PR 93-11

Pacific Oil & Gas Pty. Limited

DD92SN1 - EP54

WELL COMPLETION REPORT

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ONSHORE

CRAE Report No. **304750**

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1 ENGINEERING DATA

1.1 Engineering Summary

DD92SN1 is located in the Northern Territory Exploration Permit 54 (EP54), approximately 30 kilometres north of Mittiebah Homestead (Plan PetNTcw7044). The hole was the first of (an intended) three in a stratigraphic drilling program designed to test the source rock and reservoir potential of the Lower Mullera Formation of the South Nicholson Group.

Access to the area was via Camooweal and Gallipoli Homestead (due to localised rainfall having prevented access via the originally proposed track from the Barkly Stock Route) to Mittiebah Homestead, then north towards Mitchiebo Waterhole. One kilometre south of the waterhole the road bends to the east for approximately three kilometres and then turns north again and (after another three kilometres) reaches the boundary fence with the Waanyi/Garawa Aboriginal Land Trust, just 250 metres east of its southwestern corner. On the Mittiebah side of the fence a track leads around this corner post and follows the fenceline north. Eleven kilometres north of the corner post a temporary access track led 570 metres west to the **DD92SN1** drillsite. Site preparation involved removing the spinifex ground cover by sweeping the area (approx. 500m^2) with a grader and digging a small sump.

Prior to starting the stratigraphic core holes attempts were made to find a proximal water supply, since the nearest known supply was an established bore ("Buffalo") 23km to the south (34km by road).

Between November 6 and 10 two bores (WB1 and WB2) were drilled by reverse circulation hammering to 114 metres and 84 metres, respectively. WB2 was dry and WB1 encountered a small volume of water below 42 metres, but this was rapidly depleted by pump testing. Both bore holes were subsequently abandoned and all water was trucked from Buffalo Bore in 68km round trips.

Drilling operations on **DD92SN1** commenced at 1500 hours on November 11, 1992. The rig mast was oriented at 80° (from horizontal) toward 165° (magnetic) and a 5½" hole was drilled by reverse circulation hammering to 54 metres, to which depth 5" HW casing was set and the annulus cemented to surface. That evening a second crew arrived by air charter , so that the operation ran on a double shift from November 12 for the duration of the program.

After a delay waiting for the cement to set the casing shoe was drilled out on the evening of November 12 and HQ coring of the formation began at 53.86 metres below ground level (mbgl). The formation was continuously cored (with better than 95% recovery - see Appendix 7) down to 458.64 metres bgl without any significant mechanical problems. Below 250 metres some problems with spin-out began to occur, mostly due to the small mud pit not allowing sufficient settling out of fines. From the morning of November 22 to the evening of November 23 drilling was delayed by both rain preventing water carting and the need to obtain replacement fanbelts for the rig.

After drilling through the base of the Mullera Formation at around 430 metres on November 21 the hole was terminated at 458.64 metres bgl in the underlying sandstone at 0900 hours on November 24.

Due to the onset of inclement weather conditions (and the resultant increasing incidence of access tracks becoming impassable) it was decided to cancel the proposed downhole geophysical logging of **DD92SN1** and prematurely terminate the drilling program.

On November 25, 1992 the hole was abandoned by setting a single cement plug from 80 metres to surface. The rig and camp were packed up and moved to Mittiebah Homestead by 1500 hours on November 26. Rehabilitation of sites and tracks was begun the following day and completed on December 1, 1992. A chronological log of drilling activities is included as Appendix 1 with graphical presentation given in the Drilling Progress Chart (Plan PetNTcw7049).

1.2 General Data

Hole Name:	**DD92SN1**
Hole Type:	Stratigraphic
Operator:	Pacific Oil & Gas Pty. Limited
Licence Holder:	Pacific Oil & Gas Pty. Limited
Petroleum Title:	EP54, Northern Territory
CRAE Hole Number:	**DD92SN1**
Location:	Approx. 30km north of Mittiebah Homestead. AMG: 723342 East 7950913 North Latitude: 18°31'14"S Longitude: 137°06'56"E Mapsheets: 1:250 000 Mt Drummond SE 53-12 1:100 000 Mitchiebo 6360
Access:	Via the Barkly Highway, Barkly Stock Route and existing pastoral roads past Mittiebah Homestead to the southwestern corner of the Waanyi/Garawa Aboriginal Land Trust, then 11km north along a fenceline track and 570 metres west along a temporary access track.
Elevation:	Ground Level - approx. 320m (from 1:100 000 sheet)
Total Depth:	458.64 metres below ground level
Commencement Date:	November 11, 1992

Total Depth Reached:	November 24, 1992
Rig Released:	November 25, 1992
Drilled by:	Rockdril Contractors Pty Ltd Rig 19, RDV Versatile 1000 Mark III
Datum:	Ground Level (approx. 320m above AHD)
Hole Size:	5½ inch to 54m 3 7/8 inch to 458.64m (TD)

1.3 Drilling Rig

Rockdril Contractors Rig 19, a RD Versatile 1000 Mark III was used to drill the bores and **DD92SN1**. Specifications for this rig and all associated plant are given in Appendix 2.

1.4 Hole Size and Depths

The drilling of **DD92SN1** commenced with a 5½" reverse circulation hammer to 54 metres. After setting and cementing casing to this depth the HQ wireline coring assembly was set up and a small amount of cement was cored from the bottom of the casing prior to the coring of new formation at 53.86 metres bgl. Below this depth the hole was continuously cored in HQ size (3 7/8" or 98mm) size to the total depth of 458.64 metres bgl.

1.5 Casing

The casing set from surface to 54 metres was Longyear HW casing (1541 seamless) with an outside diameter of 114.3mm (4½") and a wall thickness of 6.5mm (¼").

1.6 Drilling Mud

The top 54 metres of **DD92SN1** were drilled by reverse circulation hammering with air as the drilling medium. During the continuously cored remainder of the hole the drilling medium was water with varying proportions of drilling mud components which were mixed and added at the discretion of the driller. The products used (supplied to Rockdril by Milpark Drilling Fluids) mainly comprised Newdrill (a polymer-based mud), Potassium Chloride and Soda Ash.

The mud was mixed into the (plastic-lined) sump/mud pit and pumped down the hole from a hose floating at the far end of the pit. After returning up the annulus it was discharged into the near end of this pit, allowing some gravitational settling of the ground rock before being recirculated. The initial size of this pit was relatively small (approx. 10,000 litres) and during the course of drilling its volume decreased as fines accumulated in it. This was the primary reason for spin-out problems occurring, at one stage (November 17) necessitating the partial cleaning out of the mud pit.

Due to the extremely tight nature of the formation fluid losses down hole were negligible.

Despite the perceived improbability of encountering significant formation gas, a mud tank and an extra quantity of Potassium Chloride were kept available in case a heavy weight mud was required to be pumped down the hole.

1.7 Water Supply

The provision of water for this program looked to be problematic from the outset. While productive water bores proliferate on the black soil country they are extremely sparse in areas where pre-Cambrian rocks are at or near the surface (i.e. no cavernous Cambrian limestone). In May 1990 the Water Resources Division of the NT Power and Water Authority drilled four bores (RN's 26466, 26467, 26508 and 26509) approximately 8km south-east of the **DD92SN1** site looking for water. The holes penetrated up to 100 metres into the Mullera Formation hoping to intersect fractures which might yield water, but all were unsuccessful.

Despite the likelihood of failure, water bores were attempted on this program in the hope that the otherwise long trek across rough tracks by the water truck could be avoided.

The first bore, WB1 (Appendix 4a), was sited near the southern edge of a narrow band of orange sandy terrain where a relatively dense patch of ghost gums are growing. A small volume of water was encountered at 42 metres in weathered sandstone but nothing more down to the drilled depth of 114 metres. Subsequent flow testing in this bore indicated a slow and declining rate of recharge. This, and the apparent quality of the water led to the supposition that this supply was probably a rainwater soak occupying a trough in the bedrock. Attempts were made to stimulate this bore, and then it was cased to 62 metres so that the small amount of water it seemed to offer could be drawn periodically, if necessary. However, ultimately it did not yield any supply, and due to a parting of the casing down hole the pump could not be retrieved at the end of the program.

The second bore, WB2 (Appendix 4b), was drilled to test an interpreted northeast trending lineament visible on aerial photos and represented at surface by a line of tall ghost gums. The lithology was weathered Mullera Formation from the surface down to 84 metres, where the hole was terminated without any water being detected. During withdrawal from this hole the next day it was noted that some water (presumably from seepage) has filled the hole to approximately 54 metres.

During the rehabilitation both of these bores were filled in.

The failure to obtain a proximal water supply meant that it was necessary to cart water from an existing bore, the nearest of which (by road) was "Buffalo" bore (RN 20398). This involved a once- to twice-daily round trip of 68 kilometres with both Rockdril's truck (approx. 2000 litre capacity) and a water trailer (6000 litre capacity) hired from the Homestead.

1.8 Bit and Deviation Record

1.8.1 Drilling Bits

Details of all bits used in drilling **DD92SN1** are contained in Appendix 3.

1.8.2 Deviation Surveys

DD92SN1 was drilled with the mast orientated at 80° from horizontal (i.e. 10° from vertical) towards an azimuth of 165° magnetic (as measured by a hand-held compass).

Initially the downhole camera was unavailable so the first attempt to run a deviation survey (November 18) was at 300 metres, however this was unsuccessful due to problems with getting the timer to work. Renewed attempts on November 20 were successful, and the results are presented in Table 1. (Note: The azimuth on survey 4 is thought to be incorrect).

SURVEY	DEPTH (m)	DIP ANGLE OF HOLE	AZIMUTH
1	100	78°	150°
2	200	78°	151°
3	300	79°	151°
4	400	79°	120°(?)

Table 1: **DD92SN1** Deviation Surveys

1.9 Well Costs

A summary of the costs incurred in the drilling program is given in Table 2.

ITEM	COST
Drilling	$49,720
Drilling supplies	$5,156
Water	$17,401
Mobilization/Demobilization	$6,400
Mud supplies	$1,305
Cement	$280
Site access and rehabilitation	$12,724
Engineering contractors	$2,128
Geophysical contractors	$725
Laboratory analyses	$2,838
Payroll	$16,086
Field and Transportation costs	$25,089
Personnel travel costs	$2,217
Office and Miscellaneous	$149
Overheads	$13,845
TOTAL	**$156,063**

Table 2: **DD92SN1** drilling costs to 07/01/93

2 GEOLOGICAL DATA

2.1 Background

The stratigraphic drilling program in which **DD92SN1** was the first of an intended three holes was designed to test the source rock and reservoir potential in the lower Mullera Formation of the South Nicholson Group.

Pacific's interest in investigating the petroleum potential of the South Nicholson Group stemmed from previously proposed broad lithological and age similarities between these strata and the Roper Group of the McArthur Basin to the northwest. The first requirement for identifying prospectivity in the South Nicholson Group was to establish a viable hydrocarbon source rock. Within the known stratigraphy (Plan PetNTcw7048) the lower half to one third of the Mullera Formation was the only interval which showed any potential to contain significant proportions of organic material.

The upper part of this interval has been drilled previously on the eastern side of the basin (in Queensland) most notably by BHP Minerals, Amoco, the Bureau of Mineral Resources and the Geological Survey of Queensland. Some of these holes encountered encouraging levels of organic material, with up to 3.0% TOC (Total Organic Carbon) revealed in subsequent sampling by CRAE of BHP Minerals Core around the intra-Mullera ironstone units of the Constance Range area. However, it appears that the lowermost Mullera Formation (from just beneath the ironstone units to the top of the Constance Sandstone) had not been drilled anywhere in the basin, and only outcrops poorly.

Also, the encouragement gained from the small intervals of promising organic content was somewhat tempered by analyses of their thermal maturation levels, which indicated that they were consistently overmature (beyond oil generation and, in some cases, beyond oil preservation).

The only previous petroleum drilling of the Mullera Formation in the Northern Territory was in **Brunette Downs 1** in 1964, which was primarily intended to investigate the prospectivity of the overlying Cambrian section. The well (located approx. 100km west of **DD92SN1**) penetrated almost 200 metres of the uppermost Mullera Formation above its TD of 621 metres, but did not identify TOC contents above 0.14% or detect any hydrocarbons within this interval.

After taking out petroleum exploration permits (EP's) 53 and 54, Pacific Oil & Gas undertook a search and review of existing data on the South Nicholson Basin and did field work to identify suitable locations for stratigraphic drilling to encounter the lower Mullera Formation at shallow depths. Despite being just north of a major ESE-trending fault system, the area finally chosen was selected because it was interpreted to have uppermost Constance Sandstone and lower Mullera Formation strata at surface, dipping at approx. 20° to the north, with relatively little faulting. Thus, a program of three holes was designed to provide overlapping sections stepping up in the section from south to north.

Due to continually worsening problems with the weather and water supply the program was terminated after the first hole.

2.2 Geological Summary

DD92SN1 was, based on field mapping, designed to core the lowermost 400 metres of the Mullera Formation and confirm the interpreted contact with the underlying Constance Sandstone. The primary goal was to ascertain the petroleum source potential of the Mullera Formation and the secondary aim was to establish any reservoir potential in intra-Mullera sandstones or the top of the Constance Sandstone.

The hole was spudded in extremely weathered mudstone, siltstone and sandstone of the Mullera Formation and drilled by reverse circulation hammering to 54 metres (thus yielding only powdered rock and small chips). After setting casing and drilling out the cement continuous HQ coring commenced from 53.86 metres below ground level (mbgl).

The intense weathering persisted down to about 81 metres, below which the primary character of the Mullera Formation in this area became much more apparent. It consists mainly of a dominantly planar- to wavy planar-stratified succession of interbedded/interlaminated mudstones, siltstones and sandstones which are commonly stacked in variably complete repetitions of an upward-coarsening cycle. This cycle comprises a lower segment of dark grey/black moderately organic-rich mudstone with interlaminated sandstone/siltstone, a middle segment of mostly dark greenish grey mudstone/siltstone and an upper segment of dominantly very fine to medium, light grey, planar to "massive" sandstone, each of which ranges from centimetres to metres in thickness.

This monotonous sequence extends down to about 430 metres, and then passes gradationally into a dominantly sandy interval (upper boundary selected at 430.7 mbgl) interpreted to be the top of the Constance Sandstone.

The sandstone is mostly very fine to medium with poorly-defined stratification dominated by planar bedding, with frequent "massive" and chaotic units. The top twenty metres mostly alternates between greenish grey and reddish brown, becoming mostly yellowish to brownish grey below about 450 metres.

Fractures and small faults occur frequently throughout the entire cored interval, with a major fault zone (including intense brecciation) between 108 and 122 metres.

A summary lithological log is included as Plan PetNTcw7047.

No indication of hydrocarbons was detected throughout the hole.

2.3 Hole Objectives Versus Performance

DD92SN1 was designed to test the source rock and reservoir potential of the lowermost Mullera Formation in a fully-cored HQ hole which was prognosed to reach the top of the Constance Sandstone between 420 and 450 metres (based on surface mapping).

Due to problems with the water supply the top part of the hole (down to the 54 metre casing point) was drilled by reverse circulation air drilling (rather than coring) to minimize water losses. However, since the section was intensely weathered down to 81 metres this, did not comprise the results.

The lower Mullera Formation was encountered from surface to 430.7 metres, where it passed gradationally into the top of the Constance Sandstone as prognosed.

Much of the Mullera Formation below the base of weathering contained numerous subintervals of dark grey to black mudstone with interlaminated siltstone and sandstone. Cumulative gross thickness of these subintervals over the 350 metres of section from 80m to 430m (base of weathering to top of Constance Sandstone) was approximately 100 metres, thus comprising almost 30% of the section. Of this an estimated 50-60% was dark mudstone, so the relatively organic-rich parts of the section totalled about 50-60 metres, or 14-17% of the unweathered Mullera Formation section intersected.

However, the darkest of these mudstones were collected (24 samples) and submitted for source rock analysis, but yielded largely disappointing results (see Appendix 5), summarized as;

(i) the source rock is organically lean, with eight samples reporting Total Organic Carbon (TOC) values less than 0.4%, only six $\geq$ 1.00% and the richest being 1.5%,

(ii) the level of extractable hydrocarbons is very low (S_1 mostly $\leq$ 0.05),

(iii) the generative potential is very low (S_2 mostly $\leq$ 0.5), and

(iv) the maturity level of the drilled section is beyond peak oil generation.

Therefore, the source rock potential of the lower Mullera Formation appears to be non-prospective for oil and of only low prospectivity for gas. While it is possible that mudstones with richer organic contents occur higher in the section (which the originally proposed program had planned to investigate) these would be likely to have similar maturation levels.

The scenario for reservoir potential is similarly uninspiring. A greater than expected proportion of net sandstone was encountered in the lower Mullera Formation, estimated to be about 20% of the cored section. When combined with the interval in the Constance Sandstone over 100 metres of net sandstone was cored in **DD92SN1**, however it all appeared very tight. The occlusion of intergranular pore spaces by authigenic quartz, carbonate, clays, etc seemed to be essentially complete, with the only significant porosity being small, isolated vugs spread sporadically throughout some sandstone beds. Due to the low prospectivity suggested by these observations (and the poor source rock results) no samples were sent for porosity/permeability analysis or petrography.

Therefore, with regard to **DD92SN1**, the objectives of the hole were adequately met, but suggested insufficient prospectivity to warrant further work. Overall, the objectives of the program were not fully achieved due to the early termination of the program after the first hole. The section of Mullera Formation between the top of **DD92SN1** and the base of the ironstones (possibly 400-500m of section) still remains unknown. Based on intervals above and below it reservoir potential is likely to be very poor and source rock quality may be better, but is still likely to be of similarly high maturity.

2.4 Stratigraphy

(see Appendix 6 for detailed descriptions and Plan PetNTcw7047 for a graphical presentation).

Mullera Formation

Surface to 430.7 metres (430.7 metres thick)

Repetitively interbedded/interlaminated dark grey/black mudstone, dark greenish grey siltstone/silty mudstone and light-medium grey very fine to medium sandstone in broadly similar proportions. The mudstones were organically lean, the sandstones very tight, and no hydrocarbons were detected.

Gradational basal contact.

Constance Sandstone

430.7 - 458.64 metres (TD) (27.94 metres thick)

Greenish grey, reddish brown and yellowish-brownish grey planar bedded to "massive"/chaotic, very fine to medium sandstone with infrequent, minor interbeds of fine, light greenish grey to dark brown mudstone.

The sandstone was very tight throughout and no hydrocarbons were detected.

The assignment of the names Mullera Formation and Constance Sandstone to the encountered section is based on correlation to units mapped at surface and published on the Mount Drummond 1:250 000 Geological Sheet.

2.5 Formation Sampling

2.5.1 Hammer Cuttings

Cuttings from the reverse circulation hammer drilled section of the hole were collected over three metre intervals. Much of the resulting sample was finely ground rock, a subsample of which was washed and described. After two bags of unwashed samples were collected (one for Pacific Oil & Gas and one for the Northern Territory Department of Mines & Energy) the excess was discarded.

2.5.2 Continuous Core

From 53.86 metres below ground level the hole was drilled using a wireline continuous coring technique. Upon recovery the HQ core was pieced together, cleaned, and indelibly marked with a blue line and a red line (red to the right when looking up the core) and a black mark on the core every twenty centimetres (annotated every metre). A wooden core block with the driller's depth was placed at the end of every core run and the intervals cut and recovered were recorded (see Appendix 7).

The core was then photographed wet and dry and laid out for description and logging prior to being packaged for dispatch to Pacific's office in Alice Springs.

2.6 Analyses

2.6.1 Source Rock Analyses

Twenty four 50+ gram samples were taken at frequent intervals throughout the Mullera Formation core, from the first dark mudstone near the base of weathering to just above the top of the Constance Sandstone, with emphasis placed on the darkest, finest-grained units.

All samples were submitted to Geotech (Perth) and, following determination of Total Organic Carbon (TOC) content, those reporting greater than 0.4% TOC were subjected to Rock-Eval pyrolysis. Results of these analyses are given in Appendix 5.

Due to the low prospectivity indicated by these results no other analytical work was undertaken.

2.7 Contributions to Geological Knowledge

DD92SN1 has provided a major contribution to the knowledge of the South Nicholson Basin in that it is the first known subsurface profile through the lowermost Mullera Formation. As such it provides a previously unavailable opportunity to obtain geological information and unweathered rock from this stratigraphic interval.

From a petroleum exploration viewpoint **DD92SN1** has provided reservoir, source rock and maturity data which downgrades the previously largely unknown prospectivity of the lower Mullera Formation.

KEYWORDS

Petroleum, Proterozoic, Drill Stratigraphic, Hydrocarbon Potential.

LOCATION

Approximately 30km north of Mittiebah Homestead.

AMG: E 723 342
N 7 950 913

Latitude: 18° 31' 14" S
Longitude: 137° 06' 56" E

1:100 000 Sheet : Mitchiebo 6360
1:250 000 Sheet : Mount Drummond SE53-12

LIST OF DPO'S

78051, 78052

APPENDIX 1

SUMMARY OF DRILLING ACTIVITIES

APPENDIX 1

SUMMARY OF DRILLING ACTIVITIES

DD92SN1

04/11/92	Travel Tennant Creek to Mittiebah Homestead (via Camooweal and Gallipoli Homestead). Stay at Homestead.
05/11/92	Repair transit damage on rig. Convert head to reverse circulation (RC) assembly. Shift from Homestead to within 3km of drillsite (impassable due to water on track). Wait on bypass track to be made. Back to Homestead.
06/11/92	Mobilize grader and make bypass. Finish rig shift to water bore site. Drill bore (WB1) RC hammer 0-72m (water at 42m). Back to Homestead.
07/11/92	Travel to rig. Repair hole in cyclone hose. RC hammer 72-114m. Small amount of water in hole. Clean/flush/air lift in attempt to improve and estimate flow. Pull out of hole (POOH) and shift to next bore site (WB2). RC hammer 0-84m (dry all the way). Back to Homestead.
08/11/92	Unload camp van and freight truck. Tow van to camp site (WB1 location). POOH WB2 (hole collared from 54m (soak water) - water inject to clear). Shift back to WB1, set up over hole, mark and run wireline to check water table depth. Hook up power to camp. Lining fitted to sump on DD92SN1 and party filled. Back to Homestead.
09/11/92	Travel to site with accommodation van and (hired) water trailer; modify tow frame on water trailer.
10/11/92	Make up 6" hammer and ream WB1 0-60m. POOH. Run 5" hammer to 84m. POOH. Run PVC casing and set at 62m. Make up and run 3" submersible pump. Pump test flow for recharge rate and volumes.
11/11/92	Start another bore (WB3) approx. 300m to north, RC hammer 0-54m; dry hole - fill in when abandoned. Move to DD92SN1 site, 5½" RC hammer 0-54m. POOH and run HW casing. Set and cement annulus to surface. Second crew arrives at Mittiebah Homestead by air charter at 6:45pm.
12/11/92	Start double shift. Day Shift (D/S) Wait on cement. Night Shift (N/S) Drill cement above plug and through to bottom. Core 53.86-62.19m.
13/11/92	D/S Core 62.19 - 89.39m. N/S Core 89.39 - 104.64m.
14/11/92	D/S Core 104.64 - 143.54m. N/S Core 143.54 - 173.64m.

15/11/92	D/S Core 173.64 - 211.71m. N/S Core 211.71 - 239.44m. 2½ hours circulating spin out.
16/11/92	D/S Core 239.44 - 266.64m. 2½ hours maintenance (springs on water truck broke). N/S Core 266.64 - 290.64. 1¼ hours circulating spin out.
17/11/92	D/S Core 290.64 - 293.64m. Wait on and replace springs on water truck. N/S Pump out and clean mud pit of excess cuttings; 2½ hours mud work.
18/11/92	D/S Core 293.64 - 316.89m. Attempt deviation survey, trouble with timer. N/S Core 316.89 - 335.24m, 1¼ hours mud work.
19/11/92	D/S Core 335.24 - 354.54m. N/S Core 354.54 - 371.64m.
20/11/92	D/S Core 371.64 - 389.64m. POOH and daff rods. N/S Finish daffing rods. Core 389.64 - 401.64m. Ran deviation, surveys at 100, 200, 300 and 400 metres.
21/11	D/S Core 401.64 - 428.64m. N/S Core 428.64 - 443.64m.
22/11	D/S Maintenance. Rig requires fan belts; no drilling. N/S Unable to work due to lack of water; track not passable in water truck due to rain.
23/11	D/S Drive to Camooweal to pick up fan belts N/S Replace fan belts. Core 443.64 - 455.64m.
24/11	D/S Core 455.64 - 458.64m. End of hole. Both crews on day shift. Attempt to pull rods and do cement job. Abandon work due to lightning.
25/11	Finish cement plug 0-80m. Start to pack up gear on site. Repair spring on water trailer, tow back to Homestead.
26/11	Finish loading gear at drill site. Pack up and load camp and submersible pump. All back at Homestead 3pm, drillers leave for Mt Isa.

APPENDIX 2

DRILLING RIG SPECIFICATIONS

APPENDIX 2

ROCKDRIL RIG 19 SPECIFICATIONS

RDV VERSATILE 1000A MARK III

MOUNTING

Leader 6 x 6 heavy duty truck fitted with all-terrain 18R x 22.5 Super Single tyres.

RIG POWER

Hydraulic pump driven by truck engine through the transfer case P.T.O.

MAST

Box Section constructed from U.C. RHS and angle. With a rated capacity of 35,000 lbs.

Length is 9.2m with a head travel of 6.7m.

By adjusting the mast support angle stays the mast can be layed back to 55° by 5° increments for angle drilling.

A dead eye is fitted to the crown of the mast to allow the use of one part travelling block.

FEED

Feed is by 5" diameter hydraulic cylinder through ¾" diameter cables giving 11,500 lbs of thrust and 14,200 lbs of retraction. The hydraulic circuit is arranged to allow high speed feed and retraction as well as full micro speed and pressure for feed thrust.

ROTARY HEAD

The head is mounted on cross slide rails of the feed frame and can be moved off the hole by 15" to allow running in of pipe. By removing a centralising stop the head can be moved in the opposite direction to allow for misalignment of drill rods.

Rotation is by a hydraulic motor through a 5 speed gear box with 4 forward and 1 reverse in each direction giving a speed range of 0-1200 rpm with a maximum of 2800 ft lbs at the spindle.

MAIN WINCH

Main winch is powered by a piston type hydraulic motor with a built-in disc brake.

By selecting control levers at the operators panel, 3 line speeds can be obtained.

Low	112 ft per min.
Med.	226 ft per min.
High	341 ft per min.

All speeds have a single line pull of 10,754 lbs. The disc brake has a dynamic capacity of 6,935 ft lbs. Drum capacity is 140 ft of ⅝" diameter wire rope.

WIRELINE WINCH

Hydraulically powered and fitted with an over centre hydraulic brake. Line speed is 8.3 ft per sec. with a line pull of 503 lbs.

Drum capacity is 3,280 ft of ¼" diameter wire rope.

CONTROLS

All controls are grouped in a console at the left hand rear of the rig.

The GM power pack gauges and safety shut down system are also mounted in the console.

MUD PUMP

John Bean 435 Triplex giving 35 gpm at 1000 psi.
Hydraulically driven through a 5 speed gear box.

COMPRESSOR

Sullair 600/350 powered by Cat 3208 engine supplying 600 cfm at 350 psi.

BREAKOUT

36" Stilson actuated by a hydraulic ram with a 4710 lbs pull.

FOOT CLAMP

Hydraulic actuated wommer type with an opening to accommodate PW casing.

Drilling capacities based on main ram hold back at 1000 psi.

BQ	4045 ft	1232m
NQ	3187 ft	971m
HQ	2109 ft	643m
PQ	1582 ft	482m

APPENDIX 3

BIT RECORD

APPENDIX 3

BIT RECORD

DD92SN1

BIT NUMBER	BRAND	TYPE	SERIAL NUMBER	SIZE	DEPTH ON (metres)	DEPTH OFF (metres)	LENGTH DRILLED (metres)
1		Hammer		5½"	0	54	54
2	Longyear	6 Step	695601	HQ	53.86	55.85	1.99
3	Longyear	Series 2	243208	HQ	55.85	62.19	6.34
4	Longyear	Series 6	781508	HQ	62.19	101.64	39.45
5	Longyear	Series 9	170701	HQ	101.64	458.64	357.00

APPENDIX 4a

WB1 WATER BORE STATEMENT

Regulation 8

THE NORTHERN TERRITORY OF AUSTRALIA

Control of Waters Act

WR4/3

FINAL STATEMENT OF BORE

From	To	Description of Strata (including colour and hardness)
(see attached)		

Water Sample Bottle No.

Location of Bore (or supply sketch on the back hereof) —

.....33.....km

(a) N NE (b) ..North of Mittiebah H.S.
S SE
E NW
W SW .....

(a) Circle appropriate direction.
(b) Use known point such as existing bore, homestead, outstation, etc.

Additional information of interest about bore.

Grid Reference 723187 E 7952421 N

Map Number 1:100,000 sheet Mitchiebo 6360
1:250,000 sheet Mount Drummond SE53-12

Samples of Strata and Water Supplies ~~have been~~ will be*

left at the following place —

.....submitted to Water Resources Division, Alice Springs

.....Kevin Langan
Signature

*Delete non applicable

For Office use only —

Name of Bore — WB1

Name of Property — Mittiebah

Name of Owner — Norland Pastoral Company

Description of Property — Pastoral

Name of Contractor — Rockdril Contractors Pty Limited

Name of Driller — Wayne McAlear

Date of Commencement — 06/11/92

Date of Completion — 11/11/92

Total Depth - 114 metres

Particulars of Casing — 62 metres of 5" PVC

Particulars of Perforations or Screens — 12 metres of slotted PVC at base

Water	1st Supply Only	2nd Supply Only	Total Supply Only
Struck at	42m		
Standing Water Level	42m		
Pumping Supply Litres/sec	Air lifted 300L		
Duration of Pump Test	-		
Water Level During Test	-		
Quality Good, Fair or Bad	Good		

24-03 Government Printer of the Northern Territory

WB1

Description of Strata

0 - 6m	Sand and silt, orange to light brown with small lateritic pebbles near top.
6 - 54m	Sandstone off-white to light brown/grey and locally pinkish, slightly (to locally abundantly) micaceous, with occasional subintervals of ferruginous sandstone and siltstone/mudstone. Mostly poorly to moderately indurated, locally hard, especially towards base.
54 - 84m	Siltstone/mudstone. Dark brown with mostly minor dark greenish grey. Commonly micaceous, with occasional minor sandstone.
84 - 114m	Sandstone. Grey to locally greenish and brownish, mostly very fine to fine, commonly to locally abundantly micaceous, with minor greenish mudstone. Mostly well indurated.

This strata is believed to be within the lower Mullera Formation.

Flow testing of this bore indicated a slow and declining rate of recharge. This, and the apparent quality of the water, led to the supposition that this supply was probably a rainwater soak occupying a trough in the bedrock.

Attempts were made to stimulate this bore, and then it was cased to 62 metres so that the small amount of water if seemed to offer could be drawn periodically, if necessary. However, ultimately it did not yield any supply, and due to a parting of the casing down hole (around 32m) the pump could not be retrieved at the end of the program.

After further attempts (by Mittiebah Station personnel) to retrieve the downhole pump this bore will be filled in and abandoned.

APPENDIX 4b

WB2 WATER BORE STATEMENT

Regulation 8 THE NORTHERN TERRITORY OF AUSTRALIA WR4/3

Control of Waters Act

FINAL STATEMENT OF BORE

From	To	Description of Strata (including colour and hardness)
		(see attached)

Water Sample Bottle No.

Location of Bore (or supply sketch on the back hereof) —

.....30.....km

(a) N NE (b) N of Mittiebah H.S.....
S SE
E NW
W SW .....

(a) Circle appropriate direction.
(b) Use known point such as existing bore, homestead, outstation, etc.

Additional information of interest about bore.

Grid Reference 723800 E 7949020 N

Map Number 1:100,000 sheet Mitchiebo 6360
1:250,000 sheet Mount Drummond SE53-12

Samples of Strata and Water Supplies ~~have been*~~ will be*

left at the following place —

Water Resources Division, Alice Springs

Kevin Langan
Signature

*Delete non applicable

For Office use only —

Name of Bore — WB2

Name of Property — Mittiebah

Name of Owner — Norland Pastoral Company

Description of Property — Pastoral

Name of Contractor — Rockdril Contractors Pty Limited

Name of Driller — Wayne McAlear

Date of Commencement — 07/11/92

Date of Completion — 07/11/92

Total Depth 84 metres

Particulars of Casing — Nil

Particulars of Perforations or Screens — Nil

Water	1st Supply Only	2nd Supply Only	Total Supply Only
Struck at	Nil		
Standing Water Level	54m (o/n seepage)		
Pumping Supply Litres/sec	Nil		
Duration of Pump Test	-		
Water Level During Test	-		
Quality Good, Fair or Bad	-		

24-83 Government Printer of the Northern Territory

WB2

Description of Strata

0 - 6m	Silt and clay, light grey to yellowish brown with dark brown lateritic pebbles (up to 5mm) and minor sand.
6 - 24m	Mudstone (claystone?) with variable, minor proportions of siltstone and sandstone. Colour variable, ranging white to light brown/orange (near top) to mostly light brownish grey, yellowish brown, reddish brown and dark grey.
24 - 54m	Siltstone and very fine sandstone. Medium brown to reddish brown colour, moderately to well indurated. Variable minor proportions of very hard black rock fragments and poorly indurated brown mudstone.
54 - 84m	Siltstone/mudstone. Dark moderate brown to greyish brown with variable proportions of greyish red, greyish green and pale brown. Moderately indurated.

The bore was drilled to test an interpreted northeast trending lineament visible on aerial photos and represented at surface by a line of tall ghost gums. The lithology was weathered Mullera Formation from the surface down to 84 metres, where the hole was terminated without any water being detected. During withdrawal from this hole the next day it was noted that some water (presumably from seepage) has filled the hole to approximately 54 metres.

This hole was not cased (except for a few metres at surface) and was filled in the day after being drilled.

APPENDIX 5

SOURCE ROCK ANALYSIS RESULTS

APPENDIX 5

ROCK-EVAL PYROLYSIS DATA (one run)

DD92SN1 **Dec 92**

SAMPLE NUMBER	DEPTH (m)	TMAX	S1	S2	S3	S1 + S2	S2/S3	PI	PC	TOC	HI	OI
2955322	73.93	nd	0.01	0.08	0.13	0.09	0.62	0.11	0.01	0.42	19	31
2955323	95.54	nd	nd	nd	nd	nd	nd	nd	nd	0.30	nd	nd
2955335	105.76	nd	0.03	0.07	0.02	0.10	3.50	0.30	0.01	0.50	14	4
2955324	111.07	nd	nd	nd	nd	nd	nd	nd	nd	0.23	nd	nd
2955336	122.53	nd	0.01	0.03	0.08	0.04	0.38	0.25	0.00	0.62	5	13
2955325	126.53	nd	nd	nd	nd	nd	nd	nd	nd	0.39	nd	nd
2955326	147.50	456	0.02	0.51	0.03	0.53	17.00	0.04	0.04	0.72	71	4
2955327	164.53	458	0.11	1.10	0.01	1.21	110.00	0.09	0.10	1.50	73	1
2955328	187.35	457	0.15	1.00	0.05	1.15	20.00	0.13	0.10	1.35	74	4
2955329	206.22	nd	0.00	0.16	0.05	0.16	3.20	0.00	0.01	0.73	22	7
2955330	231.43	455	0.05	0.49	0.07	0.54	7.00	0.09	0.04	1.00	49	7
2955331	244.78	nd	nd	nd	nd	nd	nd	nd	nd	0.38	nd	nd
2955332	268.36	451	0.03	0.39	0.04	0.42	9.75	0.07	0.03	1.05	37	4
2955333	283.06	459	0.01	0.26	0.02	0.27	13.00	0.04	0.02	0.80	33	3
2955334	293.09	nd	0.00	0.10	nd	0.10	nd	0.00	0.01	0.40	25	nd
2955337	301.30	nd	nd	nd	nd	nd	nd	nd	nd	0.32	nd	nd
2955338	319.88	nd	0.05	0.15	0.03	0.20	5.00	0.25	0.02	1.22	12	2
2955339	339.43	464	0.04	0.35	0.03	0.39	11.67	0.10	0.03	0.55	64	5
2955340	354.20	nd	nd	nd	nd	nd	nd	nd	nd	0.32	nd	nd
2955341	372.10	nd	0.04	0.15	0.01	0.19	15.00	0.21	0.02	0.55	27	2
2955342	387.99	nd	0.03	0.13	0.02	0.16	6.50	0.19	0.01	0.56	23	4
2955343	402.81	510	0.04	0.28	0.04	0.32	7.00	0.13	0.03	1.28	22	3
2955344	417.11	nd	0.05	0.16	0.05	0.21	3.20	0.24	0.02	0.49	33	10
2955345	426.96	nd	nd	nd	nd	nd	nd	nd	nd	0.19	nd	nd

TMAX = Max. temperature S2
S1 = Volatile hydrocarbons (HC)
S2 = HC generating potential
S1 + S2 = Potential yield
S3 = Organic carbon dioxide
PI = Production index
PC = Pyrolysable carbon
TOC = Total organic carbon
HI = Hydrogen index
OI = Oxygen index
nd = no data

GEOTECHNICAL SERVICES PTY LTD

SOURCE ROCK CHARACTERISATION STUDY

MT. DRUMMOND/DD 92-SN1

Prepared for:

Pacific Oil and Gas Pty Ltd

January 1993

GEOTECH GEOTECHNICAL SERVICES PTY LTD
125 Burswood Road, Victoria Park, Western Australia 6100

Telephone (09) 362 5222
Facsimile (09) 362 5908

SOURCE ROCK CHARACTERISATION STUDY

MT. DRUMMOND/DD 92-SN1

Introduction

Twentyfour core samples from well DD92-SN1 in EP54 were analysed for Pacific Oil and Gas Pty Ltd.

The purpose of this study was to assess the sequence between 73.93m and 426.96m in terms of its source potential and maturity.

Analytical Procedures

Upon arrival at the laboratory, all core samples were air dried, pulped and analysed for total organic carbon. Those sediments with TOC values in excess of 0.4% were submitted to Rock-Eval pyrolysis.

Analytical methods applied are described in detail in the "Theory & Methods" appendix in the back of this report.

General Information

Two copies of this report have been sent to Kevin Lanigan from Pacific Oil & Gas Pty Ltd. Any queries related to it may be directed to Dr. Birgitta Hartung-Kagi of Geotechnical Services Pty Ltd.

All data and information are proprietary to Pacific Oil & Gas and regarded as highly confidential by all Geotech personnel.

Geotechnical Services Pty Ltd shall not be responsible or liable for the results of any actions taken on the basis of the information contained in this study, nor for any errors or omissions in it.

Results and Interpretation

Between 73.93m and 426.96m, seventeen out of twentyfour samples analysed yielded TOC values in excess of 0.4%. Values for the remaining seven sediments range from 0.19% to 0.39%.

Those seventeen samples with more promising levels of total organic carbon yielded values between 0.40% and 1.28%. Though a total of six samples within the interval analysed contain more than 1% organic carbon, the overall source potential of the sequence has to be characterised as poor to marginal only. With the exception of samples at 164.53m and 187.35m (S_2 values of 1.1 and 1.0 mg/g, respectively), all sediments yielded S_2 values (hydrocarbon generating potential) below 1 mg/g. Amounts of free hydrocarbons present in the sediments are negligible (S_1 values below 0.2 mg/g), in spite of Tmax values of around 450° to 460°C which are indicative of fully mature source rocks.

The Tmax value of 510°C obtained at 402.81m is believed to be too high to represent the true maturity level of the sample. It is likely to be affected by the presence of considerable amounts (TOC of 1.28%) of recycled organic matter which still yielded a small S_2 peak and, in turn, an anomalously high Tmax value.

Hydrogen indices vary between 5 and 74 and reflect the gas-prone nature of the organic matter.

Summarising these results, the sediments analysed from interval 73.93m to 426.96m in well DD92-SN1 are mature, poor source rocks for gas only.

TABLE 1

ROCK-EVAL PYROLYSIS DATA (one run)

SN 1

Dec-92

#	DEPTH(m)	TMAX	S1	S2	S3	S1 + S2	S2/S3	PI	PC	TOC	HI	OI
2955322	73.93	nd	0.01	0.08	0.13	0.09	0.62	0.11	0.01	0.42	19	31
2955323	95.54	nd	nd	nd	nd	nd	nd	nd	nd	0.30	nd	nd
2955335	105.76	nd	0.03	0.07	0.02	0.10	3.50	0.30	0.01	0.50	14	4
2955324	111.07	nd	nd	nd	nd	nd	nd	nd	nd	0.23	nd	nd
2955336	122.53	nd	0.01	0.03	0.08	0.04	0.38	0.25	0.00	0.62	5	13
2955325	126.53	nd	nd	nd	nd	nd	nd	nd	nd	0.39	nd	nd
2955326	147.50	456	0.02	0.51	0.03	0.53	17.00	0.04	0.04	0.72	71	4
2955327	164.53	458	0.11	1.10	0.01	1.21	110.00	0.09	0.10	1.50	73	1
2955328	187.35	457	0.15	1.00	0.05	1.15	20.00	0.13	0.10	1.35	74	4
2955329	206.22	nd	0.00	0.16	0.05	0.16	3.20	0.00	0.01	0.73	22	7
2955330	231.43	455	0.05	0.49	0.07	0.54	7.00	0.09	0.04	1.00	49	7
2955331	244.78	nd	nd	nd	nd	nd	nd	nd	nd	0.38	nd	nd
2955332	268.36	451	0.03	0.39	0.04	0.42	9.75	0.07	0.03	1.05	37	4
2955333	283.06	459	0.01	0.26	0.02	0.27	13.00	0.04	0.02	0.80	33	3
2955334	293.09	nd	0.00	0.10	nd	0.10	nd	0.00	0.01	0.40	25	nd
2955337	301.30	nd	nd	nd	nd	nd	nd	nd	nd	0.32	nd	nd
2955338	319.88	nd	0.05	0.15	0.03	0.20	5.00	0.25	0.02	1.22	12	2
2955339	339.43	464	0.04	0.35	0.03	0.39	11.67	0.10	0.03	0.55	64	5
2955340	354.20	nd	nd	nd	nd	nd	nd	nd	nd	0.32	nd	nd
2955341	372.10	nd	0.04	0.15	0.01	0.19	15.00	0.21	0.02	0.55	27	2
2955342	387.99	nd	0.03	0.13	0.02	0.16	6.50	0.19	0.01	0.56	23	4
2955343	402.81	510	0.04	0.28	0.04	0.32	7.00	0.13	0.03	1.28	22	3
2955344	417.11	nd	0.05	0.16	0.05	0.21	3.20	0.24	0.02	0.49	33	10
2955345	426.96	nd	nd	nd	nd	nd	nd	nd	nd	0.19	nd	nd

TMAX = Max. temperature S2
S1 + S2 = Potential yield
PC = Pyrolysable carbon
OI = Oxygen Index

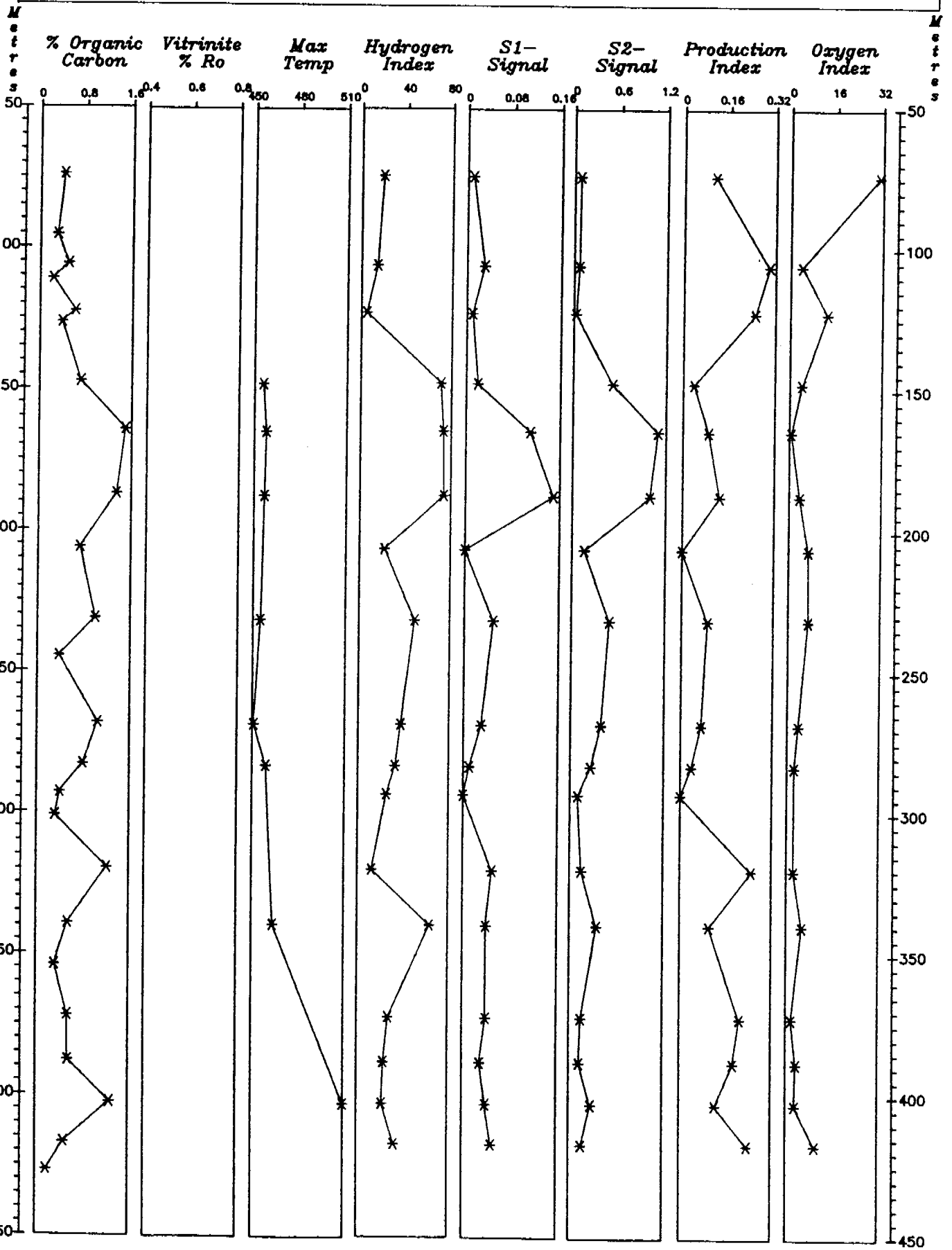
S1 = Volatile hydrocarbons (HC)
S3 = Organic carbon dioxide
TOC = Total organic carbon
nd = no data

S2 = HC generating potential
PI = Production index
HI = Hydrogen index

GEOTECH–LOG

WELL DD92 SN–1

FILE No LRD 1887B
DATE DEC 1992



APPENDIX 6

GEOLOGICAL DESCRIPTIONS

GEOLOGICAL DESCRIPTIONS

DD92SN1

CUTTINGS (washed)

Interval (mbgl)	Description
0 - 6	LATERITIC MUDSTONE. Light yellowish brown to moderate reddish brown laterite with minor very hard black (hematitic?) mudstone and very hard to very soft, white mudstone and clay.
6 - 18	SILTY MUDSTONE. Off-white to yellowish and moderate brown, variably silty, mostly moderately to poorly indurated, but with brown and (rare) black cuttings, cherty and hard.
18 - 39	CLAY/MUDSTONE. Off-white to yellowish and light greyish brown (locally pinkish), very soft clay and dark brown to black, hard (cherty) to soft mudstone.
39 - 48	MUDSTONE and SILTSTONE. Moderate and reddish brown to dark reddish and purplish brown; locally greyish red, olive brown and greenish grey towards base. Mostly moderately indurated and hard, locally soft. Variably silty.
48 - 54	SILTSTONE, SANDSTONE and minor MUDSTONE. Yellowish and reddish/pinkish brown, fine to very fine sandstone and siltstone, poorly to moderately indurated. Light olive brown, greyish red and greenish grey silty mudstone, mostly moderately indurated.

CORE

Interval (mbgl)	Description
53.86 - 430.7	Variably interbedded/interlaminated MUDSTONE, SILTSTONE and SANDSTONE. Down to approximately 81 metres the section is intensely altered by deep weathering which effectively masks much of the primary character. Colours over this interval are dominated by yellowish and pinkish browns and greys, but also include off-white to greenish grey bands and patches and fracture linings of dark grey to black material. These colours occur in an irregular, patchy and diffuse mosaic through which the original dominantly planar stratification is only poorly visible. Authigenic minerals include silica (chert) and carbonate (mostly calcium carbonate, with minor dolomite?). Also, extensive development of thin veins and fractures has occurred in multiple stages, producing very complex patterns which cross-cut the bedding. Primary textural and compositional characteristics are difficult to ascertain, so they are assumed to have been essentially the same as for the section beneath the base of weathering, described below.

This entire interval consists of mudstone, siltstone and sandstone variably interbedded/interlaminated throughout the dominantly planar to wavy planar stratification. Much of the section is dominated by a variably complete, overall upward-coarsening cycle (see Enclosure 1) which largely consists of three basic segments.

The base of the cycle is most often a sharp planar (to slightly wavy) contact from an underlying sandstone (the top of the previous cycle) to a basal segment comprising mudstone with interlaminated siltstone/sandstones. Occasionally the first (bottom) few millimetres of this mudstone includes some white, rounded, medium to very coarse quartz grains and/or 2-3 mm long platy chips/clasts of mudstone, presumably the lag from a previous erosional event.

The mudstone ranges from medium dark grey to black (with varying organic content) and silty to fine, and it dominates the interval, with only minor interlamination (usually no more than a few millimetres thick) of light to medium grey sandstones and siltstones. Stratification within this segment is planar to wavy planar and commonly exhibits small upward-fining subcycles in which thin, sharp-based sand/silt laminae grade rapidly up into the thicker mudstones. These subcycles range 0.5-5 cm in thickness (typically 1-3 cm) and the segment ranges 5-150 cm, most commonly 20-60 cm thick.

Frequently within this segment the planar stratification is modified by distinctive sedimentary structures informally termed herein as "molar" structures (to avoid any genetic connotation). These features appear to be cracks in the mud layers which are subsequently filled in by the basal sand lamina in the succeeding depositional event. During burial compaction these downward-tapering structures become compressed and ptygmatically deformed so that their profile often resembles that of a molar tooth. In plan view they are elongate (often linear) and terminate by either tapering out or intersecting each other. These "molar" structures seem to occur in greatest abundance in intervals where a repetition of mudstone-sandstone couplets are stacked up.

The basal segment of the cycle passes gradationally upward into an interval dominated by dark greenish grey mudstone, silty mudstone and siltstone. In this middle segment planar to wavy planar stratification continues to dominate, but is not as well defined due to the greater mixing of grain sizes and the paucity of sand. Also, there is a greatly increased incidence of "massive", mottled, and chaotically bedded units (the latter of which often contain platy clasts of dark greenish grey mudstone) especially when the coarser grain sizes dominate. Some of these coarser fractions appear to contain glauconite, but this has not yet been verified by analysis.

In the transition from the underlying segment there is often a zone of interleaving of dark grey/black and dark greenish grey laminae but, apart from this, the middle segment is devoid of organic-rich sediment. Sandy laminae do occur, but tend to be relatively infrequent, non-planar and more diffuse than in the lower segment. The middle segment ranges in thickness from a few centimetres to a few metres (seemingly independent of the other two segments), most commonly 40-60 cm.

The middle segment of the cycle passes gradationally upward into the cleaner siltstones and sandstones of the upper segment. These coarser units are mostly light to medium grey in colour and (like the preceding strata) are dominated by planar to wavy planar stratification, as defined by colour and/or grain size variations. This stratification is often vague or poorly defined and tends to

grade into "massive", mottled, or chaotic/irregularly bedded units. Grain size ranges from coarse silt to very coarse sand, but is mostly very fine to medium. Individual units within this segment are frequently only vaguely defined, but most seem to be upward-coarsening. Infrequently, towards the bottom of this segment (or in the transition zone to the underlying segment) a 2-10 cm, coarse to very coarse glauconitic sandstone unit, "massive" with a sharp base and top occurs. Glauconite and other micas are mostly sparse (to locally common) throughout most beds in this uppermost segment.

Thickness of this upper segment ranges from a few centimetres to a few metres, but is typically 20-80 cm. It usually has a sharp top contact (but is sometimes gradational) above which the dark mudstone of lower segment reappears to begin repeating the cycle.

Overall, the cycle ranges from tens of centimetres to metres in thickness, and commonly shows variation in the relative proportions of each of the constituent segments.

Post-depositional changes to these sediments are dominated by pore-filling mineral authigenesis and fracturing/faulting. Although not yet confirmed by petrographic work, the major diagenetic event appears to be porosity occlusion, mostly by quartz and to lesser extents by carbonates (calcite and minor dolomite), clay minerals, anhydrite and pyrite. This occlusion seems largely complete since every siltstone and sandstone unit (from laminae to beds) throughout the section appears extremely tight, with little or no effective porosity and permeability. The only exception to this is the sporadic occurrence of small isolated vugs (secondary porosity) in some of the thicker sandstones below 130 metres.

In addition to the weathering down to 81 metres, some other zones of alteration involving distinct colour changes occur within the interval, most notably between 305.8-316.7, 363.6-364.8, 399.4-402.3 and 419.6-420.0 metres. The alteration is a yellowish (sometimes also slightly greenish) colour change which occurs both as discrete bands (conforming with bed boundaries) and diffuse bands and patches. Both are observed in sandstones, siltstones and mudstones, but the discrete banding is most prevalent in laminated mudstones and thin sandstones while the diffuse banding/patches occur more commonly in the thicker and less well stratified sandstones and siltstones. A similar type of alteration, but of a dominantly light green to slightly greyish colour, is noted infrequently in some fine mudstone (claystone?) units. These range 1-20 cm in thickness, have sharp top and bottom contacts, and are usually very soft and crumbly (disintegrating with repeated wetting).

Since all this alteration pre-dates the visible fracturing it seems likely to have resulted from either some difference in the original sediment chemistry of the affected units, or fluid movement along bedding, or a combination of the two.

Fracturing and faulting occurs with varying intensity throughout the section. Small scale fractures and microfaults (millimetres to centimetres) are common, mostly at a high angle to bedding (60-90°), apparently with no strong preference for normal or reverse displacement. The largest zone of deformation occurs between 101 and 125 metres and is most intense from 108 to 122 metres. It is dominated by brittle to quasi-solid faulting, folding, and severe brecciation.

A common feature of the brittle deformation (from large zones to single fractures) is the presence of a lining of fine, soft, vitreous black carbonaceous material, which frequently shows slickensiding. Either instead of, or sometimes in addition to this carbonaceous lining, fractures may be infilled with carbonate (mostly calcite, often with associated pyrite) and/or (less commonly) anhydrite. These veins vary in thickness from about 5 mm down to less than a millimetre (mostly 1-2 mm) and occasionally the thicker examples show some small vugs and cavities.

The transition to the underlying sandstone is gradational.

430.7 - 458.64 SANDSTONE with minor interbedded MUDSTONE.

Greenish grey, reddish brown, and yellowish grey to light brownish grey sandstone with sparse dark brown to light greenish grey mudstone. The top 20 metres is dominantly greenish grey and reddish brown, mostly as alternating bands of variable thickness with occasional patchy/irregular intermixing (coincident with "massive" and chaotic units). Below about 450.6 metres the sandstone is dominantly yellowish to light brownish grey with only faint, diffuse bands of greenish grey and dark reddish brown.

Stratification is generally poorly defined throughout, dominated above 450.6 m by vague, crudely planar bedding which often passes gradually to "massive" or chaotic bedding. Delineation of the planar stratification is often greatly assisted by the occurrence of small sub-intervals with planar siltstone and mudstone laminae, and by trains of mudstone clasts.

Many of the discrete mudstone beds (2-20 cm) have very sharp tops and bases, and consist of soft, crumbly, very fine mudstone which disintegrates with repeated wetting.

Below 450.6 m the incidence of these features is reduced, so that "massive" to vaguely chaotic bedding becomes dominant.

Grain size of the sandstone ranges mostly between very fine and medium, only rarely extending to coarse, however it generally appears only moderately to poorly sorted, frequently displaying a significant silt and clay component.

Throughout this interval porosity and permeability appears to be negligible, with clays, authigenic quartz and minor calcite occluding most pore space. Some small (2-3 mm) isolated vugs occur sporadically within the sandstone beds, and below 452 metres more vugs occur in partially annealed fractures, but these also do not appear to be interconnected.

Thinly-lined fractures and veins occur mostly in the top few metres of this interval (where they contain some calcite) and in the bottom 5-6 metres, where they are becoming more common and seem to be quartzose and devoid of carbonate.

458.64 End of hole (Driller).

APPENDIX 7

CORE TALLY

South Nicholson 1 Core Tally

NO.	INTERVAL	CUT	REC.	% REC.	TOTAL CUT	TOTAL REC.
1	53.86 - 54.76	0.90	0.90	100.00	0.90	0.90
2	54.76 - 55.08	0.32	0.23	71.87	1.22	1.13
3	55.08 - 55.14	0.06	0.06	100.00	1.28	1.19
4	55.14 - 55.84	0.70	0.66	94.29	1.98	1.85
5	55.84 - 56.39	0.55	0.49	89.09	2.53	2.34
6	56.39 - 56.97	0.58	0.62	106.90	3.11	2.96
7	56.97 - 57.91	0.94	0.84	89.36	4.05	3.80
8	57.91 - 59.09	1.18	1.20	101.69	5.23	5.00
9	59.09 - 62.19	3.10	0.81	26.13	8.33	5.81
10	62.19 - 64.83	2.64	2.48	93.94	10.97	8.29
11	64.83 - 65.59	0.76	0.76	100.00	11.73	9.05
12	65.59 - 68.54	2.95	2.92	98.98	14.68	11.97
13	68.54 - 70.94	2.40	2.30	95.83	17.08	14.27
14	70.94 - 72.84	1.90	1.90	100.00	18.98	16.17
15	72.84 - 75.84	3.00	3.05	101.67	21.98	19.22
16	75.84 - 78.99	3.15	3.12	99.05	25.13	22.34
17	78.99 - 81.41	2.42	2.27	93.80	27.55	24.61
18	81.41 - 83.94	2.53	2.47	97.63	30.08	27.08
19	83.94 - 86.64	2.70	2.78	102.96	32.78	29.86
20	86.64 - 89.39	2.75	2.64	96.00	35.53	32.50
21	89.39 - 91.44	2.05	2.06	100.49	37.58	34.56
22	91.44 - 94.34	2.90	2.89	99.66	40.48	37.45
23	94.34 - 94.91	0.57	0.59	103.51	41.05	38.04
24	94.91 - 95.64	0.73	0.70	95.89	41.78	38.74
25	95.64 - 98.64	3.00	2.89	96.33	44.78	41.63
26	98.64 - 101.64	3.00	3.00	100.00	47.78	44.63
27	101.64 - 103.00	1.36	1.32	97.06	49.14	45.95
28	103.00 - 104.64	1.64	1.49	90.85	50.78	47.44
29	104.64 - 107.64	3.00	3.05	101.67	53.78	50.49
30	107.64 - 110.44	2.80	2.80	100.00	56.58	53.29
31	110.44 - 112.34	1.90	1.90	100.00	58.48	55.19
32	112.34 - 113.14	0.80	0.80	100.00	59.28	55.99
33	113.14 - 116.24	3.10	3.10	100.00	62.38	59.09
34	116.24 - 119.34	3.10	3.08	99.35	65.48	62.17
35	119.34 - 122.39	3.05	3.00	98.36	68.53	65.17
36	122.39 - 125.44	3.05	3.05	100.00	71.58	68.22
37	125.44 - 128.54	3.10	3.08	99.35	74.68	71.30
38	128.54 - 131.64	3.10	3.10	100.00	77.78	74.40
39	131.64 - 134.64	3.00	2.97	99.00	80.78	77.37
40	134.64 - 137.64	3.00	3.03	101.00	83.78	80.40
41	137.64 - 140.44	2.80	2.76	98.57	86.58	83.16
42	140.44 - 143.54	3.10	3.10	100.00	89.68	86.26
43	143.54 - 146.64	3.10	3.09	99.68	92.78	89.35
44	146.64 - 147.84	1.20	1.15	95.83	93.98	90.50
45	147.84 - 149.64	1.80	1.78	98.89	95.78	92.28
46	149.64 - 152.64	3.00	3.00	100.00	98.78	95.28
47	152.64 - 155.64	3.00	2.95	98.33	101.78	98.23
48	155.64 - 158.64	3.00	3.00	100.00	104.78	101.23

South Nicholson 1 Core Tally

NO.	INTERVAL	CUT	REC.	% REC.	TOTAL CUT	TOTAL REC.
49	158.64 - 161.50	2.86	2.82	98.60	107.64	104.05
50	161.50 - 164.60	3.10	3.04	98.06	110.74	107.09
51	164.60 - 167.64	3.04	3.00	98.68	113.78	110.09
52	167.64 - 170.64	3.00	3.00	100.00	116.78	113.09
53	170.64 - 173.64	3.00	3.04	101.33	119.78	116.13
54	173.64 - 176.64	3.00	2.91	97.00	122.78	119.04
55	176.64 - 179.64	3.00	2.92	97.33	125.78	121.96
56	179.64 - 182.64	3.00	3.00	100.00	128.78	124.96
57	182.64 - 185.64	3.00	2.91	97.00	131.78	127.87
58	185.64 - 188.64	3.00	3.07	102.33	134.78	130.94
59	188.64 - 191.64	3.00	2.93	97.67	137.78	133.87
60	191.64 - 194.64	3.00	2.99	99.67	140.78	136.86
61	194.64 - 197.64	3.00	3.00	100.00	143.78	139.86
62	197.64 - 199.96	2.32	2.28	98.28	146.10	142.14
63	199.96 - 203.10	3.14	3.08	98.09	149.24	145.22
64	203.10 - 206.14	3.04	3.05	100.33	152.28	148.27
65	206.14 - 209.19	3.05	3.08	100.98	155.33	151.35
66	209.19 - 211.71	2.52	2.52	100.00	157.85	153.87
67	211.71 - 214.81	3.10	3.14	101.29	160.95	157.01
68	214.81 - 214.94	0.13	0.13	100.00	161.08	157.14
69	214.94 - 217.94	3.00	3.01	100.33	164.08	160.15
70	217.94 - 220.94	3.00	3.09	103.00	167.08	163.24
71	220.94 - 224.04	3.10	3.01	97.10	170.18	166.25
72	224.04 - 227.14	3.10	3.10	100.00	173.28	169.35
73	227.14 - 230.14	3.00	3.14	104.67	176.28	172.49
74	230.14 - 233.24	3.10	3.07	99.03	179.38	175.56
75	233.24 - 236.34	3.10	3.13	100.97	182.48	178.69
76	236.34 - 239.44	3.10	3.05	98.39	185.58	181.74
77	239.44 - 242.54	3.10	3.15	101.61	188.68	184.89
78	242.54 - 245.64	3.10	3.12	100.65	191.78	188.01
79	245.64 - 248.64	3.00	3.00	100.00	194.78	191.01
80	248.64 - 251.44	2.80	2.80	100.00	197.58	193.81
81	251.44 - 254.54	3.10	3.03	97.74	200.68	196.84
82	254.54 - 257.61	3.07	3.11	101.30	203.75	199.95
83	257.61 - 260.64	3.03	3.01	99.34	206.78	202.96
84	260.64 - 261.04	0.40	0.38	95.00	207.18	203.34
85	261.04 - 263.64	2.60	2.54	97.69	209.78	205.88
86	263.64 - 266.64	3.00	3.07	102.33	212.78	208.95
87	266.64 - 269.64	3.00	3.00	100.00	215.78	211.95
88	269.64 - 272.64	3.00	3.00	100.00	218.78	214.95
89	272.64 - 275.42	2.78	2.75	98.92	221.56	217.70
90	275.42 - 276.97	1.55	1.55	100.00	223.11	219.25
91	276.97 - 278.64	1.67	1.73	103.59	224.78	220.98
92	278.64 - 281.64	3.00	2.95	98.33	227.78	223.93
93	281.64 - 284.64	3.00	3.05	101.67	230.78	226.98
94	284.64 - 287.64	3.00	3.06	102.00	233.78	230.04
95	287.64 - 290.64	3.00	3.00	100.00	236.78	233.04
96	290.64 - 293.64	3.00	3.00	100.00	239.78	236.04
97	293.64 - 294.14	0.50	0.52	104.00	240.28	236.56

South Nicholson 1 Core Tally

NO.	INTERVAL	CUT	REC.	% REC.	TOTAL CUT	TOTAL REC.
98	294.14 - 296.64	2.50	2.44	97.60	242.78	239.00
99	296.64 - 299.64	3.00	3.04	101.33	245.78	242.04
100	299.64 - 302.64	3.00	3.01	100.33	248.78	245.05
101	302.64 - 305.64	3.00	3.01	100.33	251.78	248.06
102	305.64 - 308.64	3.00	2.97	99.00	254.78	251.03
103	308.64 - 311.64	3.00	2.98	99.33	257.78	254.01
104	311.64 - 314.64	3.00	2.98	99.33	260.78	256.99
105	314.64 - 316.89	2.25	2.04	90.67	263.03	259.03
106	316.89 - 319.89	3.00	3.10	103.33	266.03	262.13
107	319.89 - 322.94	3.05	3.13	102.62	269.08	265.26
108	322.94 - 326.04	3.10	2.95	95.16	272.18	268.21
109	326.04 - 329.04	3.00	3.16	105.33	275.18	271.37
110	329.04 - 332.14	3.10	3.13	100.97	278.28	274.50
111	322.14 - 335.24	3.10	3.07	99.03	281.38	277.57
112	335.24 - 338.24	3.10	3.12	100.65	284.48	280.69
113	338.24 - 341.44	3.10	3.19	102.90	287.58	283.88
114	341.44 - 344.54	3.10	3.06	98.71	290.68	286.94
115	344.54 - 347.64	3.10	3.12	100.65	293.78	290.06
116	347.64 - 349.70	2.06	2.01	97.57	295.84	292.07
117	349.70 - 352.74	3.04	3.13	102.96	298.88	295.20
118	352.74 - 354.54	1.80	1.75	97.22	300.68	296.95
119	354.54 - 356.64	2.10	2.19	104.29	302.78	299.14
120	356.64 - 359.64	3.00	3.00	100.00	305.78	302.14
121	359.64 - 362.64	3.00	3.02	100.67	308.78	305.16
122	362.64 - 365.64	3.00	2.97	99.00	311.78	308.13
123	365.64 - 368.64	3.00	2.99	99.67	314.78	311.12
124	368.64 - 371.64	3.00	3.02	100.67	317.78	314.14
125	371.64 - 374.64	3.00	2.90	96.67	320.78	317.04
126	374.64 - 377.64	3.00	3.18	106.00	323.78	320.22
127	377.64 - 380.64	3.00	3.00	100.00	326.78	323.22
128	380.64 - 383.64	3.00	3.00	100.00	329.78	326.22
129	383.64 - 386.64	3.00	3.01	100.33	332.78	329.23
130	386.64 - 389.64	3.00	3.02	100.67	335.78	332.25
131	389.64 - 392.64	3.00	3.01	100.33	338.78	335.26
132	392.64 - 395.64	3.00	3.02	100.67	341.78	338.28
133	395.64 - 395.68	0.04	0.04	100.00	341.82	338.32
134	395.68 - 398.64	2.96	2.95	99.66	344.78	341.27
135	398.64 - 401.64	3.00	2.93	97.67	347.78	344.20
136	401.64 - 404.64	3.00	3.05	101.67	350.78	347.25
137	404.64 - 407.64	3.00	2.97	99.00	353.78	350.22
138	407.64 - 410.64	3.00	3.01	100.33	356.78	353.23
139	410.64 - 413.64	3.00	3.05	101.67	359.78	356.28
140	413.64 - 416.64	3.00	3.02	100.67	362.78	359.30
141	416.64 - 419.64	3.00	2.95	98.33	365.78	362.25
142	419.64 - 422.64	3.00	3.04	101.33	368.78	365.29
143	422.64 - 425.64	3.00	2.98	99.33	371.78	368.27
144	425.64 - 428.64	3.00	3.01	100.33	374.78	371.28
145	428.64 - 431.64	3.00	3.11	103.67	377.78	374.39
146	431.64 - 434.64	3.00	3.02	100.67	380.78	377.41

South Nicholson 1 Core Tally

NO.	INTERVAL	CUT	REC.	% REC.	TOTAL CUT	TOTAL REC.
147	434.64 - 437.64	3.00	2.94	98.00	383.78	380.35
148	437.64 - 440.64	3.00	3.07	102.33	386.78	383.42
149	440.64 - 442.72	2.08	2.05	98.56	388.86	385.47
150	442.72 - 443.64	0.92	0.65	70.65	389.78	386.12
151	443.64 - 445.30	1.66	1.40	84.34	391.44	387.52
152	445.30 - 446.64	1.34	1.23	91.79	392.78	388.75
153	446.64 - 448.04	1.40	1.30	92.86	394.18	390.05
154	448.04 - 449.64	1.60	1.60	100.00	395.78	391.65
155	449.64 - 452.64	3.00	3.01	100.33	398.78	394.66
156	452.64 - 455.64	3.00	2.98	99.33	401.78	397.64
157	455.64 - 458.64	3.00	2.99	99.67	404.78	400.63

136° 30'
650000 mE
137° 00'
700000 mE
137° 30'
750000 mE
18° 00'
8000000 mN

EP 54

WAANYI/GARAWA
ABORIGINAL LAND TRUST

DD92SN1

18° 30'
7950000 mN

Mitchiebo
Waterhole

"BUFFALO"
BORE

Mittiebah
Homestead

To Tablelands Hwy

BARKLY

STOCK

ROUTE

To Gallipoli
Homestead

7900000 mN
19° 00'

ALEXANDRIA
HOMESTEAD

To Alroy Downs
Homestead

To Barkly Hwy

7850000 mN
19° 30'

20 0 10 20 30 40 km

1:500,000

ARAFURA SEA
Darwin
GULF OF CARPENTARIA
SOUTH NICHOLSON PROJECT
EP53 EP54
TENNANT CREEK
CAMOOWEAL
NORTHERN TERRITORY (In Part)

Amended
Jan 93 J.B.

Pacific Oil & Gas Pty Limited

SOUTH NICHOLSON BASIN

LOCATION MAP
DD92SN1

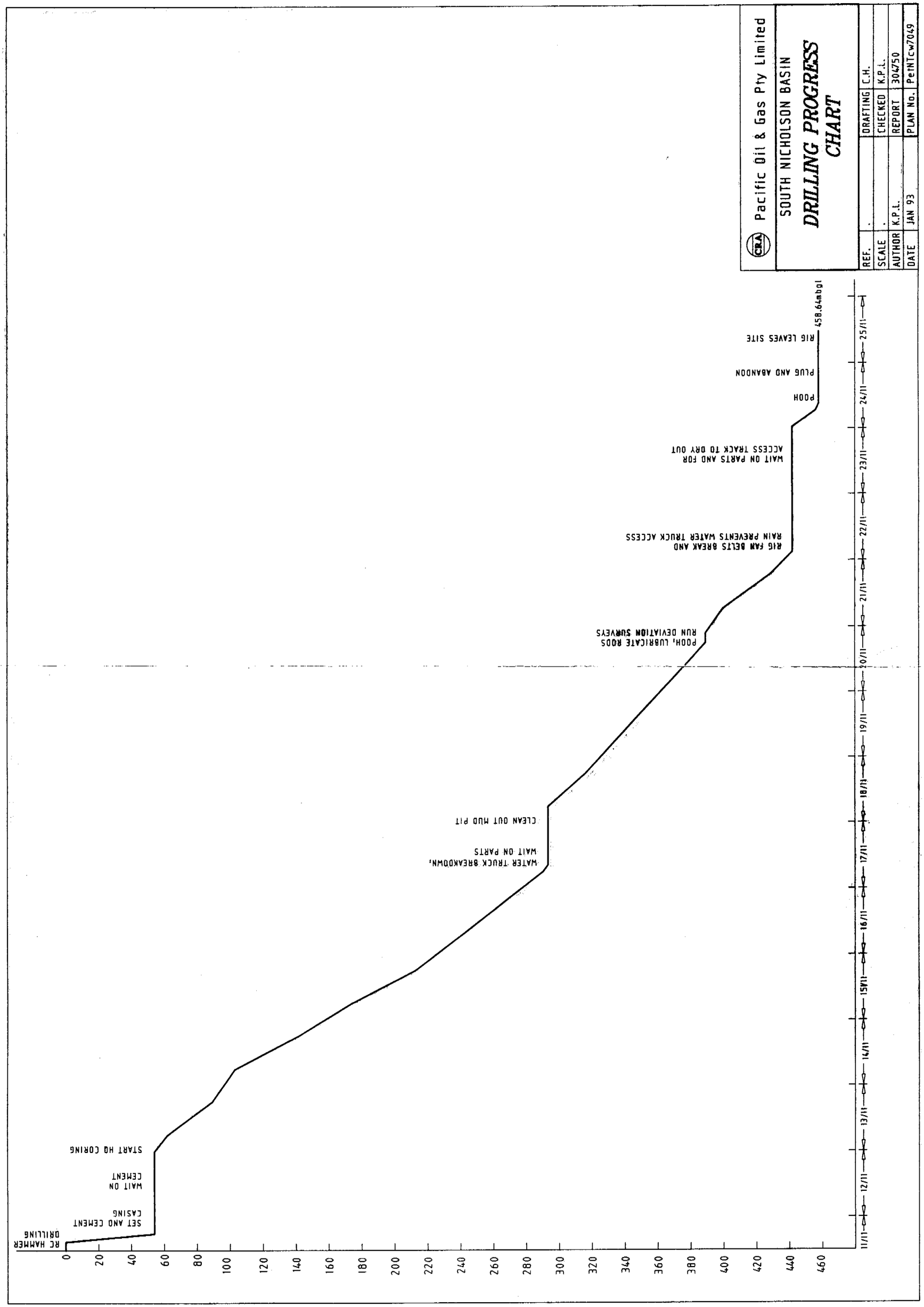
REF.	SE 53	DRAFTING	J.B.
SCALE	1:500 000	CHECKED	K.P.L.
AUTHOR	K.P.L.	REPORT	304750,304790
DATE	JAN 93	PLAN No.	PetNTcw 7044

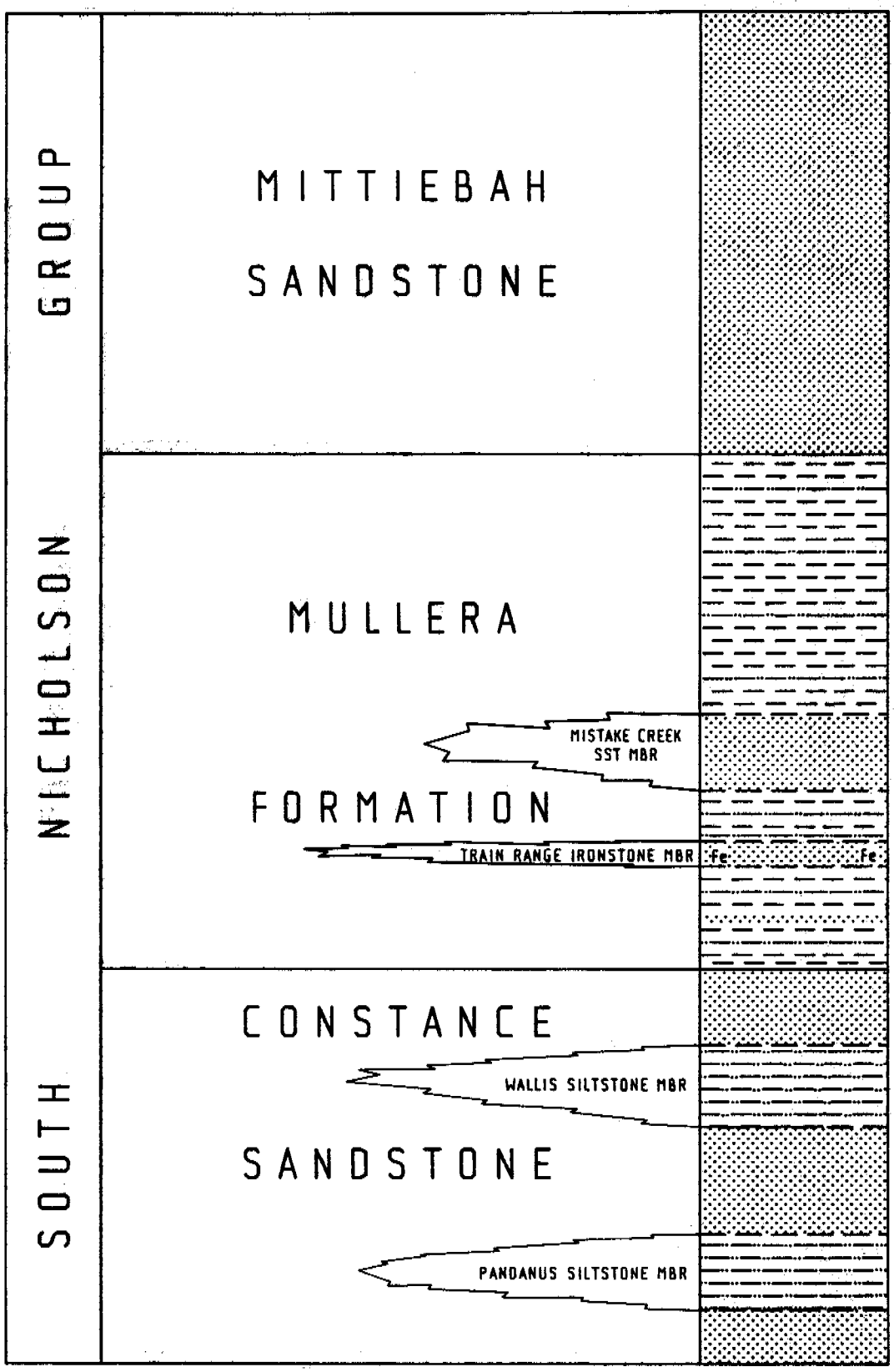
Pacific Oil & Gas Pty Limited

SOUTH NICHOLSON BASIN

DRILLING PROGRESS CHART

REF.	.	DRAFTING	C.H.
SCALE	.	CHECKED	K.P.L.
AUTHOR	K.P.L.	REPORT	304750
DATE	JAN 93	PLAN No.	PetNTcw7049





Pacific Oil & Gas Pty Limited

SOUTH NICHOLSON BASIN

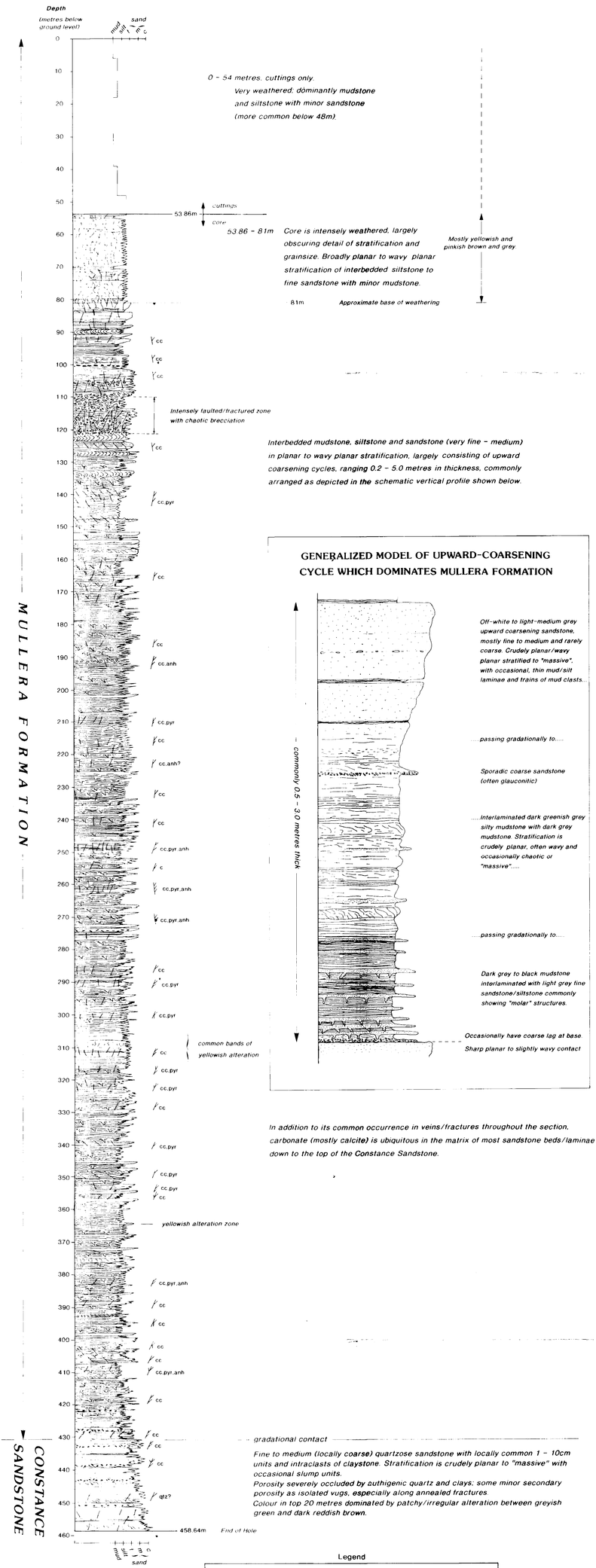
STRATIGRAPHY

REF.	.	DRAFTING	C.H.
SCALE	.	CHECKED	K.P.L.
AUTHOR	K.P.L.	REPORT	304750
DATE	JAN 93	PLAN No.	PetNTcw7048

PR93/011A

SOUTH NICHOLSON BASIN – EP 54

LITHOLOGICAL LOG HOLE DD92SN1



Interbedded mudstone, siltstone and sandstone (very fine – medium) in planar to wavy planar stratification, largely consisting of upward coarsening cycles, ranging 0.2 – 5.0 metres in thickness, commonly arranged as depicted in the schematic vertical profile shown below.

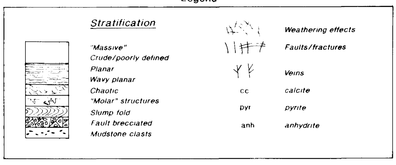
GENERALIZED MODEL OF UPWARD-COARSENING CYCLE WHICH DOMINATES MULLERA FORMATION

In addition to its common occurrence in veins/fractures throughout the section, carbonate (mostly calcite) is ubiquitous in the matrix of most sandstone beds/laminae down to the top of the Constance Sandstone.

gradational contact

Fine to medium (locally coarse) quartzose sandstone with locally common 1 – 10cm units and intraclasts of claystone. Stratification is crudely planar to "massive" with occasional slump units.
Porosity severely occluded by authigenic quartz and clays; some minor secondary porosity as isolated vugs, especially along annealed fractures.
Colour in top 20 metres dominated by patchy/irregular alteration between greyish green and dark reddish brown.

Legend



Pacific Oil & Gas Pty Limited

SOUTH NICHOLSON BASIN – EP 54

LITHOLOGICAL LOG

DD92SN1

SCALE	1:500	DRAWING	L.T
AUTHOR	K.P.L	REPORT	304750
DATE	JAN 1993	PLAN No.	PetNTcw 7047