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DEPARTMENT OF MINES
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PETROLEUM EXPLORATION DIVISION

EXPLANATORY NOTES FOR A STRUCTURAL CONTOUR PLAN OF PORTION OF THE GREATER ARTESIAN BASIN USING THE MAJOR PRE-PERMIAN UNCONFORMITY AS DATUM

by

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SR.11/5/106

27th May, 1968

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ABSTRACT

The contour map is a compilation of data from the S.A. Department of Mines and oil exploration companies working in the south-west part of the Great Artesian Basin. The datum for the plan is the pre-Permian angular unconformity, and is largely non-stratigraphic. Information was obtained from seismic surveys with control from oil exploration wells. Over the area, the unconformity lies at various positions in the stratigraphic sequence, but generally there are two cases.

In areas of Permian sedimentation, the unconformity occurs at the base of the Permian where Permian rocks generally overlie Devonian or older rocks.

Where there are no Permian rocks, Mesozoic sediments unconformably overlie lower Palaeozoic rocks, the unconformity lying at the base of the Triassic, or the Jurassic. There are a number of wells in which the depth to the unconformity does not agree with the seismic results, generally the result of using an incorrect velocity function. Because of the near or complete absence of Permian in many of these wells, the average velocity to the unconformity is considerably lower than the value used in the seismic interpretations.

In some cases, the mis-tie at the wells may be due to doubtful reflection correlations in areas of poor reflection quality or inadequate coverage.

INTRODUCTION

The structural contour plan (L68-16) of the Southwest Great Artesian Basin using the major pre-Permian angular unconformity as datum is complementary to earlier plans on the "C" (Top of Cretaceous) and "P" (Upper Permian) horizons (Freytag, 1965, and Krieg, 1967). Over the area covered, this horizon is correlated with the "Z" seismic horizon and the contours are based on seismic data, together with information from oil exploration wells.

The plan contains seismic information available from the Department up to September, 1967, and well information up to February, 1968.

Plan S6165 shows the main geographical divisions of the area covered by this contour map.

Throughout this report, elevations and depths given are relative to mean sea level.

DERIVATION OF REFERENCE HORIZON

This map has been compiled to present the structure of the horizon identified with the deepest seismic reflector which is consistent over almost all of the south-west part of the Great Artesian Basin. This is the "Z" horizon, which is correlated in most of the deep oil exploration wells with a strong angular unconformity between folded lower Palaeozoic and older rocks and overlying sediments of Permian or Mesozoic age. Although in most cases this unconformity is at the base of the Permian, this is not universal so that the "Z" horizon cannot be considered a stratigraphic boundary and in fact represents an old eroded land surface.

The area covered by the map which has been investigated to some extent by drilling, can be divided broadly into four areas where the "Z" horizon corresponds to a particular stratigraphic boundary.

In the Cooper Creek sub-basin, the "Z" horizon generally represents the base of the Permian or occasionally the base of the Permo-Carboniferous. There are a number of areas where the Permian is locally absent due to either non-deposition or erosion. These areas are usually areas of uplift and the "Z" horizon represents the base of the Mesozoic section.

West of the Cooper Creek sub-basin is the Birdsville Track Ridge running almost north-north-east from the north-

western Flinders Ranges to south-west Queensland, and, as the name implies, approximated by the course of the Birdsville Track. Here, the "Z" unconformity marks the boundary between Lower Mesozoic deposits and folded lower Palaeozoic or older rocks, Permian sediments being absent.

To the west of the Birdsville Track Ridge, the Pedirka Basin contains Permian sediments with the "Z" horizon again at the base of the Permian.

Although there is no positive evidence from wells, the "Z" horizon in the area south of the Cooper Creek Basin is interpreted as base of Mesozoic as it is considered that the Permian is absent in this area.

SOURCE AND RELIABILITY OF INFORMATION

Data has been obtained from well completion reports and seismic information supplied by the following companies:

Delhi Australian Petroleum Ltd.

Santos Ltd.

French Petroleum Company (Australia) Ltd.

Beach Petroleum No Liability

Australian Aquitaine Petroleum Pty. Ltd.

Amerada Petroleum Corp. of Aust. Ltd.

and S. Aust. Department of Mines.

Seismic surveys were carried out by:

United Geophysical Corporation (For Delhi and F.P.C.(A).)

Compagnie Generale de Geophysique (For F.P.C.(A) and Aust. Aquitaine)

Namco International Incorporated (For Delhi)

Geoseismic and Austral Geo Prospectors (For Beach Petroleum)

and S. Aust. Department of Mines

The above companies and the Mines Dept. have supplied either contour plans of the seismic "Z" horizons, time contour plans, or depth sections, which have been transferred to state

base maps, at a scale of 8 miles to 1 inch, together with the relevant data from wells.

In most cases, seismic results have been adjusted to agree with depths to the unconformity at wells to within about two hundred feet. Exceptions to this will be discussed later in the report.

Datum Reliability

The "P" seismic reflector originates from coal beds 100 to 400 feet below the top of the Permian and cannot indicate this horizon to an accuracy better than a couple of hundred feet. In contrast, the "Z" reflector originates from the unconformity boundary, so that mis-ties with depths in oil exploration wells are caused by inaccuracies in the velocities used to convert reflection times to depths, or to mis-correlation of reflections in poor reflection areas.

Over most of the area, the "Z" reflector is fairly strong and continuous, but it is less certain than either the "C" or "P" so that correlation is not as definite for this horizon. The variations in strength and character of the reflections from this horizon are probably due to variations in the erosion surface at the unconformity caused by rock type, weathering, etc.

Survey Density

Another factor to be considered when assessing the reliability of the contour plan is the seismic survey and exploration well density. In the Cooper Creek Basin, both are very good and the structures on the plan can be accepted with a high degree of confidence.

Over the rest of the area, well density is poor to fair and the structural contours are determined almost entirely on the basis of the seismic work (generally speaking, water bores are too shallow to provide direct information on the "Z" horizon).

Seismic survey density, and thus the reliability of the structural contours, is fair to good in the Pedirka Basin area north and north-west of Lake Eyre, fair over the northern section of the Birdsville Track Ridge, but poor to fair over the areas of south-west Queensland, south of the Cooper Creek sub-basin, and absent in the area south and west of Lake Eyre.

VELOCITY INFORMATION

One of the major difficulties in mapping sub-surface structure from seismic reflection work lies in the conversion of the reflection times to depth. This requires knowledge of the average velocity of the seismic disturbances through the various layers between the surface and the particular reflector being mapped.

While this velocity can be calculated from seismic records themselves by use of the TAT method of analysis (Milton and Seedsman, 1962), the results obtained are usually a very broad average over a large area, and also are highly dependent on good reflection quality for accuracy. Often this is the only information available, but in the Cooper Creek sub-basin, the well density is sufficiently good to provide a check on the velocity functions obtained by TAT analysis by means of well velocity surveys (Dobrin, 1960; Nettleton, 1940). Velocity surveys have been carried out in the following wells in the Cooper Creek sub-basin:

Dullingari No. 1
Gidgealpa No. 5
Innamincka No. 1
Merrimelia No. 2
Moomba Nos. 1, 2, 3, 5.
Nappacoongee No. 1
Orientos No. 1
Pandieburra No. 1
Pando No. 1
Spencer No. 1

From these wells an average velocity function was calculated and used over the entire area. This has resulted in errors in certain parts of the area, but in the main, ties with wells are good.

More refined interpretation techniques in the areas of wells where velocity surveys were carried out would result in more accurate depth contours and well ties, but the velocity of 8700 ft/sec. to the "Z" which has been used is remarkably uniform over this large area.

Use of this velocity function has, however, led to serious errors when the Cooper Creek sub-basin adjoins the Birdsville Track Ridge (Clifton Hills, Goyders Lagoon, and Mirra Mitta surveys). No attempt has been made to tie these surveys to the Cooper Creek sub-basin surveys at this stage.

In the other parts of the area covered by this map, velocity information has been obtained from TΔT analysis, seismic refraction techniques, and widely scattered well velocity surveys and, as has been mentioned, a serious mis-tie (about 1000 feet) occurs between the Cooper Creek area and the Birdsville Track Ridge.

WELL-SEISMIC CORRELATION ERRORS

While depths to the "Z" unconformity from seismic surveys and well logs usually agree to within about 200 feet, there are a number of cases where they do not. These wells are mainly in the Cooper Creek sub-basin where the velocity function used to convert seismic reflection times to a depth was a linear.

function, viz. 8700 ft/sec. Use of this simple function appears to be the cause of mis-ties at many of those wells where there is disagreement between seismic and well depths.

Dullingari No. 1

Here the discrepancy between well and seismic depths to the unconformity is of the order of 800-850 feet, the seismic depth being too shallow. The reflection originating from the "Z" horizon occurs at a one-way time of .9 seconds, corresponding to a depth of 7800 feet B.M.S.L. using the velocity function of 8700 feet per second. Using the time-depth curve obtained from the well velocity survey at Dullingari, a depth, corresponding to .9 seconds travel time, of 8600 feet B.M.S.L. is obtained, which agrees extremely well with the depth obtained in the well.

The depth and reflection time, and also the well velocity survey, indicates an average velocity of 9500 feet/second to the unconformity, a considerably higher value than the 8700 ft/sec. used as the seismic depth conversion factor.

Moomba No.1

The mis-tie at Moomba No.1 is about 600 feet with the seismic depth again being too shallow. A well velocity survey carried out indicates that the velocity used to convert reflection times to depths was too low as was the case at Dullingari. Using the average velocity to the unconformity of 9400 ft/sec. from the well survey, a depth of 9300 feet is obtained for the siesmic results, which agrees closely with the well log.

Moomba No. 3

Again, the well velocity survey indicates an average velocity to the unconformity of about 9400 ft/sec. rather than the 8700 ft/sec. used in the seismic survey. With the higher velocity, the seismic depth to the unconformity is 9450 feet which, while about 150 feet deeper than the true depth, is a considerably better figure than the 8750 feet obtained using a velocity of 8700 feet/sec.

In general, it would appear that the depths in the Moomba-Dullingari area are too shallow by 600-700 feet due to a local increase of about 700 feet/second in the average velocity to the unconformity. A velocity of 9400 ft/sec. instead of 8700 ft/sec. would appear to have been a better figure to use in this area when converting seismic reflection times from the "Z" horizon to depths. However, there is an exception to this in Moomba No.2 where the velocity of 8700 ft/sec. converts the seismic reflection time into a depth (about -8550') which agrees fairly well with the depth in the well.

Putamurdie No.1

A mis-tie of 700 feet occurs in Putamurdie No.1 between the seismic and well determinations of the "Z" horizon depth, the seismic depth being the greater. Although no velocity survey was carried out in this well, it is thought that the mis-tie was caused by the use of an incorrect velocity function. In this instance, the function used was $V = 6950 + .9z$, obtained from the Innamincka No. 1 Well. Reflection moveouts suggest that the average velocity to the "Z" calculated from this function may be too great, an hypothesis supported by the over-estimation of the depth at Putamurdie from the seismic results.

Pando No.1

At Pando No. 1, the discrepancy between the depth to the "Z" horizon given by the well logs and the seismic survey is 1100 feet, the seismic depth being too great.

This error appears to be caused by a combination of incorrect depth function and incorrect reflection correlation. The seismic "Z" reflection was picked at about .77 seconds one-way time (relative to mean sea level datum) whereas in the well velocity survey a one-way time to the "Z" of .7 seconds was measured. In addition, the well survey determined an average velocity to the "Z" of 8000 ft/sec. rather than the 8700 ft/sec. used for the seismic survey. These two errors act in the same direction to give a seismic depth too deep by 1100 feet. It is believed that the

low average velocity at Pando is very local, being confined to the Pando structure itself.

Naryilco No. 1

No velocity survey was carried out in Naryilco No. 1 and the reflection times were converted to depths using information from refraction work, local geology, and the velocity gradient of Innamincka No.1 well. This function (V = 5500 + 2.2z for two-way times to .8 seconds and V = 13000 ft/sec. after this) gave a predicted depth of 4650 feet B.M.S.L. for the "Z" horizon, a figure too deep by 350 feet. The above function corresponds to an average velocity to the unconformity in the Naryilco area of about 9600 ft/sec. In the absence of definite velocity information, it appears that the average value of 8700 ft/sec. used in the greater part of the S.W.G.A.B. may be more applicable here, giving a depth of 4200 ft B.M.S.L. at Naryilco No.1. However, the mis-tie could be caused by an error in the correlation of reflections over the top of the structure, or possibly by a combination of the two.

Kalladeina No.1

A mis-tie of 600 feet occurred at Kalladeina, the seismic depth being too great. Due to a mishap during the drilling, the well was completed without a velocity survey so that the nearest points of control for a velocity function are the Gidgealpa and Merrimelia areas. It appears that a lower average velocity, say 8000 ft/sec. should be used in this area.

A comparison of the well logs for those wells at which the seismic surveys gave depths to the "Z" reflector significantly greater than the correct depth indicates a cause for the low average velocities required to obtain correct depths from the seismic results.

In all cases, Permian sediments are absent or very thin so that the section above the unconformity is Mesozoic and younger. The average seismic velocity through this sequence can be expected to be less than the 8700 ft/second through the normal sequence in the area containing appreciable Permian

sedimentation.

Use of an average velocity of 8700 ft/second over the whole area has thus led to considerable over-estimation of the depth to the "Z" horizon in areas of little or no Permian rocks.

DISCUSSION

Cooper Creek Sub-basin

Over the central part of the area, the sub-surface structure on the "Z" horizon appears to be controlled by a series of north-east trending faults. The main feature is the Gidgealpa-Merrimelia-Innamincka Ridge which has a maximum relief of about 4000 feet, its elevation ranging from about -6000 feet near Innamincka No.2 well to about -8000 feet at Merrimelia. The elevation of the troughs on either side of the ridge generally falls to about -10000 feet.

A less prominent feature, which at this stage is as important as the Gidgealpa ridge, is the Moomba anticline, some 20 miles south-east of Gidgealpa. The Moomba and Gidgealpa fields constitute the first commercial hydrocarbon gas fields discovered in S.A. (Greer, 1965; Martin, 1967; Wopfner, 1966).

Pedirka Sub-Basin

Results in the Pedirka Basin are complicated by the presence of middle-Palaeozoic Finke River Beds underlying the Permian in the central part of the Sub-basin. This is at variance with the sequence in most other parts of the south-west Great Artesian Basin where the "Z" unconformity generally separates Permian and lower Palaeozoic or older rocks.

In their reports on the Poolawanna and Emery seismic surveys, C.G.G. have interpreted the "Z" horizon as the top of the lower Palaeozoic which, in the Witcherrie - Northern Territory Border area, is the base of the Finke River beds.

For the purpose of this map, the central part of the Pedirka Sub-basin has been re-contoured on the base of the Permian

so that the "Z" represents a single stratigraphic horizon over the whole sub-basin and can be used in conjunction with Krieg's plan (1967) to compile a Permian isopach map of the area.

South of the Pedirka Basin, Department of Mines seismic work between the Peake and Denison Ranges and the north of Lake Eyre indicates an initially thin Mesozoic sequence overlying lower Proterozoic and Archaean crystalline basement which begins to thicken quickly eastwards from about 25 miles east of Mt. Dutton. From Mt. Dutton to this point, the "Z" horizon lies at the base of the thin Mesozoic sediments at about -600 to -800 feet, but proceeding eastwards Mesozoic and Permian sedimentation increases until just north of Lake Eyre the "Z" horizon is overlain by some 6000 feet of Mesozoic and Permian rocks (Wopfner, 1964).

North of the border, seismic work was carried out by several companies - Austral Geo Prospectors and Geoseismic in the Beach Petroleum - Amerada area (O.P. 57) and C.G.G. in the Aquitaine area further east (O.P. 36).

In the Perlanna survey for Aquitaine, C.G.G. have mapped a reflector corresponding to the "Z" horizon and this has been incorporated in the present plan. However, in O.P. 57 to the west the deepest horizon mapped is the "P", although there is a discrepancy near Hale River No. 1 where the mapped "P" reflector appears to correlate more nearly with the base of the Permian and may in fact be the "Z".

The major control of the structure of this sub-basin is a system of faults, generally trending north-south over the area from Lake Eyre into the Northern Territory. Relief on the "Z" horizon is fairly gentle over most of the area, the depth increasing from about -2000 feet near Witcherrie No. 1 to about -9000 feet 60 miles east of Mokari No. 1, and westwards to -5000 feet near the Alice Springs railway line.

A notable exception is a small, probably closed, basin between Mt. Crispe and Witcherrie. This anomaly is bounded to the east and west by north-south faults and falls away from about -1200 feet to -4700 feet in $3\frac{1}{2}$ miles.

South West Queensland

Unlike most of the area covered by this map, sub-surface structure in the extreme south-west of Queensland is indicated by the surface topography. Cretaceous and Tertiary rocks have been folded at the surface into a number of domal structures which have been investigated by correlation reflection surveys.

Seismic coverage of this area is fairly low, being largely limited to correlation surveys and a few semi-detailed surveys over the surface domes. Geologically, the area has been described by Sprigg (1959) and Wopfner (1960).

Frome Embayment - Fortville Area

A seismic reflection traverse was shot by the S.A. Department of Mines from Dullingari No.1 to Tilcha Bore on the Moolawatana - Hawkers Gate track. Holes were shot at one mile intervals and reflections correlated on the basis of character and interval.

The deepest reflector recorded was the "P" which was correlated fairly reliably to DT 59 nearly 50 miles south of Dullingari. From there to Fortville No. 3 record quality was very poor and the correlation of a reflector at about -3475 feet near the Fortville No. 3 site with the "P" was very tentative. Drilling of Fortville No.3 revealed that the Permian had thinned out between Dullingari and Fortville and the "Z" unconformity separated the Mooga sandstone (U. Jurassic) and highly folded crystalline basement at -3170 feet (Wopfner and Cornish, 1967). It appears likely that the reflector labelled "P" at Fortville was in fact the "Z", the "P" having thinned out on the rising basement somewhere between shot point DT 59 and Fortville No. 3.

The contours in this area are based on very sparse data. In addition to the correlation survey from Dullingari to Tilcha, data have been obtained from reflection surveys in the Lake Blanche area and refraction depth probes between Lake Frome and Tilcha. Depths of the "Z" horizon along this traverse are taken as the depth to the high speed refractor which generally has a velocity

between 16000 and 20000 feet per second in this area. With no well control there is no guarantee that this high speed refractor is in fact the "Z" horizon.

CONCLUSIONS

Three conclusions are reached as a result of the compilation of this contour plan.

1. The mapping of the structure of the "Z" unconformity using reflection seismic data is feasible over a large proportion of the south-west Great Artesian Basin.
2. The results of stratigraphic wells sited on structures discovered by seismic methods indicate that seismic work can provide an accurate qualitative picture of sub-surface structure.
3. Accurate depth calculations of seismic horizons is possible only in areas of good well control, in particular, well velocity survey information. Good velocity control is essential near the edges of basins (for example, near the perimeter of the Coopers Creek Sub-basin where it rises to the Birdsville Track Ridge) and in areas where Permian sediments are locally absent. In the latter case, the average seismic velocity down to the unconformity is considerably lower than in areas of Permian sedimentation.

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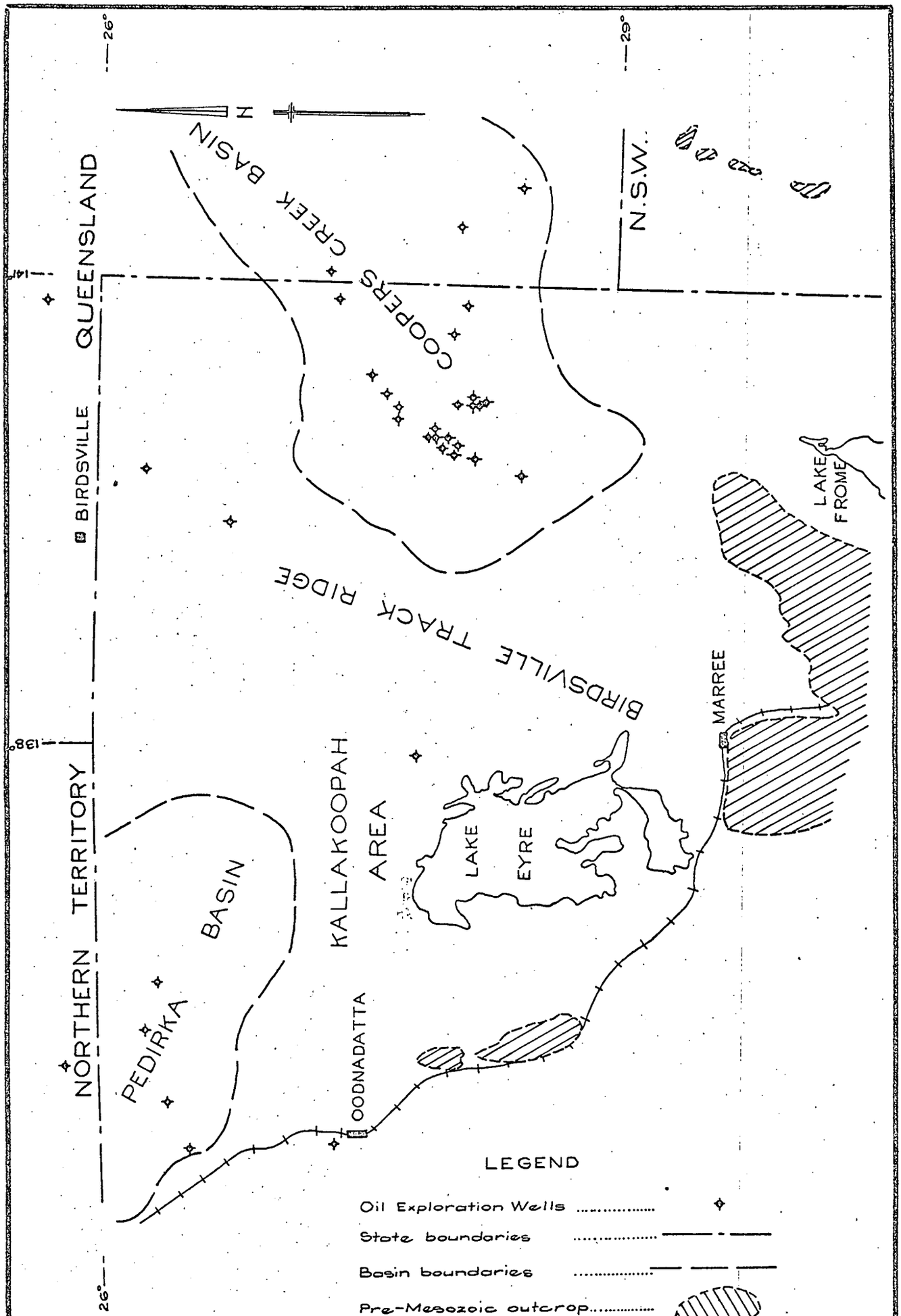
APPENDIX

SUMMARY OF WELL DATA

SUMMARY OF WELL DATA

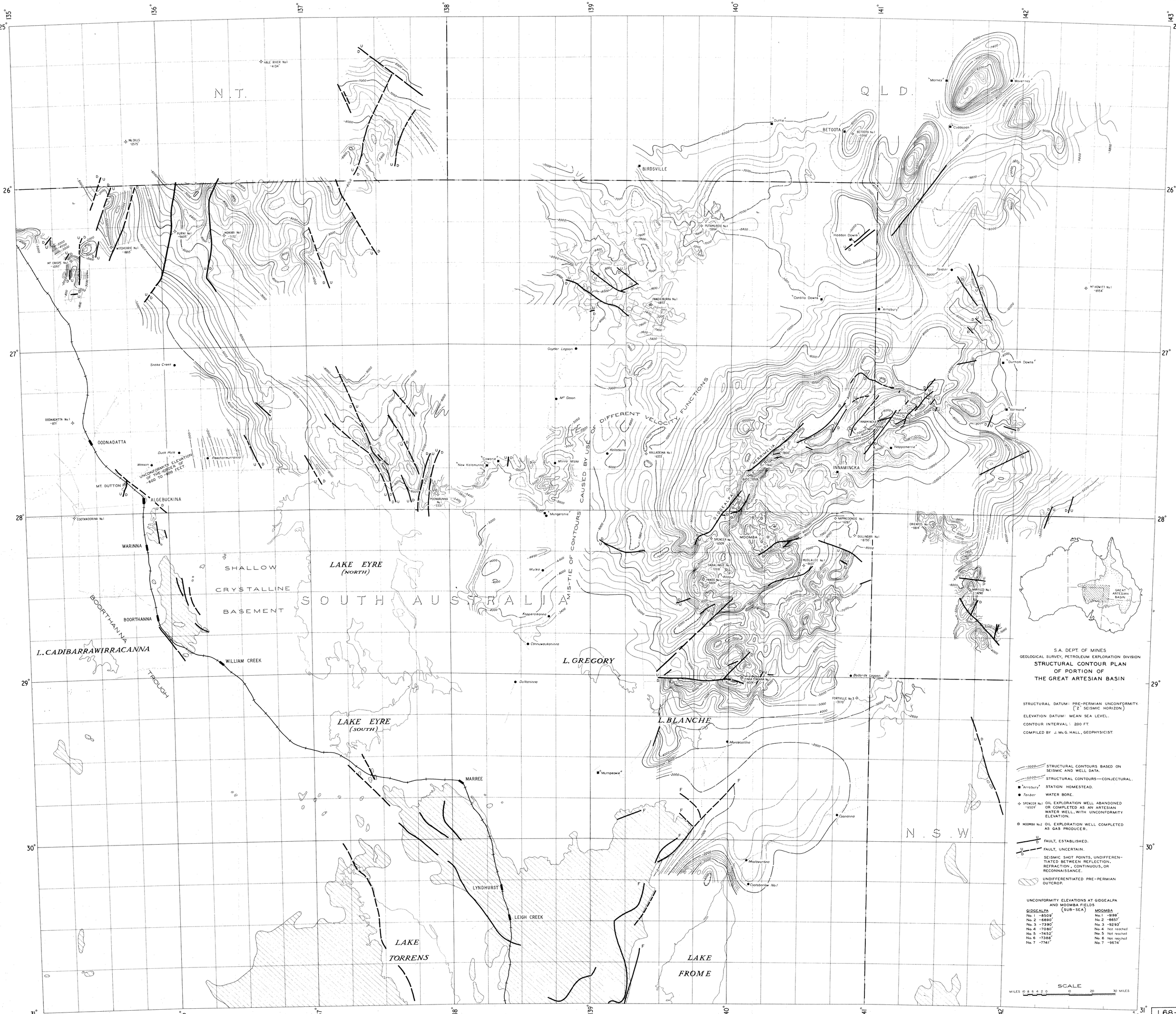
Well	Position	Depth of "Z" Unconformity (rel. to M.S. L. in brackets) Feet	Total Depth (Rel. to M.S. L. in brackets) Feet	Company
Betoota 1	25°42'30" S 140°49'46"E	5757 (-5398)	9824 (-9465)	Delhi-Frome Santos
Cootanoorina 1	28°00'30"S 135°20'00"E	not reached	3111 (-2756)	S.A.Government
Dullingari 1	28°07'56"S 140°52'30"E	9050 (-8730)	11588 (-11268)	Delhi-Santos
Fortville 3	29°07'35"S 140°53'55"E	3501 (-3170)	3610 (-3279)	S.A. Government
Gidgealpa 1	27°56'46"S 140°04'56"E	8690 (-8509)	13114 (-12933)	Delhi-Santos
2	27°56'44"S 140°03'02"E	6868 (-6690)	9020 (-8842)	Delhi-Santos
3	27°58'28"S 140°03'05"E	7566 (-7390)	10935 (-10759)	Delhi-Santos
4	27°58'37"S 140°00'34"E	7245 (-7080)	7783 (-7618)	Delhi-Santos
5	28°01'21"S 139°58'26"E	7618 (-7452)	8723 (-8557)	Delhi-Santos
6	27°55'24"S 140°02'38"E	7565 (-7388)	7805 (-7628)	Delhi-Santos
7	28°02'19"S 140°00'10"E	7909 (-7741)	10582 (-10414)	Delhi-Santos
Hale River 1	25°15'48"S 136°43'36"E	4545 (-4145)	5683 (-5272)	Amerada
Innamincka 1	27°29'21"S 140°55'08"E	7050 (-6637)	12637 (-12224)	Delhi-Frome-Santos
2	27°27'10"S 141°03'17"E	11302 (-10968)	11763 (-11429)	Delhi-Santos
Kalladeina 1	27°39'28"S 139°24'00"E	6441 (-6333)	12341 (-12233)	Delhi-Santos
MacDills 1	25°43'50"S 135°47'35"E	2987 (-2575)	10515 (-10103)	Amerada
Merrimelia 1	27°49'04"S 140°06'54"E	8610 (-8430)	10332 (-10152)	Delhi-Santos
2	27°42'00"S 140°14'04"E	7650 (-7442)	13011 (-12803)	Delhi-Santos
3	27°37'25"S 140°21'26"E	7994 (-7800)	8981 (-8787)	Delhi-Santos

Well		Position	Depth of "Z" Unconformity (rel. to M.S. L. in brackets) Feet	Total Depth (Rel. to M.S. L. in brackets) Feet	Company
Merrimelia	4	27°47'3" S 140°07'51"E	8487 (-8281)	8511 (-8305)	Delhi-Santos
Mokari	1	26°19'06"S 136°26'22"E	7395 (-7172)	7827 (-7604)	French Pet. Co. (Aust.)
Moomba	1	28°09'09"S 140°16'11"E	9322 (-9199)	9503 (-9380)	Delhi-Santos
	2	28°10'56"S 140°13'36"E	8766 (-8657)	9858 (-9749)	Delhi-Santos
	3	28°08'08"S 140°12'46"E	9474 (-9322)	9508 (-9356)	Delhi-Santos
	4	28°12'50"S 140°15'06"E	not reached	8311 (-8191)	Delhi-Santos
	5	28°02'32"S 140°13'07"E	not reached	8406 (-8246)	Delhi-Santos
Mt. Crispe	1	26°26'43"S 135°22'36"E	1528 (-1097)	5647 (-5216)	French Pet. Co. (Aust.)
Mt. Howitt	1	26°37'27"S 142°28'17"E	7426 (-6954)	7719 (-7247)	Delhi-Santos
Nappacoongee	1	28°01'53"S 140°44'39"E	6564 (-6287)	9874 (-9597)	Delhi-Santos
Naryilco	1	28°27'04"S 141°42'23"E	4739 (-4290)	4847 (-4398)	Delhi-Santos
Oodnadatta	1	27°26'S 135°21'E	1293 (-871)	1322 (-900)	Santos
Orientos	1	28°03'20"S 141°25'38"E	7288 (-6814)	11527 (-11053	Delhi-Santos
Pandieburra	1	26°45'34"S 139°25'03"E	6970 (-6853)	7253 (-7138)	Delhi-Santos
Pando	1	28°24'58"S 139°48'25"E	5702 (-5604)	6343 (-6245)	Delhi-Santos
Poonarunna	1	27°54'20"S 137°54'50"E	5349 (-5331)	5567 (-5549)	French Pet. Co. (Aust.)
Purni	1	26°17'10"S 136°05'35"E	5860 (-5605)	6150 (-5895)	French Pet. Co. (Aust.)
Putamurdie	1	26°16'31"S 139°46'35"E	6130 (-5994)	6406 (-6270)	Delhi-Santos
Spencer	1	28°10'01"S 139°51'49"E	6626 (-6509)	6747 (-6630)	Delhi-Santos
Toondina	1	27°57'S 135°22'E	not reached	305 (+3)	S.A. Government
	2	27°57'S 135°22'E	not reached	305 (+42)	S.A. Government
Witcherrie	1	26°22'20"S 135°39'10"E	(-1865)	(-4518)	French Pet. Co. (Aust.)



DEPARTMENT OF MINES — SOUTH AUSTRALIA

	Drn. J.M.G.H.	LOCALITY MAP TO ACCOMPANY EXPLANATORY NOTES ON 'Z' HORIZON CONTOUR PLAN GREAT ARTESIAN BASIN	SCALE: 80 Miles to 1 inch
	Tcd. N.E.		S 6165 994·2/4+81
	Ckd. L.V.W.		DATE: 16 Oct 67.
	Exd.		


N.T.
Q L D.
N. S. W.
SOUTH AUSTRALIA
HALE RIVER No.1 -4134'
McDILLS -2575'
WITCHERRIE No.1 -1865'
PURNI No.1 -5605'
MOKARI No.1 -1172'
MT CRISPE No.1 -1097'
OODNADATTA No.1 -871'
OODNADATTA
Duck Hole
Watson
Peechamurranna
MT. DUTTON
ALGEBUCKINA
COOTANOORINA No.1
WARINNA
BOORTHANNA
BOORTHANNA TROUGH
L. CADIBARRAWIRRACANNA
WILLIAM CREEK
Snake Creek
Geyster Lagoon
Mt Gason
Kallodeina
Mirra Mitta
New Kalamurina
Cowarie
KALLADEINA No.1 -5355'
POONARUNNA No.1 -5331'
Mungeranie
Mulka
Kopperamanna
Cannuwaukaninna
Dulkaninna
LAKE EYRE (NORTH)
LAKE EYRE (SOUTH)
SHALLOW CRYSTALLINE BASEMENT
L. GREGORY
L. BLANCHE
Montecollina
Munpeowie
MARREE
LYNDHURST
LEIGH CREEK
LAKE TORRENS
LAKE FROME
Coonanna
Mooleeurtina
Coolaborloo No.1
BIRDSVILLE
PUTAMURDIE No.1 -5994'
PANDIE BURRA No.1 -6853'
BETOOTA
BETOOTA No.1 -5398'
Duttie
Morney
Waverney
Cuddapan
Haddon Downs
Tanbar
Cordillo Downs
Arrabury
MT HOWITT No.1 -6954'
Durham Downs
Karmona
Nappanerrie
INNAMINCKA
MERRINCLIA No.1 -8442'
GIDGEALPA
SPENCER No.1 -6509'
DARALINGIE No.1 -7008'
PANDO No.1 -5604'
MOOMBA
MUDLALEE No.1 -8407'
NAPPACOONGIE No.1 -9281'
DULLINGARI No.1 -8750'
ORIENTOS No.1 -6814'
MARYFIELD No.1 -4290'
TINGA TINGANA No.1 -6906'
FORTVILLE No.1 -3170'
Ballards Lagoon
MIS-TIE OF CONTOURS CAUSED BY USE OF DIFFERENT VELOCITY FUNCTIONS
UNCONFORMITY ELEVATION OF THE ORDER OF -800 TO -3800 FEET
GREAT ARTESIAN BASIN
S.A. DEPT. OF MINES
GEOLOGICAL SURVEY, PETROLEUM EXPLORATION DIVISION
STRUCTURAL CONTOUR PLAN OF PORTION OF THE GREAT ARTESIAN BASIN
STRUCTURAL DATUM: PRE-PERMIAN UNCONFORMITY. ('Z' SEISMIC HORIZON)
ELEVATION DATUM: MEAN SEA LEVEL.
CONTOUR INTERVAL: 200 FT.
COMPILED BY J. McG. HALL, GEOPHYSICIST
STRUCTURAL CONTOURS BASED ON SEISMIC AND WELL DATA.
STRUCTURAL CONTOURS—CONJECTURAL.
'Arrabury' STATION HOMESTEAD.
Tanbar WATER BORE.
SPENCER No.1 -6509' OIL EXPLORATION WELL ABANDONED OR COMPLETED AS AN ARTESIAN WATER WELL, WITH UNCONFORMITY ELEVATION.
MOOMBA No.2 OIL EXPLORATION WELL COMPLETED AS GAS PRODUCER.
FAULT, ESTABLISHED.
FAULT, UNCERTAIN.
SEISMIC SHOT POINTS, UNDIFFERENTIATED BETWEEN REFLECTION, REFRACTION, CONTINUOUS, OR RECONNAISSANCE.
UNDIFFERENTIATED PRE-PERMIAN OUTCROP.
UNCONFORMITY ELEVATIONS AT GIDGEALPA AND MOOMBA FIELDS (SUB-SEA)
GIDGEALPA
No. 1 -8509'
No. 2 -6690'
No. 3 -7390'
No. 4 -7080'
No. 5 -7452'
No. 6 -7388'
No. 7 -7741'
MOOMBA
No. 1 -9196'
No. 2 -8657'
No. 3 -9293'
No. 4 Not reached
No. 5 Not reached
No. 6 Not reached
No. 7 -9674'
SCALE
MILES 10 8 6 4 2 0 0 20 30 MILES
L68-16
994 2/74 - 81