	
	166							"	As above	
	167							"	As above	
	168							"	As above	
	169							"	As above	
	170							"	As above	
	171							"	As above	
	172							"	As above	
	173				(Basement?)			"	As above	
	174							1-2	Grey-to-black calcareous siltstone containing coarsely crystalline calcite	
	175							1	As above	
	176							<1	As above	
	177							"	As above	
	178							"	As above	
	179							"	Brown silt interbedded with dolomite	
179	184							"	As above	
	185							-	No cuttings collected, but still limestone/dolomite	18.5.67
	186	6 T.D.						-	As above	
									Hole abandoned because water caused cuttings to clog hole, making it risky to use the hammer-bit. Rock-bit would have necessitated reaming the hole, which would have taken all day to do.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: H-2
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:** 2600' NNW from Hole H
INCLINATION:
TOTAL DEPTH: 185' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 185'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 892' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 7.5.67
COMPLETED: 7.5.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP No. SHAPIRO	FIELD ~~CORE~~ ~~ASSAY~~ SHAPIRO	DESCRIPTION	DATE
0	1						-	<1	Soil-loam, rd.bn., clayey w/pebbles of rounded chert (bl.), non-calc.	7.5.67
	2						-	"	As above	
	3						-	"	As above	
	4						-	"	As above, w/minor frags of wh. siltstone(non-calc.)	
	5						-	"	As above	
	6						-	"	As above, becoming more consolidated to a clay - "stone" - med.soft, cl.calc.	
7	10						-	"	As above	
	11						-	"	As above, w/increasing chert (bl.) and becoming ~~x~~ more ferrug.	
	12						-	"	As above	
	13						-	"	As above	
	14				Minor		-	"	As above	
15	17						-	"	As above	
	18						T	"	As above, w/larger, rounded frags. of chert (bl.) & bn., hd.,noncalc.shale.	
	19						"	"	Gravel, frag. of above becoming v.well rounded.	
	20						"	"	As above	
	21				Major			"	As above	
	22						T	"	~~X~~ Shale, bn.,non-calc.med.hd., w/bl. & bn.chert & occ.white chert and frags of wh. siltstone.	

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HOLE No.: H-2 HOLE LOGGED BY: M. CAMPBELL PAGE 2

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP SHAPIRO	FIELD ~~CORE~~ ATTITUDE ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
22	23-26	Setting Casing and Missed sample								
	27						T	"	As above, becoming v. ferruginous.	
	28						"	"	As above, w/above shale thinly interbedded w/bl.chert occ. white, calc.siltstone, chert increasing, becoming very hard.	
	29						"	"	As above, w/chert(bl.) v.abund.	
	30-31						"	I	as above	
	32						>	I	As above, w/increasing frags of wh.siltstone.	
	33						"	I-2	As above, becoming only sl. calc.	
	34						"	I-2	As above	
	35						"	I-2	As above, becoming softer.	
	36						"	I-2	As above	
	37						"	I-2	As above	
	38						"	I-2	As above	
	39						"	I-2	As above, no observed lithologic change.	
	40						"	I-2	As above	
	41				Major		"	I	As above	
	42						"	I	Clay silt, becoming consolidated, but still soft & containing small Xs. of a non-calc.,black clay(?) mineral, w/chert v. abund. rd.-bn.colour.	
	43						"	I	As above	
	44-47						"	I	As above	
	48				Major		"	I	As above	
	49						>	I	Lms.,lt.gy.(non Xl),v.hd.(siliceous),v.silty w/abund. lt.khaki siltstone; chert still v. abund.	
	50						"	I	As above, becoming more calc.,~~X~~ w/chert decreasing.	
	51						"	I	As above	
	52						"	I	As above, sample taken(crinoid stem ???)	
	53						"	I	As above	
	54						"	Missing	As above, becoming dendritic, w/chert almost wanting.	

HOLE No.: H-2 HOLE LOGGED BY: M. CAMPBELL PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP SHAPIRO	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
54	55						<		~~As above~~	
	56						"	<1	As above, w/increasing frags. of soft red.clayey soft siltstone,chert v.minor	
	57						"	"	As above	
	58						"	"	As above	
	59						"	"	As above, w/minor frags. of a dk.gy.,sl.calc.lms.(or shale),v.hd. & fractured, w/minor bn.chert.	
	60-66						"	"	As above	
	67						"	"	As above, becoming more silty, more dendritic	
	68-69						"	"	As above	
	70						"	1	As above, w/increasing frags of siliceous, bn.shale.	
	71						"	"	As above, becoming more calc. w/frags. of above lms. (or shale), chert minor.	
	72-74						"	<1	As above	
	75				Major		"	"	As above, w/minor frags. of rd.-bn.soft,v.calc.siltstone.	
	76						"	"	Siltstone, clayey, soft (similar to top of section) chert (bl.)w/minor lms(above frags.(or shale)	
	77-79						"	"	As above	
	79						"	"	As above,w/uniform abundance of above lms.(shale)	
	80-83						"	"	As above	
	84				Major		"	"	As above,w/frags. of v.lt.khaki shale,hd.,v.dendritic bn.chert abund.	
	85						<	"	Lms.,v.lt.khaki,snow-flake dendritic pattern, very abundant,bn.chert abund. w/occ.frags. of above rd.-bn.soft,clayey siltstone.	
	86-90						"	"	As above	
	91						>	"	Clay-silt=rd.-bn.,very calc.,w/chert (bl.)interbedded, shale,bn.hd.frags.minor	
	92-99						"	"	As above	
	100				Major		>>	"	As above,becoming lt.khaki w/minor lt.khaki shaly siltstones & minor bl.chert,w/frags. of non-calc.non-phosphatic, silty,lt.bn.-to-lt.orange SANDSTONE(?)	

HOLE No.: H-2 HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP SHAPIRO	FIELD ~~CORE ASSAYS~~ SHAPIRO	DESCRIPTION	DATE
100	101						"	"	As above	
	102						"	"	As above, shale, silty, lt.khaki, as above, w/minor bn. & bl. chert.	
	103						"	"	As above	
	104				Major △		<	"	As above, w/frags. of sandy, cherty lms., cl.calc.	
	105						"	"	Lms., sandy, silty, dendritic & cherty, w/bl.chert & minor frags of bn.shale-siltstone.	
	106						"	"	As above	
	107						"	"	As above	
	108						"	"	As above	
	109						"	"	As above	
	110						"	"	As above	
	111						"	"	As above, w/chert (bl.) decreasing w/dk.gy. to dk.bn. & semi-platy sl.calc. to calc.shale.	
	112						"	"	As above	
	113						"	"	As above	
	114	↑ Middle Cambrian (?)			Major △		"	"	As above	
	115-185T.D.	↓ Paradise Creek Fm.(?) L.Prot.				All <1% P_2O_5			Shale, calc. to sl.calc., partly siliceous, semi-platy lt.gy. to dk.gy. & dk.bn. w/occ. colour changes (slight) - Total still very slightly phosphatic.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: J-1
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 40' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 40'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 984' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 10.4.67
COMPLETED: 10.4.67
HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1		Phosphatic					<2	Red-brown surface soil with siltstone.frags.	10.4.67
	2							<2	Chert pebbles - red-brown.	
	3							3	Banded chert pebbles.	
	4							<2	Buff loam with chert pebbles and siltstone.	
	5							<2	As above	
	6							3	Clayey loam with siliceous siltstone.	
	7							2	As above; but more siliceous siltstone.	
	8							<3	Limonitic with large yellow-brown & chert pebbles.	
	9							<3	Pale buff-limonitic siltstone and pebbles.	
	10							<3	As above; but darker yellow-brown.	
	11							<3	Dark chert heavily limonitic with siliceous siltstone pebbles.	
	12							3	Purple-black (Mn?) slightly limonitic little siltstone.	
	13							3	Yellow-brown Mn nodules - limonitic.	
	14							2-3	Grey siltstone with chert pebbles.	
	15							2-3	As above	
	16							2-3	Grey loosely consolidated siltstone chert abundant.	
	17							2-3	Brown, as above	
	18							2-3	Grey to brown and yellow soft to medium soft mottled	
									(& white and yellow) limonitic siltstone with	
									abundant white siliceous siltstone and chert.	

HOLE No.: J-1 HOLE LOGGED BY: J. SIMPSON PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~BKK~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	FIELD ~~CORE XXXXBK~~ SHAPIRO	DESCRIPTION	DATE
18	19							2-3	Dark brown earthy ferruginous and manganiferous powder with slightly silicified siltstone fragments and chert.	
	20							2	Khaki coloured powder with mottle d white and yellow siltstone and abundant chert.	
	21							<2	Light grey powder with frags. of white and green, medium soft siltstone abundant siliceous siltstone and chert.	
	22							<2	Light grey powder with grey medium hard clayey siltstone with trace of chert (slightly more at 23').	
	23							<2	As above	
	24							<2	Grey, with mottled siltstone as above. Abundant siliceous medium hard siltstone and chert.	
	25							<2	As above; but lighter in colour and more chert.	
	26							<2	Yellow-brown, limonitic with mottled siltstone and silicified siltstone and chert; powdery.	
	27							3	As above; siltstone with abundant chert.	
	28							2	Grey siltstone as above; with chert.	
	29							4	As above	
	30							4	Grey-brown, mottled limonitic siltstone and medium hard siliceous siltstone.Chert rare - Earthy and powdery.	
	31							4	As above	
	32	2.2						~~2-3~~	~~Yellow-brown limonitic mottled med. soft siltstone.Chert rare.~~	
	33	2.4						5	~~Yellow-brown,powdery & pebbles fine grained crystalline Limestone,~~ siltstone and chert rare or absent.	
	34	2.3						4	As above	
	35							4	As above	
	36							4	As above	
	37							3	As above	
	38							3	As above	
	39							4	As above	
	40 T.D.							4	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: J-2
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 100' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 100'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 972' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 12.4.67
COMPLETED: 13.4.67
HOLE LOGGED BY: R. GRASSO

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
0	5							<1	Brown, silty sandy clay with chert fragments. Alluvium.	12.4.67
	6							"	Grey and brown mottled clay with grey ? bentonitic fragments in a brown clay matrix.	
7	9							"	Mostly grey, medium soft, (soft when wet) bentonitic shale with iron stained joints. 8-9 foot is slightly more brown).	
	10							"	As above	
10	13							"	Mostly grey bentonitic clay - soft soapy feel when wet.	
13	14							"	Mostly as above; but more brown coated surfaces on grey bentonitic fragments.	
14	18							"	Mostly as above, but also brown ironstained, polished surfaces.	
18	19							"	As above; but light brown powder on surfaces. Less ironstained polished surfaces.	
19	26							"	As above; but light brown powder on surfaces. Less ironstained polished surfaces.	
26	27							"	As above	
27	29							"	Mostly as above. Light grey bentonitic shale; but smaller cuttings; coated with brown powder.	
29	30							"	As above; but also contains inclusions of brown limonite.	

HOLE No.: J-2 HOLE LOGGED BY: R. Grasso PAGE 2

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	SAMPLED INTERVAL No.	~~CORE~~ CUTTINGS	DESCRIPTION	DATE
30	35							"	As above; with limonitic inclusions in places. Also finely micaceous in minor places. Also slightly silty.	
35	38	Change in colour						"	Light grey with slight mauve tinge bentonitic shale.	
38	39							"	Mostly light brown bentontic shale.	
39	40							"	Light grey and purple shale.(Slightly harder than above. May also be less bentonitic).	
40	43							"	Light grey, medium hard bentonitic shale.	
43	44							"	Mostly faint mauve-brown bentonitic shale.	
44	45							"	As above	
45	50							"	As above; but softer.	
50	51	Change						"	Mostly chert and shale fragments.	
51	53							"	Mostly chert with brown powdery coatings. Also grey and yellow partly silicified siltstone.	
53	57							"	Mostly as above; but less chert and more shaly siltstone (mostly white, grey and brown which grinds to a cream powder).	
57	60							"	Cream, light brown and grey shaly siltstone; partly silicified. Trace of chert fragments.	
60	63							"	Light brown powder with abundant chert fragments. Powder contains five rounded, light grey and light brown shaly siltstone grains.	13.4.67
63	72	Lost partial circulation at 64'. Hole caving.						"	As above; but more chert fragments and slightly darker coloured. The lithology appears to be light grey and light brown medium soft weathered shaley siltstone with abundant interbeds of grey and brown chert.	
72	77	Poor returns						"	As above; but less chert and less cuttings.	
77	78							"	Mostly light to medium brown powder with chert and siltstone fragments. The siltstone is white to medium brown, medium hard to medium soft and slightly silicified in minor places.	

HOLE No.: J-2 HOLE LOGGED BY: R. GRASSO PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
78	79	Phosphatic						1-2	As above; but more powder and less chert.	
	80							1-2	As above	
	81	Very poor returns						1-2	Light brown(coated) fragments of light grey medium soft slightly silty shale and chert.	
	82	"						1-2	As above	
	83							3-4	As above; but slightly more sample. More chert.	
	84							2-3	Mostly light brown (coated) fragments of light grey to mauve bentonitic shale and chert.	
	85							2-3	As above	
	86							2-3	As above	
	87							2-3	Mostly light brown powder with light to medium brown semi-friable shaly siltstone. Also light grey to light mauve bentonitic shale.	
	88							<1	As above	
	89							"	As above	
	90							1	As above	
	91							1	As above	
	92							1	As above	
	93	?basement						1	As above; but also trace rounded quartz grains.	
	94							1	As above; but more rounded quartz grains.	
	95							<1	As above, but more quartz grains.	
	96							"	As above	
	97							"	As above	
	98							"	As above	
	99							"	As above	
	100 T.D.							"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: J-3
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 63' T.D.

ROTARY DRILLING: Depth from 0' to 63'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 963' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 13.4.67
COMPLETED: 13.4.67
HOLE LOGGED BY: J. SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Red-brown, heavily Fe stained siltstone (med.hard)	13.4.67
									siltstone slightly siliceous plus small amount chert.	
	2							"	As above	
	3							"	As above, large pebbles siltstone Fe stained & trace	
									limonitic trace chert.	
	4							"	Pale red-brown, with cream siltstone (as above Fe	
									stained slight Mn coating on some siltstone	
									pebbles). Very little chert.	
	5							"	Pale buff colour calcareous siltstone some Fe staining	
									on pebbles, some siltstone clayey and mottled	
									(med. soft.).	
	6							"	Yellow-grey mainly calcareous pale cream siltstone.	
	7							"	As above, less calcareous material.	
	8							"	As above, siltstone more limonitic (streaks and mottled	
									yellow and cream).	
	9							"	As above	
	10							"	Cream colour, siltstone limonitic in part. Some dark	
									grey chert. Not much calcareous material.	
	11							"	As above, more chert.	
	12							"	As above, siliceous and limonitic siltstone, high % chert.	

HOLE No.: J-3 HOLE LOGGED BY: J. SIMPSON PAGE 2

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
12	13							"	Yellow brown siltstone (limonitic) siltstone contains small chert pebbles; chert.	
	14							"	Paler in colour than above siltstone and chert limonitic mottling ✱ in siltstone dark grey chert.	
	15							"	Cream-white some ferruginous staining on siltstone, high % chert.	
	16							~3	Khaki powder and siltstone (mottled & limonitic) light grey siltstone with chert becoming rare.	
	17							12-14	As above, slightly lighter coloured chert with mottled limonitic siltstones.	
	18							7	Yellow brown, soft mottled stilstones, grey oolitic phosphorite, ferruginous and Mn ? nodules; chert.	
	19							3	Yellow-brown medium hard siliceous siltstone and chert, powdery. Grey siltstone finely bedded and limonitic.	
	20							3	Buff coloured, ferruginous pebbles, banded phosphatic chert, unbanded grey chert, med.hard siliceous siltstone.	
	21							2	Yellow brown, banded and unbanded chert pebbles and limonitic pebbles, also siliceous siltstone.	
	22	Fossil (Trilobite pygidium)						2	Grey brown and grey limonitic and Mn! nodules, chert powdery coating on pebbles.	
	23							3	As above, Fe or Mn pebbles also chert pebbles (banded and unbanded).	
	24							8	Grey-brown, bedded cherts and sil. siltstone (hard) Fe and Mn nodules earthy.	
	25							4	As above	
	26							3	As above	
	27							2	Deep reddish brown (Mn?) bedded sil. siltstones and cherts, earthy.	

HOLE No.: J-3 HOLE LOGGED BY: J. SIMPSON PAGE 3

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	No.	FIELD ~~CORE~~ SHAPIRO	DESCRIPTION	DATE
27	28							3	Brown-grey, soft limonitic siltstone Fe & Mn (trace) nodules and pebbles. Chert common.	
	29							4	As above	
	30							6	As above, chert dominant Mn? rare.	
	31							4	Dark brown, earth and powdery chert nodules and siliceous siltstone.	
	32							2	As above, lighter in colour.	
	33							2	As above	
	34							2	As above	
	35							2	As above only containing higher % of soft limonitic siltstone, clayey in part.	
	36							3	Khaki colour, earthy, soft limonitic siltstone, chert pebbles, recrystallized carbonate material, numerous manganese nodules.	
	37							3	As above, more XI $CaCO_3$ less chert Mn common. Limonitic siltstone also common.	
	38							3	As above, more chert.	
	39							4	As above, chert rare. $CaCO_3$ material common.	
	40							3	As above, chert rare.	
	41							3	Mustard colour powdery chert absent $CaCO_3$ material rare no Mn? siliceous siltstone more common. Limonitic nodules.	
	42							3	As above	
	43							3	As above	
	44							3	Yellow brown powdery siltstone limonitic.	
	45							5	Pale yellow brown powdery limonitic nodules, siltstone (cream coloured) present.	
	46							3	Darker in colour than above small siltstone nodules as above powdery.	
	47							2	Pale yellow brown, as above, only containing manganiferous nodules.	

HOLE No.: J-3 HOLE LOGGED BY: JOHN SIMPSON

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	SAMPLED INTERVAL No.	FIELD ~~CORE ANALYSIS~~ SHAPIRO	DESCRIPTION	DATE
47	48							3	As above, recrystallized calcareous material present as small pebbles powdery.	
	49							3	As above	
	50							4	As above, very powdery and dusty.	
	51							4	As above, cream siltstone more common, chert also becoming common.	
	52							4	As above, $CaCO3$ material common, siltstone present in small amounts very powdery.	
	53							4	As above, trace chert.	
	54							4	Medium brown, as above	
	55							4	As above	
	56							2	As above, less $CaCO_3$.	
	57							3	As above, siltstone, powdery.	
	58							3	As above, trace carbonate.	
	59							2	As above, very powdery, chert common.	
	60							2	As above, chert common.	
	61							1	As above, quartz grain, sandstone basement.	
	62							<1	As above	
	63 T.D.							"	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: JF-1
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: ~~XXXXXXX~~ 245' T.D.

ROTARY DRILLING: Depth from 0' to 245'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 963' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 24.5.67
COMPLETED: 24.5.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	AMDEL ~~XX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHI P ~~XRD.~~ SHAPIRO	FIELD ~~CORE~~ ~~ATTITUDE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
0	1						>	1	Soil,bn., phosphatic, w/frags of rd.-bn.,silty, clay-silt, non-calc., soft shale-siltstone.	24.5.67
	2	4.5					>>	6	As above	
	3	13.9					"	10	As above	
	4	6.8			Minor (?) △		"	8	As above, becoming more reddish-bn.	
	5	4.5					"	6	Siltstone,v.soft and powdery, lt.chocolate w/minor frags. of hd. dk.bn. shale.	
	6	3.8					"	5	As above, w/minor red clayey material w/red, white, bl. & bn. softer inclusions - weathering products of what(?)	
	7	1.9			Major △		"	3	As above	
	8	4.0					"	5	Shale-siltstone, lt.khaki, med.soft to hd.silty,w/abund. chert (bl.) non-calc.	
	9	6.1			Major △		"	7	As above,w/minor frags of lt.gy.siltstone.	
	10	6.5					"	5	Siltstone, lt.gy.soft,w/abund.chert(bl.),w/abund.hder. shales as above - interbedding (?)	
	11	0.7					"	1	As above, still non-calc.	
	12				Major △		"	1	As above	
	13						<	<1	Siltstone, dk.purple,w/chert (cavings ?), soft,w/med. grained, well rounded quartz,w/frags. of lt.gy. siltstone as above, non-calc.	

HOLE No.: JF-1 HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~BH~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~SHAPIRO~~	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
13	14						"	"	As above	
	15						"	"	As above	
	16						X	"	As above	
	17						X	"	As above	
	18						"	"	As above	
	19						"	"	As above, w/above quartz gns.in siltstone,but w/occ.red matrix.	
	20-22						"	"	As above	
	23						"	"	As above, becoming more dk. purple, but w/major lt.gy.	
	24-30						"	"	As above	
	31				Major (?)		"	"	Shale, becoming lt.khaki,w/dk.purple shale.	
	32						"	"	Shale @ ~50%, chert (bl. & bn.) still abundant caving from above (?) - non-calc.	
	33-35						"	"	As above	
	36						"	"	As above, becoming a dk. purple, hd.shale.	
	37						"	"	As above	
	38						"	"	As above, becoming very hd.	
	39-47						"	"	As above	
	48						"	"	As above, w/v. minor yellow aggregates - either new var. chert or v. minor mineralization along(v.hd.) bedding planes, also lt.gn.coating along partings as v.minor (seen in H-2 PreCambrian(?) shales - dendritic.	
	49-58						"	"	As above	
	59						"	"	As above, w/occ. aggregates of finely XI qtz. gns. in red (Fe) matrix.	
	60-64						"	"	As above	
	64-168				Minor (?)		"	"	As above	
	169						"	"	Shale, v. siliceous, non-calc.,dk.blue to black, otherwise v. similar to above lt. to dk. purple shales, still w/occ. yellow & gn. coatings alongbedding planes.	
170	172						"	"	As above.	
172	245 T.D.						"	"	As above,very uniform lithology.	

CALLED OFF AT 245' BY B. FITZPATRICK

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: JF-2
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 245'T.D.

ROTARY DRILLING: Depth from 0' to 245'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 870' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 3.6.67
COMPLETED: 3.6.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH to (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~NGK~~ SHAPIRO	FIELD ~~SONE ASTRIDE~~ SHAPIRO	DESCRIPTION	DATE
0	1							<1	Soil, w/abund.chert (variety colours),w/white med. soft, siltstone, non-calc.	3/6/67
	2							"	As above	
	3				Major			"	As above	
	4							"	Shale, rd.-bn.,non-calc.,hd.-w/minor soft,dker rd.shale-siltstone,chert (bl.) abund.,silty.	
5	8							"	As above	
	9							"	As above, chert decreasing	
	10						>	"	As above, becoming dker.bn.	
	11							"	As above	
	12							"	As above,very dk.bn.-perhaps v.limonitic.	
	13-14							"	As above	
	15						<	"	As above, becoming lter.bn.,w/v.minor chert frags.	
	16							"	As above,w/minor lt.gy.shale-siltstone.	
17	20							"	As above	
	21							"	As above, dk.bn.again.	
	22							"	As above, chert > sl.	
	23							"	As above	
	24							"	As above, lt.bn. > chert(bl.)~20%.	
	25							"	As above, becoming sl.calc. & med. hd.	

HOLE No.: JF-2 HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	AMDEL ~~MIX~~ SHAPIRO	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP ~~MIX~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
25	34							"	As above	
	35							"	As above, chert > ~30%	
	36							"	As above	
	37							"	As above	
	38						>	"	As above, becoming mottled texture, chert ~20%.	
39	44							"	As above	
	45	2.2						1	As above	
	46							1-2	As above	
	47							1-2	As above	
	48							1	As above	
	49							1	As above	
	50							1	As above	
	51							1	As above	
	52							1	As above	
	53-56							< 1	As above	
	57							2	As above	
	58							1-2	As above	
	59							1-2	As above	
	60						<	1	As above, becoming more silty, < chert & more calc.	
	61							1	As above	
	62							"	As above, chert almost wanting.	
	63							"	As above	
	64				Major			"	As above	
	65							"	Lms., semi Xl., lt.gy. to lt.bn., silty, w/occ.qtz.gns., sl.calc.(dolomitic), chert wanting.	
66	74				Major(?)			"	As above	
	75							"	As above	
	76							"	Calcarenite, sl.calc.to non-calc., v.sandy, approaching a sandstone w/v.well rounded, semi-well sorted qtz. & chert gns., w/matrix of lt.bn., calc.material similar to that in above lms.	

HOLE No.: JF-2 HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
76	83							"	As above	
	84							"	As above, dkr. to rd.-bn.,w/definite quartz gns.w/o matrix as above, but very ferruginous.	
	85							"	As above	
86	88								As above	
	89								As above, becoming lt.gy.	
90	93								As above	
	94								As above, dk.bn. to rd.bn.,as in 84 & 85'	
	95								As above,w/chert (blue-black variety) w/wh.inclusions(?)	
	96								As above, becoming dendritic.	
	97-102								As above	
	103				Major △		>		As above	
	104								Shale, non-calc.silty,soft,dk.bn.w/variation,chert (bl. > ~15%.	
105	110								As above	
	111				Major △	(Basement(?) <			As above	
	112								Shale, med.hd.,sl.calc.,lt.purple to lt.violet;chert wanting,yellow-gn.mineralisation along bedding planes v. minor.occ.metallic Xs distributed uniformly,but v.minor-probably primary pyrite - could also be calcite X - v.small.	
112	200								As above	
200	245 T.D.								As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: Continental Oil Company of Australia Ltd.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: JF-3
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 85'T.D.

ROTARY DRILLING: **Depth from** 0' **to** 85'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: 840' ELEVATION
DRILLING CONTRACTOR: AUSTRALIGEO PROSPECTORS PTY. LTD.
SPUDDED: 29.5.67
COMPLETED: 29.5.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
0	2						X		Soil, dk.bn.,w/v.minor chert (wh.) & numerous white, varied coloured, med.hd.siltstone-shale;calcareous.	29.5.67
	3						X		As above, > frags. of siltstone-shale & < soil material.	
	4				Major		X		As above, siltstone-shale,dk. to med.bn.,calc., chert (wh. & bl.) minor	
5	8						X		As above	
	9				Major		X		As above, becoming lighter in colour w/> frags. of siltstone.	
	10						X		Siltstone, lt. purple to white, non-calc.,med.soft, w/minor frags of above dk.bn.soft,calc.siltstone-shale,w/chert(wh. & bl.) v. minor.	
	11						X		As above	
	12						X		As above	
	13						X		As above, chert & softer siltstone-shale almost wanting.	
14	18						X		As above	
	19				Major		X		As above, predominantly lt.gy.	
	20						X		As above, becoming dk.bn.siltstone.	
	21						X		Shale,sl.calc.,lt.khaki to med.bn.,siliceous,w/chert (bl.) abund. Minor frags. of above.	
	22						X		As above	
	23						X		As above	

HOLE No.: JF-3 HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP % SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
23	24						X		As above	
	25						X		As above, becoming dendritic.	
26	27						X		As above	
	28						X		As above, chert decreasing to ~15%.	
29	33						X		As above	
	34						X		As above, w/chert > to ~30%	
35	46						X		As above	
	47				Major		X		As above	
	48						X		Shale, v.silty, non-calc.,v.dk.bn.,w/chert (bl.)minor, v.limonitic.	
	49	2.1					>	5	As above	
	50	1.9						4	As above	
	51	2.1						14	As above	
	52	4.3						16	As above	
	53	3.3						15	As above	
	54	5.3			Major			18	As above	
	55						<	<1	Calcarenite, sl.calc.,sandy,lt.orange to lt.bn.,w/ mixture of small gns. of qtz. & calcite partly unconsolidated	
56	57						X	"	As above	
	58 -64	(62 - 2.5)					X	"	As above	
	65-67	(63 - 2.1)						"	As above	
	68		CAVING BADLY					1-2	As above	
	69							2-3	As above	
	70							2-3	As above	
	71							1-2	As above	
	72							2	As above	
	73							1-2	As above	
	74							1-2	As above	
	75							1-2	As above	

DLE No.: JF-3 HOLE LOGGED BY: M. D. CAMPBELL PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XX~~ SHAPIRO	FIELD ~~CORE~~ ~~ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
75	76							1-2	As above	
	77							1	As above	
	78							1	As above	
	79							1	As above	
	80							1	As above	
	81							1	As above	
	82							1-2	As above	
	83							1-2	As above	
	84							1-2	As above	
	85 T.D.		caving badly & getting stuck - gave away.					1-2	As above	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: JF-3A
STATE: QUEENSLAND **COUNTY:**
PARISH: **HOLDING:**
LAT. **LONG.** **CO-ORDINATES:**
INCLINATION:
TOTAL DEPTH: 99' T.D.

ROTARY DRILLING: **Depth from** 0' **to** 99'
DIAMOND CORE DRILLING: **Depth from** **to**
DRILLING: **Depth from** **to**
GROUND LEVEL: ~845' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 2.6.67
COMPLETED: 2.6.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	AMDEL ~~BH~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	chip ~~BH~~ shapiro	FIELD ~~CORE~~ ATTITUDE SHAPIRO	DESCRIPTION	DATE
0	3				Major		SI>	1-2	Lms.frags.wh.XI,siltstone frags.,wh.,med.hd. & soil, bn. & calc.,chert wanting. SI. phosphatic.	2.6.67
	4				Minor(?)		>>	1-2	Siltstone-shale,calc.,wh. to lt.gy. w/small Xs of calcite, chert (bl.) minor, med.soft.	
	5						"	1	Shale, lt.khaki, chert (bn.& bl.) minor; sl.calc., blocky fracture, w/v.minor XI aggregates of qtz. & calcite, mottled texture & dendritic. (Similar to C-4 & C-5 material(?)).	
	6						"	1	As above	
	7						"	1	As above	
	8						"	1	As above	
	9						"	2	As above	
	10	3.2					"	2-3	As above	
	11						"	2	As above	
	12	2.3					"	2	As above	
	13				Major			2-3	As above	
	14						<	2-3	Lms.,XI, silty, sl.calc. to v. calc.(partially dolomitic) lt.gy. to white,vughy w/aggregates of qtz. - calcite.	
	15	3.1					X	2-3	As above	

HOLE No.: JF-3A HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL+ ~~XXX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XX~~ SHAPIRO	FIELD ~~CORE STRUCTURE~~ SHAPIRO	DESCRIPTION	DATE
15	16	1.5					X	1	As above	
	17						X	1	As above	
	18						X	2	As above	
	19						X	1	As above	
	20						X	1	As above	
	21						X	2	As above	
	22						X	2-3	As above	
	23						X	1	As above	
	24						X	1	As above	
	25						X	1	As above	
	26	1.0					X	4	As above	
	27						X	1-2	As above, w/> qtz.-calcite aggregates.	
	28						X	1-2	As above	
	29				Major		X	1-2	As above	
	30						>	1	Shale, sl.calc.,med.khaki,med.soft,chert minor(bl.)	
	31						"	1-2	As above	
	32						"	1	As above	
	33						"	1-2	As above	
	34				Major		"	1	As above	
	35						SI<	1	Lms.,v.silty,lt.orange to lt.bn.,mottled,sl.calc. (dolomitic), semi XI.	
	36						"	1	As above	
	37	1.5					>	6-7	As above	
	38						"	2	As above	
	39						"	<1	As above	
	40						"	1-2	As above	
	41						"	1	As above	
	42						"	1-2	As above	
	43				Major		<<	<1	As above	
	44						X	<1	Calcarenite,sl.calc.,sandy,friable,(simiar to JF-3 calcarenite, ~~but not identical with~~),qtz. fine & well rounded.	

HOLE No.: JF-3A HOLE LOGGED BY: M.D.CAMPBELL PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~XIX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XIX~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ SHAPIRO	DESCRIPTION	DATE
44	45						X	<1	As above	
45	59 ;						X	"	As above	
	60				Minor		X	"	As above	
	61						S1>	1	As above, lms., becoming X1, lt.orange to lt.bn.,still sl.calc. & sandy,w/ Xs v.large,i.e. 1/16" in length - sl.phosphatic.	
	62						"	1	As above	
	63						<	<1	As above	
64	75						X	"	As above	
	76				Minor(?)		X	"	As above, becoming v. silty & dk.bn., perhaps limonitic(?)	
	77						>	"	As above	
	78						X	"	As above	
	79						X	"	As above	
	80				Minor(?)		X	"	As above	
	81						X	"	As above, lt. bn. to lt.gy.,becoming a calcarenite(?) >"sandy mess".	
	82-87						X	"	As above	
	88				Minor		X	"	As above	
	89						>	"	As above, dk.bn. again	
	90							"	As above, lt.bn. to lt.gy. becoming v.sandy & caving.	
90	99 T.D.							"	Caving badly and getting stuck. Gave away.	

FITZPATRICK, JOHNSON & ASSOCIATES

GEOLOGICAL LOG OF DRILL HOLE

OWNER: CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.
PROJECT: UNDILLA BASIN PHOSPHATE
HOLE No.: JF-4
STATE: QUEENSLAND COUNTY:
PARISH: HOLDING:
LAT. LONG. CO-ORDINATES:
INCLINATION:
TOTAL DEPTH: 245' T.D.

ROTARY DRILLING: Depth from 0' to 245'
DIAMOND CORE DRILLING: Depth from to
DRILLING: Depth from to
GROUND LEVEL: 862' ELEVATION
DRILLING CONTRACTOR: AUSTRAL GEO PROSPECTORS PTY. LTD.
SPUDDED: 4.6.67
COMPLETED: 4.6.67
HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH to feet ins.	BIT	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~No.~~ SHAPIRO	FIELD ~~CORE NUMBERS~~ SHAPIRO	DESCRIPTION	DATE
0	2						SI.T		Soil, lt.bn.,calc.,silty, and siltstone,silty (after lms.): chert wanting, med.hd. to soft.	4.6.67
	3						X		Siltstone-shale,v.calc.,lt.bn. to lt.gy.,med.soft (weathered appearance).	
	4				Minor(?)		X		As above	
	5						X		As above, w/chert (bl.) > & becoming a lt.rd.-bn.shale.	
6	8						X		As above	
	9						X		As above, lt.bn.(from lt.rd.-bn.) to lt.gy. & becoming softer w/> chert (bl.)	
10	17						X		As above	
	18						X		As above, becoming harder	
	19-21						X		As above	
	22						X		As above, becoming softer (weathered ?)	
23	25						X		As above	
	26						X		As above, becoming dker bn. (limonitic ?) w/chert still minor.	
	27						X		As above	
	28				Major		X		As above, lms.,v. silty,siliceous,dk.bn. to dk.violet, w/chert (bn. & bl.) - partly spiculitic(?); dendritic.	
29	31				Major		X		As above	
	32						X		As above	

HOLE No.: JF-4 HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From (feet ins.)	DRILLED DEPTH To (feet ins.)	BIT	CORE RECOVERED (feet ins.)	% CORE RECOVERY	SAMPLED INTERVAL From (feet ins.)	SAMPLED INTERVAL To (feet ins.)	CHIP SHAPIRO	FIELD ~~CORE~~ ATTITUDE SHAPIRO	DESCRIPTION	DATE
32	33						X		Shale, silty, v.calc.,partly siliceous, partly med. soft, chert almost wanting; dk.bn. & platy (similar to C-3, 4 & 5 upper shales ?)	
	34						X		As above	
	35						X		As above, w/minor frags.	
35	45						X		As above, w/> chert at 45'	
	46						X		As above, > frags. of lms.(lt.gy.semi-xl) then interbeds(?).	
	47						X		As above, w/chert bl.<	
	48						X		As above - interbedding lms. & shales.	
49	55						X		As above	
	56				Major △		X		As above	
56	76						X		Shale, med.soft, sl.calc.,lt.khaki to bn.,silty w/chert (bl.) v. minor.	
77	80						X		As above	
80	90				Major △		X		As above	
	91						X		Lms., silty, calc.,w/above frags.,dk.bn.	
	92						X		As above	
	93				Major △		X		As above	
	94						X		Shale, as above, but v.calc., med.soft to med.hd.chert wanting.	
95	99						X		As above	
	100				Major △	(Basement?)	X		As above	
	101				△ (?)		X		Shale, sl.calc.,dk.blue to dk.violet to bl.,v.hd.	
	102				△ (?)		X		Shale, lt. khaki,as at 94' but harder.	
	103						X		Shale, dk.blue, as at 101'	
	104				△ (?)		X		As above	
	105						X		Shale, lt.khaki, as at 102'	
	106						X		As above	
	107				△ (?)		X		As above	
	108						X		Shale, lt.khaki to bn.,dendritic, hd., sl.calc.	
	109-114						X		As above	

HOLE No.: JF-4 HOLE LOGGED BY: M. D. CAMPBELL PAGE 3

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	amdel ~~BX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~%~~ SHAPIRO	FIELD ~~CORE ATTRIBUTE~~ SHAPIRO	DESCRIPTION	DATE
114	151				Major		X		Lms.,Xl,silty, lt.gy. to lt.bn. or orange - mottled texture, w/large aggregates of calcite Xs = vughy w/minor qtz. Xs same size as calcite Xs is lt. orange (bn.) silty matrix.	
151	159				Major		S1>		As above	
	160							1-2	As above	
	161							1-2	As above	
	162							<1	As above	
	163							<1	As above	
	164							2	As above	
	165							1-2	As above	
	166							1	As above	
	167							4	As above	
	168							<1	As above	
	169							<1	As above	
	170							1-2	As above	
	171							1-2	As above	
	172							1-2	Shale, med.soft, calc.,chert wanting, dk.khaki w/lms. frags. as above.	
	173				Major			2-3	As above	
	174	3.7						3-4	Lms.,as at 151'	
	175							<1	As above	
	176							"	As above	
	177	3.0						2-3	As above	
	178							<1	As above	
	179							"	As above	
	180							"	As above	
	181							"	As above	
	182							"	As above	
	183	0.7						2-3	As above	

HOLE No.: JF-4

HOLE LOGGED BY: M. D. CAMPBELL

DRILLED DEPTH From feet ins.	DRILLED DEPTH To feet ins.	AMDEL ~~MX~~ SHAPIRO	CORE RECOVERED feet ins.	% CORE RECOVERY	SAMPLED INTERVAL From feet ins.	SAMPLED INTERVAL To feet ins.	CHIP ~~XRF~~ SHAPIRO	FIELD ~~CORE ATTITUDE~~ ~~XXXXXX~~ SHAPIRO	DESCRIPTION	DATE
183	184	6.1						6-7	As above	
	185							<1	As above	
	186	12.1						12	Asabove	
	187							1-2	As above	
	188							<1	As above	
	189							"	As above	
	190							"	As above	
	191							"	As above, becoming lt. khaki w/last shale > w/limonitic	
	192								frags. > also.	
								"	As above, [redacted].	
	193							"	As above, back to lt.gy. to lt.bn.(orange) lms.	
	194							"	As above	
	195							"	As above	
	196							2-3	As above	
	197	1.5						<1	As above	
	198							1-2	As above	
	199							<1	As above, lt.khaki shales again as minor - w/limonitic frags.>	
	200							"	As above	
	201								As above, limonitic frags. <	
	202						<		As above	
202	209						X		As above, becoming lt. orange and > Mn frags(similar	
	210						X		to C-3, 4 & 5 lower Lms.) approaching a calcarenite.	
	211						X		As above	
211	245 T.D.						X		As above	

APPENDIX 5

COMPOSITE LOGS OF ALL OPEN HOLES, I.E., GAMMA LOGS, % P_2O_5 FIELD SHAPIRO AND A.M.D.E.L. RESULTS

CONCERNING:

LILY CREEK AREA

SHERRIN CREEK AREA

D-TREE AREA

B AREA

REFERENCE

Shale (or Shaly)

Siltstone (or Silty)

Claystone (or Clayey)

Sandstone (or Sandy)

Limestone (or Limey)

Dolomite (or Dolomitic)

Chert

Platy Habit

Conglomerate , Nodules or Pebbles.

Quartz pebbles or large grains (well-rounded).

all Alluvium (or Soil Material.)

Gamma Log : 1 sec. T.C.
·0025 MR / HR.
12 feet / minute.

108'
T.D DRLD. Total Depth Drilled.

14' av.
10·2% (A)

Major phosphate interval in feet averaging ≥ 5·0% P_2O_5 by (A) A.M.D.E.L. Shapiro or (F) Field Shapiro.

Minor phosphate interval ≥ 5·0% P_2O_5 (A) or (F).

LILY CREEK AREA

HOLES:

LILY CREEK NO. 1
LILY CREEK NO. 2
LILY CREEK NO. 3
LILY CREEK NO. 4
LILY CREEK NO. 5
LILY CREEK NO. 6
LILY CREEK NO. 7
LILY CREEK NO. 8
LILY CREEK NO. Y
LILY CREEK NO. Z

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD

AREA

WELL LILY CREEK 1

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

% P₂O₅ field analysis SHAPIRO

% P₂O₅ analysis AMDEL

ELEV 884'

all

1' av. ⇒ 6·0% (A)

12' av. ⇒ 11·2% (A)

11' av. ⇒ 6·5% (A)

3' av. ⇒ 6·0% (A)

2' av. ⇒ 5·0% (A)

153' T.L.D.

160' T.D.
DRLD.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL LILY CREEK 2

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

% P_2O_5 as field analysis SHAPIRO

% P_2O_5 as analysis AMDEL

0 10 20 10 20

ELEV. 890'

all.

50

100

150

Low P_2O_5

23' av. ≥ 9.4% (A)

1' av. ≥ 11.0% (A)

17' av. ≥ 9.5% (A)

0' 20' 40' 60' 80' 100' 120' 140' 160' 180'

188' T.L.D.

195' T.D.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD

AREA

WELL LILY CREEK 3

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20 10 20

ELEV 902'

oil

0'
20'
40'
50
60'
80'
100
100'
120'
140'
150
160'

Low P_2O_5

12' av. ≥ 8·3% (A)

19' av. ≥ 8·3% (A)

7' av. ≥ 5·1% (A)

158' T.L.D.

162'
T.D. DRLD.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL LILY CREEK 4

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

Gamma Log

0 10 20 10 20

ELEV. 937'

0 all.

50

100

150

Low P_2O_5

33' @ 13.3% (A)

180'
T.D. DRL.D.

172' T.L.D.

0' 20' 40' 60' 80' 100' 120' M 140' 160' 180'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD

AREA

WELL LILY CREEK 5

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20 10 20

ELEV. 848'

all.

Low P_2O_5

1' av. ≥ 6·0%(A)

11' av ≥ 17·4%(A)

Low P_2O_5

0'
20'
40'
50
60'
80'
100
100'
120'

120'
T.D. DRLD.

117' T.L.D.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL LILY CREEK 6

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

Gamma Log

ELEV. 861'

all

?

?

TD 197'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD

AREA

WELL LILY CREEK 7

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

% P₂O₅ field analysis SHAPIRO

% P₂O₅ analysis AMDEL

Gamma Log

0 10 20 10 20

ELEV. 890'

Δ all.

50

100

150

150' T.L.D.

160'
T.D. DRLD.

0'
20'
40'
60'
80'
100'
120'
140'
160'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO. AUST. LTD.

AREA

WELL LILY CREEK 8

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis ADDEL

0 10 20 10 20

ELEV. 855'

all.

50

100

128' T.L.D.

140'
T.D. DRLD.

0'
20'
40'
60'
80'
100'
120'
140'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL Y

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

ELEV. 848'

Low P_2O_5

5' av ≥ 7·0% (A)

2' av ≥ 5·5% (A)

2' av ≥ 6·5% (A)

2' av ≥ 6·5% (A)

1' av ≥ 7·0% (A)

6' av ≥ 9·0% (F)

1' av ≥ 5·0% (F)

196' T.D. DRL'D.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL Z

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

% P₂O₅ field analysis SHAPIRO

% P₂O₅ analysis AMDEL

ELEV 873'

all.

50

100

150

200

3' av. ⇒ 8·3% (A)

6' av. ⇒ 11·2% (A)

2' av. ⇒ 5·5% (A)

2' av. ⇒ 9·0% (A)

1' av. ⇒ 5·0% (A)

6' av. ⇒ 8·2% (A)

6' av. ⇒ 7·2% (A)

9' av. ⇒ 7·7% (A)

0 10 20 10 20

0' 20' 40' 60' 80' 100' 120' 140' 160' 180'

Extends to 227' T.D. with no lithologic change.

SHERRIN CREEK AREA

HOLES:

SHERRIN CREEK NO. 1
SHERRIN CREEK NO. 2
SHERRIN CREEK NO. 3
SHERRIN CREEK NO. 4
SHERRIN CREEK NO. 5
SHERRIN CREEK NO. 5A
SHERRIN CREEK NO. 5B
SHERRIN CREEK NO. 6
SHERRIN CREEK NO. 7
SHERRIN CREEK NO. 9
SHERRIN CREEK NO. 9A
SHERRIN CREEK NO. 10
SHERRIN CREEK NO. 11
SHERRIN CREEK NO. 12
SHERRIN CREEK NO. 13
SHERRIN CREEK NO. 14
SHERRIN CREEK NO. 15
SHERRIN CREEK NO. 16
SHERRIN CREEK NO. 17
SHERRIN CREEK NO. 18
SHERRIN CREEK NO. 19
SHERRIN CREEK NO. 20
SHERRIN CREEK NO. 21
SHERRIN CREEK NO. 22
SHERRIN CREEK NO. 23
SHERRIN CREEK NO. 24
SHERRIN CREEK NO. 25
SHERRIN CREEK NO. 26
SHERRIN CREEK NO. 27
SHERRIN CREEK NO. 28
SHERRIN CREEK NO. 29
SHERRIN CREEK NO. 30
SHERRIN CREEK NO. 31
SHERRIN CREEK NO. 32
SHERRIN CREEK NO. W

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 1

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 1009'

oil

Low P_2O_5

1' ov ≥ 5·0% (A)

10' ov ≥ 9·8 % (A)

4' ov ≥ 5·0 % (A)

Low P_2O_5

84' T.L.D.

90'
T.D. DRLD.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20

10

0'
20'
40'
50
60'
80'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 2

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

% P_2O_5 Field analysis SHAPIRO

P_2O_5 analysis AMDEL

ELEV. 1011'

1' av ≥ 6.0% (A)

4' av ≥ 5.8% (A)

15' av ≥ 5.8% (A)

3' av ≥ 5.0% (A)

1' av ≥ 6.0% (A)

Low P_2O_5

154' T.L.D.

157'
T.D. DRLD

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 3

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV 1028'

all.

50

100

120'
T.D. DRLD.

% P2O5 field analysis SHAPIRO

% P2O5 analysis AMDEL

0 10 20 10 2

0'
20'
40'
60'
80'
100'
120'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 4

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 1027'

all.

50

100

Low P_2O_5

20' av 14·2% (A)

110' T.L.D.

120'
T.D. DRLD.

% P_2O_5 field analysis SHAPIRO

P_2O_5 analysis AMDEL

0 10 20 10

0' 20' 40' 60' 80' 100' 120'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 5

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY

LOCATION

WELL

OPEN HOLE

% P. O5 field analysis SHAPIRO

L.R. O5 analysis AUDEL

Gamma Log

0 10 20 10

ELEV. 1039'

Soil

50

80'
T.D. DRLD.

0'
20'
40'
60'
80'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 5A

COUNTY STATE QUEENSLAND

COORDINATES: N S

ELEVATION: D.F. K.B. G.L.

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20 10

ELEV. 1058'

Low P_2O_5

2' ov 14.5 % (A)

Low P_2O_5

80' TD DRLD

78' T.L.D.

0' 20' 40' 60' 80'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 5B

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV 1048'

Low P_2O_5

18' ≥ 8.4% (A)

1' ≥ 5.0% (A)

159'
T.D. DRLD

158' T.L.D.

% P_2O_5 field analysis SHAPIRO

P_2O_5 analysis AMDEL

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 6

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
LOCATION
WELL

OPEN HOLE

% P_2O_5 Or field analysis SHAPIRO

P_2O_5 Or analysis ADDEL

Gamma Log

ELEV. 1042'

all

50

Low P_2O_5

88'
T.D. DRLD.

0 10 20 10 2

0'
20'
40'
60'
80'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 7

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

% P_2O_5
field analysis
SHAPIRO

P_2O_5
analysis
MODEL

Gamma Log

ELEV. 1058'

all

Low P_2O_5

170'
T.D. DRL'D

0 10 20 10

0' 20' 40' 60' 80' 100' 120' 140' 160'

50 100 150

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 9

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

% P_2O_5 from field analysis - SHAPIRO

P_2O_5 analysis ADDEL

Gamma Log

0 10 20 10

ELEV. 1003'

0'

20'

40'

60'

80'

100'

Low P_2O_5

50

Low P_2O_5

75' T.L.D.

92'
T.D. DRL.D.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 9A

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 1004'

oil

Low P_2O_5

1^{av}_{N} 5·0% (A)

76' T.L.D.

115'
T.D. DRLD.

0 20' 40' 50 60' 80' 100 100' ? 120'

% P_2O_5 field analysis SHAPIRO

0 10 20

% P_2O_5 analysis AMDEL

10 2

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 10

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

ELEV. 1024

clay

Low P_2O_5

2' av. ≥ 7·5% (A)

4' av. ≥ 8·5% (A)

8' av. ≥ 14·0% (A)

1' av. ≥ 9·0% (A)

1' av. ≥ 5·0% (A)

134'
T.D. DRLD.

0 10 20 10

0
20'
40'
50
60'
80'
100
100'
120'
140'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD

AREA

WELL SHERRIN CREEK II

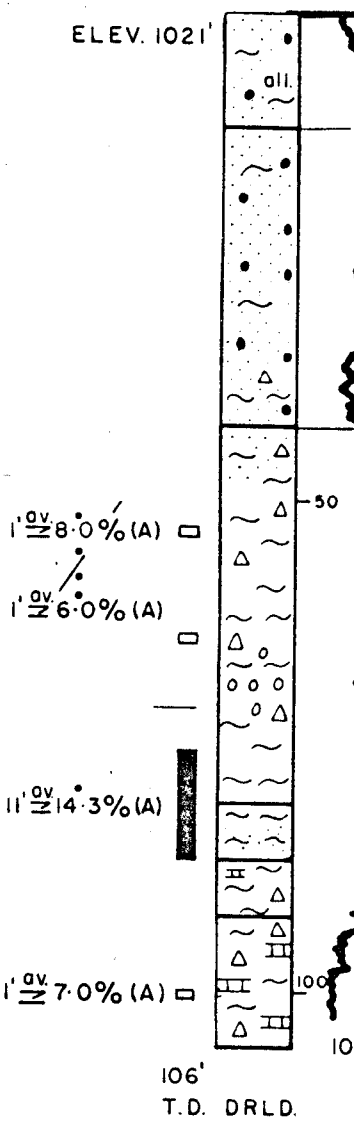
COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 1021'



103' T.L.D.

106'
T.D. DRLD.

% P2 O5
field analysis
SHAPIRO

0 10 20

0'
20'
40'
60'
80'
100'

% P2 O5
analysis
ADDEL

10 20

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD

AREA

WELL SHERRIN CREEK 12

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

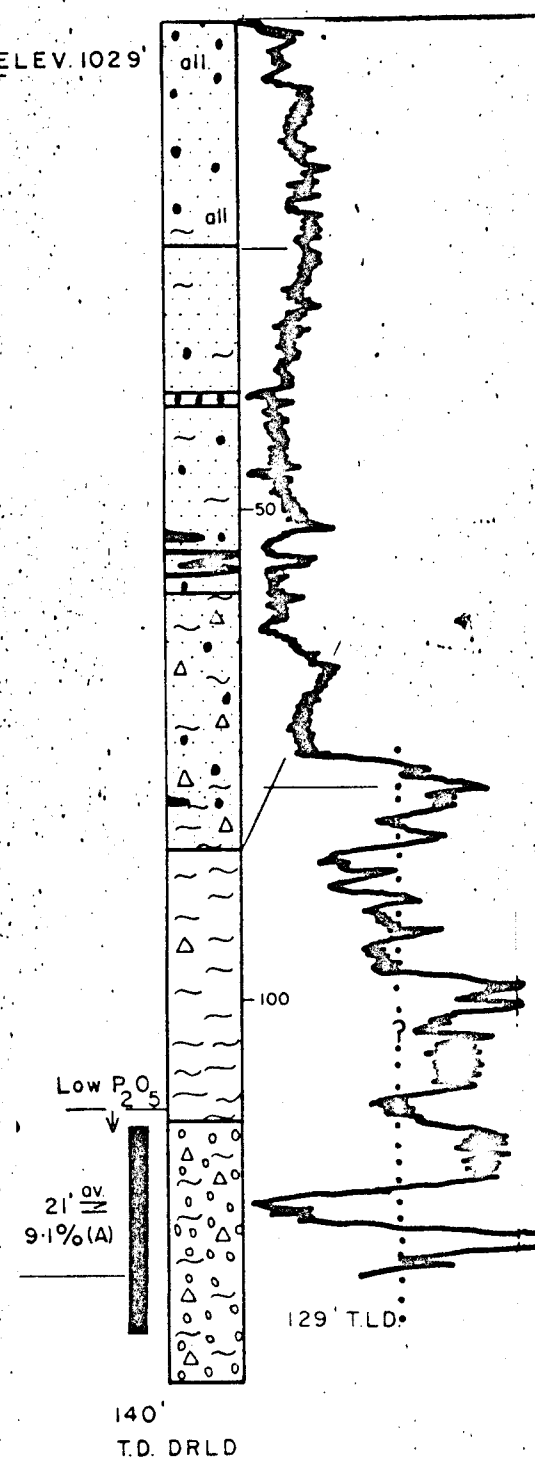
OPEN HOLE

% P_2O_5 Os
field analysis
SHAPIRO

% P_2O_5 Os
analysis
AMDEL

Gamma Log

ELEV. 1029'



0 10 20 10 2

0' 20' 40' 60' 80' 100' 120' 140'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 13

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV 1013'

oil

Low P O 2.5

1' av. ≧ 5·0% (A)

1' av. ≧ 7·0 % (A)

105' T.D DRLD.

104' T.L.D.

% P2O5 field analysis SHAPIRO

% P2O5 analysis AMDEL

0 10 20 10

0'
R
T.E.
40'
60'
80'
100'

50
100

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 14

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 1049'

% P2O5 field analysis SHAPIRO

% P2O5 analysis AMDEL

200'
T.D. DRL'D.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD

AREA

WELL SHERRIN CREEK 15

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 1022'

15' @ ≥ 23·5% (A)

96' T.L.D.

101'
T.D. DRLD.

% Li O_5 field analysis SHAPIRO

% Li O_5 analysis AMDEL

0 10 20 10 20

0' 20' 40' 60' 80' 100'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

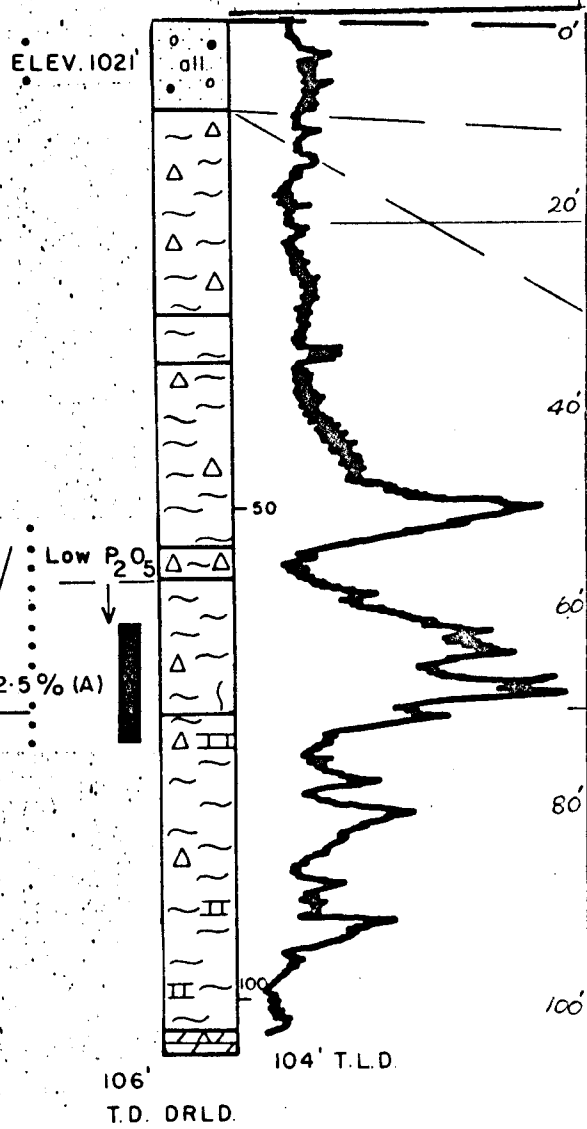
WELL SHERRIN CREEK 16

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log



% P_2O_5 field analysis SHAPIRO

0 10 20

% P_2O_5 analysis AMDEL

10 20

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 17

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 1026'

oil

50

100

7' av. ≥ 12·3% (A)

3' av. ≥ 8·3% (A)

119' T.L.D.

120'
T.D. DRL'D.

% P₂O₅ field analysis SHAPIRO

% P₂O₅ analysis AMDEL

0 10 20 10 20

0 20 40 60 80 100 120

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 18

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 1025'

all

all

50

100

150

148' T.L.D

Low P_2O_5

154'

T.D. DRLD.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20 10 2

0'
20'
40'
60'
80'
100'
120'
140'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 19

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY

WELL

LOCATION

OPEN HOLE

Gamma Log

ELEV. 1035'

0

20'

40'

50

60'

80'

Low P_2O_5

? 100

100'

120'

122' T.L.D.

125' T.D. DRLD.

% P_2O_5 field analysis SHAPIRO

0 10 20

% P_2O_5 analysis AMDEL

10 20

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD.

AREA

WELL SHERRIN CREEK No. 20

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

ELEV 1041'

soil

50

Low P_2O_5

1' ov. ≥ 5.0% (A)

82'

T.D. DRLD.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20 10 20

0

20'

40'

60'

80'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD

AREA

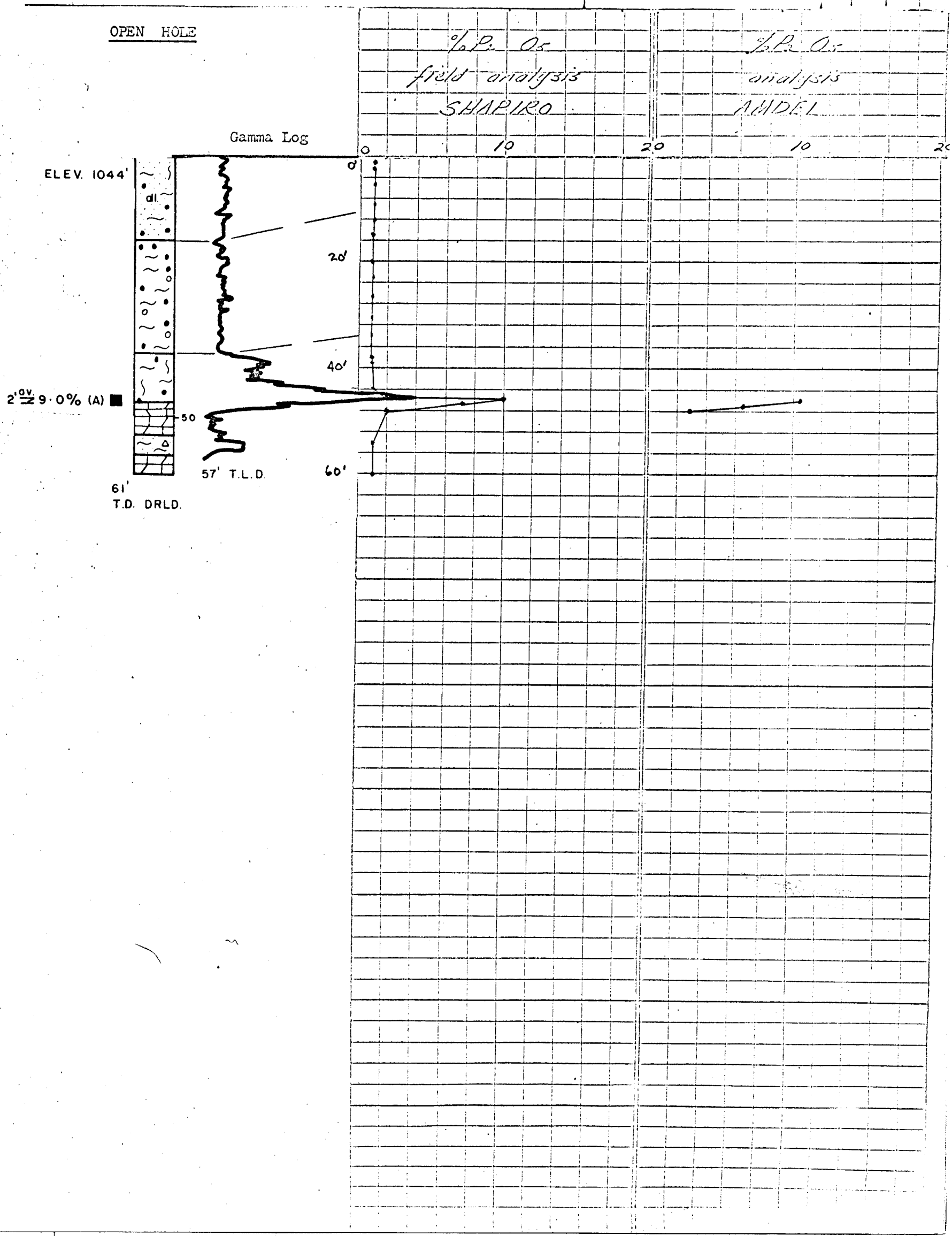
WELL SHERRIN CREEK 21

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE



PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 22

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

FILE

CONTRACTOR

OPEN HOLE

Gamma Log

ELEV 1031'

Δ all. o

Low P_2O_5

85' T.L.D

90'
T.D DRLD.

% P_2O_5
field analysis
SHAPIRO

0 10 20

% P_2O_5
analysis
AMDEL

10 2

0
20'
40'
60'
80'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

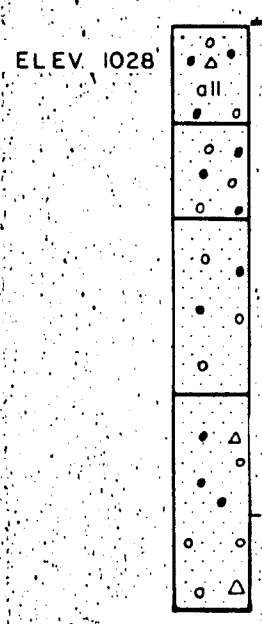
WELL SHERRIN CREEK 23

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log



% P2O5 field analysis SHAPIRO

% P2O5 analysis AMDEL

0 10 20 10

0'
20'
40'
60'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD

AREA

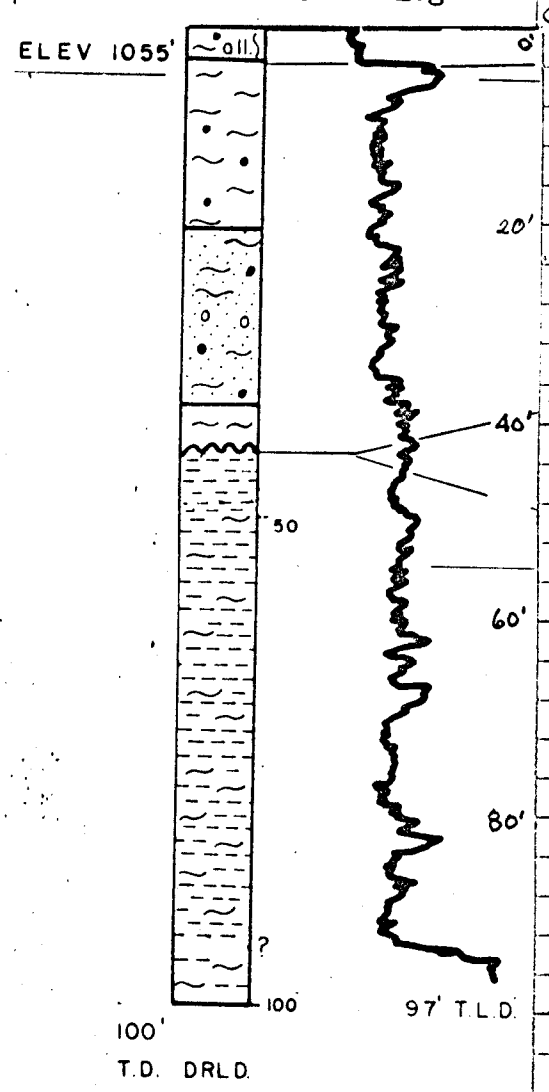
WELL SHERRIN CREEK 24

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE



% P2O5 field analysis SHAPIRO

0 10 20

% P2O5 analysis AUDEL

10 20

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 25

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

ELEV. 1053'

soil

1' av = 7.0% (A)

Low P_2O_5

50

?100

120'
T.D. DRLD.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20 10 20

0
20'
40'
60'
80'
100'
120'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 26

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 1009'

Low P_2O_5

2' av ≥ 11·0% (A)

13' av ≥ 14·0% (A)

90'
T.D. DRLD.

86' T.L.D.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20 10

0' 20' 40' 60' 80'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 27

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV 1019

P_2O_5

13' av ≥ 13·2% (A)

1' av ≥ 5·0% (A)

123'
T.D DRLD.

121' T.L.D.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 28

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

% P_2O_5
field analysis
SHAPIRO

% P_2O_5
analysis
AMDEL

Gamma Log

ELEV. 1017'

1' av. ≥ 5.0% (F)

4' av. ≥ 12.5% (F)

140'
T.D. DRLD.

138' T.L.D.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO. AUST. LTD.

AREA

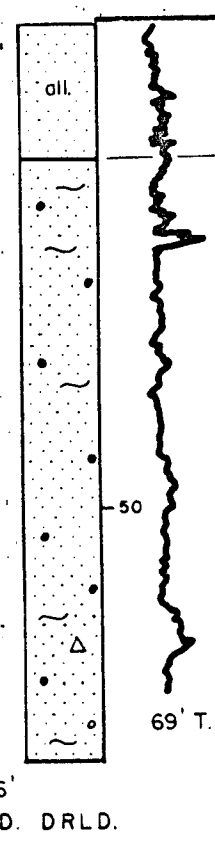
WELL SHERRIN CREEK 29

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log



% P2O5 field analysis SHAPIRO

0 10 20

0' 20' 40' 60' 80'

% P2O5 analysis AMDEL

10 2

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 30

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

% P. O5 field analysis SHAPIRO

% P. O5 analysis AMDEL

ELEV 1039'

oil.

ELEVATION

0 10 20

0 10 20

0'
20'
40'
60'
80'
100'
120'

1000'

50

100

35' av = 10·1 %(A)

102' T.L.D

120'
T.D. DRL.D.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL SHERRIN CREEK 31

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 1007'

Low P_2O_5

14' av. ≧ 9·5 % (A)
1' av. ≧ 5·0 % (A)
1' av. ≧ 6·0 % (A)
2' av. ≧ 5·0 % (A)
1' av. ≧ 5·0 % (A)
3' av. ≧ 5·0 % (A)
1' av. ≧ 5·0 % (A)

100' T.L.D.

100'
T.D. DRLD.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO. AUST. LTD.

AREA

WELL SHERRIN CREEK 32

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY

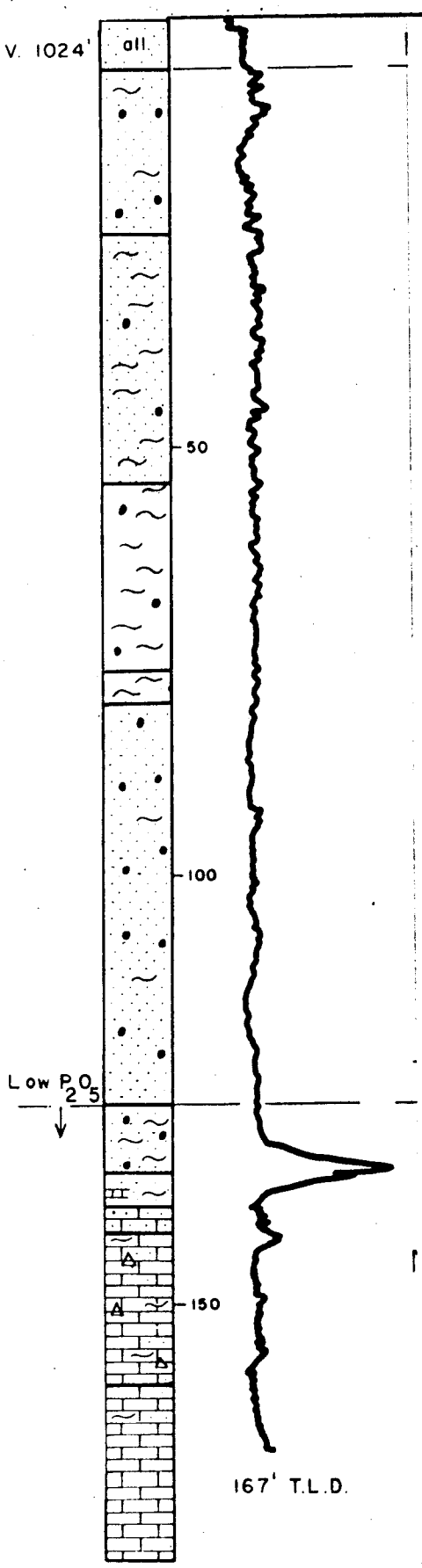
WELL

LOCATION

OPEN HOLE

Gamma Log

ELEV. 1024'



% P_2O_5
field analysis
SHAPIRO

% P_2O_5
analysis
AMDEL

0 10 20

0' 20' 40' 60' 80' 100' 120' 140' 160' 180'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL W

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

% P_2O_5 by field analysis SHAPIRO

% P_2O_5 by analysis AMDEL

ELEV. 997'

Low P_2O_5

6' av. ≥ 5.0% (F)

50

100

150

?

155'
T.D. DRLD

0 10 20 10

0'
20'
40'
60'
80'
100'
120'
140'
160'

B AREA

HOLES:

A

B1A

B2

B6

B7

B8

B9

C

C2

C3

C4

C5

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL A

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY

WELL

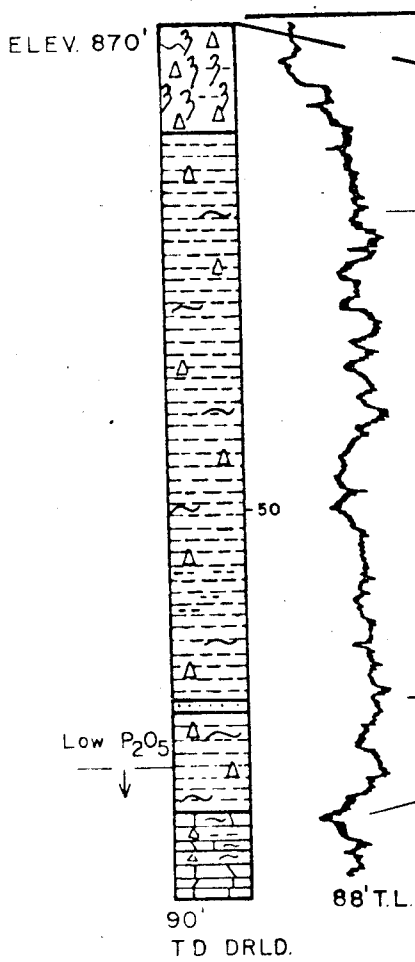
LOCATION

OPEN HOLE

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

Gamma Log



0 10 20 10 20

0'
20'
40'
60'
80'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL B I A

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

ELEV 840'

14' @ 6.0 % (A)

105'
T.D. DRLD.

102' T.L.D.

% P₂O₅ field analysis SHAPIRO

P₂O₅ analysis AMDEL

0 10 20

10 20

0'
20'
40'
60'
80'
100'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD

AREA

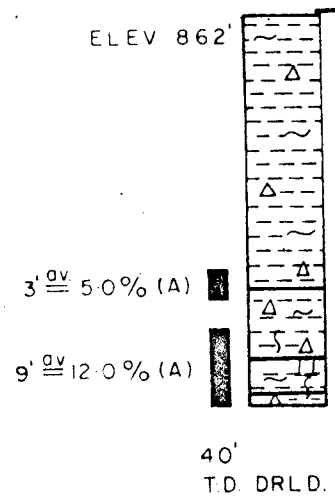
WELL B 2

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log



% P2O5 field analysis SHAPIRO

% P2O5 analysis AMDEL

0 10 20 10

0' 20' 40'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD

AREA

WELL B6

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

ELEV. 844'

2' @ 13.0% (A)

6' @ 8.8% (A)

45'
T.D. DRL'D.

41' T.L.D.

0'
20'
40'

0 10 20

% P2O5
field analysis
SHAPIRO

10

% P2O5
analysis
AMDEL

10

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD

AREA

WELL B 7

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

OPEN HOLE

Gamma Log

ELEV. 852'

Low P.O 25

1' ov 6·0% (A)
1' ov 5·0% (A)
2' ov 5·0% (A)

50

71' T.L.D

85'
T.D. DRL.D.

% P₂O₅
field analysis
SHAPIRO

0 10 20

0'
20'
40'
60'
80'

P₂O₅
analysis
ADDEL

10 2

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL B 8

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

FIELD

COMPANY

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis ADDEL

ELEV. 862'

Low P_2O_5

10' av. ≙ 6.47% (A)

8' av. ≙ 7.07% (A)

1' av ≙ 5.0% (A)

126' T.D. DRL'D

126' T.L.D.

0 10 20 10 2

0 20 40 60 80 100 120

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL B 9

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

ELEV 866'

Low P_2O_5

2' ov ≡ 5·0 % (A)

15' ov ≡ 6·7 % (A)

128' T.L.D

140'
T.D. DRL'D

% P_2O_5
field analysis
SHAPIRO

% P_2O_5
analysis
AMDEL

0 10 20 10 2

0' 20' 40' 60' 80' 100' 120' 140'

50 100

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO. AUST. LTD.

AREA

WELL C

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

ELEV. 846'

all

50

Low P_2O_5

100

17' ov ≙ 9.7% (A)

127' T.L.D

8' ov ≙ 7.0% (F)

150

152'
T.D. DRLD.

% P_2O_5
field analysis
SHAPIRO

0 10 20

0'
20'
40'
60'
80'
100'
120'
140'

% P_2O_5
analysis
AUDEL

10 2

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL C 2

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

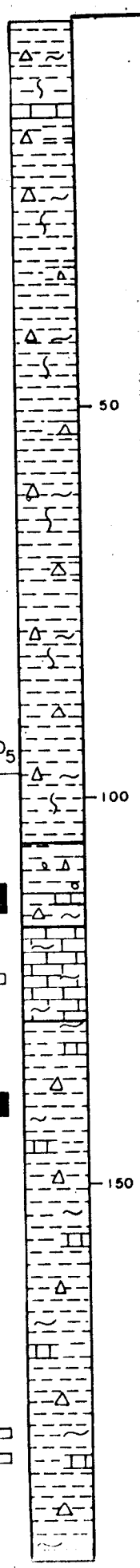
OPEN HOLE

% P_2O_5
field analysis
SHAPIRO

P_2O_5
analysis
AMDEL

Gamma Log

ELEV 861'



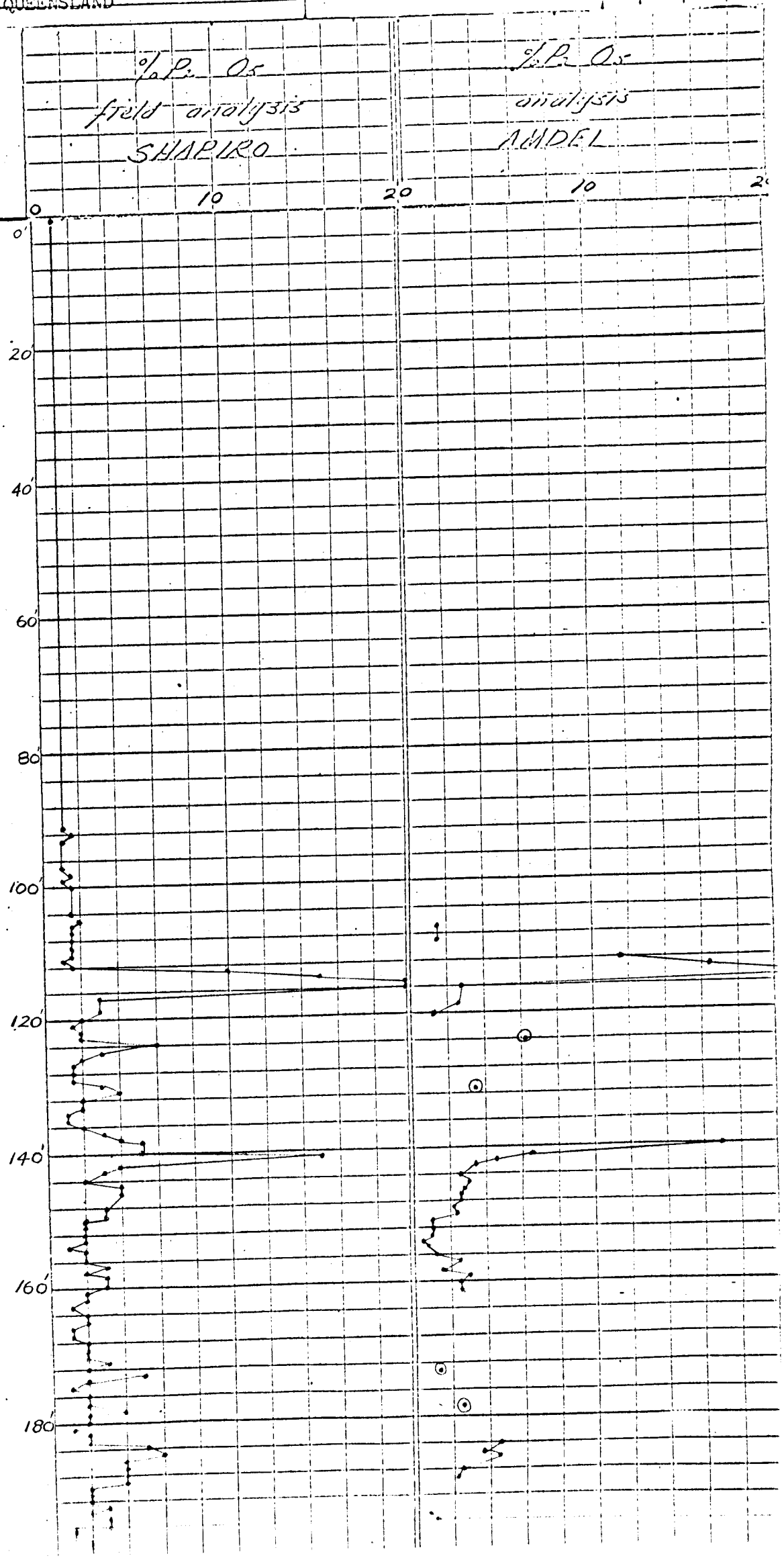
4' av ≡ 18·5% (A)

1' av ≡ 6·0% (A)

3' av ≡ 9·3% (A)

1' av ≡ 5·0% (A)

1' av ≡ 5·0% (A)



PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD

AREA

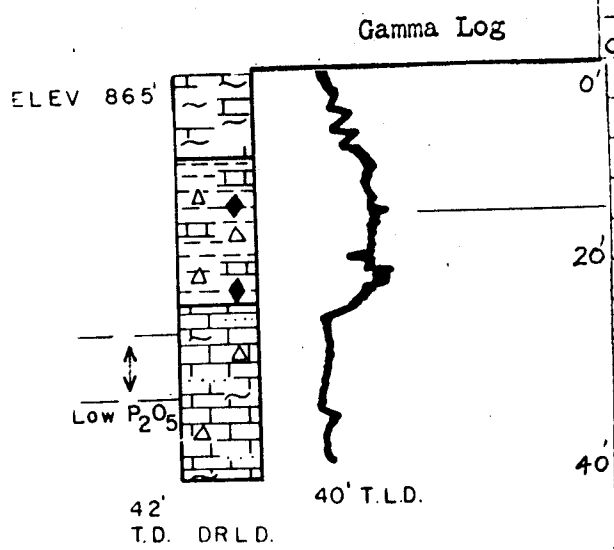
WELL C 3

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE



% P_2O_5 field analysis SHAPIRO

0 10 20

0'
20'
40'

% P_2O_5 analysis AMDEL

10 2

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL C 4

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY

WELL

LOCATION

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

ELEV. 885'

4' av. ≡ 10·4 % (A)

Low P_2O_5

14' av. ≡ 6·1 % (A)

1' av ≡ 5·0 % (A)

Low P_2O_5

1' av ≡ 7·0 % (A)

CAVITY

161' T.L.D.

166'
T.D. DRL.D.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL C 5

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY

WELL

LOCATION

OPEN HOLE

Gamma Log

ELEV. 894'

4' av ≡ 6 2 % (A)

Low P_2O_5

1' av ≡ 5·0% (A)

1' av 5·0% (A)

14' av ≡ 6·7 % (A)

1' av ≡ 6·0% (A)

1' av ≡ 7·0% (A)

176' T.L.D.

185'
T.D. DRLD

%P₂O₅
field analysis
SHAPIRO

%P₂O₅
analysis
AMDEL

D-TREE AREA

HOLES:

D-TREE NO. 1

D-TREE NO. 2A

D-TREE NO. 3

D-TREE NO. 4A

D-TREE NO. 5C

D-TREE NO. 7

D-TREE NO. 7A

D-TREE NO. 9

D-TREE NO. 11

D-TREE NO. 13

D

E2

E3

E5

E6

F

G2

H

H2

13



PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL D – TREE 1

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

ELEV 886'

Low P O 2.5

11' av ≅ 9·3 % (A)

11' av ≅ 9·2 % (A)

Low P_2O_5

142' T.L.D.

185'
TD DRLD

% P_2O_5
field analysis
SHAPIRO

% P_2O_5
analysis
AMDEL

0 10 20

0 10 20

0' 20' 40' 60' 80' 100' 120' 140' 160' 180' 200'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO. AUST. LTD.

AREA

WELL D – TREE 2A

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

ELEV 876'

all

all

50

Low P_2O_5

16' ov ≡ 11·6% (A)

94' T.L.D.

100

32' ov ≡ 8·5% (F)

2' ov ≡ 7·0% (A)

150

Low P_2O_5

171'
TD DRLD

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20 10 20

0' 20' 40' 60' 80' 100' 120' 140' 160'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL D - TREE 3

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY

WELL

LOCATION

OPEN HOLE

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

Gamma Log

ELEV 958'

all

Low P_2O_5

Low P_2O_5

50

87' T.L.D.

100

150

170'
T.D. DRL'D.

0 10 20 10 2

0' 20' 40' 60' 80' 100' 120' 140' 160'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL D – TREE 4A

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY

WELL

LOCATION

OPEN HOLE

Gamma Log

ELEV 875'

50

82' T.L.D

91'

T D DRLD.

% P₂O₅ field analysis SHAPIRO

% P₂O₅ analysis AMDEL

0 10 20 10 20

0'
20'
40'
60'
80'
100'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD

AREA

WELL D – TREE 5C

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

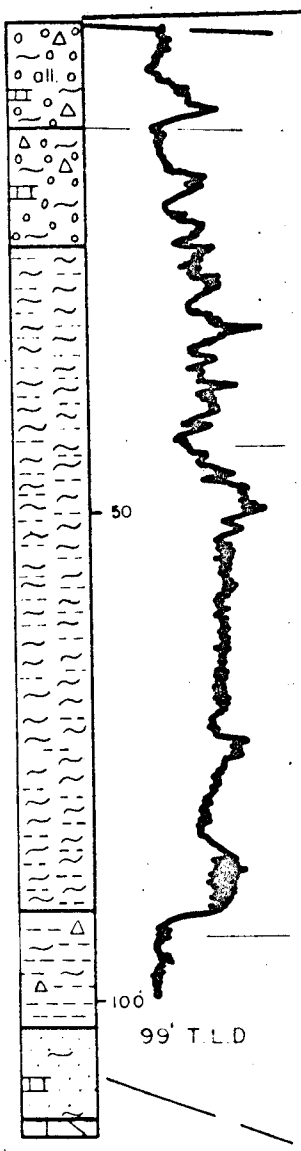
OPEN HOLE

% P2O5
field analysis
SHAPIRO

% P2O5
analysis
AMDEL

Gamma Log

ELEV 893'



99' T.L.D

4' av = 50% (A)

114'
T D DRLD

0 10 20 10 20

0'
20'
40'
60'
80'
100'
120'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL D-TREE 7

COUNTY STATE QUEENSLAND

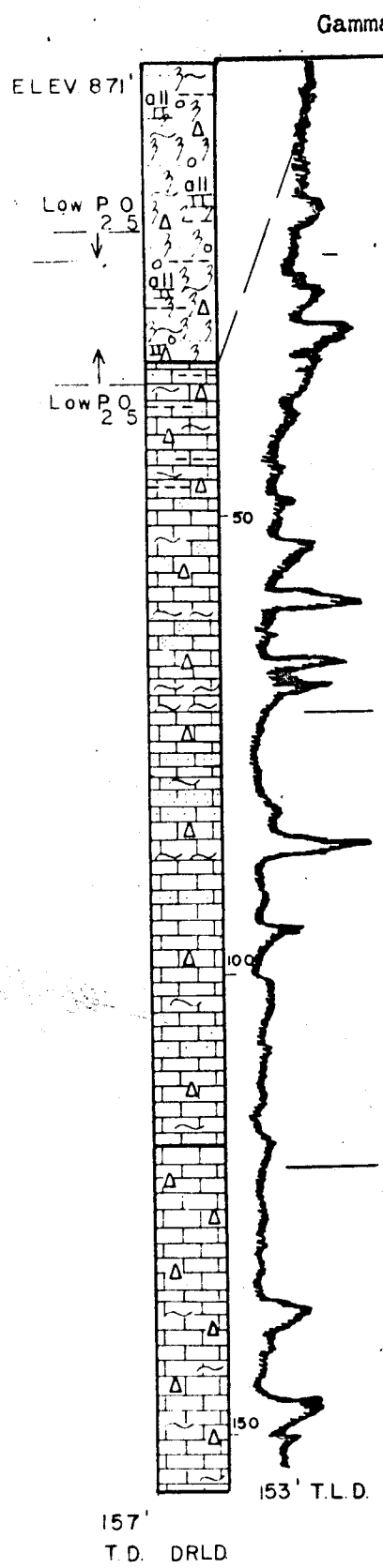
COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

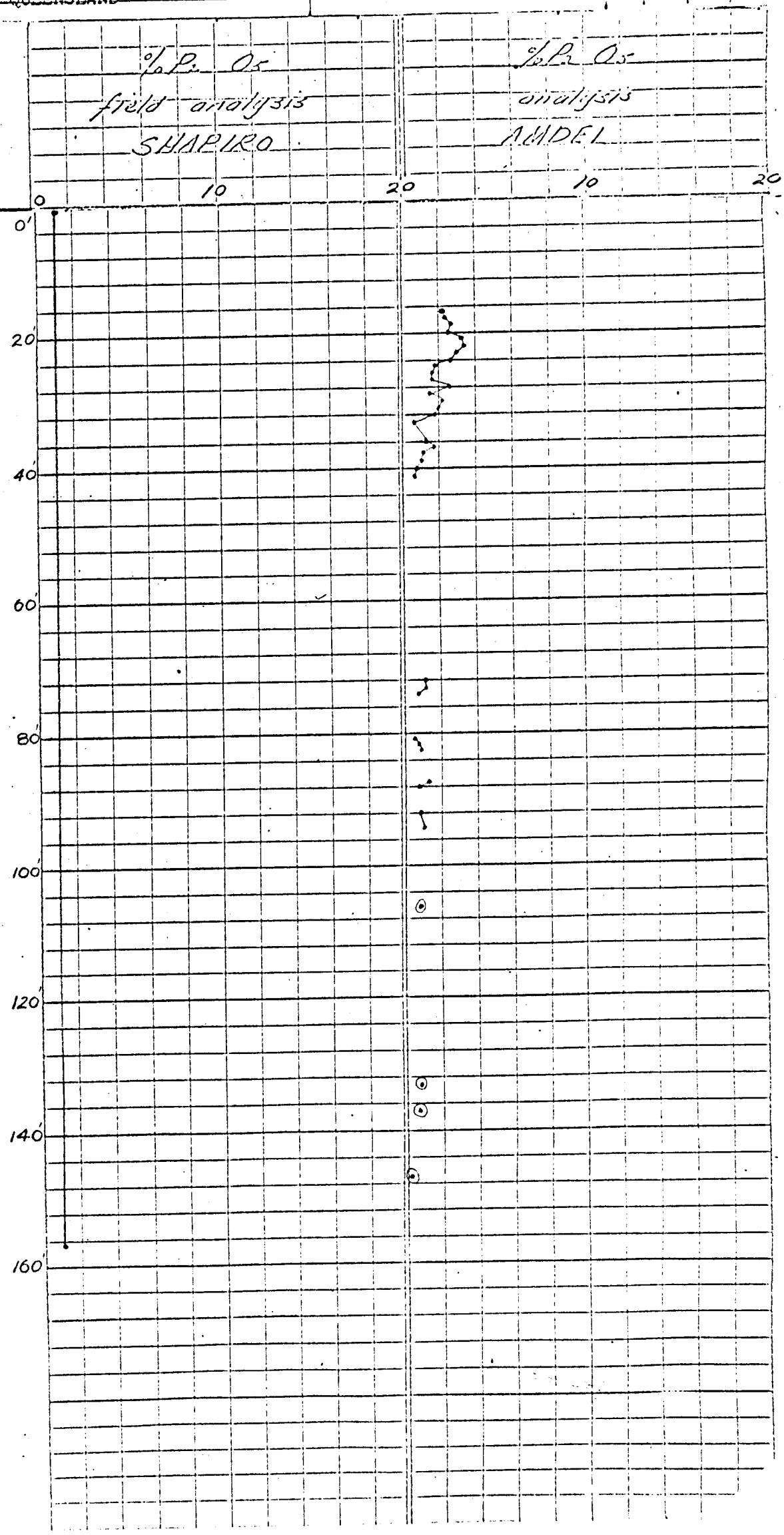
LOCATION

WELL

COMPANY

OPEN HOLE





PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD

AREA

WELL D-TREE 7A

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

Gamma Log

ELEV 910'

Low P_2O_5

2' av 8.5%(A)

11' av 8.1%(A)

2' av 5.5%(A)

Low P_2O_5

1' av 6.0%(A)

Cavity

171' T.L.D

180'
T.D. DRL'D.

0 10 20 10 20

0' 20' 40' 50 60' 80' 100 100' 120' 140' 150 160' 180'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL D – TREE 9

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

ELEV 864'

Low P_2O_5

2' av 6·0 % (A)

16' av 8·9 % (A)

7' av 6·6 % (A)

7' av 6·0 % (A)

3' av 5·0 % (A)

126' T.L.D.

133'
T.D. DRL'D.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20

10 20

0' 20' 40' 60' 80' 100' 120'

50 100

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD

AREA

WELL D – TREE II

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

CORRECTION

FILE

COMPANY

OPEN HOLE

Gamma Log

ELEV 859'

Low P_2O_5

18' ov = 11·3 % (A)

Low P_2O_5

116' T.L.D.

120'
T D DRLD.

0 10 20

0'
20'
40'
50
60'
80'
100
100'
120'

% P_2O_5 field analysis SHAPIRO

0 10 20

% P_2O_5 analysis ADDEL

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL D – TREE 13

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20 10 20

ELEV. 878'

Low P_2O_5

3' ov = 5.0 % (A)

1' ov = 13.0 % (A)

0' 20' 40' 60' 80' 100' 120' 140' 160' 180'

50

100

Low P_2O_5

150

181'

TD. DRLD.

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL D

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

ELEV 929'

all.

50

100

150

Low P_2O_5

200

1' @ 5.0 %(F)

1' @ 6.0 %(F)

1' @ 6.0 %(F)

1' @ 5.0 %(F)

1' @ 5.0 %(F)

247'
TD DRL'D.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20

0 10 20

0
20'
40'
160'
180'
200'
220'
240'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL E 2

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

ELEV 863'

Low P_2O_5

19' av 7 3 % (A)

86'
TD DRLD.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20

0' 20' 40' 60' 80'

10 20

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL E 3

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

ELEV~860'

1' av = 14·0% (F)

3' av = 5·2% (F)

1' av = 7·0% (F)

75'
T D DRLD.

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

0 10 20

0' 20' 40' 60' 80'

10 20

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD

AREA

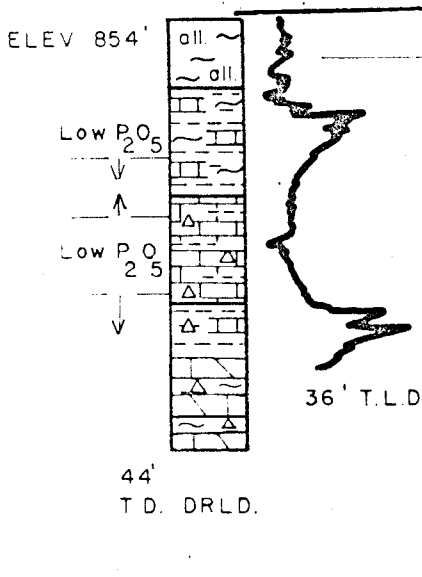
WELL E 5

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE



% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis MUDEL

0 10 20

0' 20' 40'

0 10 20

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST LTD

AREA

WELL E 6

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

ELEV 871'

Low P_2O_5

Low P_2O_5

1' av ≡ 7·0% (A)

1' av ≡ 5·0% (F)

1' av ≡ 5·0% (A)

2' av ≡ 6·0% (A)

178' T.L.D

180' T.D. DRLD

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL F

COUNTY STATE QUEENSLAND

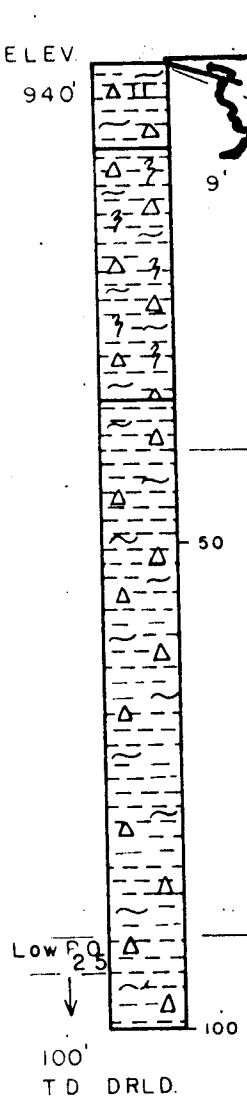
COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

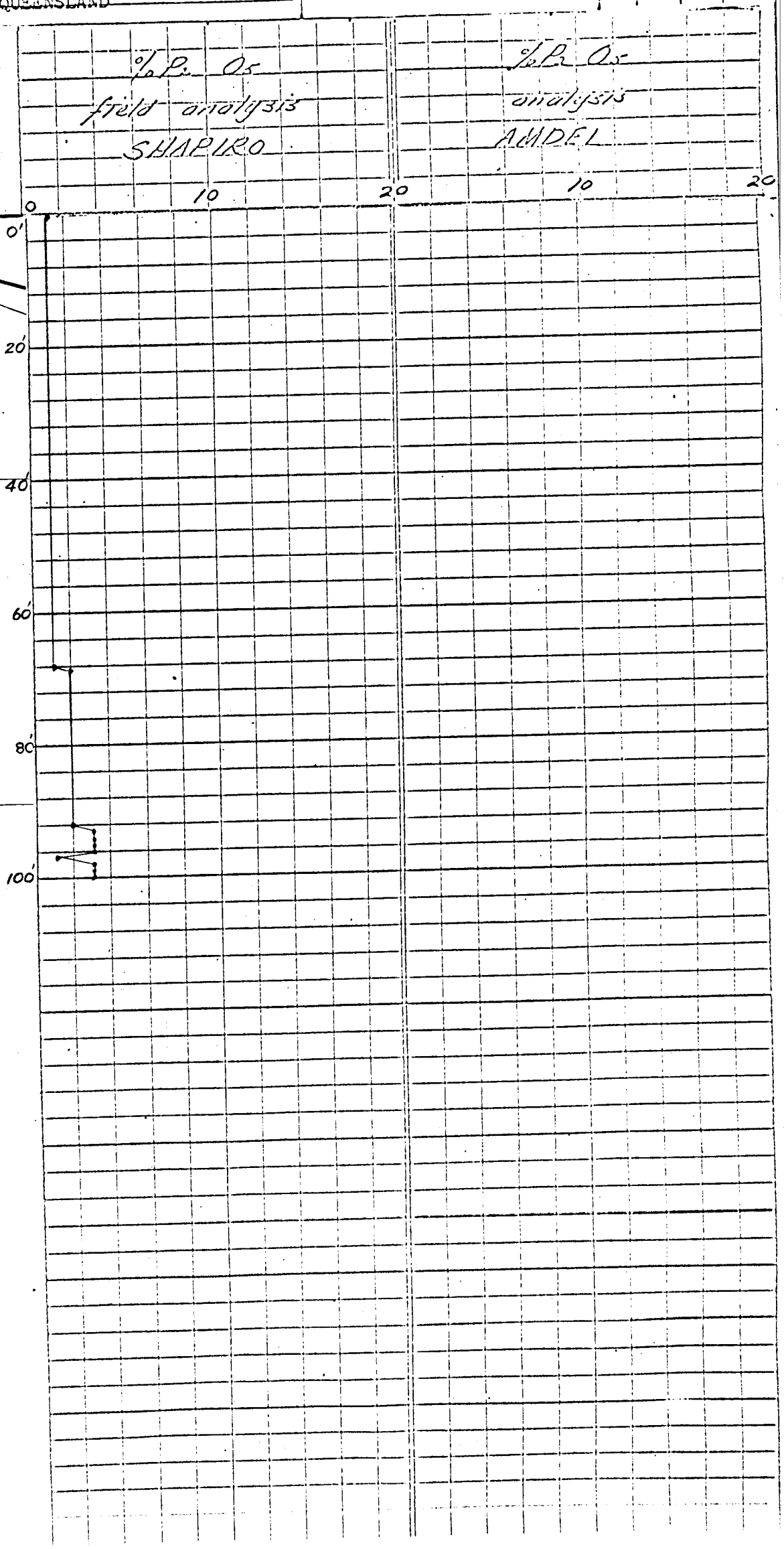
COMPANY

WELL

LOCATION

OPEN HOLE





PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO AUST. LTD.

AREA

WELL H 2

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

COMPANY
WELL
LOCATION

OPEN HOLE

Gamma Log

% P_2O_5 field analysis SHAPIRO

% P_2O_5 analysis AMDEL

ELEV 892'

Low P_2O_5

Low P_2O_5

50

100

150

185'
T.D. DRL.D.

181' T.L.D.

0 10 20 10 20

0' 20' 40' 60' 80' 100' 120' 140' 160' 180'

PHOSPHATE LOG

COMPANY CONTINENTAL OIL CO. AUST. LTD.

AREA

WELL I 3

COUNTY STATE QUEENSLAND

COORDINATES:
N
S
ELEVATION:
D.F.
K.B.
G.L.

LOCATION

WELL

COMPANY

OPEN HOLE

Gamma Log

ELEV 943'

50

Low P O 2 5

73' T.L.D.

100

108'
T.D DRLD.

% P2O5
field analysis
SHAPIRO

% P2O5
analysis
AMDEL

0 10 20 10 2

0'
20'
40'
60'
80'
100'

19° 15'

19° 30'

Morstone H S

Thorntonia H.S.

A.T.P. 354 M
(Area No. 1)

Undilla H.S

B AREA

D-TREE AREA

19° 45'

CAMOOWEAL

BARKLY

OM
ON
OO

M AREA

20° 00'

OW-1
OS
OT
OP
OQ
OR

WHISTLER CK.
AREA

HIGHWAY

Yelvertoft H.S.

20° 15'

A.T.P. 354M
(Area No.2)
OU
OV

OX

LILY CK.
AREA

(Upper)

SHERRIN CK.
AREA

(Lower)

A to P 375 M

Barkly Downs H.S.

138° 15'

138° 30'

138° 45'

139° 00'

N
W
E

OR 2338

PLATE I

CONTINENTAL OIL COMPANY OF
AUSTRALIA LTD

PLANT FOODS EXPLORATION

LOCALITY PLAN DRILLING AREAS
A to P. 354 M and 375M

UNDILLA BASIN QUEENSLAND

SCALE 1" = 4 MILES

MILES 4 2 0 4 8 MILES

BY: M.D. CAMPBELL DATE: 8-10-67

19° 15'

19° 30'

Morstone H.S.

Thorntonia H.S.

A.T.P. 354 M
(Area No. 1)

Undilla H.S.

B AREA

D – TREE AREA

19° 45'

CAMOOWEAL

BARKLY

OM
ON
OO

M AREA

20° 00'

OW-1
OS
OT
OP
OQ
OR

WHISTLER CK.
AREA

HIGHWAY

Yelvertoft H.S.

20° 15'

A.T.P. 354M
(Area No.2)
OU
OV

OX

LILY CK.
AREA

(Upper)

SHERRIN CK.
AREA

(Lower)

A to P 375 M

Barkly Downs H.S.

138° 15'

138° 30'

138° 45'

139° 00'

N
W
E

GR 2338 /

PLATE I

CONTINENTAL OIL COMPANY OF
AUSTRALIA LTD

PLANT FOODS EXPLORATION

LOCALITY PLAN DRILLING AREAS
A to P. 354 M and 375M

UNDILLA BASIN QUEENSLAND

SCALE 1" = 4 MILES

MILES 4 2 0 4 8 MILES

BY ; M.D. CAMPBELL DATE ; 8-10-67

138°51' 138°52' 138°53' 138°54' 138°55' 138°56' 138°57' 138°58' 138°59'

20°19' 20°20' 20°21' 20°22' 20°23' 20°24' 20°25' 20°26' 20°27' 20°28' 20°29'

SC 9
No P_2O_5

SC 9 A
66'
Low Grade

SC 1
50'
Low Grade

W
60'
Low Grade

SC 14
No P_2O_5

SC 12
140'–120'
7' – 12%

SC 10
60'–65'
6 – 17%

SC 13
83'
Low Grade

SC 2
43'
Low Grade

SC 31
54'–66'
13'–8%

SC 26
73'–83'
11'–14%

SC 27
82'–90'
9' – 17%

SC 16
62'–71'
10'–14%

SC 18
132'
Low Grade

SC 28
115'
V. Poor Samples

SC 11
76'–82'
7'– 19%

SC 15
72'–85'
14'–25%

SC 3
TD 120'
NOT DEEP ENOUGH

SC 30
76'–111'
35'–10%

SC 17
94'–100'
7'–12%

SC 32
127'
Low Grade

SC 29
T.D. 76'
Lost Hole

SC 4
99'–109'
11' – 19%
109' – 116'
7' – 8%

SC 23
T.D. 60'
Lost Hole

SC 5
T.D. 80'
Lost Hole

SC 6
T.D. 88'
Lost Hole

SC 7
170'
Low Grade

SC 22
51'
Low Grade

SC 19
86'
Low Grade

SC 5B
74'–77'
4'– 18%
80'–82'
3'– 10%
86'–89'
4 – 16%

SC 21
45'
Low Grade

SC 25
58'
Low Grade

SC 24
No P_2O_5

SC 20
63'
Low Grade

SC 5A
42'
Low Grade

50'
75'
100'

FENCE

PRECAMBRIAN

PRECAMBRIAN

N
W E

PLATE II

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

PRELIMINARY ISOPACH PLAN *1

INCLUDING

POTENTIAL AREAS OF GRADE PHOSPHATE *2

SHERRIN CREEK AREA

AUTHORITY TO PROSPECT - 375 M

QUEENSLAND

BY: R.N. ARRINGTON

SCALE: 4 inches = 1 mile

0·25 0 0·25 0·5 0·75 1 MILES

This map has been re-joined and may not be to scale

*1. DEPTH TO TOP OF PHOSPHATE ZONE (shown by solid line.)

*2. GRADE PHOSPHATE DEFINED AS ≥ 10·0 % P_2O_5 A.M.D.E.L. (shown by dashed line.)

GR 23381

138°42' 138°43 138°44' 138°45' 138°46 138°47 138°48'

20°19' 20°20' 20°21' 20°22' 20°23' 20°24' 20°25' 20°26' 20°27'

Y

Z

LC 1

LC 2

LC 3

LC 4

LC 5

LC 6

LC 7

LC 8

PRECAMBRIAN

PRECAMBRIAN

N

W E

PLATE III

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

MAP LOCATIONS

OF

CROSS SECTIONS

LILY CREEK AREA

AUTHORITY TO PROSPECT - 375 M

QUEENSLAND

CR 2338

SCALE: 4 inchs = 1 mile

0·25 0 0·25 0·5 0·75 1 MILES

BY : M.D. CAMPBELL DATE : 8-10-67

138°42' 138°43 138°44' 138°45' 138°46 138°47 138°48'

20°19' 20°20' 20°21' 20°22' 20°23' 20°24' 20°25' 20°26' 20°27'

Y

Z

LC 1

LC 2

LC 3

LC 4

LC 5

LC 6

LC 7

LC 8

PRECAMBRIAN

PRECAMBRIAN

N

W E

PLATE III

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

MAP LOCATIONS

OF

CROSS SECTIONS

CR 2338 1

LILY CREEK AREA

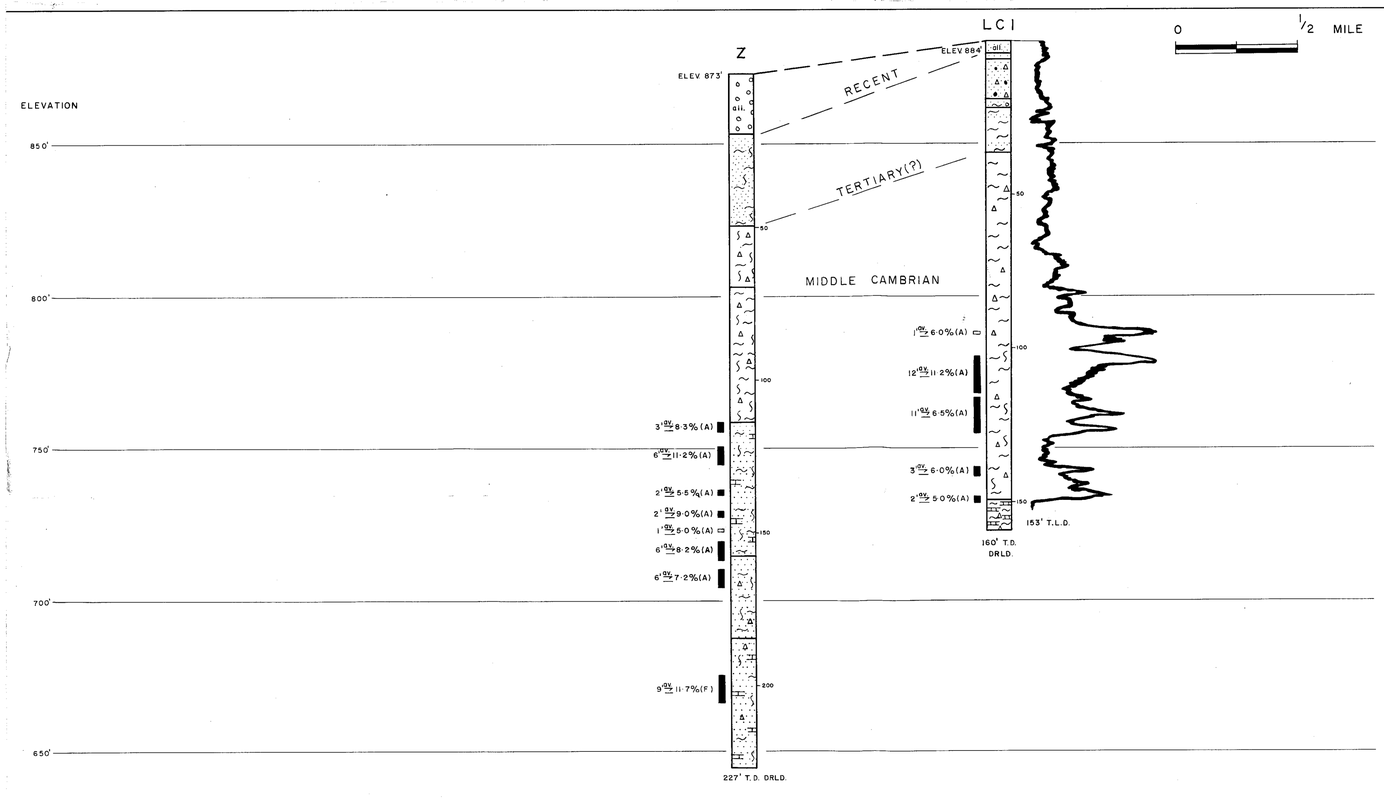
AUTHORITY TO PROSPECT - 375 M

QUEENSLAND

SCALE: 4 inchs = 1 mile

0·25 0 0·25 0·5 0·75 1 MILES

BY : M.D. CAMPBELL DATE : 8-10-67



REFERENCE

- Shale (or Shaly)
- Siltstone (or Silty)
- Claystone (or Clayey)
- Sandstone (or Sandy)
- Limestone (or Limey)
- Dolomite (or Dolomitic)
- Chert
- Conglomerate , Nodules or Pebbles.
- Quartz Pebbles or Large Grains (well-rounded)
- all. Alluvium (or Soil Material.)
- Gamma Log : 1 sec. T.C. ·0025 MR / HR. 12 feet / minute.
- 108' T.D. DRLD. Total Depth Drilled.
- 14' 0V 10·2% (A) Major phosphate interval in feet averaging ≥ 5·0% P2O5 by (A) A.M.D.E.L. Shapiro or (F) Field Shapiro.
- Minor phosphate interval ≥ 5·0% P2O5 (A) or (F).

PLATE IV

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

CROSS SECTIONS

LILY CREEK AREA

GR 23381

AUTHORITY TO PROSPECT - 375 M

QUEENSLAND

Horizontal Scale : 4 inchs : 1 mile.
Vertical Scale : 1 inch : 20 feet.
Vertical Exaggeration : 66 x
Elevations Based on Dajara Datum.

Compiled By : M.D. Campbell Date : 25·7·67

Well-Site Geologists: R. Grasso , J.L. Simpson
N. Murphy & M.D. Campbell

This map has been re-joined and may not be to scale

138°51' 138°52' 138°53' 138°54' 138°55' 138°56' 138°57' 138°58' 138°59'

20°19'

SHERRIN CREEK (UPPER)

W

SC 9 SC 9A SC 1

20°20'

SC 31

20°21'

SC 14 SC 12 SC 10 SC 13 SC 2 SC 26 SC 27

FENCE

SC 16

SC 18 SC 28

20°22'

PRECAMBRIAN

SC 11 SC 15 SC 3 SC 30

SC 17

20°23'

SC 32 SC 29

20°24'

SC 4

PRECAMBRIAN

SC 23

20°25'

SHERRIN CREEK (LOWER)

FENCE

20°26'

SC 5 SC 6 SC 7

SC 22

SC 5B SC 21 SC 25

SC 19

20°27'

SC 24 SC 20

SC 5A

20°28'

20°29'

138°51' 138°52' 138°53' 138°54' 138°55' 138°56 138°57' 138°58' 138°59'

N

W E

PLATE V

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

MAP LOCATIONS

OF

CROSS SECTIONS

SHERRIN CREEK AREA (UPPER & LOWER.)

AUTHORITY TO PROSPECT - 375 M

QUEENSLAND

SCALE : 4 inches = 1 mile

0·25 0 0·25 0·5 0·75 1 MILES

By : M.D. CAMPBELL

Date : 8-10-67

CR 2338

This map has been re-joined and may not be to scale

138°51' 138°52' 138°53' 138°54' 138°55' 138°56' 138°57' 138°58' 138°59'

20°19'

SHERRIN CREEK (UPPER)

W

SC 9 SC 9A SC 1

20°20'

SC 31

20°21'

SC 14 SC 12 SC 10 SC 13 SC 2 SC 26 SC 27

FENCE

SC 16

SC 18 SC 28

20°22'

PRECAMBRIAN

SC 11 SC 15 SC 3 SC 30

SC 17

20°23'

SC 32

SC 29

20°24'

SC 4

SC 23

PRECAMBRIAN

20°25'

SHERRIN CREEK (LOWER)

FENCE

20°26'

SC 22 SC 5 SC 6 SC 7

SC 19 SC 5B SC 21 SC 25

20°27'

SC 24

SC 5A SC 20

20°28'

20°29'

138°51' 138°52' 138°53' 138°54' 138°55' 138°56 138°57' 138°58' 138°59'

N

W E

PLATE V

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

MAP LOCATIONS

OF

CROSS SECTIONS

SHERRIN CREEK AREA (UPPER & LOWER.)

AUTHORITY TO PROSPECT - 375 M

QUEENSLAND

SCALE: 4 inches = 1 mile

0·25 0 0·25 0·5 0·75 1 MILES

By: M.D. CAMPBELL

Date: 8-10-67

CR 23381

This map has been re-joined and may not be to scale

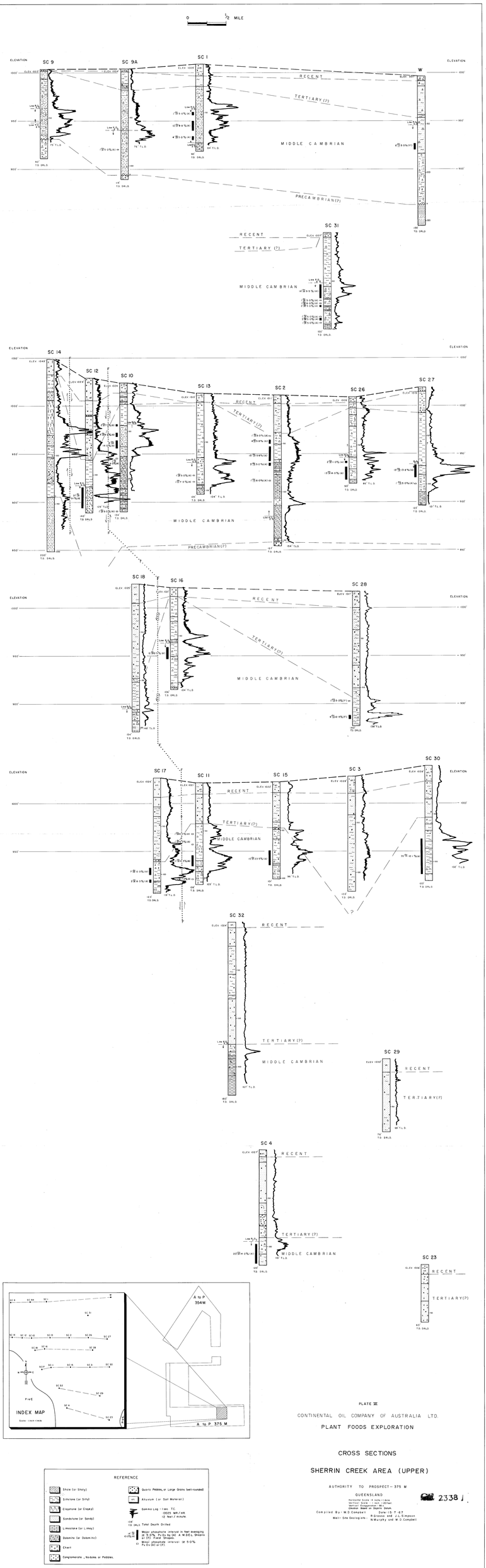


PLATE XI

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

CROSS SECTIONS

SHERRIN CREEK AREA (UPPER)

AUTHORITY TO PROSPECT – 375 M

QUEENSLAND

Horizontal Scale - 4 inches = 1 mile
Vertical Scale - 1 inch = 200 feet
Vertical Exaggeration - 26.4
Datum - Mean Sea Level Datum.

Compiled By - M.D. Campbell — Date - 15.7.67

Well-Site Geologists - R.Grosse and J.L.Simpson
R.Murphy and M.D.Campbell

2338 I

REFERENCE

- Shale (or Shaly)
- Siltstone (or Silty)
- Claystone (or Clayey)
- Sandstone (or Sandy)
- Limestone (or Limey)
- Dolomite (or Dolomitic)
- Chert
- Conglomerate, Nodules or Pebbles.
- Quartz Pebbles, or Large Grains (well-rounded)
- Alluvium (or Soil Material)
- Gamma Log - Ions. T.C. (0025 MR/HR 20 Years / minute
- TD Total Depth Drilled
- Major phosphate interval in feet averaging 10.0% P_2O_5 (A) or 4.5% P_2O_5 (B) or 17.7 P_2O_5 Grade).
- Minor phosphate interval: ie 5.0% P_2O_5 (A) or (7).

0 ½ MILE

ELEVATION

ELEVATION

SC 22 SC 5 SC 6 SC 7

ELEV. 1031' ELEV. 1039' ELEV. 1042' ELEV. 1058'

RECENT

TERTIARY(?)

PRECAMBRIAN (?)

Low P_2O_5

90' T.D. DRLD. 85' T.L.D. 80' T.D. DRLD. 88' T.D. DRLD. 170' T.D. DRLD.

MIDDLE CAMBRIAN(?)

1050' 1000' 950' 900'

ELEVATION

ELEVATION

SC 19 SC 5B SC 21 SC 25

ELEV. 1035' ELEV. 1048' ELEV. 1044' ELEV. 1053'

RECENT

TERTIARY(?)

Low P_2O_5

18' @ 8.4% (A)

1' @ 5.0% (A)

2' @ 9.0% (A)

1' @ 7.0% (A)

125' T.D. DRLD. 122' T.L.D. 159' T.D. DRLD. 158' T.L.D. 61' T.D. DRLD. 57' T.L.D. 120' T.D. DRLD.

MIDDLE CAMBRIAN

PRECAMBRIAN(?)

1050' 1000' 950' 900'

ELEVATION

ELEVATION

SC 24 SC 5A SC 20

ELEV. 1055' ELEV. 1058' ELEV. 1041'

RECENT

TERTIARY(?)

Low P_2O_5

2' @ 14.5% (A)

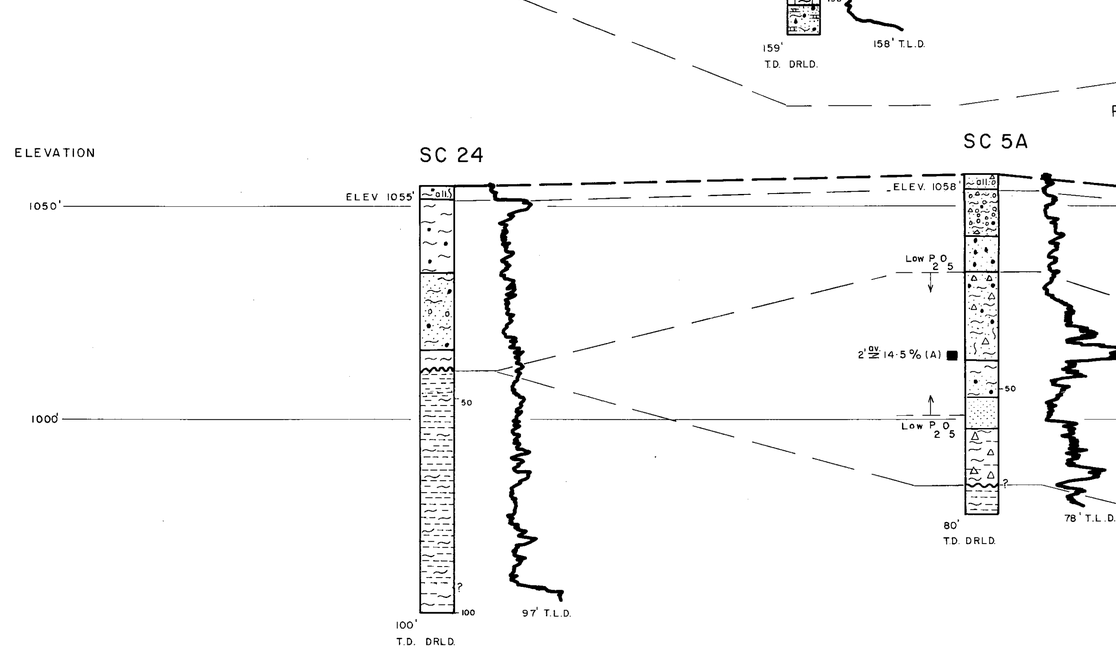
1' @ 5.0% (A)

100' T.D. DRLD. 97' T.L.D. 80' T.D. DRLD. 78' T.L.D. 82' T.D. DRLD.

MIDDLE CAMBRIAN

PRECAMBRIAN(?)

1050' 1000'



REFERENCE

- Shale (or Shaly)
- Siltstone (or Silty)
- Claystone (or Clayey)
- Sandstone (or Sandy)
- Limestone (or Limey)
- Dolomite (or Dolomitic)
- Chert
- Conglomerate , Nodules or Pebbles.
- Quartz pebbles or large grains (well-rounded).
- all. Alluvium (or Soil Material.)
- Gamma Log : 1 sec. T.C. .0025 MR / HR. 12 feet / minute.
- 108' T.D. DRLD. Total Depth Drilled.
- 14' @ ≥ 10·2% (A) Major phosphate interval in feet averaging ≥ 5·0% P_2O_5 by (A) A.M.D.E.L. Shapiro or (F) Field Shapiro.
- Minor phosphate interval ≥ 5·0% P_2O_5 (A) or (F).

PLATE VII

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

GR 23381

CROSS SECTIONS

SHERRIN CREEK AREA (LOWER)

AUTHORITY TO PROSPECT - 375 M

QUEENSLAND

Horizontal Scale : 4 inchs = 1 mile.
Vertical Scale : 1 inch = 20 feet.
Vertical Exaggeration : 66x
Elevations Based on Dajarra Datum.

Compiled By : M.D. Campbell Date : 14·7·67

Well—Site Geologists .. R. Grasso , J. L. Simpson
N. Murphy & M.D. Campbell.

138°51' 138°52' 138°53' 138°54' 138°55' 138°56'

19°38' 19°39' 19°40' 19°41' 19°42' 19°43' 19°44' 19°45' 19°46' 19°47'

A. to P. 315 M
(I.M.C.)

A. to P. 354 M
(CONAUS)

A. to P. 315 M
(I.M.C.)

A
B6
B1
A-B
B2
B9
B8
B7
C5
C4
C3
C
C2
D
E6
E2
E3
E5
D.T. 13
D.T. 11
WEST THORNTON CK.
D.T. 9
7A
D.T. 7
F
G2
5B
D.T. 5
5C
5A
D.T. 4
4A
D.T. 2A
D.T. 1.
Airstrip
H2
I3
H
D.T. 3
JF4
JF3
JF3A
J1
J2
J3
JF2
JF1
To Borkly Hwy.

N
W E

PLATE VIII

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

MAP LOCATION OF CROSS SECTIONS

B AREA & D—TREE AREA
AUTHORITY TO PROSPECT - 354 M

QUEENSLAND

SCALE: 4 inchs = 1 mile

0·25 0 0·25 0·5 0·75 1 MILES

By: M.D. CAMPBELL Date: 8-10-67

CR 23301

138°51' 138°52' 138°53' 138°54' 138°55' 138°56'

19°38' 19°39' 19°40' 19°41' 19°42' 19°43' 19°44' 19°45' 19°46' 19°47'

A. to P. 315 M
(I.M.C.)

A
B6
B1
A-B
B2
B9
B8
B7
C3
C5
C4
C
C2

A. to P. 354 M
(CONAUS)

A. to P. 315 M
(I.M.C.)

D
E6
E2
E3
E5
D.T. 13
D.T. 11
WEST THORNTON CK.
D.T. 9
7A
D.T. 7
F
G2
5B
D.T. 5
5C
5A
D.T. 2A
D.T. 4
4A
D.T. I.
Airstrip
H2
I3
H
D.T. 3
JF4
JF3
JF3A
J1
J2
J3
JF2
JF1

To Borkly Hwy.

N
W E

PLATE VIII

CR 23381

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

MAP LOCATION

OF

CROSS SECTIONS

B AREA & D—TREE AREA
AUTHORITY TO PROSPECT - 354 M
QUEENSLAND

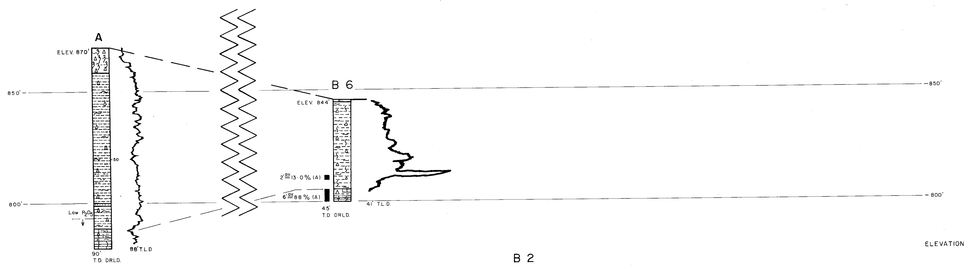
SCALE: 4 inchs = 1 mile

0·25 0 0·25 0·5 0·75 1 MILES

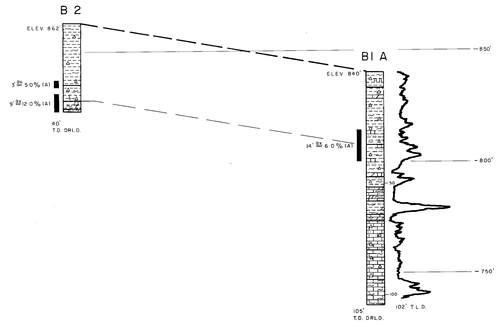
By: M.D. CAMPBELL Date: 8—10—67



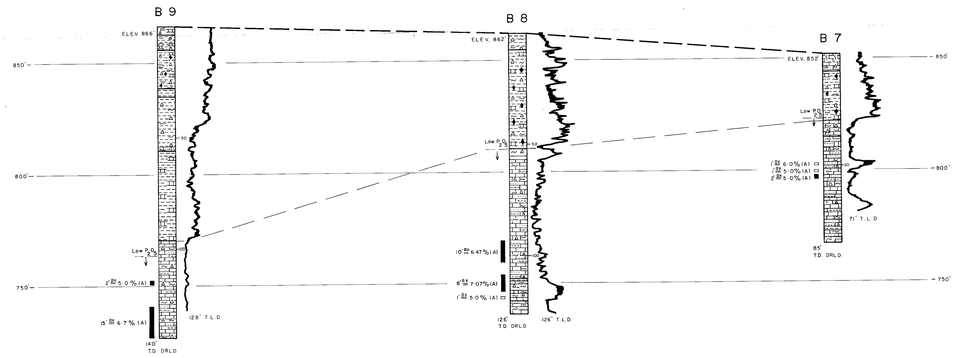
ELEVATION



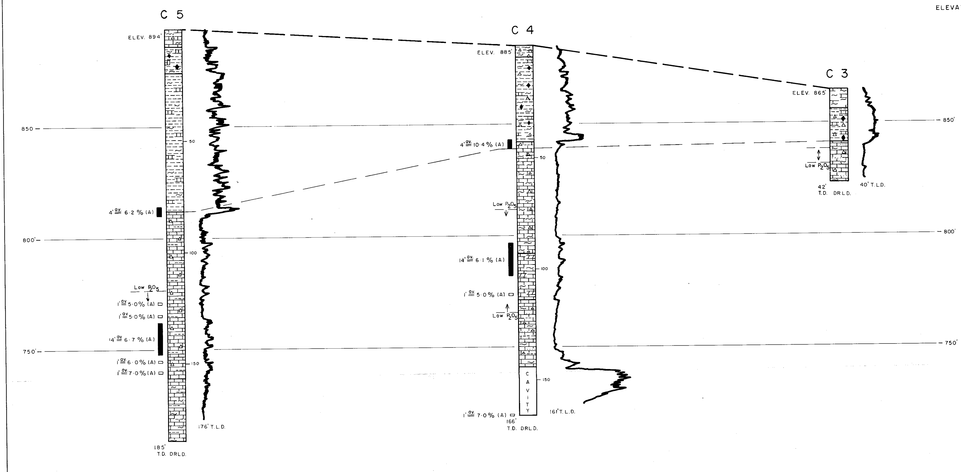
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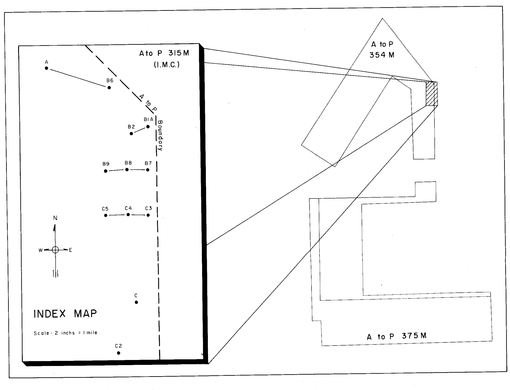


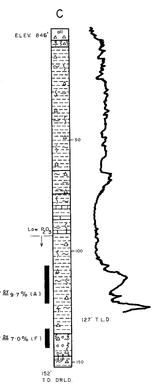
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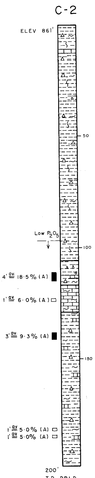


ELEVATION









REFERENCE

- Conglomerate
- Shale (or Shaly)
- Siltstone (or Silty)
- Claystone (or Clayey)
- Sandstone (or Sandy)
- Limestone (or Limey)
- Dolomite (or Dolomitic)
- Chert — Platy Habit
- Alluvium (or Soil Material)
- Gamma Log 1 sec. T.C. .0025 MR/HR 12 feet/minute
- 108 T.D.DRLD. — Total Depth Drilled
- Major phosphate interval in feet averaging ≥ 5.0% P_2O_5 by (A) AMDEL, Shapiro or (F) Field Shapiro. Minor phosphate interval ≥ 5.0% P_2O_5 (A) or (F)

PLATE IX

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

CR 23381

CROSS SECTIONS

B AREA

AUTHORITY TO PROSPECT - 354 M

QUEENSLAND

Horizontal Scale : 32 inches = 1 mile.
Vertical Scale : 1 inch = 20 feet.
Vertical Exaggeration : 264
Elevations : Based on Datum.

Compiled By : M.D.Campbell — Date : 14-7-67
Well-Site Geologists : R. Grasso and M.D.Campbell

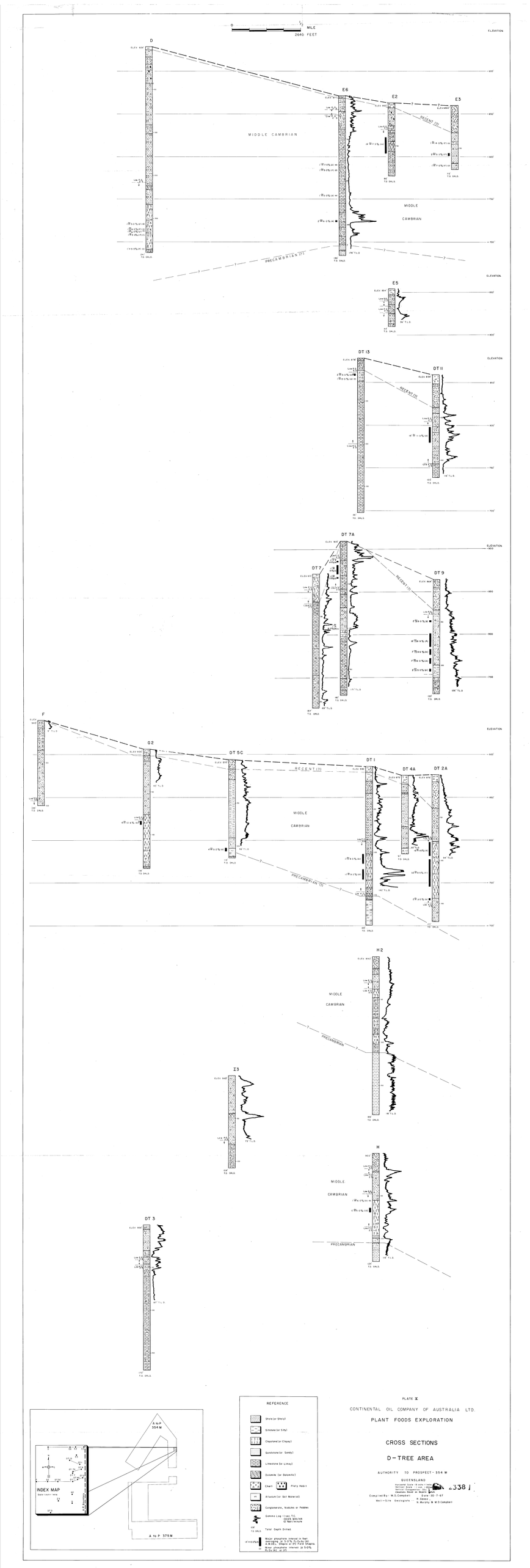


PLATE X

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

CROSS SECTIONS

D-TREE AREA

AUTHORITY TO PROSPECT - 354 M

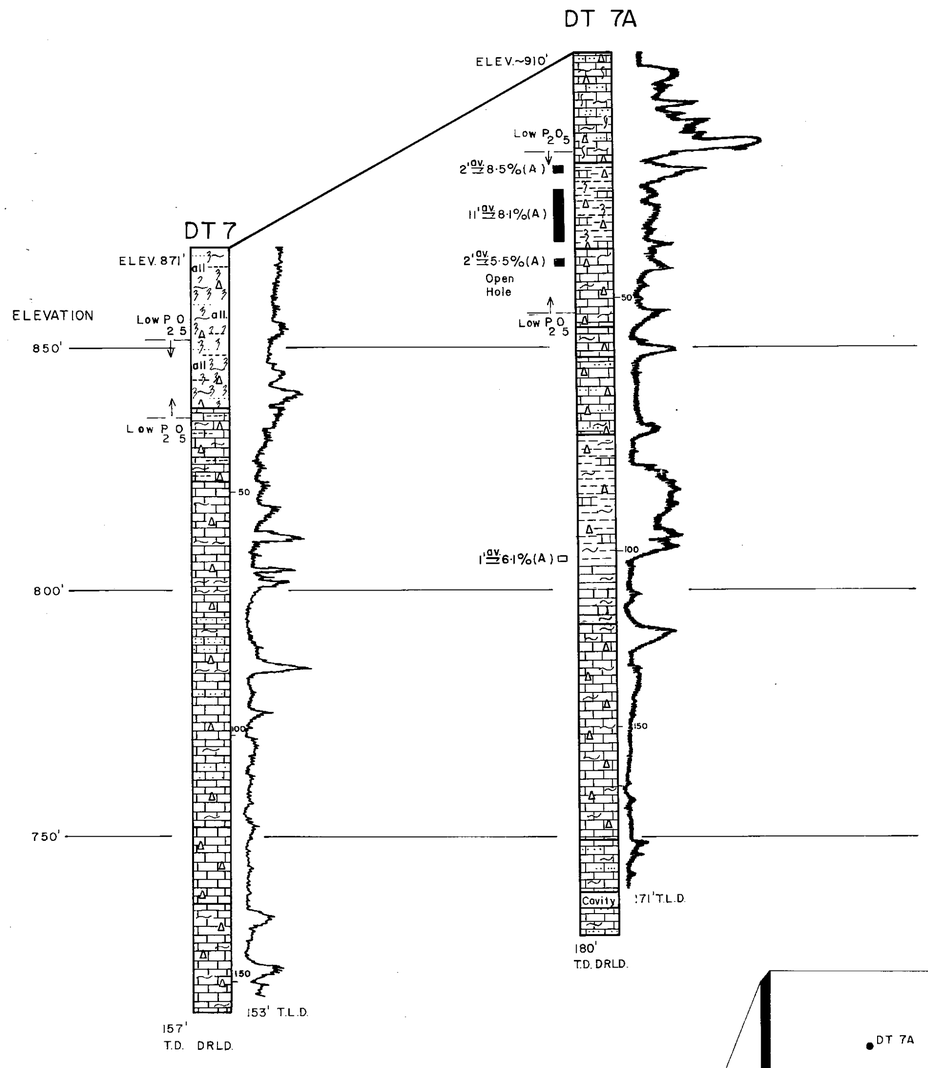
QUEENSLAND

Horizontal Scale 1 inch = 1 Mile
Vertical Scale 1 inch = 100 Feet
Vertical Exaggeration 20:1

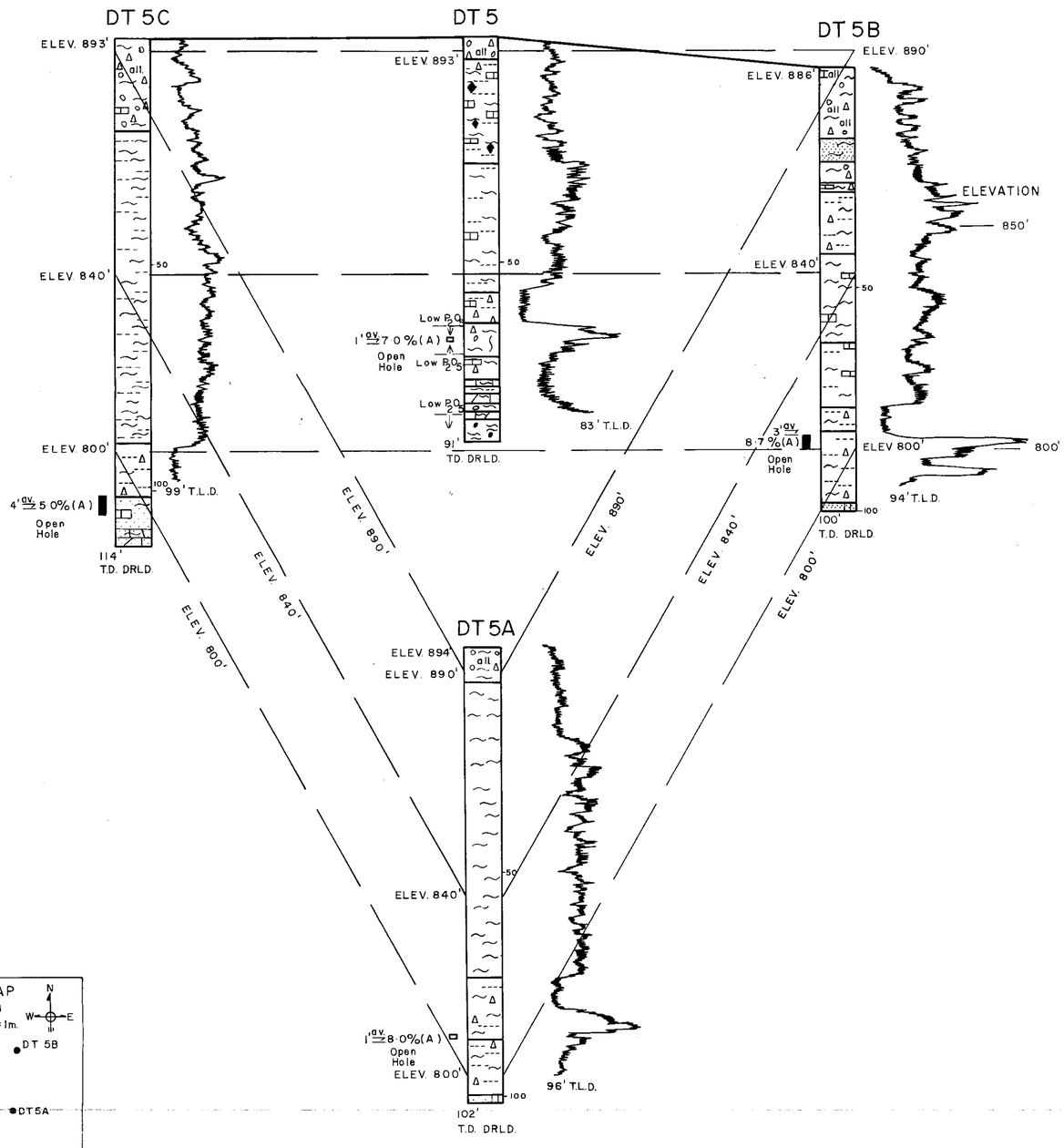
2338 J

Compiled By: W.D.Campbell
Well-Site Geologists: H. Geeves, N. Murray & W.D.Campbell

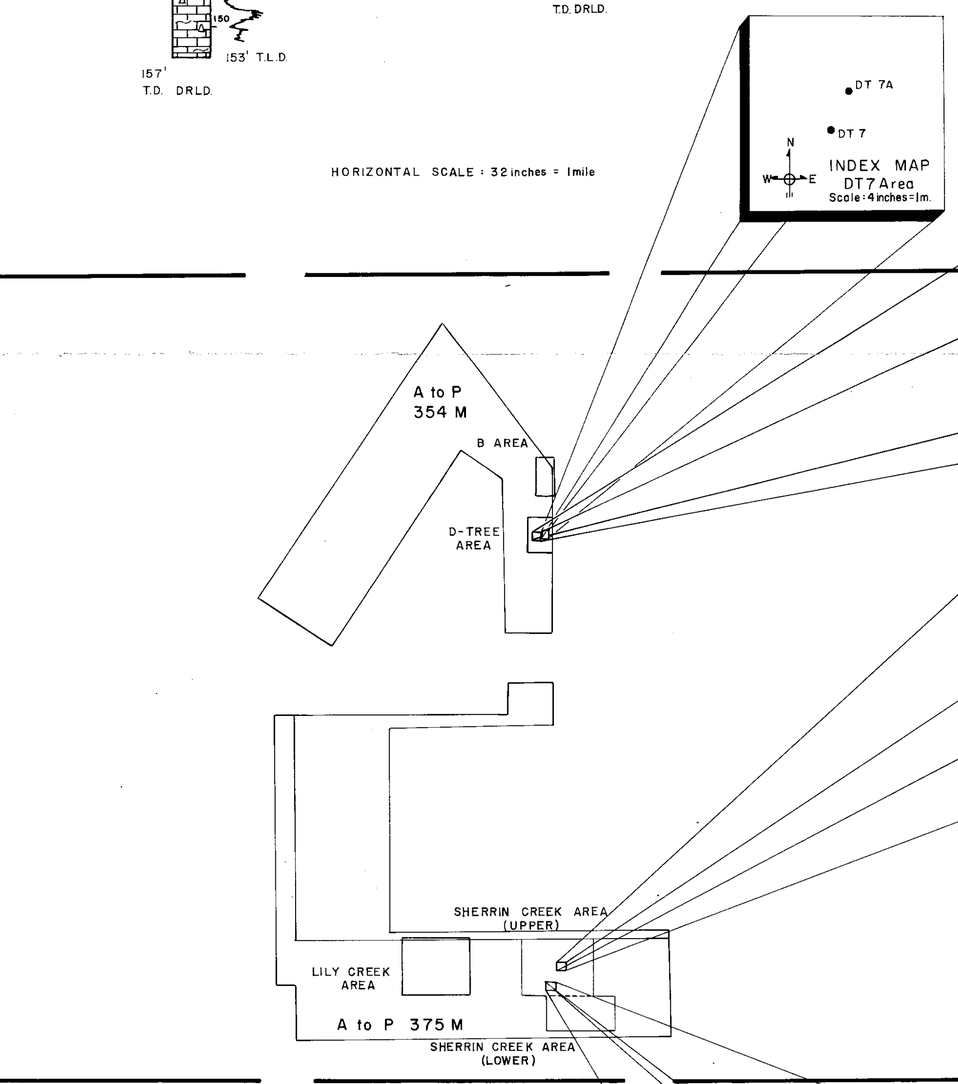
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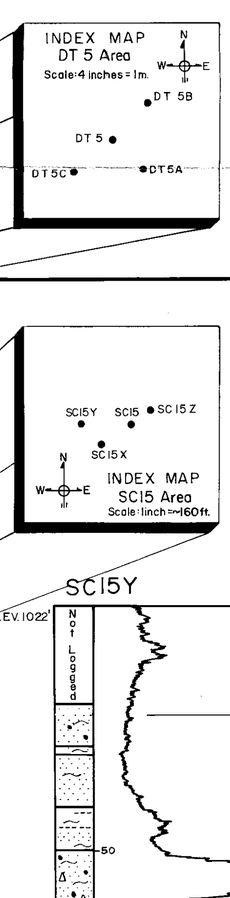


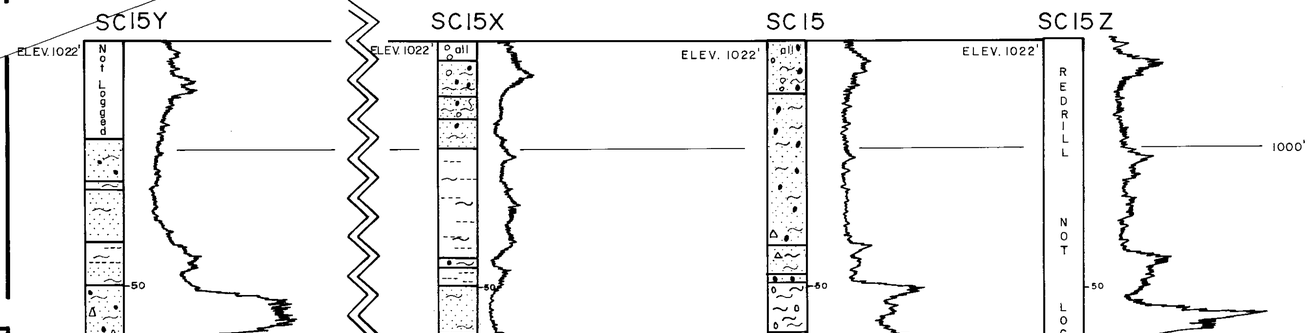
HORIZONTAL SCALE : 32 inches = 1 mile



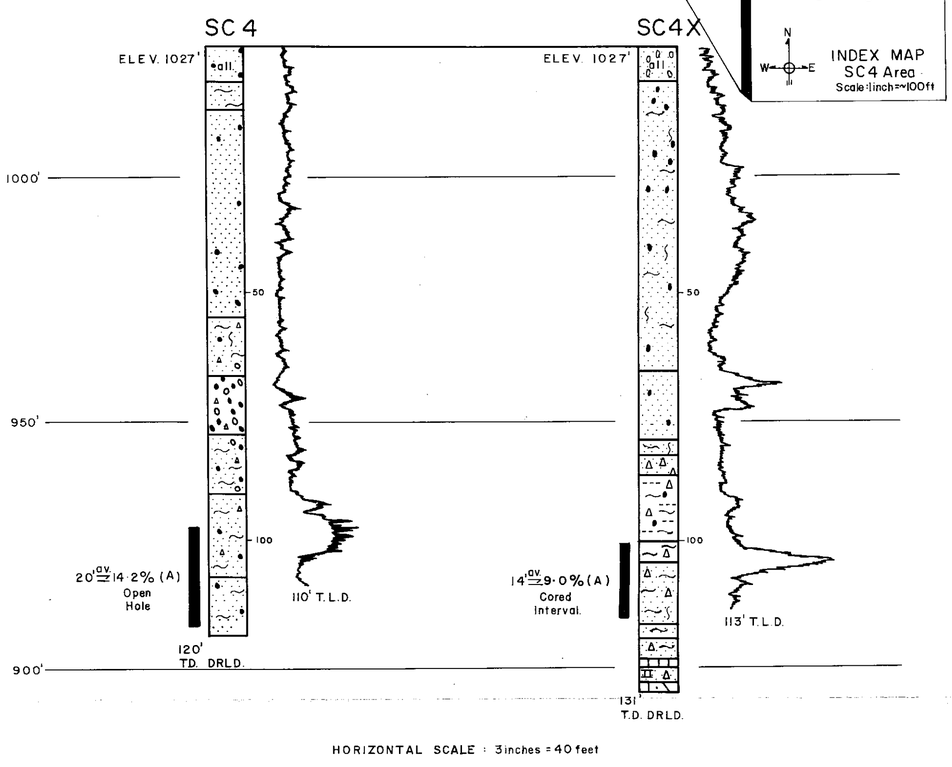
HORIZONTAL SCALE : 32 inches = 1 mile







HORIZONTAL SCALE : 3 inches = 50 feet (approx)



HORIZONTAL SCALE : 3 inches = 40 feet

REFERENCE

- Shale (or Shaly)
- Siltstone (or Silty)
- Claystone (or Clayey)
- Sandstone (or Sandy)
- Limestone (or Limey)
- Dolomite (or Dolomitic)
- Chert — Platy Habit
- Conglomerate, Nodules or Pebbles
- Quartz pebbles, or large grains (well-rounded)
- all. — Alluvium (or Soil Material)
- Gamma Log : 1 sec. T.C. ·0025 MR / HR. 12 feet / minute.
- 108' T.D. DRLD. — Total Depth Drilled
- 14' av 10.2%(A) — Major phosphate interval in feet averaging ≥ 5.0% P_2O_5 by (A) A.M.D.E.L. Shapiro or (F) Field Shapiro.
- Minor phosphate interval ≥ 5.0 % P_2O_5 (A) or (F).

PLATE XI

CONTINENTAL OIL COMPANY OF AUSTRALIA LTD.

PLANT FOODS EXPLORATION

OR 2338

CROSS SECTIONS ON

VARIABILITY

AUTHORITY TO PROSPECT 354M. AND 375M.

QUEENSLAND

Horizontal Scale : as indicated
Vertical Scale : 1 inch = 20 feet.
Elevations Based on Dajarra Datum.

Compiled By : M. D. Campbell
Well — Site Geologists : R. Grasso, J.L. Simpson, N. Murphy & M.D. Campbell

Date : 21·8·67