EXOIL (N.T.) PTY. LTD.

WELL COMPLETION REPORT

HIGHWAY ANTICLINE NO. 1

by

N. R. McTaggart and R.L. Pemberton

C O N T E N T S

A P P E N D I C E S

I L L U S T R A T I O N S

THERE WERE NO
ILLUSTRATIONS SUBMITTED
WITH THIS REPORT,
NOR WAS THERE
A FIGURE 02.

128

SUMMARY

The Highway Anticline No. 1 well was drilled by Exoil (N.T.) Pty. Ltd. and partners as a stratigraphic and structural test of the Highway (James "C") Anticline, approximately 50 miles south of Alice Springs on the Stuart Highway in the Northern Territory of Australia.

Drilling operations were carried out by Oil Drilling and Exploration Ltd., using a T-32 rig with air, mist and aerated water as circulating fluids. The well was spudded on May 18th, 1965 and abandoned as a dry hole at 3770 feet on June 15th, 1965. Exoil supplied the supervisory and geological personnel.

A total of 2838 feet of Cambrian and 932 feet of Proterozoic section was penetrated. The presence of a "bald headed" anticline was proven, strong pre-Pertaoorrta erosion over the anticlinal axis having completely removed the large thickness of Proterozoic Pertatataka and Areyonga Formations. The lowest formation of the Cambrian Pertaoorrta Group was also found to be missing, due probably to stratigraphic pinchout over the axis.

Although traces of residual hydrocarbons were observed, no significant shows of oil or gas were encountered in the well.

RESUME OF DRILLING OPERATIONS

Air drilled 12¼" hole from surface to 188 feet. Reamed to 20" to 158 feet. Ran 16" casing, hit bridge at 70 feet, hoisted. Re-reamed 20" hole from 70 feet to 150 feet. Ran 16" casing to 123 feet and cemented to surface. Mist drilled 13¾" hole from 188 feet to 239 feet. Mist drilled 13¾" hole from 239 feet to 479 feet with hammerdril in string but not operating, removed same. Mist drilled 13¾" hole ahead to 755 feet. Ran Induction Electric Log. Ran 10¾" casing to 745 feet and cemented. Mist drilled 9⅞" hole ahead to 1846 feet. Mist drilled 8¾" hole ahead to 2,065 feet. Mist drilled 7⅞" hole ahead to 2,668 feet. Mudded up and logged hole. Ran D.S.T. from 2,200 feet to 2,668 feet, recovered 1,400 feet of mud. Reamed 8¾" hole to 9⅞" from 1,846 feet to 1,889 feet. Mist drilled 7⅞" hole from 2,668 feet to 2,700 feet. Drilled 7⅞" hole ahead with aerated water to 3,760 feet. Cut bottom-hole core 3,760 feet to 3,770 feet, mudded up, logged and abandoned well.

I N T R O D U C T I O N

Highway Anticline No. 1 well is the tenth wildcat drilled in the Amadeus Basin and the ninth drilled by the Exoil group. The well was drilled in O.P. 43 issued by the Administrator of the Northern Territory of Australia to Magellan Petroleum Corporation. The operation was conducted under farmout arrangements between Magellan and Exoil (N.T.) Pty. Ltd. Partners in the venture were Transoil (N.T.) Pty. Ltd. and Farmout Drillers No Liability.

The well, approximately 50 miles south of Alice Springs, was drilled to examine the Cambrian Pertaoorrta section on an anticlinal high in an area of merging carbonate and shale facies, and to test the petroleum potential of both the Cambrian and Proterozoic section. Primary targets were Lower Cambrian carbonates and sandstones and Proterozoic sandstones.

WELL HISTORY

GENERAL DATA:

Well Name and Number: Highway Anticline No. 1

Location: 24°20'23"S; 133°27'06"E
Map Reference - 4 mile map G.53-1 Henbury

Name and Address of Operator:

Exoil (N.T.) Pty. Ltd.,
Perry House,
Elizabeth Street,
BRISBANE. QUEENSLAND.

Name and Address of Tenement Holder:

Magellan Petroleum Corporation,
276 Edward Street,
BRISBANE. QUEENSLAND.

Details of Petroleum Tenement:

Oil Permit 43, Northern Territory of Australia

Area: 9,918 square miles.

District: Henbury

Total Depth: 3,770 feet

Date Drilling Commenced: 18th May, 1965

Date Drilling Completed: 13th June, 1965

Date Well Abandoned: 15th June, 1965

Date Rig Released: 15th June, 1965

Drilling Time to Total Depth: 26 days

Elevation: Ground 1603' a.s.l., Kelly Bushing 1616' a.s.l.

Status: Dry and abandoned

Cost:

Subsidy Paid:

DRILLING DATA:

Name and Address of Drilling Contractor:

Oil Drilling and Exploration Ltd.,
93 York Street,
SYDNEY. N.S.W.

Drilling Plant:

Make: National Ideal

Type: Rotary T-32

Rated capacity with 4½" drill pipe: 7,500 feet

Motors (3): Cummins Type N.H. 1600, 200 b.h.p.

Mast:

Make: Ideco

Type: Junior Fullview

Rated Capacity: 490,000 lbs.

Pumps:

Make:	Ideal	Ideal
Type:	C-250	C-150
Size:	7¼" x 15"	7¼" x 12"

Air Drilling Equipment:

Unit	Make	Type	Size	Motors
Compressors (3)	Gardner-Denver	WEK	1500 c.f.m. 300 p.s.i.	G.M.C. Twin 471
Boosters (2)	Gardner-Denver	R.D.X.	1500 c.f.m. 1500 p.s.i.	Waukesha 148 D.K.U.
Injection Pump	Bethlehem	Triplex	-	G.M.C.

Blow Out Preventor Equipment:

Make:	Hydril	Schaffer	Schaffer
Type:	G.K.	E.F. Double Gate	Rotating
Size:	12"	12"	12"
Series:	900	900	900

Hole Sizes and Depths:

20" hole from surface to 158 feet

13¾" hole from 158 feet to 755 feet

9⅞" hole from 755 feet to 1889 feet

8¾" hole from 1889 feet to 2065 feet

7⅞" hole from 2065 feet to 3760 feet

7 13/16" hole from 3760 feet to 3770 feet

Casing Details:

Size:	16"	10¾"
Weight:	56 lbs.	40.5 lbs.
Grade:	Conductor	H-40
Setting Depth:	123 feet	745 feet

Casing Cementing Details:

Size:	16"	10¾"

Setting Depth:	123 feet	745 feet
Cement Used:	270 sacks	350 sacks
Cemented To:	Surface	-
Method:	Rig Pumps - down Annulus	B.J. cementing unit - plug

Drilling Fluid:

Highway Anticline No. 1 was drilled from surface to 188 feet with air, from 188 feet to 2700 feet with mist, and from 2700 feet to 3770 feet with aerated water. While mist and aerated water drilling, a solution in water of foaming agent and corrosion inhibitor was continuously injected by mist and rig pumps respectively. The hole was mudded up only for two logging runs.

The following mud and additives were used:-

Gel	9,000 lbs.
Lime	3,300 lbs.
Bi-Chromate	106 lbs.
Teepol	406½ gallons
Comprox	60 gallons

Water Supply:

A water bore was drilled for Exoil by Austral Geo Prospectors Pty. Ltd. 200 feet from the wellsite to 250 feet. A plentiful supply of fresh water was encountered below 180 feet. While mist and aerated water drilling, water was produced from the well at rates up to 1,000 barrels per hour, more than sufficient to keep the reserve pit and mud tanks constantly full. Water supply was adequate at all times.

Perforation and Shooting Record:

No perforation or shooting was required.

Plugging Back and Squeeze Cementation Jobs:

No squeeze cementation jobs were required.

In abandoning the well, the following plugs were run with a B.J. cementing unit:-

Plug No.	Interval	Cement	Felt At
1	2860' - 3310'	100 sacks + 4% $CaCl_2$	3250'
2	3050' - 3250'	50 sacks + 4% $CaCl_2$	
3	600' - 800'	75 sacks + 4% $CaCl_2$	600'
4	Surface - 55'	15 sacks	

Fishing Operations:

No time was lost fishing.

Side-tracked Hole:

No side-tracking was required.

Logging and Testing:

Ditch Cuttings:

Drill cuttings were caught at ten foot intervals from the blooey line while drilling, and at five foot intervals while coring. Cuttings from air drilling were packaged as they came from the blooey line. Cuttings from mist and aerated water drilling were washed and dried before packaging. Sample quality from surface to total depth was very good.

Four cuts of all samples were made - one for Exoil; one for Magellan Petroleum Corporation; one for the Bureau of Mineral Resources, Canberra, and one for the Northern Territory Administration, Alice Springs.

Coring:

Six cores were cut at approximately 600 foot intervals for stratigraphic information as set forth in the subsidy agreement. The well encountered no hydrocarbon bearing zones which required alteration to the coring programme.

Coring equipment consisted of a Hughes Tool Co. 20 foot type "J" conventional core barrel using $7\frac{7}{8}$" hard formation core heads, and a 60' x $6\frac{1}{4}$" Christensen diamond core barrel with a $7\frac{13}{16}$" diamond core head. Five cores were cut with the conventional barrel and the final core was cut with the diamond barrel.

124

The following table lists cored intervals and recoveries:-

Core No.	Interval	Cored	Recovered	% Recovered
1	592' - 603'	11'	9'	82
2	1251' - 1261'	10'	7'6"	75
3	1776' - 1786'	10'	9'	90
4	2428' - 2440'	12'	4'	33
5	3150' - 3155'	5'	3'2"	64
6	3760' - 3770'	10'	4'	40

Total Footage Cored: 65'

Total Footage Recovered: 42'7"

Percentage Recovered: 63%

See Appendix 1 for core descriptions.

Side-Wall Samples:

No side-wall cores were taken.

Electrical and Other Logging:

Three logging runs were made by Welex. For the first run Induction Electric log at 755 feet, hole fluid consisted of a natural water fill up. The hole was mudded up prior to the other two logging runs.

The following logs were run at scales of 2" = 100' and 5" = 100'.

Induction-Electric Log	Run 1	121' - 744'
	Run 2	742' - 2660'
	Run 3	2660' - 3719'
Contact-Caliper Log	Run 1	742' - 2663'
	Run 2	2660' - 3723'
Acoustic Log	Run 1	743' - 2661'
	Run 2	2660' - 3719'
Gamma-Ray Log	Run 1	Surface- 3702'
Continuous Dip-meter	Run 1	1100' - 3723'

See Appendix 4 for dip-meter calculations.

Drilling Time and Gas Log:

Rate of penetration was recorded on a Geolograph

recorder and is plotted on the composite log as minutes per five-foot interval.

As the hole was drilled with air, mist and aerated water from surface to total depth a conventional mud gas detector was not required. Drilling without mud. provided a continuous test of formations drilled. A pilot light was kept burning continuously at the end of the blooey line while drilling and coring and would have provided near-instantaneous detection of any hydrocarbons encountered.

A Corelab hot-wire gas detector was available on site in the event that mud drilling was required.

Formation Testing:

Two conventional drill-stem tests were run to evaluate traces of blue fluorescence between 2250 feet and 2290 feet and black residual hydrocarbons in thin sands in the interval 2390' - 2430'.

D.S.T. No. 1: 2200' - 2668'

Misrun - packer failed to seat and disc valve failed to break.

D.S.T. No. 2: 2190' - 2668'

Initial shut-in 2 minutes; Flowing 30 minutes; Final Shut-In 30 minutes.

I.H.P.	830 p.s.i.	F.F.P.	495 p.s.i.
I.S.I.P.	727 p.s.i.	F.S.I.P.	625 p.s.i.
I.F.P.	366 p.s.i.	F.H.P.	825 p.s.i.

Blow: Fair initial blow dying to zero.

Recovery: 1400 feet drilling mud

Pressure Chart: Figure (see Appendix 2).

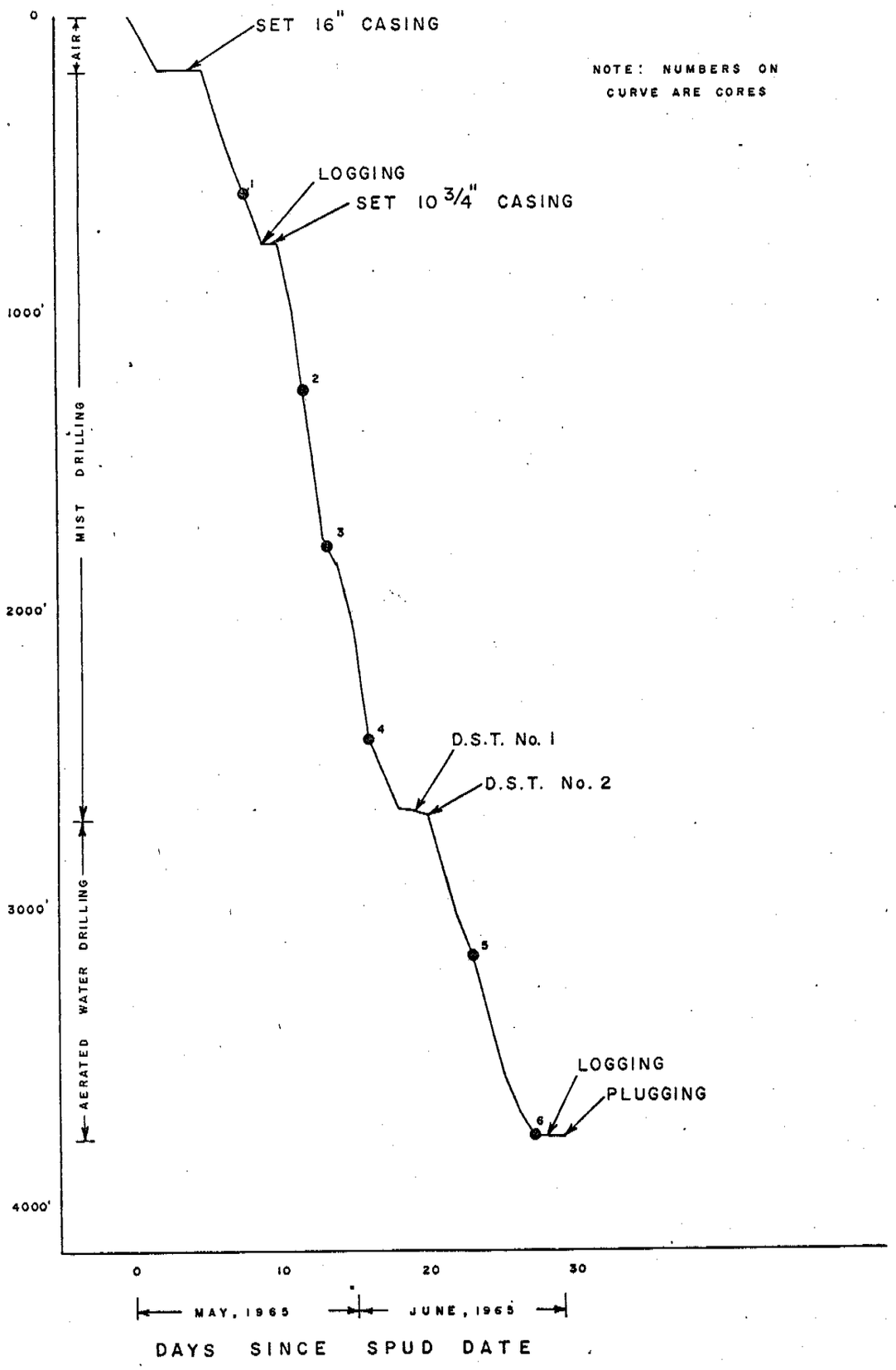
Conclusions: Test mechanically successful - no hydrocarbons present. Formation slightly permeable. Detailed test results are included as Appendix 2.

Deviation Surveys:

Surveys were taken using a Lane Wells "Sure-Shot" instrument run inside the drill-pipe on a sand line.

Deviation was a major problem caused by steeply dipping beds. Surveys were therefore run at closely

FIG. 2



EXOIL (N.T.) PTY. LTD.

HIGHWAY ANTICLINE No. 1

TIME VERSUS DEPTH

spaced intervals and reduced drilling weights were often necessary to minimize deviation.

The table below lists all surveys taken:-

82' - ¾°	975' - 3°	1965' - 3¼°
140' - ¾°	1000' - 2¾°	2060' - 2¾°
230' - 1°	1060' - 3°	2200' - 3¾°
280' - ¾°	1130' - 2½°	2345' - 3¼°
262' - ½°	1190' - 3°	2500' - 4¾°
390' - ¼°	1310' - 3¼°	2560' - 5¼°
440' - 1°	1370' - 3½°	2590' - 5¼°
500' - ⅞°	1430' - 3°	2620' - 5¼°
560' - 1°	1490' - 3°	2765' - 5¼°
650' - 1°	1550' - 2¾°	2920' - 5¼°
795' - 1½°	1670' - 3¼°	3090' - 4¾°
825' - 1½°	1730' - 3½°	3120' - 4¾°
915' - 2½°	1820' - 3¼°	3700' - 4¾°

Temperature Surveys:

No temperature surveys were run in the well.

G E O L O G Y

Summary of Previous Work:

Geological -

Several geologists and expeditions have made reconnaissance or semi-detailed stratigraphic surveys of the area in the vicinity of the James Ranges. The most notable workers who have made cursory examinations of the area are Chewings, Brown, Tate of the Horn Expedition, Ward, Mawson and Madigan.

In 1956, the Bureau of Mineral Resources commenced regional mapping of the Amadeus Basin, and Prichard and Quinlan (1962) defined the type stratigraphic units on the northern limb as a basis for future work. Frome-Broken Hill Pty. Ltd. undertook regional reconnaissance mapping of the whole of the basin (inter alia Leslie, 1960) and since 1960, Magellan geologists have carried out

extensive and locally detailed surveys in the basin, especially in the vicinity of anticlinal features (Stelk and Hopkins, 1962; McNaughton, 1962). Continuing their mapping programme, the Bureau of Mineral Resources covered the central, southern and western areas of the basin and instituted local nomenclature for central and south-western facies variants in the Proterozoic and Cambrian sequences (Wells, Ranford and Cook, 1963). During subsequent coverage of the Henbury 4-mile Sheet, Ranford and Cook (1964) elaborated on the mapping of the James Range anticlines and presented a plausible correlation between the south-western and northern facies of the Cambrian and Proterozoic.

Geophysical -

The Bureau of Mineral Resources carried out a reconnaissance helicopter gravity survey of the Central Amadeus area in 1961 and in general anticlinal features were shown to be coincidental with areas of gravity maxima. The only other geophysical work done in the James Ranges' area was a gravity profile along the Finke River conducted by International Resource Surveys Incorporated and a short reflection seismic survey in the vicinity of the Stuart Highway performed by Geophysical Associates Pty. Ltd. The gravity results showed profile minima over the anticlinal trend indicating a salt core, but the seismic survey was inconclusive due to poor quality reflections.

Drilling -

The only previous drilling for oil in the James Ranges was the Exoil James Range No. 1 well, 30 miles to the west of the Highway site. The recently completed Centralia Oil Waterhouse No. 1 lies 24 miles to the north.

REGIONAL STRATIGRAPHY -

The Amadeus Basin, in its present form, occurs as a latitudinally elongate, downwarped region between the Musgrave (southern) and Arunta (northern) metamorphic-igneous complexes.

However, the sediments of the basin are considered to be merely shelf deposit remnants of a former depositional basin which extended considerably further to the north and east over the Arunta Block. The section covers strata from Upper Proterozoic to Devonian and embraces an aggregate thickness of some 20,000 feet.

In the northern part of the basin the Upper Proterozoic comprises a group of four conformable formations each of which shows evidence of deposition under marine, shallow water conditions. The basal Amadeus unit is the Heavitree Quartzite, a transgressive sandstone/siltstone sequence up to 1,400 feet thick which shows bold outcrop along the truncated northern rim of the basin. The conformably overlying Bitter Springs Limestone consists mainly of algal bearing dolomitic limestone some 3,000 feet in thickness, but varying minor amounts of shale and sandstone also occur and in places the carbonate rock has a high clastic content. The Areyonga Formation, which follows with transitional contact, mainly, comprises a mixed unit of siltstone, sandstones and conglomerates of glacial aspect with limestones concentrated at the top and bottom of its sequence. Its thickness is 1,400 feet in the north central part of the basin but it thins markedly to the east and west, suggesting a deltaic accumulation of outwash material. Conformably following this unit, the unfossiliferous Pertatataka Formation comprises up to 2,000 feet of black to vari-coloured shales and siltstones with thin interbeds of glauconitic sandstones and oolitic limestones.

Along the south-western margin of the basin, the Dean Quartzite and the Pinyinna, the Inindia and the Winnall Beds have been respectively equated with the above four formations. A total thickness of some 14,000 feet has been estimated for these beds and each unit shows an appreciable thickening in comparison with its northern counterpart. In further contrast, local unconformity is

suggested between the Inindia and the Winnall Beds in the former's type area and the latter is a distinctly sandy facies variant of the Pertatataka.

The Cambrian deposits of the Amadeus Basin are included under the composite name Pertaoorrta Group, a 5-6,000 feet marine sequence which shows an interesting clastic to carbonate facies change. The better known central facies comprises the predominantly sandy Arumbera Formation, the abundantly fossiliferous Hugh River Shale and the sandy Goyder Formation. Eastward, the uppermost two units become more carbonate rich through an increasing abundance of limestone tongues until, east of Alice Springs, this facies, the Jay Creek Limestone, occupies the entire lithological interval of the two formations.

To the west the Hugh River Shale becomes sandier, particularly in its second and uppermost quarters, whereby it is divisible into the Tempe Member, the Illara Sandstone, the Deception Member and the Petermann Sandstone. The Tempe overlies the Eninta Sandstone which is equivalent to the upper part, at least, of the Arumbera Formation. Further west the Deception Member also changes to sand and the sequence is mapped as the 3,000 feet thick Cleland Sandstone which overlies the Winnall Beds with unconformity. The Tempe and Illara have been described under the names Mission and Gardner formations by McNaughton.

To the south of the James Ranges, the Chandler Limestone, occurring between the Eninta and the Tempe, comprises up to 300 feet of contorted cherty limestone, dolomite and minor clastics. However, the detailed stratigraphic relationship of the Chandler to the Tempe and the limits of the former's geographical distribution have not, as yet, been established.

Conformably following the Pertaoorrta is the Larapinta Group of fossiliferous marine strata. The basal unit is the Cambro-Ordovician Pacoota Sandstone, up to 2,500

feet thick, composed predominantly of clean quartz sandstone. The overlying Horn Valley Siltstone is 440' thick in the north-west, but it thins and pinches out completely eastward and southward. The phosphatic Stairway Sandstone conformably overlies the Horn Valley but is more transgressive, overlapping the lower Larapintine units to the south and east where it unconformably rests upon Pertaoorrta. The formation is almost 900 feet thick in the north-west and central parts of the basin but it thins eastward and southward in harmony with its contiguous formations. The top Larapinta unit is the Stokes Formation, comprising up to 2,000 feet of vari-coloured siltstones with limestones in the lower part and some transitional sands at the base.

The Mereenie Sandstone overlies the Stokes Formation conformably in the central part of the Amadeus Basin but elsewhere, laps unconformably onto lower Larapintine units. Where conformity exists; a basal 450 feet of brown sand is always present which contains fossils of Ordovician aspect. The upper part of the Mereenie consists of some 2,000 feet of white to vari-coloured unfossiliferous, possibly continental sandstone, usually assigned to the Silurian on a residual basis. As with the underlying Larapinta units, the Mereenie Sandstone shows thinning to the east and south, the latter being the more marked.

The Pertnjara Formation, at least 10,000 feet of continental clastics, overlies the Mereenie with angular unconformity. It comprises a lower siltstone section and an upper unit of red-brown to white silty and pebbly sandstone. Plant and fish remains of Devonian aspect have been found in both sections. The Pertnjara Formation is the topmost Amadeus unit and it occurs as an obscuring fill type deposit over the northern and central regions of the trough.

FORMATIONS PENETRATED -

Stratigraphic Table

Age	Lithological Unit	Formation Tops Depth	Subsea	Thickness
Cambrian	Goyder Formation	Surface	+1616'	480'+
Cambrian	Hugh River Shale	480'	+1136'	2358'
Proterozoic	Bitter Springs Limestone	2838'	-1222'	932'+

Detailed Stratigraphy:

Goyder Formation Surface - 480' (480'+)

Age: Cambrian

Predominantly sandstone at the top with interbeds of limestone and minor shale and siltstone increasing to dominance downwards. Sandstone yellow to red-brown, limonitic, calcareous, fine to coarse grained, fairly porous, oolitic in places, grades to sandy limestone. Shale and siltstone red-brown, grey, green and white, ochreous, micaceous, often grade one to the other. Limestone brown, buff and light grey, dolomitic, often silty to sandy, crypto-crystalline, rarely oolitic and gypseous, dense but occasionally vuggy. The base of the formation is taken at the last massive sand, which pick agrees in both samples and logs with that made in Exoil Alice No. 1.

Hugh River Shale 480' - 2838' (penetrated thickness 2538')

Age: Cambrian

Siltstone-Shale-Limestone 480' - 1090' (thickness 610')

Slight excess of brown, pink and white, dense, crystalline, rarely oolitic, dolomitic limestone over equal amounts of red brown, occasionally grey green, micaceous, slightly calcareous siltstone and shale. Siltstone often sandy, grades to minor brown to green, calcareous, ferruginous, slightly porous sandstone. Siltstone increases to half total percentage over bottom 200 feet of section. Trace gypsum throughout, especially 760' - 780' interval.

Siltstone Section 1090' - 1685' (thickness 595')

Mainly red brown, occasionally grey green, micaceous siltstone as above. Grades to shale on one hand and becomes sandy,

grading to trace of white and grey green, ferruginous, calcareous, slightly porous sandstone on the other. Two zones of buff dolomitic limestone are interbedded in lower half of section, the lower one of which produced a marked break on the electric-log due to its theft of mud.

Dolomite with red-brown to blue-grey clastics 1685' - 2310' (thickness 625')

Red-brown to blue-grey micaceous siltstone, as above, occasionally grading to sandstone, comprises over half of lithology of section. Remainder consists of roughly equal amounts of similar shale and grey, white and amber, gypseous, granular, dolomitic limestone and dolomite. Blue-grey siltstone and shale are seen as un-weathered parent material of red brown. Carbonate shows fair amount of black interstitial, residual hydrocarbon.

Dolomite with vari-coloured clastics 2310' - 2838' (thickness 528')

Siltstone in excess of shale and carbonate as in section above. Dolomite and dolomitic limestone mainly white to amber as before, but siltstone/shale fraction shows alternatively dominant red-brown colour and gradations of white, cream, lilac, tan, blue-grey, grey and black. Trace sandstone throughout, quartzose, fine, tight, cherty, micaceous, showing same colour variations as siltstone/shale, except red-brown. Black and white speckling is common below 2650', tan and white mottling below 2760' and black pelletal grains occur in sandstone below 2810'.

Bitter Springs Limestone 2838' - 3770' (penetrated thickness 932'+)

Age: Upper Proterozoic

White, grey, amber and brown dolomite, dolomitic limestone and some pure limestone with minor interbeds, generally of black, grey and red-brown shale and siltstone. Carbonate occasionally pyritic, gypseous, glauconitic, cherty, oolitic, vuggy and styolitic. Several weathered zones, usually associated with an increase in shale and siltstone, occur in which carbonates become tan to red-brown and almost indistinguishable from

clastics. Strata are steeply dipping and variously fractured and slickensided. Algal impressions were recovered in Core No. 6 (3150' - 3155'). The formation top was picked at the change to massive, dense carbonate in the cuttings and at the marked shoulders on the gamma-acoustic log.

STRUCTURE -

Highway Anticline No. 1 was sited on the crest of a closed structure, known also at James Range "C" Anticline, which was defined by geological mapping. Closure around the latitudinal plunges and the northern flank of the structure is marked by dips up to 20° in the Pacoota Sandstone. The results of the seismic reflection survey conducted to determine the southerly closure were disappointing, but some deepening reflections, coupled with scattered low southerly surface dips, were considered sufficient to confirm that closure exists. Net closure is undoubtedly enhanced by two faults which are apparent on the south flank, one proximal to and the other about three miles from the wellsite.

Highway Anticline lies on an anticlinal hinge line which extends from the Gardner Range in the west, through the James Range structures eastward through the Mt. Burrel Anticlinorium to the Hale River metamorphic inlier. North of this line the Amadeus Basin shows considerable downwarp of strata, a thick fill of Pertnjara Formation, gentle fold elements and fair conformity between formations. In contrast, the area to the south of this alignment is characterised by faulting, major unconformities and hiati and appreciable post-depositional folding. A number of breached anticlines on this southern block show basally truncated Pertaoorrta resting with marked angular unconformity upon Pertatataka, Areyonga and even Bitter Springs, indicating deposition of the Pertaoorrta over a pavement high of uplifted and eroded Proterozoic. Incipient positive folding of the Palaeozoic strata has produced typical "bald headed" anticlinal features. While it was realised that

this type of structural configuration possibly exists beneath the James Range features, surface mapping tended to indicate that the severity of the pre Pertaoorrta movement was decreasing eastward and consequently the Highway Anticline No. 1 well was programmed for a full Cambrian section. Drilling, however, showed that the Highway Anticline is as "bald headed" as the western features to the extent of onlap removal of the Arumbera and the basal Hugh River over an eroded high in the Bitter Springs.

RELEVANCE TO OCCURRENCE OF PETROLEUM

No significant indications of petroleum were encountered in Highway Anticline No. 1. Five zones within the Hugh River Shale (1530' - 1550', 1810' - 1830', 1970' - 2090', 2250' - 2310' and 2810' - 2830') showed probable residual hydrocarbon in the form of interstitial masses, vug linings or small pellets. These were black and hard except the 1530' - 1550' occurrence which was brown and the 2250' - 2310' sample where the material graded to brown, some of which was soft and waxy. This latter zone was covered by Drill Stem Test No. 2 from which no hydrocarbons were recovered. Traces of similar black residual were also recorded from the Bitter Springs in the well in the intervals 2870' - 2880', 3650' - 3660' and 3740' - 3750' and some brown coloration was noted in the uppermost instance.

The black form fluoresced only in the zone 3650' - 3660' where it gave a dull blue colour. On the other hand, the brown residual fluoresced brightly but in scattered or pinpoint fashion in yellow and blue. Fluorescence was also noted at 2450' - 2470', apparently in association with pyrite, and at 2810' - 2830' in dolomite but dissociated with the black residual material.

The absence of the primary target, the Arumbera Formation, has implications that may warrant further investigations on this structure. That the Arumbera is represented in wells to the north and in outcrop to the west indicates that

the formation must wedge out at least on the northern and western flanks of the Highway Anticline. Furthermore, outcrop a few miles to the south, mapped by Ranford and Cook (loc.cit.) as Pertatataka, has an Arumbera aspect and suggests that the Highway structure is completely circumscribed by a pinchout edge of the unit.

Pre-Pertaoorrta erosion of the upfolded Proterozoic has exposed a core of Bitter Springs which, off structure, must be flanked by the Areyonga and Pertatataka. Thus, there probably exists a truncated cone of Areyonga, ideally capped upsection by Pertatataka, and an interesting entrapment condition could prevail, either within the Areyonga or the Arumbera pinchout.

POROSITY AND PERMEABILITY OF SEDIMENTS PENETRATED

Drill cuttings and cores indicated a general lack of intergranular porosity except in the sandstones of the Goyder Formation and in the siltstone-shale-limestone section at the top of the Hugh River Shale. In the Hugh River and Bitter Springs, vugular porosity was noted in the carbonate beds, for example, in the aquifer at 1530' - 1580', it was estimated to be at least 20%, but in the main it appears to be a minor value. The Bitter Springs penetrated section showed an aquifer and a thief zone of magnitudes far out of proportion to the slight vugular porosities observed. Consequently, it must be inferred that these were fracture zones, a conclusion which is supported by the amount of fracturing noted in Cores 5 and 6 in this formation.

Several aquifers were encountered in the well in sands in the Goyder and the uppermost Hugh River unit, in vugular carbonates in the siltstone section of the Hugh River and, as mentioned, in a probable fracture zone in the Bitter Springs. No drilling problems were caused by these aquifers since the well was air drilled, but an indication of their lost circulation potential was suggested when drilling fluid

FIG. 4

ALICE SPRINGS

HIGHWAY ANTICLINE

HIGHWAY ANTICLINE No.1 WELL

Stuart

HUGH

RIVER

HUGH RIVER
CHANDLER

ORANGE CREEK H.S.

Q
S
Olp
Oms
Olh
Cup
Tp
Tc
Ouf

LEGEND

- Q — Recent
- S — Mereenie
- Ouf — Stokes
- Oms — Stairway
- Olh — Horn Valley
- Olp — Pacoota
- Cup — Geyder
- Fault

EXOIL (N.T.) PTY. LTD.

SURFACE GEOLOGY

HIGHWAY ANTICLINE

NOTE: Geology after WILLIAMS, SWARBRICK & FITZPATRICK

SCALE OF MILES (APPROX.)

0 1/2 1

for logging would not rise above the 1530' - 1580' aquifer.

The thief zone at 3670' - 3740' took about 800 barrels per hour of water and after it was encountered the well yielded little more than the drilling injection rate. It is inconceivable that the thief horizon would have been dry when encountered, but since it took fluid from above, its water table must have been very low, at least below that of the 3340' aquifer.

CONTRIBUTIONS TO GEOLOGICAL CONCEPTS AS A RESULT OF DRILLING

The most important contribution made by drilling Highway Anticline No. 1 is the confirmation that the James Range anticlinal alignment is the site of an important pre-Pertaoorrta hinge line. The exact structural nature of the buried lineament was not established from the drilling of one well but it is inferred that it is anticlinal from observations on the exposed western continuation in the Gardner Range. It was previously conceived that some of the Pertatataka may have been removed by pre-Pertaoorrta erosion of the uplifted axis, but it was by no means envisaged that this central part of the feature would be breached to the Bitter Springs and that the basal Pertaoorrta would be missing over it.

The Hugh River Shale was shown to be a typical central Amadeus shale facies with fingers of carbonate throughout its whole thickness. These carbonate bands continue up into the Goyder and herald the incoming of the eastern Jay Creek Limestone facies. However, since carbonate is in minority in the drilled section and since the Hugh River and Goyder are readily discernible units it is considered unjustified in mapping Jay Creek at this point.

The four sections demarcated in the Hugh River correspond almost exactly with the Petermann, Deception, Illara and Tempe units, according to a log correlation through Exoil James Range 'A' No. 1 to Exoil East Johnny's Creek No. 1.

However, there is very little or no lithological representation of the Petermann or Illara sand facies in either of the James Range wells.

Correlation of Highway Anticline No. 1 with Exoil Alice No. 1 is hampered by the occurrence of salt at the base of the Hugh River in the latter well. However, the sonic and gamma logs indicate that the top of the salt (6770') in Alice No. 1 corresponds to the point 2470' in Highway Anticline No. 1 and that the salt section (400') of the former well equates with the basal 370' of Hugh River in the latter.

Since the lowermost 40 feet of Hugh River and the whole of the Arumbera are missing from the Highway Anticline well (as shown by James Range 'A' No. 1) little tangible contribution was made to solving the Chandler Limestone-Tempe problem. Outcrops of contorted cherty limestone two miles south of the well, mapped by Ranford and Cook (loc.cit) as Chandler, do not appear to have any obviously recognisable equivalent in the well. However, it is possible that the cherty section below 2470' is Chandler equivalent, which conclusion would be in accord with an assignment of the Alice No. 1 salt and the cherty zone below 1590' in James Range 'A' to this member.

REFERENCES

LESLIE, R.B., 1960 - The geology of the southern part of the Amadeus Basin, Northern Territory. Unpubl. Rep. for Frome - Broken Hill Co. Pty. Ltd. No. 4300 - G - 28.

McNAUGHTON, D.A., 1962 - Petroleum prospects Oil Permits 43 and 46, Northern Territory, Australia. Unpubl. Rep. for Magellan Petroleum Corporation.

PRICHARD, C.E., and QUINLAN, T., 1962 - The geology of the southern part of Hermannsburg 1:250,000 Sheet. Bur. Min. Resour. Aust. Rep., 61.

RANFORD, L.C., and COOK, P.J., 1964 - Geology of the Henbury 1:250,000 Sheet area, Amadeus Basin. Bur. Min. Resour. Aust. Rec. 1964/40 (unpub.).

STELK, C.R., and HOPKINS, R.M., 1962-- Early Sequence of interesting Shelf Deposits, Central Australia. J. Alberta. Soc. Pet. Geol. 10, 1-13.

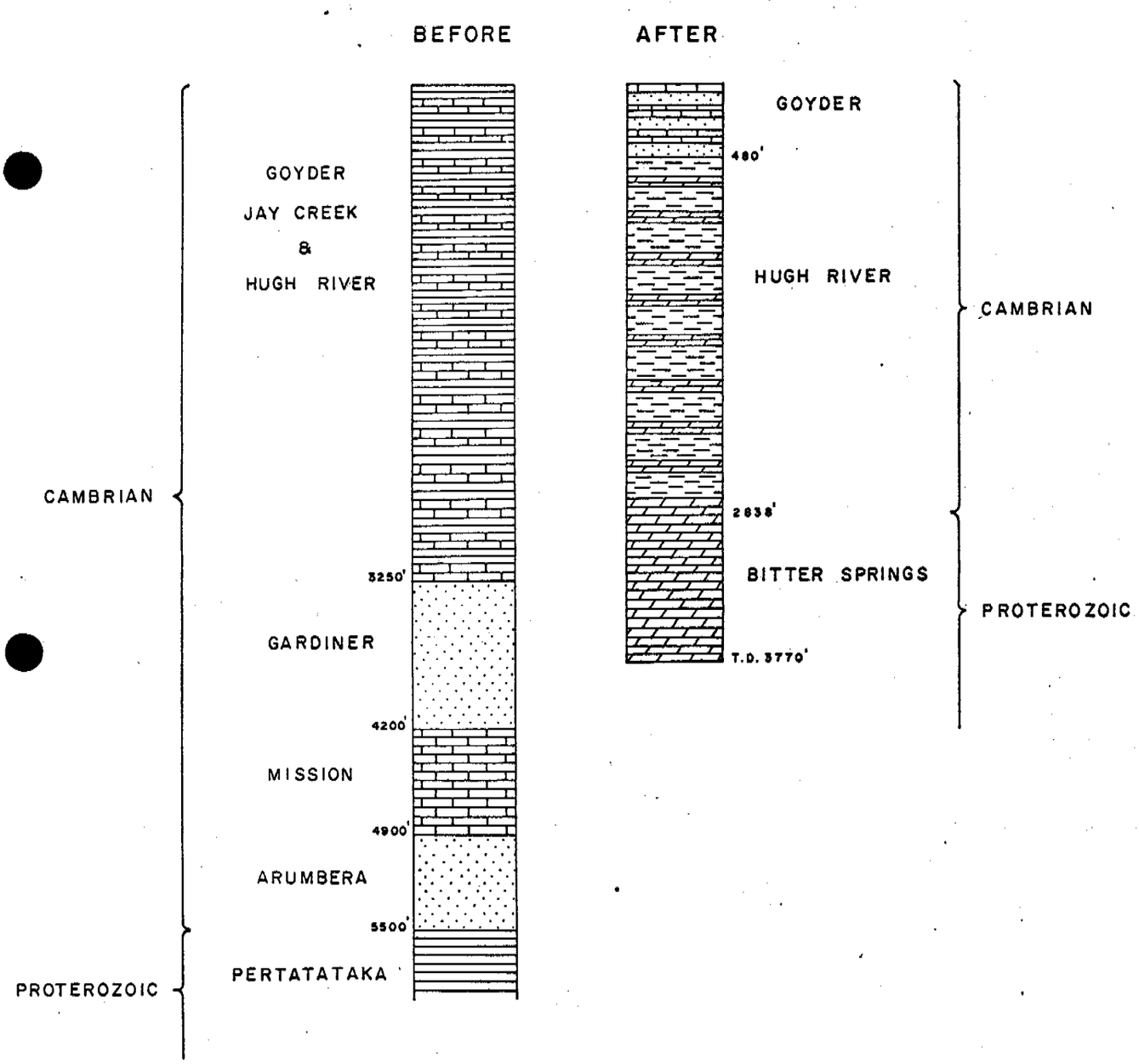
WELLS, A.T., RANFORD, L.C., and COOK, P.J., 1963 - The Geology of the Lake Amadeus 1:250,000 Sheet area. Bur. Min. Resour. Aust. Rec. 1963/51 (unpub.).

FIG. 3

STRATIGRAPHIC SECTIONS

BEFORE AND AFTER DRILLING

HIGHWAY No. 1



NORTHERN TERRITORY ADMINISTRATION—ANIMAL INDUSTRY BRANCH

WATER ANALYSIS

Origin of water ORANGE CREEK (EXOIL) HIGHWAY ANTICLINE WATER BORE

Reference Sn 65 / 658

Specimen Advice Note No. 9535

Date sampled 13/6/65

Date received 16/6/65

* Results in milligrams per litre of filtered sample.

	Sample	Recommended Maximums (see over page). Domestic	Stock	Agriculture
HARDNESS (calculated as $CaCO_3$)—				
" Total	428	500	—	—
" Carbonate	219	—	—	—
" Non-Carbonate	209	—	—	—
ALKALINITY IN EXCESS OF TOTAL HARDNESS	Nil	—	—	—
CHLORIDE	320	500	—	—
SULPHATE	181	250	2,000	—
BICARBONATE	267	—	—	—
NITRATE	5	Child 20 / Adult 120	—	—
FLUORIDE	0.4	1.5	5.0	—
CARBONATE	Nil	—	—	—
SODIUM	185	—	—	—
POTASSIUM	18	—	—	—
CALCIUM	85	100	—	—
MAGNESIUM	52	100	300	—
TOTAL DISSOLVED SALTS	1,113	3,000	8,000	1,000
RESIDUE ON EVAPORATION	-	3,000	8,000	1,000

pH 8.2

General remarks of Analysing Officer with particular reference to suitability of the water for the purpose for which it is stated to be required.

The sample, as analysed, is chemically suitable for human consumption.

Signature Dean M. R Newman.

Date 12-8-65.

* 14.3 milligrams per litre equals 1 grain per gallon. 437.5 grains equals 1oz.

NORTHERN TERRITORY ADMINISTRATION—ANIMAL INDUSTRY BRANCH

95

WATER ANALYSIS

Origin of water ORANGE CREEK (EXOIL) HIGHWAY NO. 1 246-755'

Reference Sn 65 / 641

Specimen Advice Note No. 9523

Date sampled 29/5/65

Date received 7/6/65

* Results in milligrams per litre of filtered sample.

	Sample	Recommended Maximums (see over page). Domestic	Stock	Agriculture
HARDNESS (calculated as $CaCO_3$)—				
" Total	464	500	—	—
" Carbonate	250	—	—	—
" Non-Carbonate	214	—	—	—
ALKALINITY IN EXCESS OF TOTAL HARDNESS	Nil	—	—	—
CHLORIDE	340	500	—	—
SULPHATE	196	250	2,000	—
BICARBONATE	305	—	—	—
		Child 20	—	—
NITRATE	Not Determined	Adult 120	—	—
FLUORIDE	" "	1.5	5.0	—
CARBONATE	Nil	—	—	—
SODIUM	250 Approx.	—	—	—
POTASSIUM	20	—	—	—
CALCIUM	108	100	—	—
MAGNESIUM	47	100	300	—
TOTAL DISSOLVED SALTS	—	3,000	8,000	1,000
RESIDUE ON EVAPORATION	1,200	3,000	8,000	1,000

pH 8.0

General remarks of Analysing Officer with particular reference to suitability of the water for the purpose for which it is stated to be required.

The above results are forwarded for your information.

Signature [signature]

Date 9-8-65.

* 14.3 milligrams per litre equals 1 grain per gallon. 437.5 grains equals 1oz.

NORTHERN TERRITORY ADMINISTRATION—ANIMAL INDUSTRY BRANCH

94

WATER ANALYSIS

Origin of water ORANGE CREEK (EXCIL) HIGHWAY NO. 1 745-1585' Reference Sn 65/641

Specimen Advice Note No. 9523

Date sampled 26/5/65 Date received 7/6/65

* Results in milligrams per litre of filtered sample.

	Sample	Recommended Maximums (see over page). Domestic	Stock	Agriculture
HARDNESS (calculated as $CaCO_3$)—				
" Total	1,576	500	—	—
" Carbonate	136	—	—	—
" Non-Carbonate	1,440	—	—	—
ALKALINITY IN EXCESS OF TOTAL HARDNESS	Nil	—	—	—
CHLORIDE	355	500	—	—
SULPHATE	2,177	250	2,000	—
BICARBONATE	166	—	—	—
NITRATE	Not Determined	Child 20 Adult 120	—	—
FLUORIDE	" "	1.5	5.0	—
CARBONATE	Nil	—	—	—
SODIUM	660 Approx.	—	—	—
POTASSIUM	14	—	—	—
CALCIUM	446	100	—	—
MAGNESIUM	112	100	300	—
TOTAL DISSOLVED SALTS	-	3,000	8,000	1,000
RESIDUE ON EVAPORATION	4,000	3,000	8,000	1,000

pH 8.0

General remarks of Analysing Officer with particular reference to suitability of the water for the purpose for which it is stated to be required.

The above results are forwarded for your information.

Signature [signature]

Date 9-8-65.

* 14.3 milligrams per litre equals 1 grain per gallon. 437.5 grains equals 1oz.

NORTHERN TERRITORY ADMINISTRATION—ANIMAL INDUSTRY BRANCH

93

WATER ANALYSIS

Origin of water ORANGE CREEK (EXOIL) Reference Sn 65 / 658

HIGHWAY NO. 1 DST NO. 2 - TOP WATER Specimen Advice Note No. 9535

Date sampled 5/6/65 Date received 16/6/65

* Results in milligrams per litre of filtered sample.

	Sample	Recommended Maximums (see over page). Domestic	Stock	Agriculture
HARDNESS (calculated as $CaCO_3$)—				
" Total	712	500	—	—
" Carbonate	53	—	—	—
" Non-Carbonate	659	—	—	—
ALKALINITY IN EXCESS OF TOTAL HARDNESS	Nil	—	—	—
CHLORIDE	340	500	—	—
SULPHATE	1,661	250	2,000	—
BICARBONATE	64	—	—	—
		Child 20	—	—
NITRATE	Not Determined	Adult 120	—	—
FLUORIDE	" "	1.5	5.0	—
CARBONATE	Nil	—	—	—
SODIUM	770 Approx.	—	—	—
POTASSIUM	17	—	—	—
CALCIUM	261	100	—	—
MAGNESIUM	15	100	300	—
TOTAL DISSOLVED SALTS	-	3,000	8,000	1,000
RESIDUE ON EVAPORATION	3,200	3,000	8,000	1,000

pH 7.9

General remarks of Analysing Officer with particular reference to suitability of the water for the purpose for which it is stated to be required.

The above results are forwarded for your information.

Signature [signature]

Date 9-8-65.

* 14.3 milligrams per litre equals 1 grain per gallon. 437.5 grains equals 1oz.

NORTHERN TERRITORY ADMINISTRATION—ANIMAL INDUSTRY BRANCH

92

WATER ANALYSIS

Origin of water ORANGE CREEK (EXOIL) — Reference Sn 65 / 658

HIGHWAY NO. 1 DST NO. 2 - BOTTOM WATER — Specimen Advice Note No. 9535

Date sampled 5/6/65 — Date received 16/6/65

* Results in milligrams per litre of filtered sample.

	Sample	Recommended Maximums (see over page). Domestic	Stock	Agriculture
HARDNESS (calculated as $CaCO_3$)—				
" Total	2,306	500	—	—
" Carbonate	234	—	—	—
" Non-Carbonate	2,072	—	—	—
ALKALINITY IN EXCESS OF TOTAL HARDNESS	Nil	—	—	—
CHLORIDE	120	500	—	—
SULPHATE	1,493	250	2,000	—
BICARBONATE	285	—	—	—
		Child 20	—	—
NITRATE	Not Determined	Adult 120	—	—
FLUORIDE	" "	1.5	5.0	—
CARBONATE	Nil	—	—	—
SODIUM	375 Approx.	—	—	—
POTASSIUM	17	—	—	—
CALCIUM	814	100	—	—
MAGNESIUM	66	100	300	—
TOTAL DISSOLVED SALTS		3,000	8,000	1,000
RESIDUE ON EVAPORATION	3,200	3,000	8,000	1,000

pH 7.7

General remarks of Analysing Officer with particular reference to suitability of the water for the purpose for which it is stated to be required.

The above results are forwarded for your information.

Signature W. H. R. Newsome

Date 9-8-65.

* 14.3 milligrams per litre equals 1 grain per gallon. 437.5 grains equals 1oz.

NORTHERN TERRITORY ADMINISTRATION—ANIMAL INDUSTRY BRANCH

91

WATER ANALYSIS

Origin of water ORANGE CREEK (EXOIL) HIGHWAY NO. 1 - 3350' — Reference Sn 65/658

Specimen Advice Note No. 9535

Date sampled 10/6/65 — Date received 16/6/65

* Results in milligrams per litre of filtered sample.

	Sample	Recommended Maximums (see over page). Domestic	Stock	Agriculture
HARDNESS (calculated as $CaCO_3$)—				
" Total	2,370	500	—	—
" Carbonate	185	—	—	—
" Non-Carbonate	2,185	—	—	—
ALKALINITY IN EXCESS OF TOTAL HARDNESS	Nil	—	—	—
CHLORIDE	3,660	500	—	—
SULPHATE	2,540	250	2,000	—
BICARBONATE	225	—	—	—
		Child 20	—	—
NITRATE	Not Determined	Adult 120	—	—
FLUORIDE	" "	1.5	5.0	—
CARBONATE	Nil	—	—	—
SODIUM	3,050 Approx.	—	—	—
POTASSIUM	41	—	—	—
CALCIUM	684	100	—	—
MAGNESIUM	161	100	300	—
TOTAL DISSOLVED SALTS	-	3,000	8,000	1,000
RESIDUE ON EVAPORATION	10,300	3,000	8,000	1,000

pH 7.5

General remarks of Analysing Officer with particular reference to suitability of the water for the purpose for which it is stated to be required.

The above results are forwarded for your information.

Signature Donald R. Newman

Date 9-8-65.

* 14.3 milligrams per litre equals 1 grain per gallon. 437.5 grains equals 1oz.

HIGHWAY ANTICLINE NO. 1 WELL

CORE DESCRIPTIONS

Core No. 1: 592' - 603' recovered 9'

Coring Times: 10, 5, 4, 4, 4, 4, 4, 3, 5, 5, 6 mins./ft.

1'8" Laminated Shale green, purple, micaceous, slightly silty, calcareous and Limestone, dark green, argillaceous, crypto-crystalline, dense.

1'4" Shale red, silty, calcareous, with thin lenticular laminations of Limestone, dolomitic, dark grey, silty, crypto-crystalline, dense.

8" Limestone, dolomitic, buff, ochre, green, partly very silty, argillaceous, crypto-crystalline, dense.

1' Shale red as above.

1'4" Shale, green, micaceous, laminated with thin lenticular grey Limestone partings, as in top 1'8".

8" Shale, red, very silty, micaceous, few angular Limestone fragments at base.

2'4" Thinly interbedded and gradational Shale, red, micaceous, calcareous, and Limestone, argillaceous, vari-coloured, crypto-crystalline, dense.

Dip 5°.

No oil or gas indications.

Core No. 2: 1251' - 1261' recovered 7'6"

Coring Times: 10, 7, 10, 13, 6, 7, 7, 8, 6, 5 mins./ft.

Siltstone rusty red, grading to Shale, very micaceous, (predominately muscovite) non oriented; non calcareous, well indurated, tough.

Few thin partings and rare angular fragments of Sandstone, grey, silty, micaceous, slightly calcareous, tight. Rare small open cavities containing crystalline calcite and gypsum. Many fine fractures healed with white calcite.

Dip of bedding 5°.

No oil or gas indications.

Core No. 3: 1776' - 1786' recovered 9'

Coring Times: 5; 8, 7, 7, 5, 7, 7, 7, 6, 6 mins./ft.

Shale, rusty red-brown, silty, finely micaceous, grading to Siltstone, non calcareous.

Scattered fine laminae and beds to 2" thick of green micaceous Shale.

Locally abundant white-orange gypsum spar filling very fine to wide fractures - gypsum encloses a few Shale fragments.

Core No. 3 (cont.)

Rare thin calcite veins. Core is fractured locally only.

Dip of bedding 5° ±.

No oil or gas indications.

Core No. 4: 2428' - 2440' recovered top 3'10"

Coring Times: 7, 4, 4, 4, 4, 6, 7, 11, 6, 7, 8, 7 mins./ft.

Core composed approximately equal amounts of black resinous Shale and Siltstone and about 20% black fine to medium, tight Sandstone. Bottom 2" of recovery is giving way to red brown Siltstone which agrees with cuttings 2435' - 2440'. Siltstone shows current bedding on black Shale wafers. Some Shale sections are slightly contorted and jointed. No petroleum indications despite asphaltic appearance of matrix and Shale.

Dip of core averages 10°.

Core No. 5: 3150' - 3155' recovered 3'2"

Coring Times: Not recorded - Geolograph not working.

Pink, white and light grey Dolomite and dolomitic Limestone, dense, fractured, massive and showing angular spaces to ½" across. Core crowded with algal heads, mostly horizontal indicating vertical dip of rock. At 3151'8" - 3151'10" a detached piece of banded dark grey to black shale occurs on which cutting head markings indicate dip of 75°.

No petroleum indications in core.

Core No. 6: 3760' - 3770' recovered 3'10"

Coring Times: Not recorded - Geolograph not working.

60% White and pink Dolomite, minor Limestone with trace angular porosity and prominent black stylolitic markings.

40% Red brown to grey green incompetant Shale, folded, fractured and much broken during coring.

Dip of strata 45° - 65°.

No petroleum indications.

(Bottom of core present - loss appears to be from shales at top and middle of cored interval).

Form 5
Report No. 3

Company EXOIL (N.T.) PTY. LTD.

DRILL STEM TEST REPORT

Well: Highway Anticline Elevation K.B.: _____ G.L.: _____ Date: 5th June, 1965

Test No.: No. 1 Interval: 2200-2668 Operator: O.D.E.

Tester, Size & Type: Johnson 4½" Packer, Size & Type 7½ O.H.

Anchor, Length & O.D.: 468' x 4½ Drill Collar Footage above Tester: 360'

Capacity (bbl./foot) - Drill Pipe: _____ Drill Collars: _____

Pressure Bombs (Type: T1 Position: 2175 / T2 2668)

Anchor Perforations (From 2200 To 2210 / From _____ To _____)

Disk Valve Position: 1804 Water Cushion: Nil Mud Wt.: _____ Vis: _____

Chokes - Top: Open ⅝" B.H.: _____ Drill pipe, size & Type: 4½ F.H.

Full Hole, Size & Depth: 9⅞ to 1846', 7⅞ to 2668' Rat Hole, Size & Depth: _____

Mud Level, Before Valve Opened: _____ After Valve Opened: _____

Time Record: Started In: 6:00 a.m. Set Packer: 7:35a.m. Valve Opened: 7:40 a.m.

Disk Broken: 7:50 Valve Shut: 8:20 Pulled Packer: 8:50 Out of Hole: _____

Nature of Blow: Weak air blow built up over 5 minutes died completely in 20 mins.

Gas flow Measuring Method: _____

Time: _____

Reading: _____

Rate of Flow: _____

Oil or Water Flow: _____

Fluid Recovery: _____

Chart Readings: Time Elapsed, mins: ISI _____ Flowing: _____ FSI _____

Pressures: IHP _____ ISIP _____ IFP _____ FFP _____ FSIP _____ FHP _____

Maximum Temperature: _____

Samples: 1 x ½ gallon

Remarks: Disc did not break after initial shutin and leaked fluid past disc. Packer possibly failed also.

Geologist: N. R. McTaggart

Form 5
Report No. 3

Company EXOIL NO LIABILITY

DRILL STEM TEST REPORT

Well: HIGHWAY ANTICLINE NO.1 Elevation K.B.: - G.L.: - Date: 5th June, 1965.

Test No.: 2 Interval: 2190' - 2668' Operator: O.D.& E.

Tester, Size & Type: Johnston 4½" Packer, Size & Type 7½" O.H.

Anchor, Length & O.D.: 478' x 4½" Drill Collar Footage above Tester: 360'

Capacity (bbl./foot) - Drill Pipe: .01422 Drill Collars: .00817

Pressure Bombs (Type: T1 Position: 2165' (From 2200' To 2210'

T2 2665' Anchor Perforations (From To

Disk Valve Position: 1804 Water Cushion: Nil Mud Wt.: - Vis: -

Chokes - Top: Open ⅝" B.H.: - Drill pipe, size & Type: 4½" F.H.

Full Hole, Size & Depth: 9⅞" to 1846'; 7⅞" to 2668' Rat Hole, Size & Depth: -

Fluid Level, Before Valve Opened: - After Valve Opened: -

Time Record: Started In: 11:30 Set Packer: 1:02 Valve Opened: 1:04

Disk Broken: 1:06 Valve Shut: 1:36 Pulled Packer: 2:06 Out of Hole: 3:40

Nature of Blow: Strong blow throughout test, dying slightly.

Gas flow Measuring Method:

Time:

Reading:

Rate of Flow:

Oil or Water Flow:

Fluid Recovery: 1400' of drilling mud and muddy fresh water.

Chart Readings: Time Elapsed, mins: ISI 2 Flowing: 30 FSI 30

Pressures: IHP 830 ISIP 727 IFP 366 FFP 495 FSIP 625? FHP 825

Maximum Temperature:

Samples: 1 x half gallon ex top recovery

2 x half gallon ex bottom recovery

Remarks: Readings top chart. Valve may not have closed fully for FSI as indicated on chart and by continuation of air blow during FSIP.

Geologist: N. R. McTaggart

RESEARCH FOR INDUSTRY

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

CONYNGHAM STREET · PARKSIDE · SOUTH AUSTRALIA

TELEPHONE 791662 · TELEGRAMS 'AMDEL' ADELAIDE

Please quote this reference in your reply:

MP 3/162/0

13th July, 1965

Your reference:

Chief Geologist,
Exoil (N.T.) Pty. Ltd.,
1st Floor, Perry House,
Elizabeth Street,
BRISBANE, QLD.

REPORT MP10-66

YOUR REFERENCE:	Letter dated 30/6/65; RLP:BAE
MATERIAL:	Core rock sample
LOCALITY:	Highway Anticline No.1 at 3766 feet
IDENTIFICATION:	Core
DATE RECEIVED:	2/7/65
WORK REQUIRED:	Dip determination from x-ray photograph

There are three definite bedding planes in the sample. They appear to be cross-bedding features. Assuming the core to have a vertical orientation the average dip angle would be near to 25°.

Investigation and Report by: E.C. Stock

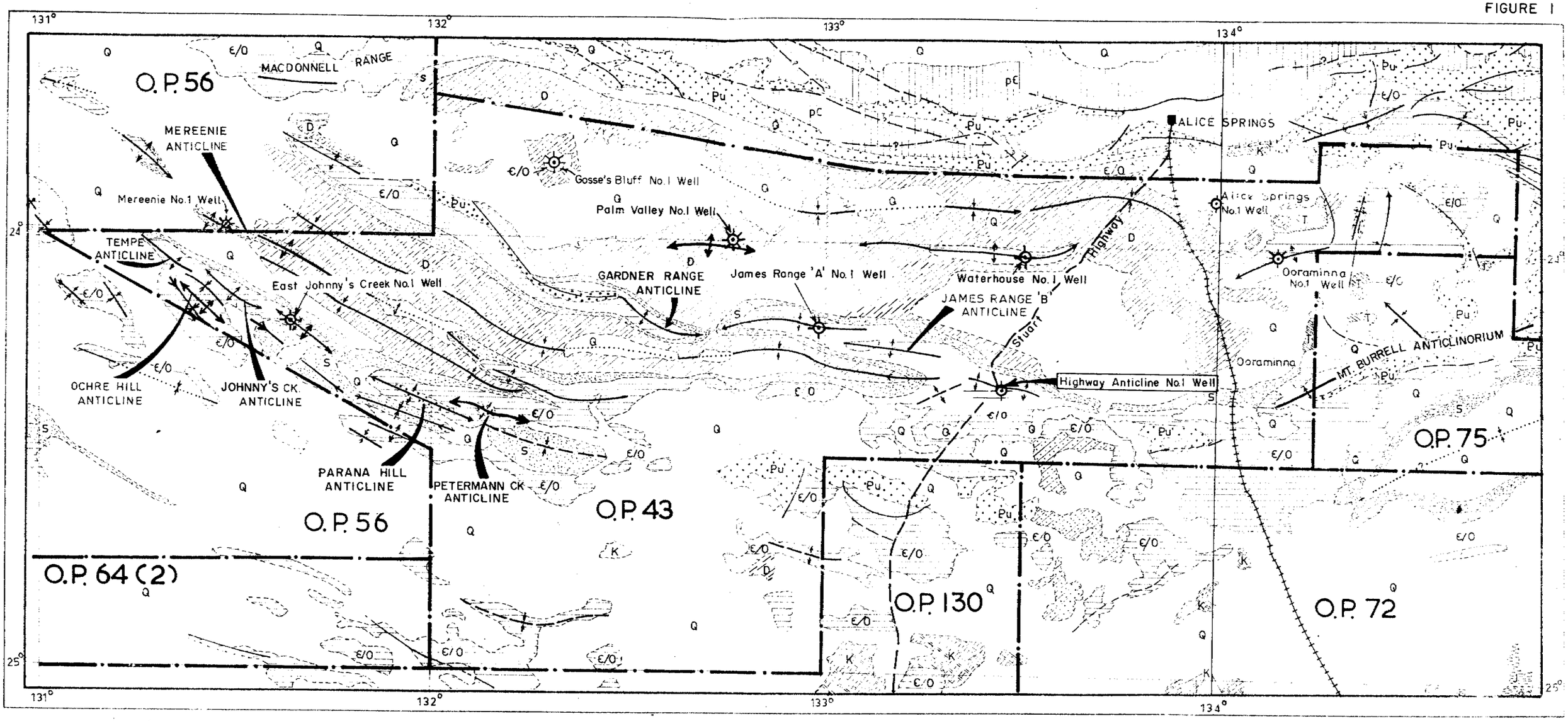
Officer in Charge, Mineralogy Section: H.W. Fander

for H.W. Fander

P. Dixon
Acting Director.

mw:1 E.C.S.

FIGURE 1



LEGEND

- Q — QUATERNARY
- T — TERTIARY — Sediments
- TERTIARY — Grey billy
- K — CRETACEOUS
- ? JURASSIC
- D — DEVONIAN
- S — ? SILURIAN
- €/O — ORDOVICIAN—CAMBRIAN
- Pu — UPPER PROTEROZOIC
- pC — Undifferentiated
- Fault
- Anticline, showing plunge
- Syncline

WELL LOCATION & REGIONAL GEOLOGICAL MAP

HIGHWAY ANTICLINE No. 1

SCALE OF MILES

16 8 0 16 32

Geology after: T. Quinlan, BMR