LAKES OIL NL

ACN 004 247 214

PETRO TECH-1
WELL COMPLETION REPORT
PEP 135
GIPPSLAND BASIN

Petro Tech-1

Well Completion Report

W1168

Prepared by
I.D. BUCKINGHAM

Level 20
459 Collins Street
Melbourne, Victoria 3000
phone: (03) 9629 1566 fax: (03) 9629 1624

Internet Site: www.reflections.com.au/LakesOil
Email Address: lakesoil@bigpond.com

LAKES OIL N.L.

WELL COMPLETION REPORT

PETRO TECH NO. 1

PEP 135

GIPPSLAND BASIN

VICTORIA

Prepared by: I.D. Buckingham
May, 1997

LIST OF CONTENTS

FIGURES PAGE

TABLES PAGE

APPENDICES

ENCLOSURES		**Scale**
1.	Composite Well Log	1:500
2.	Halliburton Formation Evaluation Log	1:500
3.	BPB Wireline Logs	
	DLL-MSFL -GR	1:200
	&	1:500
	CSS-CAL-GR	1:200
	&	1:500
	CNS-PDS-GR	1:200
	&	1:500

SUMMARY

Petro Tech No. 1 was drilled as an appraisal well in the old Lakes Entrance Oil Field, PEP 135, Gippsland Basin, Victoria. The only participant in the well was Petro Tech Pty Ltd, a wholly owned subsidiary of Lakes Oil N.L. The Operator for the well was Lakes Oil N.L.

Petro Tech No. 1 well is located approximately 1.5 km north of the township of Lakes Entrance, which is situated on the Princes Highway, 314 kilometres east of Melbourne.

The Glauconitic Sandstone of the Oligocene aged Lakes Entrance Formation was the primary objective of the well. This unit is the reservoir that had previously produced minor quantities of oil during development operations carried out from the 1930's through to the 1950's.

The well spudded at 13:00 hours, 3 March 1997 and reached a total depth of 425 m (KB) at 17:00 hours, 6 March 1997.

At total depth the following logs were run:

Run#1	DLL-MSFL-SP-GR-Cal
Run#2	CNS-PDS
Run#3	SGS-CSS
Run#4	RFS

All attempts to recover formation fluids by wireline methods were unsuccessful.

Low gas recordings were observed during drilling. The first background gas (C1) readings were observed at a depth of 327 m. and correspond approximately to the top of the Lakes Entrance Formation. C1 values remained relatively constant with depth and showed little appreciable change, even through the reservoir section, until basement was encountered at 405.5m. No other higher hydrocarbons were recorded during drilling.

No fluorescence was observed prior to penetrating the Glauconitic Sandstone of the Lakes Entrance Formation. Traces of pin point dull gold fluorescence with slow deep blue-white streaming cut and dull gold residual was observed while coring. Some free oil was recovered from the inner core barrel while slabbing prior to sealing for core analysis.

Three conventional cores, using fibre glass inner barrels, were cut over the gross interval 379.2 m. to 405 m. (K.B.). Core No.1 (379.2 m. - 388.3 m.) recovered approximately 1 m. of core. Core No.2 (388.3 m. - 397.3 m.) recovered 8 m. of core and Core No.3 (397.3 m. - 405.0 m.) recovered 7.2 m. No descriptions of any of the cores was available at the wellsite as recovered core and the fibreglass inner barrel were immediately cut into 1 metre lengths and sealed for future core analysis. On cutting, each surface was examined and observed under fluorescent light.

Petro Tech No. 1 was plugged and suspended to allow for re-entry for further field evaluation purposes should the need arise. The rig was released at 1300 hours, 9 March 1997.

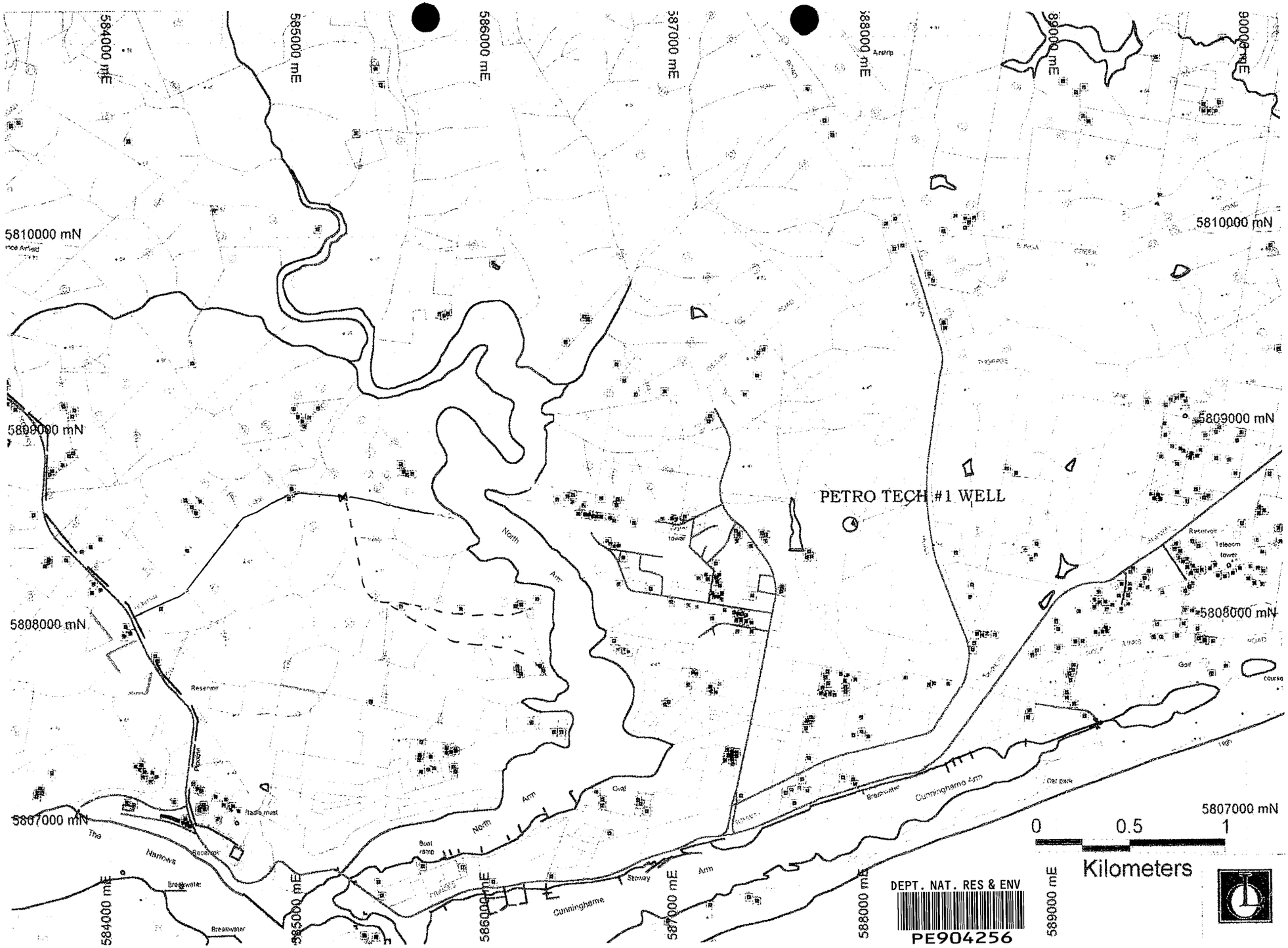
PE904256

This is an enclosure indicator page.
The enclosure PE904256 is enclosed within the container PE900825 at this location in this document.

The enclosure PE904256 has the following characteristics:

ITEM_BARCODE	= PE904256
CONTAINER_BARCODE	= PE900825
NAME	= Location map
BASIN	= GIPPSLAND
PERMIT	= PEP135
TYPE	= GENERAL
SUBTYPE	= PROSPECT_MAP
DESCRIPTION	= Location Map (enclosure from WCR) for Petro Tech-1
REMARKS	=
DATE_CREATED	= 31/05/97
DATE_RECEIVED	= 23/01/88
W_NO	= W1168
WELL_NAME	= PETROTECH-1
CONTRACTOR	= LAKES OIL NL
CLIENT_OP_CO	= LAKES OIL NL

(Inserted by DNRE - Vic Govt Mines Dept)


584000 mE
585000 mE
586000 mE
587000 mE
588000 mE
589000 mE
590000 mE
5810000 mN
5809000 mN
5808000 mN
5807000 mN
PETRO TECH #1 WELL
North Arm
Cunningham Arm
Narrows
Reservoir
Oval
Golf course
Boat ramp
Breakwater
Radio mast
Stairway
0
0.5
1
Kilometers
DEPT. NAT. RES & ENV
PE904256

CONCLUSIONS

- Petro Tech No.1 was drilled on a topographic high that corresponded to a palaeo-high at the level of the Glauconitic Sand.

- A core point was called at 379.2m (K.B.). This depth was chosen as it was believed (based on surrounding well data) that a short section of the overlying seal unit and part of the underlying 'greensand' reservoir would be obtained from this point. Poor core recovery for Core-1 is believed due to a hard segment of the reservoir, probably the indurated crust, jamming the Core Catcher and subsequently milling on the soft unconsolidated material forming the reservoir.

- The primary reservoir objective of this well, the Glauconitic Sands of the Oligocene Lakes Entrance Formation were present. The sands have a gross, log derived thickness of 22 metres and appear to be poorly consolidated, exhibit very high log derived porosities, but were shown by core analyses to have extremely low permeabilities. Core analysis indicates that the best hydrocarbon saturations occur between 395.0m. and 397.4m., a zone of 2.4 metre thickness which also exhibits the highest permeabilities.

- The lowermost section of the Glauconite Sands from 395.5m to 403m appears to exhibit the best porosity through this section as evidenced by the micro-caliper tool. This porosity development continues through the 2.5 metre section of the Colquhoun gravels. The 2.4 metre section from 395.0m to 397.4m, appears on logs (DLL-MSFL) to possibly represent a hydrocarbon zone above the water saturated basal section of the Glauconitic sands and Colquhoun Gravels.

- Several attempts to obtain formation fluid recoveries within the reservoir zone using the RFS tool failed due to plugging of the screen protecting the cylinder chamber. This plugging is believed to have occurred when the fine grained, unconsolidated materials comprising the reservoir invaded the testing probe and blocked the screen leading to the chamber.

- The loss of the opportunity to use the Spectral Gamma Tool due to its malfunction has resulted in a poor Gamma Log definition through the 'hot' minerals contained in the primary reservoir. This lack of definition of the reservoir in conjunction with the loss of core through the upper section of the reservoir has not allowed for an adequate evaluation of at least the upper 7 metres of the reservoir.

1. INTRODUCTION

Petro Tech No.1 was drilled to appraise the feasibility of producing 'heavy oil' in commercial quantities from the abandoned Lakes Entrance Oil Field. The data obtained from the drilling of this well would be used to design a pilot testing program for the field.

This pilot program, based on the 'steam pulsing' technique that is used extensively throughout North America on similar 'heavy oil' accumulations, requires the laboratory testing of fresh physical samples from the reservoir unit. Data to be collected includes - fluid samples, sample cuttings, conventional core material and electric logs. These materials will be analysed and evaluated to determine :

- the porosity and permeability characteristics, petrology and petrography of the formation reservoiring the oil accumulation;
- the nature and integrity of the sealing unit;
- the physical characteristics of the hydrocarbons contained within the formation.

Within the Lakes Entrance Area of the Gippsland Basin the basal Glauconitic Sands of the Lakes Entrance Formation have long been known to contain significant quantities of 'heavy oil'. These sands however, are generally regarded as being 'tight' and all previous attempts to produce the oil in commercial volumes has to date been unsuccessful. Lakes Oil N.L., through its wholly owned subsidiary Petro Tech Pty. Ltd., investigated a method of recovering this oil ('steam pulse" technique), and the Petro Tech No.1 well is the initial response to the process of evaluation that will test the applicability of the method to the Lakes Entrance Oil Field.

The Petro Tech No.1 location was chosen on the basis that the historical production information indicated that this area of the field was significantly more productive than some other areas and therefore the reservoir quality should be of a reasonable standard, that the location was centrally located within the known limits of the field, that access to the location was reasonable and that it was not yet surrounded by residential development.

The well developed infrastructure and proximity of markets were other reasons justifying the drilling of Petro Tech No. 1.

2. WELL HISTORY

2.1 Location (See Figures 1 & 2)

Co-ordinates:	Latitude:	37° 51′ 57.2″S
	Longitude:	147° 59′ 56.8″E

Australian Map Grid Co-ordinates, Zone 55,
E 587880.85
N 5808579.70

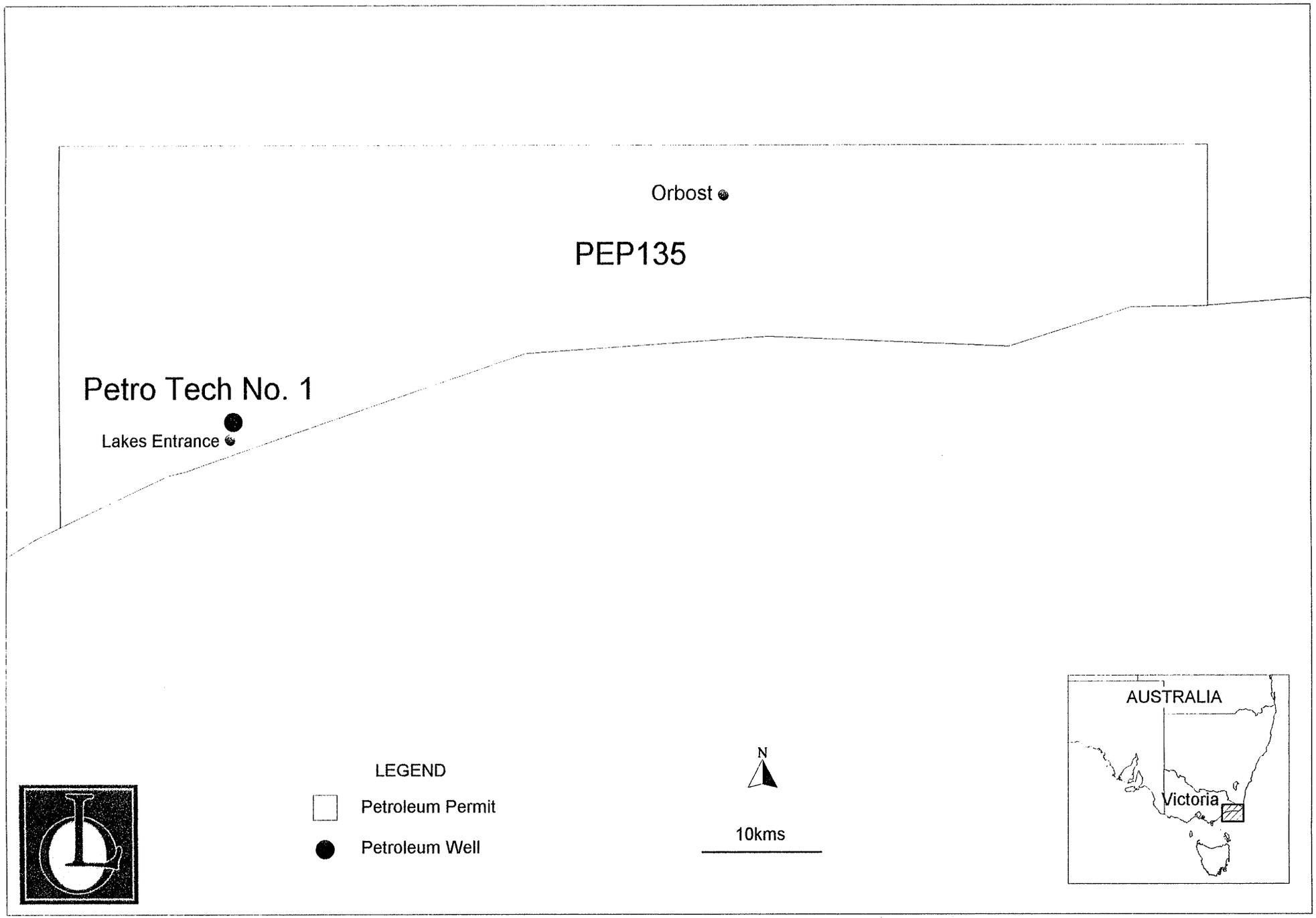
Description:	Colquhoun Road, Lakes Entrance Title No. 9515474 East Gippsland Shire
Property Owners:	Kent Engineering Co. Pty. Ltd.
Access to Location:	From end of Whiters Road, along access track through property owned by Kent Engineering Co. Pty. Ltd.

2.2 General Data

Well Name:	Petro Tech No. 1	
Operator:	Lakes Oil N.L. Level 20 459 Collins Street Melbourne 3000	
Elevation:	Ground Level: 48.97 m ASL Kelly Bushing: 50.47 m ASL (unless otherwise stated, all depths refer to K.B.)	
Total Depth:	Driller: Logger:	431.4 m. 431.4 m.
Pre-Spud:	28 February, 1997	
Spudded:	3 March, 1997 @ 1300 hours	
T.D. Reached:	6 March, 1997 @ 1700 hours	
Rig Released:	9 March 1997 @ 1300 hours	
Time to T.D.:	3 days	
Status:	Plugged and suspended, oil shows.	

LAKES OIL N.L.

Petro Tech No. 1 Location Map



LAKES OIL N.L.

PETRO TECH - 1
Drilling Time VS Depth

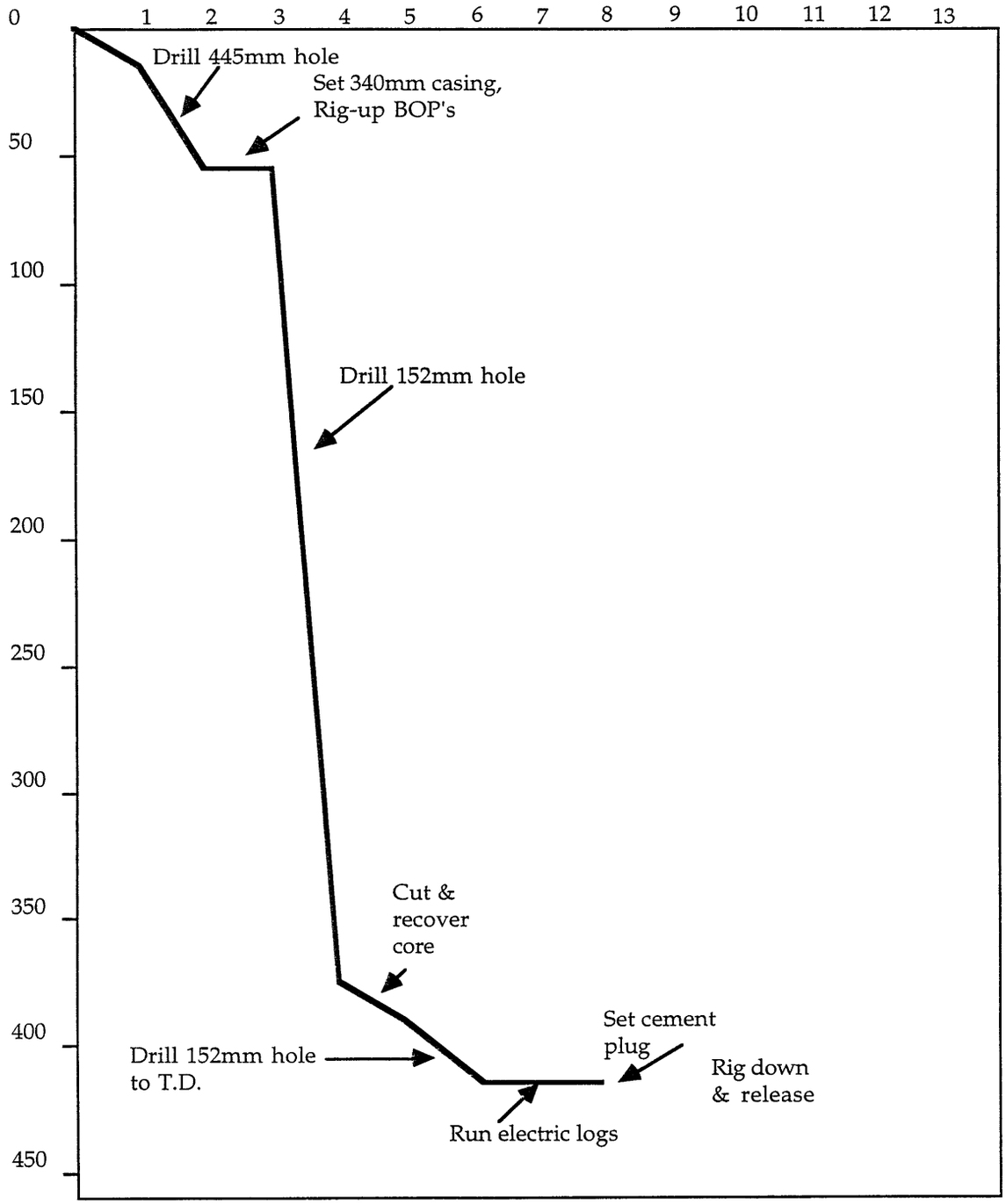


Figure 3

2.3 Drilling Data (see Appendices 1, 2 &3)

2.3.1 Drilling Contractor

David Henry Drilling Pty. Ltd.
R.M.D. 6064 Rosedale Road
Longford Victoria 3851

2.3.2 Drilling Rig

Bourne 2000R

(See Appendix 1 for details of the Drilling Rig and Plant).

2.3.3 Casing and Cementing Details

(i) Casing

Conductor

457mm (18") conductor was set at 8.0 m prior to rig up.

Surface Casing

Size:	340mm ($13^{3/8}$")
Weight and Grade:	
Float Collar:	
Shoe:	59.7 m
Cement:	Class G at 1.89 S.G.
Method:	Displacement
Equipment:	Halliburton Services

Cap

Installed casing cap for well suspension.

(ii) Cement Plugs

Plug No.:	1
Interval:	425 - 360 m
Cement:	$1.9m^3$ Class G + 35% Silica Flour cmt @ 1.89 SG
Method:	Balanced
Tested:	No

Plug No.:	2
Interval:	90 - 30 m
Cement:	$3.2m^3$ Class G neat @ 1.89 SG
Method:	Balanced
Tested:	Yes, plug and casing to 4000 kPa.

2.3.4 Drilling Bits

Bit No.	1	CB1	CB2	CB3	RR1
Size (mm)	152	150	150	150	152
Make	HTC	Chris	Chris	Chris	HTC
Type	STR-1	RC315	RC315	RC315	STR_1
IADC Code	1.1.6				1.1.6
Serial No.	W61XW	0119877	0119877	0119877	W61XW
Nozzles (32nd)	3X14	TFA 0.4	TFA 0.4	TFA 0.4	3X14
Depth In (m)	64	379.2	388.3	397.3	405
Depth out (m)	379	388.3	397.3	405	425
Total Metres	315	9.1	9.0	7.7	20.0
Total Hours	19.5	3.5	2.5	1	6.5
WOB (dN)	2 to 3	2 to 3	2 to 3	2 to 3	2 to 3
RPM	100	70	70	70	100
Condition	2.2 in	0% wear	0% wear	0% wear	3.2.in
HSI	0.57				0.57
JV (m/sec)	42				42

Table 1. Drilling Bits

2.3.5 Drilling Fluids

A 445mm ($17^{1/2"}$) hole was spudded using a fresh water Aquagel/caustic soda mud. The hole was drilled to the casing point at 64 m. The 340mm ($13^{3/8"}$) casing was set at 59.7 m as the casing could not be lowered any further despite attempts by the driller.

The 152mm ($6^{1/8"}$) hole was drilled to 425 m over 3 days using a Aquagel/starch/KCL mud system. The caliper log showed a very good gauge hole over the top section of the hole but some rugosity developed over the basal section through the Lakes Entrance Formation with good guage returning through the basal Glauconitic Sands and Colquhoun Gravels above basement. Typical mud properties close to T.D. were:

Density:	1.12 SG	Sand:	1.0 %
Viscosity:	46 seconds	Solids:	7 %
Water Loss:	8.2 ml	K+:	15000 mg/l
pH:	9.5	Cl-:	13000 mg/l
Filter cake:	2 mm	Ca++:	100 mg/l
PV/YP	14 - 15 cp/Pa	PHPA:	0 kg/m^3
Gels:	3/8 10s/10m		

Table 2. Drilling Fluids

For further details see Appendix III, "Drilling Fluids Recap".

2.3.6 Water Supply

Town water was used for drilling and was carted by tanker from the East Gippsland Shire Council's depot at Lakes Entrance.

2.4 Formation Sampling and Testing

2.4.1 Cuttings

Cuttings samples were collected at 5m. intervals from surface to casing point and at 3m. intervals from casing shoe to total depth. Samples for immediate analysis were washed and a split stored in a clear plastic sample tray. Larger sample volumes were not washed but allowed to air dry. No splits were made with the total sample to be sent to the

Department of Manufacturing and Industry Development for storage. This set of unwashed and dried samples was dispatched to the Department (Director of Energy Division) and the remaining plastic sample tray collection was retained by the operator. (see Appendix IV for description).

2.4.2 Cores

(i) Three conventional cores were cut across the primary reservoir zone. As the reservoir sands were expected to be poorly consolidated fibre glass inner core sleeves were used. Cores were cut into one metre sections and the ends sealed immediately in order to preserve the pore fluids and integrity of the cores. No description of the cores were made at well site but cores were described in the laboratory. A detailed description of these cores appears in Appendix V and core analyses in Appendix VI.

(ii) No sidewall coring operations were attempted.

2.4.3 Tests

No conventional open hole drill stem tests were carried out while drilling as it was proposed that production casing would be run at T.D. and testing undertaken as part of the appraisal program of the well. Wireline testing was attempted at several locations within the reservoir zone while logging (383m., 384m., 385m., 386m., 388m with an extended flow at 388m.). No successful recovery of fluids was achieved as in each instance plugging of the tool's filter screen by sediment particles prevented the ingress of fluids.

2.5 Logging and Surveys (see Enclosure 1)

2.5.1 Mud Logging

A standard skid-mounted Halliburton (Geodata Division) unit was used to record penetration rate, continuous mud gas monitoring, intermittent mud and cuttings gas analysis, pump rate and mud volume data. The mud log is included as Enclosure 2.

2.5.2 Wireline Logging (see Enclosure 3)

Wireline logging was performed by BPB Wireline Logging Services using a standard truck mounted unit. Given the shallow nature of the well and the lack of a large sump interval the following logging runs were carried out at total depth:

Run 1	DLL-MSFL-SP-CAL	430.6m. - 0.0m.
Run 2	CNS-PDS	430.4m. - 130.0m.
Run 3	CSS	428.9m. - 59.67m.
Run 4	RFS	Pre-tests @ 383m., 384m., 385m., 386m., 388m. with extended flow @ 388m.

Owing to the chemical character of the minerals forming the glauconitic sand reservoir it was decided to run a Spectral Gamma Log as part of the program. Unfortunately, this tool malfunctioned and could not be run as part of the logging suite.

2.5.3 Deviation Surveys

Hole deviation surveys were conducted at T.D. of each section during the drilling operations.

The survey results were:

64 m. - 0.75 deg.
425 m. - 1.75 deg.

2.5.4 Velocity Survey

No Velocity Survey was recorded.

2.6 Noise Assessment (Appendix VII)

At the request of the East Gippsland Shire Council, the Operator undertook a noise assessment of the drilling operations. The survey was conducted by HAZCON Pty Ltd.

The planning permit for the well drilling operations required compliance with the Construction and Demolition Site Noise as detailed in the Environment Protection Authority Technical Guidelines, "Noise Control Guidelines TG 302/92", Appendix 7.3. These requirements are outlined in the report provided by HAZCON Pty Ltd. The conclusions drawn from the noise measurements that were undertaken during drilling operations were that the noise levels measured at the residential dwellings nearest to the well were not excessive. A series of recommendations to control noise at the proposed Hunter Lane drilling location were provided for consideration.

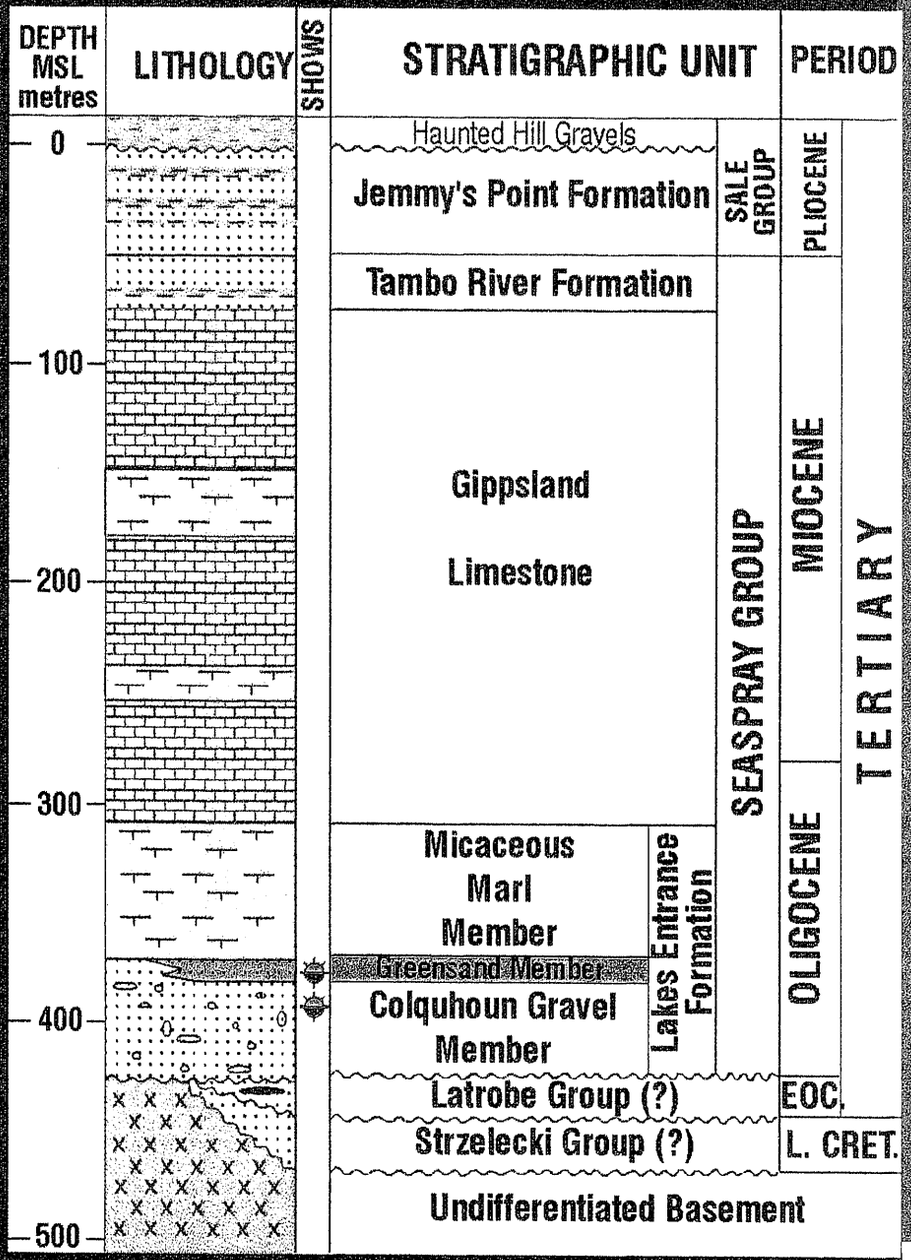
PE904257

This is an enclosure indicator page.
The enclosure PE904257 is enclosed within the container PE900825 at this location in this document.

The enclosure PE904257 has the following characteristics:

ITEM_BARCODE	= PE904257
CONTAINER_BARCODE	= PE900825
NAME	= Generalised Stratigraphy
BASIN	= GIPPSLAND
PERMIT	= PEP135
TYPE	= WELL
SUBTYPE	= STRAT_COLUMN
DESCRIPTION	= Generalised Stratigraphy of Lakes Entrance Oil Field (enclosure from WCR) for Petro Tech-1
REMARKS	=
DATE_CREATED	= 31/05/97
DATE_RECEIVED	= 23/01/88
W_NO	= W1168
WELL_NAME	= PETROTECH-1
CONTRACTOR	= LAKES OIL NL
CLIENT_OP_CO	= LAKES OIL NL

(Inserted by DNRE - Vic Govt Mines Dept)



Gravel

Sandstone

Siltstone

Claystone

Marl

Limestone

Coal

Oil and gas show

LAKES ENTRANCE OIL FIELD GENERALISED STRATIGRAPHY

3. RESULTS OF DRILLING

3.1 Stratigraphy

The following stratigraphic intervals have been identified using penetration rate, cuttings and wireline log interpretation.

Age	Formation	Depth (K.B.)	Depth (S.S.)	T'ness (m)
	Jemmy's Point	Surf.	+48.97	30
	Tambo River	30	+20.5	26
Miocene	Gippsland Lmst.	56	5.5	245
Oligocene	Lakes Entrance	301	250.5	80
	Glauconitic Sands	381	330.5	22
	Colquhoun Gravels	403	352.5	2.5
Palaeozoic	Basement (weathered)	405.5	355	3.5
	Basement (mica granite)	409	358.5	16+
	Total Depth	425	374.5	

Table 3. Stratigraphic Units Penetrated in Petro Tech-1 Well

3.2 Lithological Description

3.2.1 Jemmy's Point Formation (surface - 30m)

SANDS, yellow to orange, loose with weak clayey and very fine grained sand matrix, medium to very coarse, becoming finer grained and more clayey with depth, sub-angular to sub-rounded, with occasional rounded grains, common iron oxide staining, trace hematite grains, poorly sorted.

3.2.2 Tambo River Formation 30 m - 56 m

MARLSTONE (CLAYSTONE), Light grey to medium grey, calcareous, sticky, argillaceous, very fine sand in part, rare glauconite grains, irregular thin layers of shells and shell fragments, shells becoming more abundant with depth, more sand with depth; interbedded with

LIMESTONE, white to pale grey, fine to medium grains, fossils and calcareous grains sponges, forams, bryzoa, shell fragments, grey argillaceous matrix, common limonite grains, loose to friable.

3.2.3 Gippsland Limestone 56 m - 301 m

56 m - 93 m
MARLSTONE (CLAYSTONE), light grey to medium grey, very calcareous, abundant very fine to medium grained quartz, common medium to coarse glauconite grains, sticky, argillaceous, silty to very fine sand in parts; with

SHELL FRAGMENTS, gastropods, bivalves, bryozoa, echinoids & spines, lamellibranchs, forams (often with glauconite infilling), fenestrella.

93 m - 301
BRYZOAN LIMESTONE, white, cream, buff, light grey to medium grey, occasional glauconite grains, matrix comprises a light grey marlstone, abundant shell and echinoid spines in addition to bryozoa; interbedded with

MARLSTONE (CLAYSTONE), light grey, mid-grey, pale green, cream, very calcareous, silty, very soft, non dispersive, common glauconite disseminated throughout; and bands of

LIMESTONE, light grey, buff, yellow, very hard, coralline.

3.2.4 Lakes Entrance Formation 301 m - 405.5 m

Glauconitic Sands 381m. - 403m.
Colquhoun Gravels 403m. - 405.5m.

301 m - 381 m
CLAYSTONE, grading in parts to SILTSTONE, dark grey to medium grey brown, speckled, micromicaceous, slightly carbonaceous, very fine grains of glauconite disseminated throughout, fossiliferous, very soft to firm, sub-blocky, occasional pellets of glauconite becoming more abundant with depth; and

CLAYSTONE, pale green to off white, predominantly soft to occasionally firm, laminated, very fossiliferous, mottled with cream clay in parts; with interbeds of

MARLSTONE (CLAYSTONE), light grey, very calcareous, silty in parts, dispersive, common glauconite disseminated throughout; and

LIMESTONE, dark grey to brown, speckled, very fine grains of glauconite, very calcareous, occurs as occasional thin very hard (indurated) bands towards base.

381 m - 403 m
GLAUCONITIC SANDS, dark green, light to medium grey green, predominantly very fine to fine grained quartz, sub-rounded, common

coarse to very coarse clear to slightly opaque sub-angular quartz grains, poorly sorted, weak calcareous cement, dispersive green grey argillaceous matrix, abundant glauconite (in grains and pelletal form), abundant fossil fragments, trace carbonaceous specks, trace pyrite, soft aggregates of grains, friable, inferred poor porosity, trace pinpoint moderately bright gold fluorescence, moderate bright blue white slow streaming cut; interbedded with

SILTSTONE, medium green-grey brown, predominantly argillaceous occasionally arenaceous, trace carbonaceous specks, soft, sub-fissile to sub-blocky; and

CLAYSTONE, cream, moderately hard to hard, sub-blocky.

403 m - 405.5 m
GRAVELS, dark green to dark green brown, black, light to medium grey green, very fine to fine grained, silty, micaceous, non indurated, friable, mica and glauconite rich, glauconite pellets up to medium sand size, abundant calcite, rare bivalves and bryozoa, poorly sorted, burrows common, abundant pyrite in parts, minor iron oxide cement in places.

3.2.5 Palaeozoic Granite 405.5 m - Total Depth (425 m)

405.5 m - 409 m
WEATHERED GRANITE, clear to slightly milky, white, yellow, pale grey, pale green quartz grains, coarse to grit sized, loose, sub-angular to sub-rounded, weathered felspars, biotite inclusions in some quartz grains, abundant biotite flakes.

409 m - 425 m
GRANITE, clear to slightly milky quartz grains some quartz grains exhibit pale green tinge, medium to coarse, angular, trace plagioclase felspar, biotite inclusions in some quartz grains, abundant biotite flakes becoming more abundant with depth.

3.3 Hydrocarbon Indications

3.3.1 Mud Gas Reading

The mud gas detection equipment was operational from spud to the total depth (425 m). No background gas was recorded above the Lakes Entrance Formation. Initial readings of C1 were recorded commencing at 327 m. Between 327 m and 379 m background gas levels remained low and relatively stable with C1 values ranging from 470 ppm to a maximum of 1209 ppm. Only four readings in excess of 1000 ppm were

recorded and these were all within 15 metres of the top of the first recorded gas shows. No C2 or higher gas readings were noted at anytime during drilling operations.

Mud gas readings decreased during coring operations and below 405 m moved rapidly towards zero.

3.3.2 Sample Fluorescence

Cutting samples were routinely inspected for fluorescence at 5m. intervals from surface to 64m. (casing point). From casing shoe (60m.) to total depth samples were inspected at 3m. intervals. Other than the standard 3m. interval no samples were circulated for analysis other than at the called core point at 379.2m.

Traces of pinpoint moderately bright gold fluorescence, with moderate bright blue white slow streaming cut was observed while coring. A very weak dull gold residual fluorescent ring was observed in the evaporation tray after cutting with chlorethane.

After cutting and prior to sealing the sectioned cores ultraviolet light was played on the core sections. Fluorescence descriptions range from mottled yellow to uniform yellow.

3.3.3 Liquid Hydrocarbons

On laying down Core#2 free oil was found in the fibre glass inner barrel. A sample of this oil was collected and along with the core material sent for analysis. A discussion of the analytical results of this sample are contained in Section 4.

4. GEOLOGY

4.1 Structure

The Petro Tech No.1 location was chosen on the basis that the historical production information indicated that this area of the field was significantly more productive than some other areas and therefore the reservoir quality should be of a reasonable standard and that the location was centrally located within the known limits of the field. In addition, access to the location was reasonable and that it was not yet surrounded by residential development.

Drilling results from Petro Tech-1 well indicate that the Glauconite Sands unit is structurally high at this location. The only well that is structurally higher is No 1 Houghton's; furthermore strong doubts about the validity of the top of the Glauconitic Sands in all previous wells must be held. The exception being Woodside Petroleum's Lakes Entrance No.1 well.

The relative thinness of the Colquhoun Gravels in this well compared with thicknesses in other wells also suggests that this area represents a local palaeo-high at the time of deposition of this unit.

4.2 Porosity and Water Saturation - Log Analysis

The wireline log suite run in Petro Tech-1 included the density - neutron logs. The decision to run these logs was made on the basis that the determination of the porosity of the Glauconite sands was extremely important in determining the hydrocarbon saturations contained in the reservoir. While the sonic log was being run it was regarded as imperative that a second porosity reading tool be run to provide confirmation of the porosity characteristics.

No potential reservoirs were penetrated during the drilling of the Gippsland Limestone nor upper section of the Lakes Entrance Formation above the Glauconite sands.

The large wash-outs, as exhibited on the caliper curve and the unconsolidated nature of the sands have combined to produce dramatically high log derived porosities. Furthermore, the exotic mineral assemblage has affected the resistivity and gamma ray logs and when these elements are combined and analysed significantly lower and eroneous Sw values are produced.

Porosity values in this well calculated from both porosity tools must be regarded as being in general far too high. Diagenetic cement(s), unconsolidated formations, hole rugosity and secondary porosity, exotic mineral assemblages, all of which are present in this well, will affect the responses of the logging tools and distort the derived values.

4.3 Core Descriptions and Core Analysis Results

After recovering the core barrel from each coring run, cores were sectioned and sealed for analysis. Cores were delivered to Amdel Laboratories in Adelaide. Within the laboratory environment the cores were described and a total of 28 plug samples cut for detailed core analyses.

4.3.1 Core Descriptions (Appendix V)

Three cores using fibre glass inner barrels, were cut over the gross interval 379.2m. to 405.0m.

Core No.1 (379.2m - 388.3m.) recovered approximately 1m. The top of the core was composed of a brown, well indurated limestone. Underlying this was a thin, green, silty to fine grained sandstone that was very hard and contained large diameter burrows, altered glauconite pellets and Fe staining. Both the limestone and sandstone sections recovered appeared to have spent a considerable period jammed in the core catcher as both showed evidence of milling on their surfaces. The remaining material comprised a yellow to light brown micaceous silt that had to be forced from the core barrel as it appeared to have been compacted in the barrel as a result of the harder materials jamming for some time in the core catcher during the coring process.

Core No.2 (388.3m. - 397.3m.) recovered 8m. of core. The core was dominantly composed of dark green sandstone, very fine to fine grained and often silty. Several palaeo-surfaces have been identified with increases in abundance of oyster shells and/or intensive burrowing. Glauconite pellets are abundant and vuggy porosity is developed where aragonite has dissolved. No fluorescence was observed above 391.2m. and at this depth it consisted only of weak light green concentrated along the burrows. Mottled yellow fluorescence was observed at 395.0m. and increased in intensity to become an even yellow at 395.4m. From this depth to 397.3m. (base of core) fluorescence was observed to be even bright yellow with bitumen saturations.

Core No.3 (397.3m. - 405.0m.) recovered 7.2m. of core. The top 300mm of this core is composed of a brown-green, very fine to fine grained sandstone with the top 100mm exhibiting mottled yellow fluorescence.

No fluorescence is observed below 397.4m. The remainder of this core is composed of black to dark green to dark green brown, very fine to fine, silty, micaceous and soft sandstone. Mica and glauconite are abundant and mottling due to burrows and bio-turbidation are common.

4.3.2 Core Analysis Descriptions (Appendix VI)

Twenty-eight sample plugs for analysis were taken from 388.6m. to 397.4m. Plugs were analysed for porosity, permeability, residual pore saturations and grain density and lithological descriptions were also made of each.

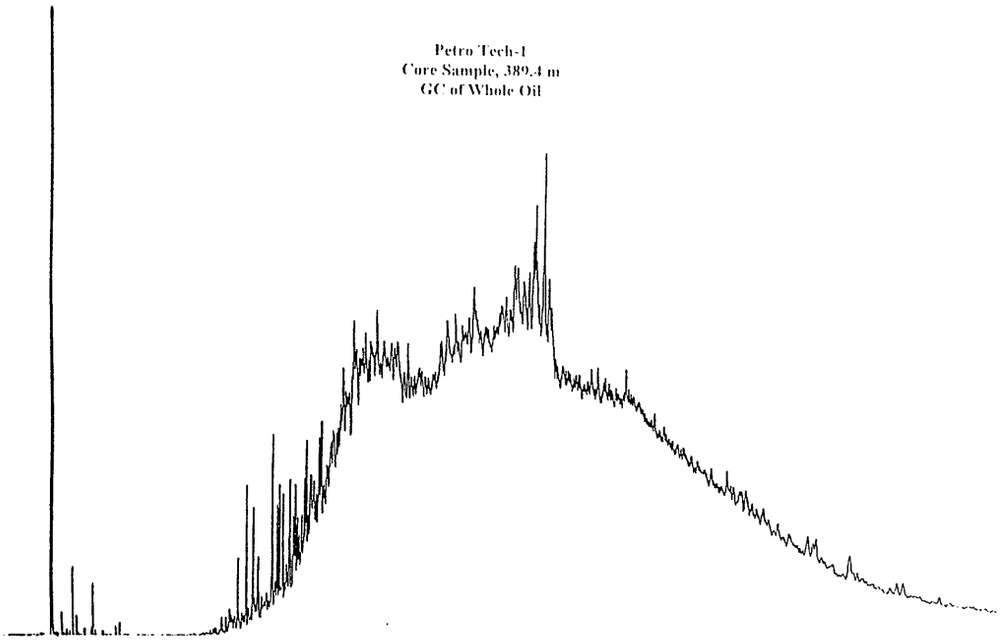
Porosity measurements indicate that generally values are high and lie within a range of 21.3% to 41.4% with the majority in the mid-thirty per cent range. Permeabilities are generally very low, with one sample at 391.6m. and the lowest six samples from 395.2m. to 397.4m. being the only samples exhibiting permeabilities above 1 millidarcy. These lower six samples correspond to the best fluorescence shows in the cores as described in the previous section. The lowermost five of these samples also showed low levels of residual oil saturation.

Analyses indicate that while porosities are generally very high and that there are residual oil saturations present within the section, that the extremely low permeabilities i.e., 0.003 md lowest reading with 20 samples under 1 md, provide an impediment to the flow of hydrocarbons within this area of the reservoir.

4.4 Hydrocarbon Extractions

Two samples were examined using Gas Chromatography. One analysis was made of an oil sample collected when oil flowed from the core barrel while sectioning the core. The sample was collected at 389.4m. and the GC profile indicates an oil that appears to have been bio-degraded and/or water washed with little in the way of lighter hydrocarbons present.

The second sample was taken from a core sample at 395.9m. and shows an almost identical GC profile as the previous sample. These GC profiles are seen in Figure 4.



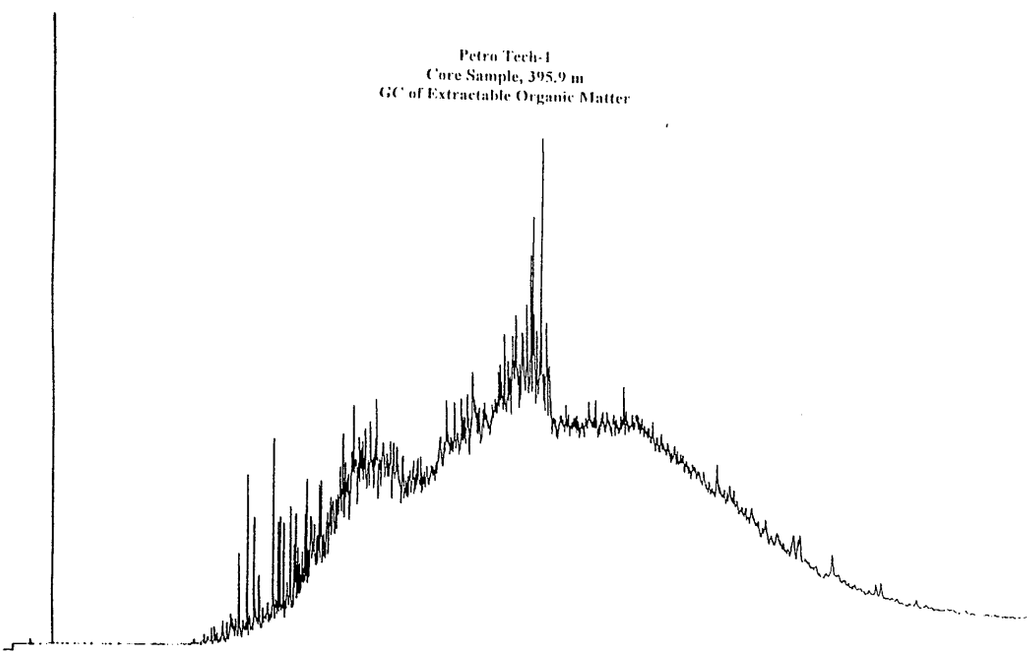


Figure 4 Gas Chromatograph Profiles

APPENDIX 1

APPENDIX I

Details of Drilling Rig and Plant

051 497556

DAVID HENRY DRILLING P/L

R.M.B. 6064 Rosedale Road Longford Vic. 3851

Telephone: (051) 49 7247
Fax: (051) 49 7556
Mobile: 018 517 568

17th June 1996

Ian Buckingham
C/o Lakes Oil N.L.
The Atrium, Level 5,
459 Collins Street,
Melbourne, Vic. 3000.

PERSONNEL

We will be providing a three man crew for each 12 hour shift
Tool Pusher - Class 3 water well drillers licence with 25 years experience,
Driller - oil field with BOP tickets,
Derrickman,
One rough neck,

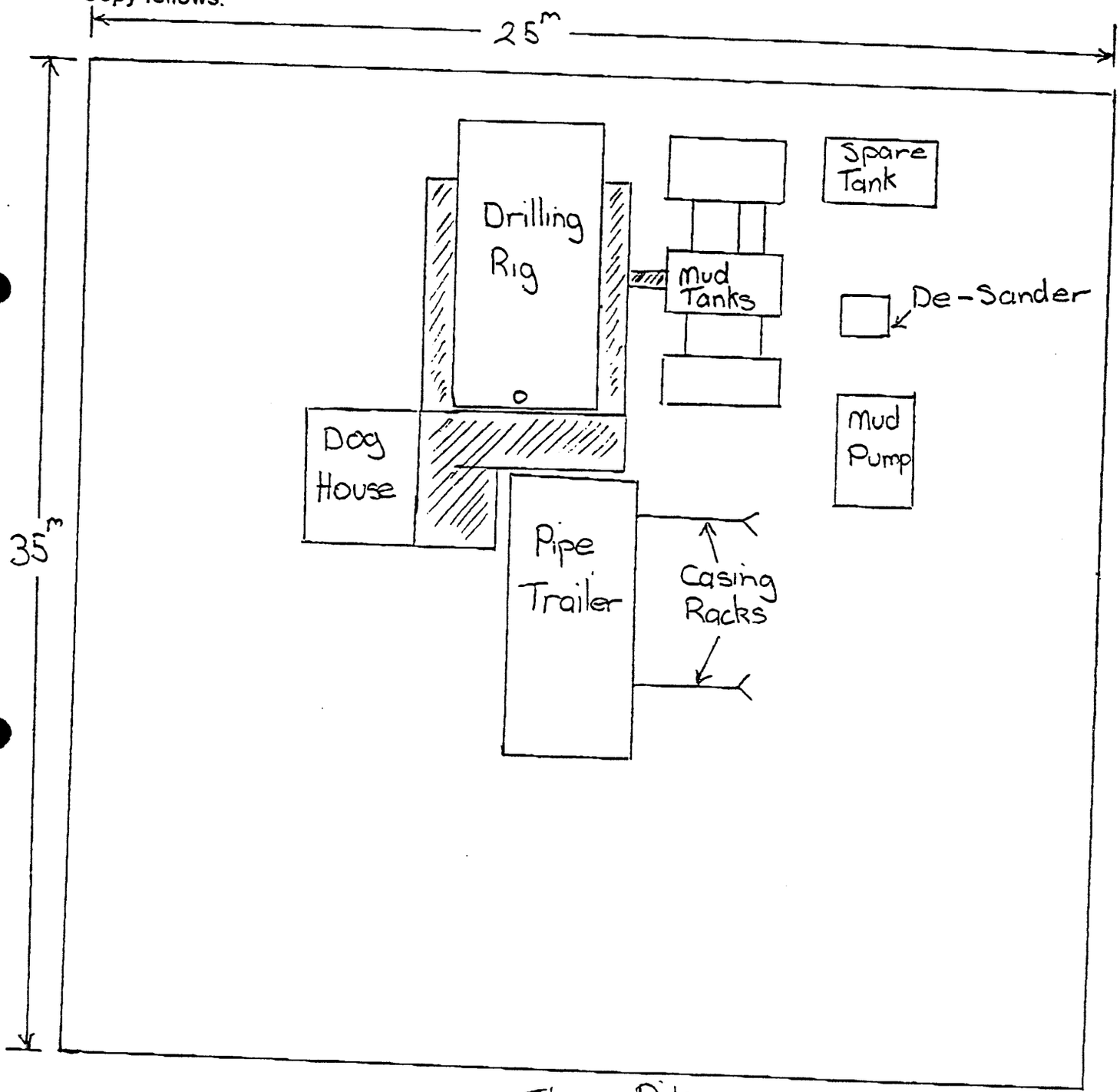
EQUIPMENT LIST

Drilling Rig Bourne 2000R
Rated 60,000 lb Hook Load
237 hp Mack Maxidyne Turbo Charged Motor
7½x8" Duplex Mud Pump
Rig is semi trailer mounted.
Rig has fully enclosed engine canopy for noise control.
Skid mounted 5½"x 8" duplex mud pump for extra drilling fluid or mud mixing.
Jack up sub base to allow to use shale shaker, de-sander, BOP's and portable mud tanks to enable sampling to be carried out.
3000psi BOP
Drill pipe 600 meters of 3½" at 13.3lb per foot.
Drill collars 20 meters 5¾" and 4¾".
Stabilisers to suit diameter of hole being drilled.
Cross over subs from 3½"IF to 4½"API regular.
Cross over subs from 3½"IF to 6⅝"API regular.
All pipe lifting plugs and elevators and chains.
Semi trailer used for drill pipe rack.
Elevated rig floor and walk ways with hand rails.
Night lights.
Dog house for employees and company men.
On site welder and generator.

HANDLING EQUIPI.....
Fork lift tractor will be on site.

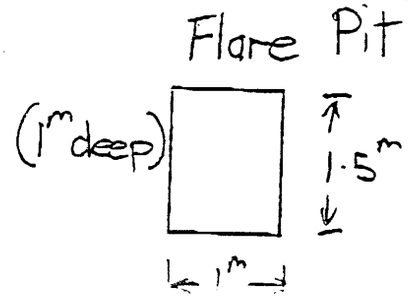
MUD TANKS
Portable cement tanks.
Extra mud tank will be provided and a cutins skip.
Trip tank.

SITE PREPARATION
Copy follows.



Yours sincerely.

DAVID HENRY



APPENDIX 2

APPENDIX II

Summary of Wellsite Operations

&

Drilling Fluids Recap

LAKES OIL NL

DAILY DRILLING REPORT

Well:	PETROTECH-1	Report No:	6	Date:	9-Mar-97
2400 hr Depth:	31 m PBTD	Last Depth:	425 m	Day Progress:	0
Total Fuel:		Fuel Usage:		Daily Cost:	$5,170
Last Casing:	13-3/8" @ 59.7m			Cumm Cost:	$223,288
				Est Total:	$245,658

0600 hr Operations: Rig Released
Remarks: No accidents

BIT INFORMATION		
Bit Number		
Size (in)		
Make		
Type		
IADC Code		
Serial Number		
Nozzles (32nd)		
Depth In (m)		
Depth Out (m)		
Total Metres		
Total Hours		
WOB (dN)		
RPM		
Condition		
HSI		
JV (m/sec)		

OPS BREAKDOWN (hrs)	
Drilling	
Tripping	1.0
Surveys	
Coring	
Testing	0.5
Circ Sample	
Casing	
Cementing	
Wireline	
Circ & Cond	
BOP's	3.5
Rig Service	
Wait on Cement	
Standby	8.0
Total	13.0

MUD PROPERTIES		
Density		SG
Viscosity		sec
Water Loss		ml
pH		strip
Filter Cake		mm
PV/YP		cp/Pa
Gels		10s/10m
Sand		%
Solids		%
K+		mg/l
Chlorides		mg/l
Calcium		mg/l
PHPA		kg/m3
Day Cost	$0	
Cumm Cost	$1,848	

BHA:

OPERATIONS SUMMARY

From	To	Time	Operation
0000	0800	8.0	Standby
0800	0830	0.5	RIH. Tag plug #2 at 31m
0830	0900	0.5	Test plug and casing to 4000 kPa
0900	0930	0.5	POH
0930	1300	3.5	Rig down BOP's and bradenhead.
			Install casing cap for well suspension
			Rig released @ 1300 hours 9 March

CHEMICALS USED

Type	Unit Size	Qty
Aquagel	25 kg	
Caustic Soda	25 kg	
Dextrid	25 kg	
Soda Ash	25 kg	
Pot Chloride	25 kg	
QB-II	25 kg	

GAS (units)		
Depth	B'ground	Peak

PUMP DATA		
SPM		st/min
Output		l/min
Pressure		kPa
AV DP		m/min
AV DC		m/min

Supervisor: Peter Dwyer

LAKES OIL NL

DAILY DRILLING REPORT

Well:	PETROTECH-1	Report No:	5	Date:	8-Mar-97
2400 hr Depth:	425 m	Last Depth:	425 m	Day Progress:	0
Total Fuel:		Fuel Usage:		Daily Cost:	$10,120
Last Casing:	13-3/8" @ 59.7m			Cumm Cost:	$223,288

0600 hr Operations: Standby - rig repair
Remarks: No accidents

BIT INFORMATION		
Bit Number		
Size (in)		
Make		
Type		
IADC Code		
Serial Number		
Nozzles (32nd)		
Depth In (m)		
Depth Out (m)		
Total Metres		
Total Hours		
WOB (dN)		
RPM		
Condition		
HSI		
JV (m/sec)		

OPS BREAKDOWN (hrs)	
Drilling	
Tripping	5.5
Surveys	
Coring	
Testing	
Circ Sample	
Casing	
Cementing	2.0
Wireline	
Circ & Cond	2.0
BOP's	
Rig Service	
Wait on Cement	0.5
Standby	14.0
Total	24.0

MUD PROPERTIES		
Density	1.11	SG
Viscosity	48	sec
Water Loss	9	ml
pH	10	strip
Filter Cake	2	mm
PV/YP	15/15	cp/Pa
Gels	3/6	10s/10m
Sand	1.0	%
Solids	7	%
K+	15000	mg/l
Chlorides	13000	mg/l
Calcium	160	mg/l
PHPA	0	kg/m3
Day Cost	$0	
Cumm Cost	$1,848	

BHA:

OPERATIONS SUMMARY

From	To	Time	Operation
0000	0700	7.0	Standby - waiting on orders
0700	1000	3.0	Pick up tubing cement tail pipe RIH on DP to 425m
1000	1130	1.5	Circulate and condition hole
1130	1230	1.0	Mix and pump 1.9m3 Class G + 35% Silica Flour cement at 1.89 SG. Set balanced plug #1 over interval 425m to 360m.
1230	1300	0.5	POH to 330m. Circulate pipe clean
1300	1430	1.5	POH to 90m
1430	1500	0.5	Circulate and condition hole
1500	1600	1.0	Mix and pump 3.2m3 Class G neat at 1.89SG. Set balanced plug #2 over interval 90m to 30m
1600	1630	0.5	POH with tubing stinger
1630	1700	0.5	Wait on cement.
1700	2400	7.0	Standby

CHEMICALS USED		
Type	Unit Size	Qty
Aquagel	25 kg	
Caustic Soda	25 kg	
Dextrid	25 kg	
Soda Ash	25 kg	
Pot Chloride	25 kg	
QB-II	25 kg	

GAS (units)		
Depth	B'ground	Peak

PUMP DATA		
SPM		st/min
Output		l/min
Pressure		kPa
AV DP		m/min
AV DC		m/min

Supervisor: Peter Dwyer

LAKES OIL NL

DAILY DRILLING REPORT

Well:	PETROTECH-1	Report No:	4	Date:	7-Mar-97
2400 hr Depth:	425 m	Last Depth:	425 m	Day Progress:	0
Total Fuel:		Fuel Usage:		Daily Cost:	$37,670
Last Casing:	13-3/8" @ 59.7m			Cumm Cost:	$213,168

0600 hr Operations: Standby- waiting on orders
Remarks: No accidents

BIT INFORMATION		
Bit Number		
Size (in)		
Make		
Type		
IADC Code		
Serial Number		
Nozzles (32nd)		
Depth In (m)		
Depth Out (m)		
Total Metres		
Total Hours		
WOB (dN)		
RPM		
Condition		
HSI		
JV (m/sec)		

OPS BREAKDOWN (hrs)	
Drilling	
Tripping	
Surveys	
Coring	
Testing	
Circ Sample	
Casing	
Cementing	
Wireline	16.5
Circ & Cond	
BOP's	
Rig Service	
Wait on Orders	2.5
Standby	5.0
Total	24.0

MUD PROPERTIES		
Density	1.11	SG
Viscosity	43	sec
Water Loss	8.8	ml
pH	9.5	strip
Filter Cake	2	mm
PV/YP	12/13	cp/Pa
Gels	2/5	10s/10m
Sand	1.0	%
Solids	7	%
K+	16000	mg/l
Chlorides	13000	mg/l
Calcium	100	mg/l
PHPA	0	kg/m3
Day Cost	$0	
Cumm Cost	$1,848	

BHA:

OPERATIONS SUMMARY

From	To	Time	Operation
0000	1630	16.5	Run electric logs:
			Run #1: DLL-MSFL-SP-GR-Cal
			Run #2: CNS-PDS
			Run #3: SGS-CSS
			Run #4: RFS
			Rig down loggers
1630	1900	2.5	Wait on orders
1900	2400	5.0	Standby - waiting on orders

CHEMICALS USED		
Type	Unit Size	Qty
Aquagel	25 kg	
Caustic Soda	25 kg	
Dextrid	25 kg	
Soda Ash	25 kg	
Pot Chloride	25 kg	
QB-II	25 kg	

GAS (units)		
Depth	B'ground	Peak

PUMP DATA		
SPM		st/min
Output		l/min
Pressure		kPa
AV DP		m/min
AV DC		m/min

Supervisor: Peter Dwyer

LAKES OIL NL

DAILY DRILLING REPORT

Well:	PETROTECH-1	Report No:	3	Date:	6-Mar-97
2400 hr Depth:	425 m	Last Depth:	397.3 m	Day Progress:	27.7 m
Total Fuel:		Fuel Usage:		Daily Cost:	$20,466
Last Casing:	13-3/8" @ 59.7m			Cumm Cost:	$175,498

0600 hr Operations: Running wireline logs
Remarks: No accidents

BIT INFORMATION		
Bit Number	CB3	1RR
Size (in)	6	6-1/8
Make	Chris	HTC
Type	RC315	STR-1
IADC Code		1.1.6
Serial Number	0119877	W61XW
Nozzles (32nd)	TFA 0.4	3x14
Depth In (m)	397.3	405
Depth Out (m)	405	425
Total Metres	7.7	20.0
Total Hours	1	6.5
WOB (dN)	2 to 3	2 to 3
RPM	70	100
Condition	0% wear	3.2.In
HSI		0.57
JV (m/sec)		42

OPS BREAKDOWN (hrs)	
Drilling	6.5
Tripping	9.0
Surveys	
Coring	1.5
Testing	
Circ Sample	
Casing	
Cementing	
Wireline	1.5
Circ & Cond	3.0
BOP's	
Rig Service	
Handle Tools	0.5
Handle Core	1.0
Reaming	1.0
Total	24.0

MUD PROPERTIES		
Density	1.12	SG
Viscosity	46	sec
Water Loss	8.2	ml
pH	9.5	strip
Filter Cake	2	mm
PV/YP	14/15	cp/Pa
Gels	3/9	10s/10m
Sand	1.0	%
Solids	7	%
K+	16000	mg/l
Chlorides	13000	mg/l
Calcium	100	mg/l
PHPA	0	kg/m3
Day Cost	$328	
Cumm Cost	$1,848	

BHA: Core bit: core barrel: 1 x 4-3/4" DC: XO: 4 x 4-1/8" DC's: XO
Bit: bit sub: 1x4-3/4" DC: XO: 4x4-1/8" DC's: XO

OPERATIONS SUMMARY			
From	To	Time	Operation
0000	0200	2.0	RIH with core barrel
0200	0230	0.5	Circulate and tag bottom
0230	0330	1.0	Cut core #3 f/397.3m to 405.0m
0330	0600	2.5	POH
0600	0730	1.5	Lay out core recovery. Lay out barrel
0730	0930	2.0	RIH with bit 1RR to 379m
0930	1030	1.0	Ream core hole f/379m to 405m
1030	1700	6.5	Drill 6-1/8" hole f/405m to 425m
1700	2000	3.0	Circulate and condition hole
2000	2230	2.5	POH. Recover survey - 1.75
2230	2400	1.5	Rig up loggers
			Run #1: DLL-MSFL-SP-GR-Cal

CHEMICALS USED		
Type	Unit Size	Qty
Aquagel	25 kg	2
Caustic Soda	25 kg	1
Dextrid	25 kg	4
Soda Ash	25 kg	
Pot Chloride	25 kg	6
QB-II	25 kg	

GAS (units)		
Depth	B'ground	Peak
408 m	0.00	1.50
425 m	0.00	0.10

PUMP DATA		
SPM	55	st/min
Output	729	l/min
Pressure	1800	kPa
AV DP	57	m/min
AV DC	96	m/min

Supervisor: Peter Dwyer

LAKES OIL NL

DAILY DRILLING REPORT

Well:	PETROTECH-1	Report No:	2	Date:	5-Mar-97
2400 hr Depth:	397.3 m	Last Depth:	379.2 m	Day Progress:	18.1 m
Total Fuel:		Fuel Usage:		Daily Cost:	$16,020
Last Casing:	13-3/8" @ 59.7m			Cumm Cost:	$155,032

0600 hr Operations: Laying down core #3. Present TD - 405 m
Remarks: No accidents

BIT INFORMATION		
Bit Number	CB1	CB2
Size (in)	8	8
Make	Chris	Chris
Type	RC315	RC315
IADC Code		
Serial Number	0119877	0119877
Nozzles (32nd)	TFA 0.4	TFA 0.4
Depth In (m)	379.2	388.3
Depth Out (m)	388.3	397.3
Total Metres	9.1	9.0
Total Hours	3.5	2.5
WOB (dN)	2 to 3	2 to 3
RPM	70	70
Condition	0% wear	0% wear
HSI		
JV (m/sec)		

OPS BREAKDOWN (hrs)	
Drilling	
Tripping	13.0
Surveys	
Coring	6.0
Testing	
Circ Sample	
Casing	
Cementing	
Wireline	
Circ & Cond	0.5
BOP's	
Rig Service	
Handle Tools	3.5
Handle Core	1.0
Total	24.0

MUD PROPERTIES		
Density	1.12	SG
Viscosity	53	sec
Water Loss	13.2	ml
pH	9.5	strip
Filter Cake	2	mm
PV/YP	14/15	cp/Pa
Gels	3/9	10s/10m
Sand	1.0	%
Solids	7	%
K+	15000	mg/l
Chlorides	13000	mg/l
Calcium	100	mg/l
PHPA	0	kg/m3
Day Cost	$100	
Cumm Cost	$1,622	

BHA: Core bit: core barrel: 1 x 4-3/4" DC: XO: 4 x 4-1/8" DC's: XO

OPERATIONS SUMMARY

From	To	Time	Operation
0000	0030	0.5	Circulate and condition hole
0030	0330	3.0	POH
0330	0430	1.0	Pick up core barrel
0430	0700	2.5	RIH
0700	0730	0.5	Circulate and tag bottom
0730	1100	3.5	Cut core #1 f/379.2m to 388.3m
1100	1330	2.5	POH
1330	1400	0.5	Lay out core recovery
1400	1500	1.0	Service core barrel. Install fibre inner
1500	1700	2.0	RIH
1700	1730	0.5	Circulate and tag bottom
1730	2000	2.5	Cut core #2 f/388.3m to 397.3m
2000	2230	2.5	POH
2230	2300	0.5	Lay out core recovery
2300	2330	0.5	Service core barrel. Install fibre inner
2330	2400	0.5	RIH

CHEMICALS USED		
Type	Unit Size	Qty
Aquagel	25 kg	
Caustic Soda	25 kg	
Dextrid	25 kg	
Soda Ash	25 kg	
Pot Chloride	25 kg	8
QB-II	25 kg	

GAS (units)		
Depth	B'ground	Peak
385 m	1.00	4.50
395 m	1.00	1.50

PUMP DATA		
SPM	45	st/min
Output	596	l/min
Pressure	3150	kPa
AV DP	47	m/min
AV DC	79	m/min

Supervisor: Peter Dwyer

Note: "Person in Charge" and "Hazchem"+B14 signs received and erected on site.

LAKES OIL NL

DAILY DRILLING REPORT

Well:	PETROTECH-1	Report No:	1	Date:	4-Mar-97
2400 hr Depth:	379.2 m	Last Depth:	64 m	Day Progress:	315.2 m
Total Fuel:		Fuel Usage:		Daily Cost:	$139,012
Last Casing:	13-3/8" @ 59.7m			Cumm Cost:	$139,012

0600 hr Operations: RIH with core barrel
Remarks: No accidents - held pre-spud safety and operation meeting with crews.

BIT INFORMATION		
Bit Number	1	
Size (in)	8-1/8	
Make	HTC	
Type	STR-1	
IADC Code	1.1.6	
Serial Number	W81XW	
Nozzles (32nd)	3x14	
Depth In (m)	64	
Depth Out (m)	379	
Total Metres	315	
Total Hours	19.5	
WOB (dN)	2 to 3	
RPM	100	
Condition	2.2.In	
HSI	0.57	
JV (m/sec)	42	

OPS BREAKDOWN (hrs)	
Drilling	19.5
Tripping	1.5
Surveys	
Coring	
Testing	
Circ Sample	
Casing	
Cementing	
Wireline	
Circ & Cond	1.0
BOP's	
Rig Service	
FIT	0.5
Drill Shoe	0.5
Total	23.0

MUD PROPERTIES		
Density	1.11	SG
Viscosity	55	sec
Water Loss	8.8	ml
pH	10.5	strip
Filter Cake	2	mm
PV/YP	16/19	cp/Pa
Gels	5/9	10s/10m
Sand	1.25	%
Solids	6.5	%
K+	15000	mg/l
Chlorides	13000	mg/l
Calcium	140	mg/l
PHPA	0	kg/m3
Day Cost	$1,422	
Cumm Cost	$1,422	

BHA: Bit: bit sub: 2x4-3/4" DC's: stabiliser: XO: 4x4-1/8" DC's: XO:

OPERATIONS SUMMARY

From	To	Time	Operation
0000	0100		Pressure tested BOP's and manifold to 4000kPa. Complete turnkey phase. Commence day rate operations @ 0100 hours 4 March 1997.
0100	0230	1.5	RIH with bit#1 and BHA.
0230	0300	0.5	Drill out casing shoe and new formation to 68m
0300	0330	0.5	Circulate. Conduct FIT to 1.49SG EMW
0330	2300	19.5	Drill 8-1/8" hole f/68m to 379.2m
2300	2400	1.0	Circulate and condition hole

CHEMICALS USED

Type	Unit Size	Qty
Aquagel	25 kg	24
Caustic Soda	25 kg	2
Dextrid	25 kg	11
Soda Ash	25 kg	1
Pot Chloride	25 kg	32
QB-II	25 kg	5

GAS (units)

Depth	B'ground	Peak
327 m	0.00	2.35
330 m	2.35	8.00
379.2 m	3.00	4.70

PUMP DATA

SPM	55	st/min
Output	729	l/min
Pressure	1700	kPa
AV DP	57	m/min
AV DC	96	m/min

Supervisor: Peter Dwyer

Note: Under turnkey arrangement, Contractor had previously: Set 457mm conductor at 8m. Drilled 445mm hole to 64m. Survey - 0.75 deg. Ran and cemented 340mm casing at 59.7m. Installed and tested BOP's and manifold to 4000 kPa.

APPENDIX 3

APPENDIX III

Cuttings Sample Description

LAKES OIL N.L.

WELL: Petro Tech-1 **PERMIT:** PEP135 **DATE:** 1 March 1997

GEOLOGIST: I.Buckingham **PAGE:** 1

INTERVAL (m)	%	CUTTINGS DESCRIPTION	SHOWS						
			GAS					FLUOR	
			TOTAL	C1	C2	C3	C4	NAT	CUT
1.5 - 35	100	**Sand** - yellow, orange, loose with weak clayey and vf sand matrix, med-v.crs, becoming finer and more clayey with depth, sub-ang to sub-rndd, occ rnd, comm Fe staining, tr hematite, poorly sorted.							
35 - 64	100-60 0-40	**Marl** - light grey-med. grey, calcareous, sticky, argillaceous, vf sand in parts, rr glauconite, irregular thin layers of shells and shell frags, shells becoming more abundant with depth, more sand with depth, occ limestone bands. **Limestone** - white, pale grey, foss material and calc grns, f-med and occ crs grains, songes, forams, bryzoa, shell frags, grey argillaceous matrix, comm limonite grains, loose-friable.							
		Surface casing set at 59.67m.							
66	80 20 Tr Tr	**Marl** - grey-med grey, sticky, v calcareous, silty to vf sandy, generally clayey, argillaceous, comm glauconite (rnd) black to dark green dispersed through out sample. **Shell Fragments** - gastropods, bivalves, bryozoa, echinoid spines, lammellibranchs, forams, fenestrella. **Lithics** - light grey, orange. **Sand** - quartzose, white to clear, f-med grained, sub-ang to sub-rndd							

LAKES OIL N.L.

75	80 20	**Marl** - grey-med grey, sticky, v calcareous, silty to vf sandy, generally clayey, argillaceous, comm glauconite (rnd) black to dark green dispersed through out sample. **Shell Fragments** - gastropods, bivalves, bryozoa, echinoid spines, lammellibranchs, forams, fenestrella, glauconite appears as infilling material in a number of shell and coral fragments.							
78	90 10	**Marl** - grey-med grey, sticky, v calcareous, silty to vf sandy, generally clayey, argillaceous, comm glauconite (rnd) black to dark green dispersed through out sample. **Shell Fragments** - gastropods, bivalves, bryozoa, echinoid spines, lammellibranchs, forams, fenestrella, glauconite appears as infilling material in a number of shell and coral fragments.							
81	80 20	**Marl** - light grey-med grey, sticky, v calcareous, abundant vf-med quartz grains, comm glauconite med-crs (rnd) black to dark green infilling pores in shells and corals. **Shell Fragments** - a.a.							
84	80 20	**Marl** - grey-med grey, sticky, v calcareous, silty to vf sandy, generally clayey, argillaceous, less glauconite than above sample (rnd) black to dark green dispersed through out sample. **Shell Fragments** - a.a.							
87	90 10	**Marl** - a.a. **Shell Fragments** - a..							
90	70 30	**Marl** - a.a. and becoming less sandy. **Shell Fragments** - a.a.							
93	70 30 Tr	**Marl** - light grey-med grey, sticky, v calcareous, silty to vf sandy, generally clayey, argillaceous, minor glauconite (rnd) black to dark green dispersed through out sample. **Shell Fragments** - a.a., glauconite appears as infilling material in foram tests. **Limestone** - pale grey, white, calcareous, v fossiliferous, hard.							
96	50 40 10	**Marl** - a.a. **Shell Fragments** - a.a. **Limestone** - pale grey, white, calcareous, v fossiliferous, hard.							

99	50 40 10	**Shell Fragments** - a.a. **Marl** - a.a. **Limestone** - a.a.							
102	50 40 10	**Shell Fragments** - a.a. **Marl** - a.a. **Limestone** - a.a. **Pyrite** - rare grains of pyrite crystal aggregates							
105	80 20	**Shell Fragments** - a.a. **Marl** - a.a.							
108	80 20	**Shell Fragments** - a.a. **Marl** - a.a.							
111	80 20 Tr Tr	**Shell Fragments** - a.a. **Marl** - a.a. **Siltstone** - med-dark grey, brown, firm, calcareous. **Pyrite** - pyrite crystal aggregates							
114	80 20 Tr	**Shell Fragments** - a.a. **Marl** - a.a. **Glauconite** - loose grains probably subsurface dispersed throughout marl.							
117	80 20 Tr	**Shell Fragments** - a.a. **Marl** - a.a. **Glauconite** - a.a							
120	70 30	**Bryozoan Limestone** - white, cream, pale grey, fawn, abundant echinoid spines with forams. **Marl** - light to medium grey, v calcareous, sticky, few glauconite gns.							
123	70 30	**Bryozoan Limestone** - white, cream, pale grey, fawn, with forams. **Marl** - light to medium grey, v calcareous, sticky, few glauconite gns.							
126	70 30	**Bryozoan Limestone** - a.a. **Marl** -a.a.							
129	70 30	**Bryozoan Limestone** - a.a. **Marl** - a.a. with fine grains of disseminated galuconite.							
132	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a. with fine grains of disseminated galuconite.							

135	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
138	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
141	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
144	70 30	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
147	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
150	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
153	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
156	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
159	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
162	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
165	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
168	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
171	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
174	60 40	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
177	50 50	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
180	50 50	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
183	70 30	**Bryozoan Limestone** - a.a. **Marl** - a.a. glauconite becoming more abundant							

LAKES OIL N.L.

186	80 20	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
189	80 20	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
192	80 20	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
195	80 20	**Bryozoan Limestone** - a.a. **Marl** - a.a. glauconite increasing.							
198	80 20	**Bryozoan Limestone** - a.a. **Marl** - a.a. becoming greener.							
201	70 30	**Bryozoan Limestone** - a.a. **Marl** - dominantly light grey becoming v pale green-grey, sticky, v calcareous, silty, non dispersive, comm f grains of glauconite disseminated throughout.							
204	70 30	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
207	70 30	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
210	70 30	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
213	70 30	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
216	70 30	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
219	60 40 Tr	**Bryozoan Limestone** - light grey-mid grey, cream. **Marl** - light grey, mid grey, pale green, cream, v calcareous, silty, non dispersive, comm glauconite disseminated throughout. **Crystalline Limestone** - light grey, hard, coralline.							
222	60 40 Tr	**Bryozoan Limestone** - a.a. **Marl** - a.a. **Crystalline Limestone** - a.a.							
225	50 50	**Bryozoan Limestone** - a.a. **Marl** - a.a.							

228	50 50	**Bryozoan Limestone** - a.a. **Marl** - a.a.							
231	60 40	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
234	60 40	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
237	60 40	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
240	60 40	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
243	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
246	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
249	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
252	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
255	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
258	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
261	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
264	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
267	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
270	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
273	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
276	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							

279	60 40	**Marl** - light grey, pale green, light brown, dispersive, very calcareous, contains vf fossil fragments, v soft, comm specks of glauconite. **Bryozoan Limestone** - cream, buff, light brown, occassional glauconite grains, abundant fossil fragents.							
282	60 40	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
285	60 40	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
288	60 40	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
291	70 30 Tr	**Marl** - a.a. **Bryozoan Limestone** - a.a. **Crystalline Limestone** - buff, yellow, v hard.							
294	70 30 Tr	**Marl** - a.a. **Bryozoan Limestone** - a.a. **Crystalline Limestone** - buff, yellow, v hard.							
297	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
300	70 30	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
303	90 10	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
306	90 10	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
309	90 10	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
312	90 10	**Marl** - a.a. **Bryozoan Limestone** - a.a.							
315	90 10	**Marl** - a.a. with increasing dark grey-brown, speckled (~40%) v soft, micromicaceous, silty, carbonaceous argillaceous. **Bryozoan Limestone** - a.a.							

318	90 10	**Marl** - a.a. with increasing dark grey-brown, speckled (~40%) v soft, micromicaceous, silty, carbonaceous argillaceous. **Bryozoan Limestone** - a.a.							
321	60 40 Tr	**Claystone/Siltstone** - dark grey-brown, speckled, fine grains of glauconite disseminated throughout, slightly carbonaceous. **Marl** - a.a. **Bryozoan Limestone** - a.a.							
324	60 40 Tr	**Claystone/Siltstone** - a.a. **Marl** - a.a. **Bryozoan Limestone** - a.a.							
327	60 40 Tr	**Claystone/Siltstone** - a.a. **Marl** - a.a. **Bryozoan Limestone** - a.a.	2.4	470				Nil	Nil
330	70 30 Tr	**Claystone/Siltstone** - a.a. with glauconite becoming more abundant, rr glauconite pellets. **Marl** - a.a. **Bryozoan Limestone** - a.a.	6.0	1209				Nil	Nil
333	90 10 Tr	**Claystone/Siltstone** - dark grey-brown, mid grey, speckled, micromicaceous, vf glauconite disseminated throughout, rr glauconite pellets, v soft. **Marl** - a.a. **Bryozoan Limestone** - a.a.	4.2	840				Nil	Nil
336	100 Tr Tr Tr	**Claystone/Siltstone** - dark grey-brown, mid grey, speckled, micromicaceous, vf glauconite disseminated throughout, rr glauconite pellets, v soft. **Marl** - a.a. **Bryozoan Limestone** - a.a. **Claystone** - pale green, firm, fossiliferous, mottled with cream claystone in part.	5.0	1008				Nil	Nil
339	100 Tr Tr Tr	**Claystone/Siltstone** - a.a. **Marl** - a.a. **Bryozoan Limestone** - a.a. **Claystone** - a.a.	5.0	1008				Nil	Nil

342	100 Tr Tr Tr	**Claystone/Siltstone** - a.a. **Marl** - a.a. **Bryozoan Limestone** - a.a. **Claystone** - a.a.	5.7	1142				Nil	Nil
345	100 Tr Tr Tr	**Claystone/Siltstone** - a.a. **Marl** - a.a. **Bryozoan Limestone** - a.a. **Claystone** - a.a.	2.6	537				Nil	Nil
348	90 10	**Claystone/Siltstone** - dark grey-brown, mid grey, silty, speckled, micromicaceous, f disseminated glauconite. **Claystone** - pale green, mottled cream, firm, laminated.	2.8	571				Nil	Nil
351	90 10	**Claystone/Siltstone** - a.a. **Claystone** - a.a.	2.92	585				Nil	Nil
354	90 10	**Claystone/Siltstone** - a.a. **Claystone** - a.a.	2.42	484				Nil	Nil
357	90 10	**Claystone/Siltstone** - a.a. **Claystone** - a.a.	3.02	605				Nil	Nil
360	90 10	**Claystone/Siltstone** - a.a. **Claystone** - a.a.	4.5	907				Nil	Nil
363	90 10	**Claystone/Siltstone** - a.a. with glauconite pellets more abundant. **Claystone** - a.a.	4.1	820				Nil	Nil
366	90 10	**Claystone/Siltstone** - a.a. **Claystone** - a.a.	3.5	705				Nil	Nil
369	90 10	**Claystone/Siltstone** - a.a. **Claystone** - a.a.	4.5	900				Nil	Nil
372	90 10 Tr	**Claystone/Siltstone** - a.a. **Claystone** - a.a. **Pyrite** -						Nil	Nil
375	90 10 Tr	**Claystone/Siltstone** - a.a. **Claystone** - a.a. **Pyrite** -						Nil	Nil
378	90 10 Tr	**Claystone/Siltstone** - a.a. **Claystone** - a.a. **Pyrite** -						Nil	Nil

LAKES OIL N.L.

379.2	90 10 Tr	**Claystone/Siltstone** - a.a. **Claystone** - a.a. **Pyrite** -						Nil	Nil
		Stopped drilling at 379.2 m. to cut Core#1.							
		379.2m - 388.3m Core#1 (cut 9.1m., rec. 1m) **388.3m - 397.3m Core#2 (cut 9.0m., rec. 8m)** **398.3m - 405.0m Core#3 (cut 7.7m., rec 7.2m)**							
408	30 30 30 10	**Sandstone** - dark green, fine grained, glauconitic, argillaceous, firm, micaceous. **Sandstone** - dark grey to mid green, fine grained, glauconitic with glauconite finely disseminated throughout cuttings, micro-micaceous, hard, no visual por. **Lithics** - dark green, v hard, ang to sub-rndd, may be weathered aggregates of glaucoite pellets or pyroxenes. **Claystone/Siltstone** - mid-brown, tan, micro-micaceous, soft.	1.0	202				Nil	Nil
411	100	**Granite** - quartz grains: white, yellow, clear, pale grey, pale green, loose, sub-ang to sub-rndd, crs to grit, felspars, biotite as inclusions in qtz grains and some flakes.	0.24	47				Nil	Nil
414	100	**Granite** - a.a. with biotite becoming more abundant as inclusions in qtz grains and flakes.	0.1	20				Nil	Nil
417	100	**Granite** - generally clear to slightly milky quartz with some exhibiting greenish tinges, abundant biotite, tr plagioclase.	0.13	26.9				Nil	Nil
420	100	**Granite** - a.a.	0.4	80				Nil	Nil
423	100	**Granite** - a.a.	0.25	50				Nil	Nil
425	100	**Granite** - a.a.	0.18	35				Nil	Nil
		Total depth called at 425m. K.B.							

APPENDIX 4

APPENDIX IV

Cores Descriptions

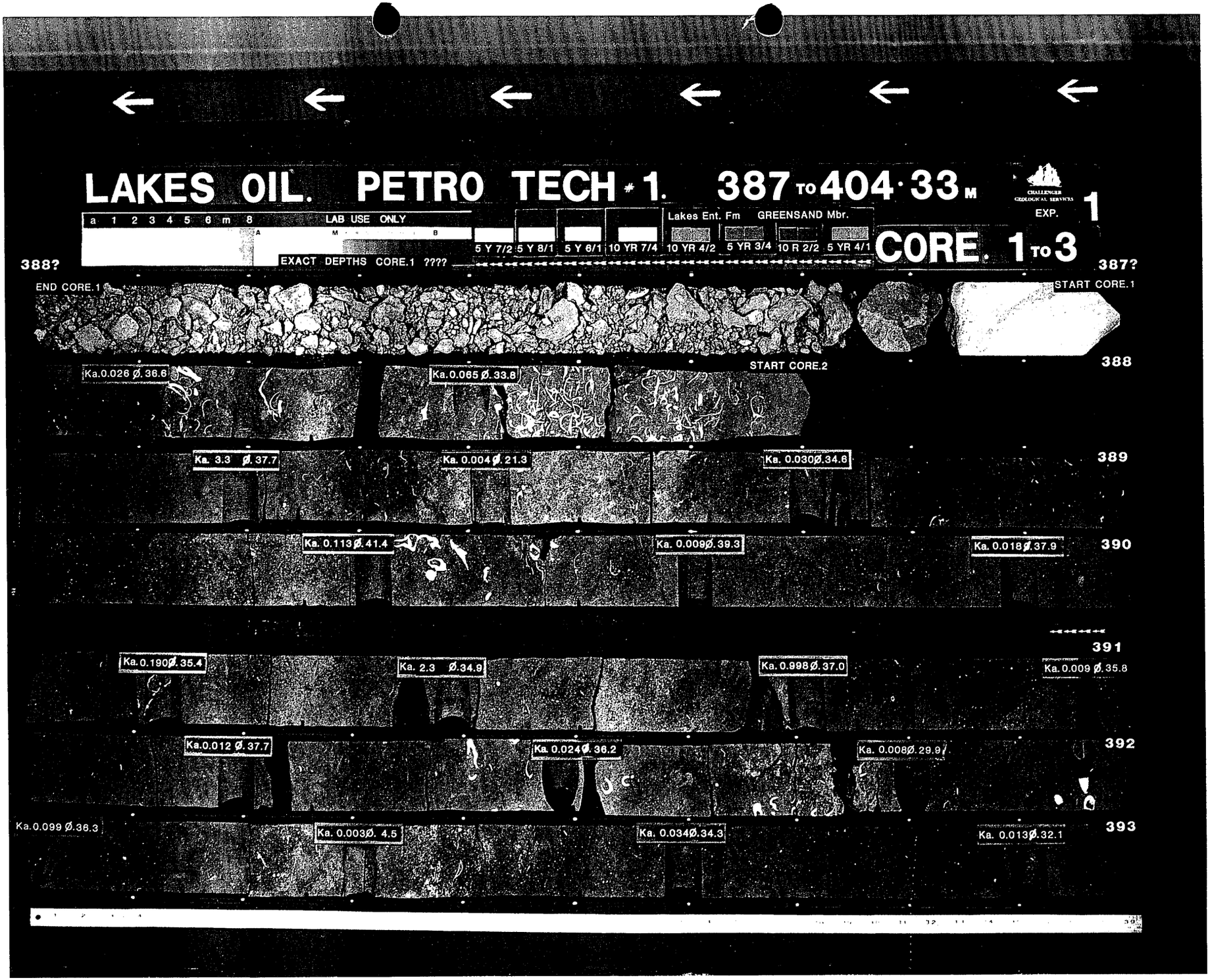
PE904258

This is an enclosure indicator page.
The enclosure PE904258 is enclosed within the container PE900825 at this location in this document.

The enclosure PE904258 has the following characteristics:

ITEM_BARCODE	= PE904258
CONTAINER_BARCODE	= PE900825
NAME	= Core Photograph
BASIN	= GIPPSLAND
PERMIT	= PEP135
TYPE	= WELL
SUBTYPE	= CORE_PHOTOS
DESCRIPTION	= Core Photograph (enclosure from WCR, appendix 4) for Petrotech-1
REMARKS	=
DATE_CREATED	= 31/05/97
DATE_RECEIVED	= 23/01/88
W_NO	= W1168
WELL_NAME	= PETROTECH-1
CONTRACTOR	=
CLIENT_OP_CO	= LAKES OIL NL

(Inserted by DNRE - Vic Govt Mines Dept)



Lakes Oil NL

CORE DESCRIPTION

Date 05/03/97 Page 1 of 10

Well Name PETROTECH-1 CORE No 1

Location: Latitude

Longitude

Interval 379.2-388.3 m Cut Feet

Recovery Feet %

Elevation: G.L. K.B.

Formation GREENSAND MBR, LAKES ENT. FM

Geologist J. MATTHENS, N. LEMON

Age

CORE ANALYSIS Ø	CORE ANALYSIS K	SAMPLES FOR ANALYSIS	DEPTH m	R.O.P. (min./ft.)	VIS. Ø	Fluor GOOD FAIR TRACE	LITHOLOGY	DESCRIPTION
			?		0			Legend:
			?+.2					
			?					

LIMESTONE: brown, well indurated, micritic - very fine grained matrix. Scattered shell fragments. Burrow traces at the base, medium sand sized glauconite pellets now altered to Fe oxides.

SANDSTONE: green silty to fine grained. Well indurated. Mottled colours due to burrows as large as 30-50 mm diameter. Occasional calcite cemented zones. ~5% altered ooids or glauconite pellets (to coarse sand sized) now replaced by brown Fe-oxides. Rare shell fragments.

SILT: yellow to light brown, micaceous. Non-indurated. Some range to silty poorly sorted very fine-f, again mn-indurated. Both lithologies are calcite rich. This box is completely disturbed so no structures or lithologic boundaries observed.

Note: Core 1 is contained in 2 cartons with no depths. Box 1 has ~20cm of indurated core. Box 2 is full of unconsolidated material.

61 8 2342933

Lakes Oil NL

CORE DESCRIPTION

Date 05/03/97 Page 2 of 10

Well Name PETRO TECH-1 CORE No 2

Location: Latitude Interval 388.3 - 397.3 m Cut Feet

Longitude Recovery Feet %

Elevation: G.L. K.B. Formation GREENSAND MBR, LAKES ENT. FM

Geologist J. MATTHEWS, N. LEMON Age

CORE ANALYSIS Ø	CORE ANALYSIS K	SAMPLES FOR ANALYSIS	DEPTH m	R.O.P. (min./ft.)	VIS. Ø	Fluor GOOD FAIR TRACE	LITHOLOGY	DESCRIPTION
			388.3		0			SANDSTONE: dark green, very fine to fine grained, silty. Glauconite, mica and pyrite.
			388.4		0			SANDSTONE: dark green very fine to fine grained, silty with bivalve and oyster shells arranged in fining-upwards bed (storm bed?) well cemented.
			388.6		0			SANDSTONE: dark green, very fine to fine grained, silty, well cemented, with oyster and bivalve shells. Some calcareous zones, glauconite pellets with minor muscovite and pyrite. Vuggy pores where aragonite shells dissolved.
			388.8		0			
			389.0		0			SANDSTONE: dark green, very fine to fine grained, silty, poorly sorted, massive, well cemented with scattered shelly fragments. Glauconite pellets (minor muscovite).
			389.2		0			cut
			389.4		0			
			389.6		0			ground surface Oyster Shells on Boundary
			389.8		0			ground surface SANDSTONE: dark green, fine to very fine grained, silty, burrowed, well cemented, glauconite pellets. Burrows to 30mm across - shown by coarser grain size.
			390.0		0			
			390.2					

Lakes Oil NL

CORE DESCRIPTION

Date 05/03/97 Page 3 of 10

Well Name PETRO TECH -1 CORE No 2

Location: Latitude

Longitude

Interval 388.3 - 397.3 m Cut Feet

Recovery Feet %

Elevation: G.L. K.B.

Formation GREENSAND MBR, LAKES ENT. FM.

Geologist J. MATTHEWS, N. LEMON

Age

CORE ANALYSIS Ø	CORE ANALYSIS K	SAMPLES FOR ANALYSIS	DEPTH m	R.O.P (min./ft.)	VIS. Ø	Fluor GOOD FAIR TRACE	LITHOLOGY	DESCRIPTION
			390.2					cut
					0			SANDSTONE: dark green, very fine-fine grained, very silty, massive, well cemented. Minor calcite cemented zones occasional burrows.
			390.4					
			390.6		0			Concentration of thick-walled shells on boundary.
			390.8		0			SANDSTONE: dark green, fine grained (glauconite pellets to medium sand size), very silty, massive. Well cemented minor calcite cemented zones.
			391.0		0			
			391.2		0			cut
								Some burrows - weak light green fluorescence along burrows
			391.4		0			Shelly concentration
			391.6		0			ground surface
								missing block
			391.8		0			
			392.0		0			cut
			392.2					

Lakes Oil NL

CORE DESCRIPTION

Date 05/03/97 Page 4 of 10

Well Name PETRO TECH-1 CORE No 2

Location: Latitude

Longitude

Interval 388.3-397.3 Cut Feet

Recovery Feet %

Elevation: G.L. K.B.

Formation GREENSAND MBR, LAKES ENT. FM.

Geologist J. MATTHEWS, N. LEMON

Age

CORE ANALYSIS Ø	CORE ANALYSIS K	SAMPLES FOR ANALYSIS	DEPTH m	R.O.P. (min./ft.)	VIS. Ø	Fluor GOOD FAIR TRACE	LITHOLOGY	DESCRIPTION
			392.2					Legend:
					1			SANDSTONE: dark green, fine to occ. medium grained, silty, micaceous, shelly. Vuggy porosity where aragonite dissolved. Medium sand size glauconite pellets "Ophiomorpha"? burrows. Calcite shells fluoresce yellow.
			392.4					
					0			ground surface
			392.6					
					0			SANDSTONE: dark green, very fine to fine grained, very silty, massive, poorly sorted. Medium sized glauconite pellets, well cemented.
			392.8					
					0			
			393.0					Cut
			393.2					
			393.4					
			393.6		1			Shelly zone with bivalves, oysters and bryozoa.
			393.8					ground surface
					0			SANDSTONE: dark green, very fine to fine grained, very silty, massive, poorly sorted, glauconitic.
			394.0					Cut
			394.2					

Lakes Oil NL

CORE DESCRIPTION

Date 05/03/97 Page 5 of 10

Well Name PETRO TECH-1 CORE No 2

Location: Latitude

Longitude

Interval 388-3 - 397-3 Cut Feet

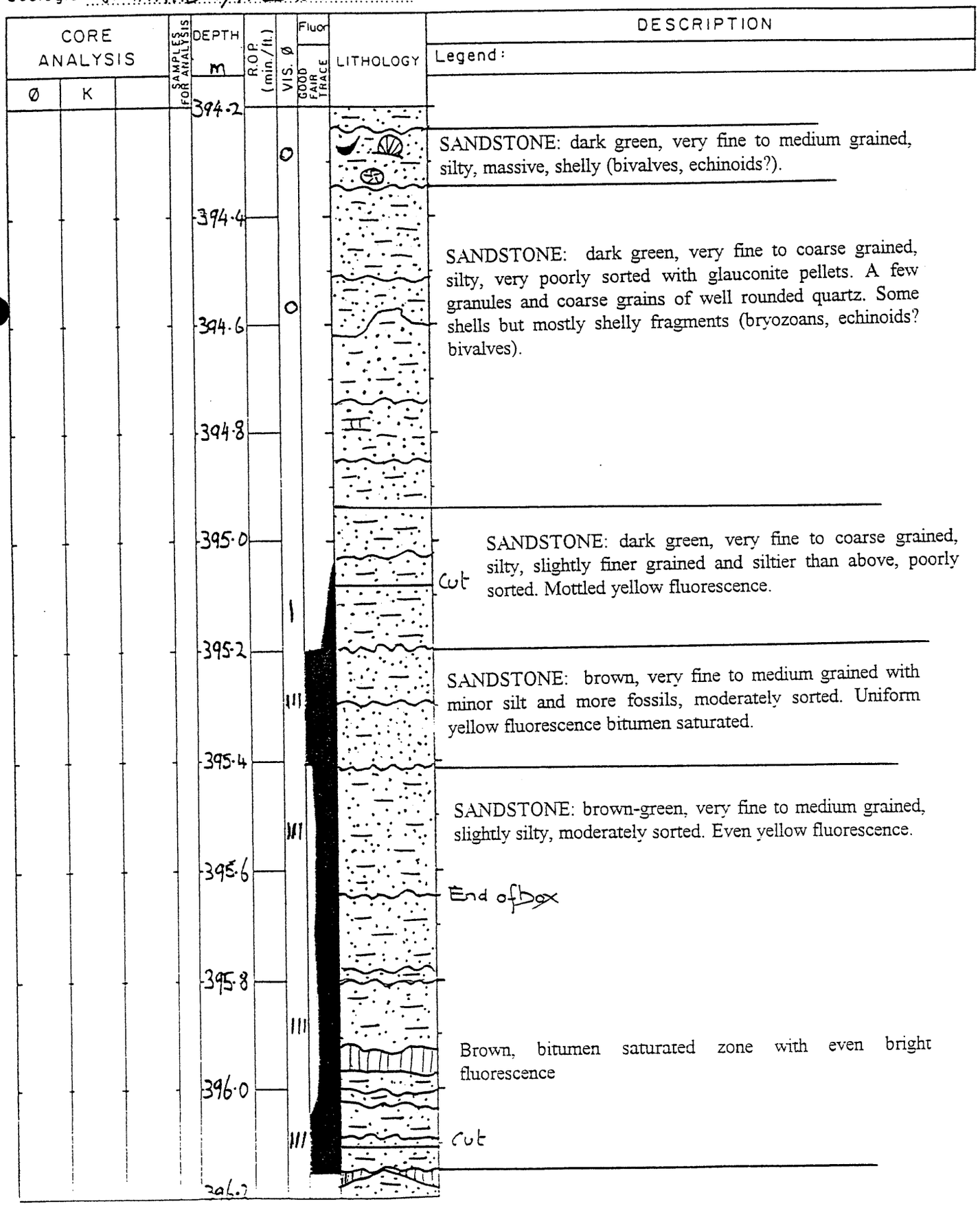
Recovery Feet %

Elevation: G.L. K.B.

Formation GREENSAND MBR, LAKES ENT. FM.

Geologist J. MATTHEWS, N. LEMON

Age



Lakes Oil NL

Date 05/03/97

CORE DESCRIPTION

Well Name PETRO TECH-1

CORE No 2+3

Location : Latitude

Interval 388.3-397.3 / 397.3-405.0 Cut Feet

Longitude

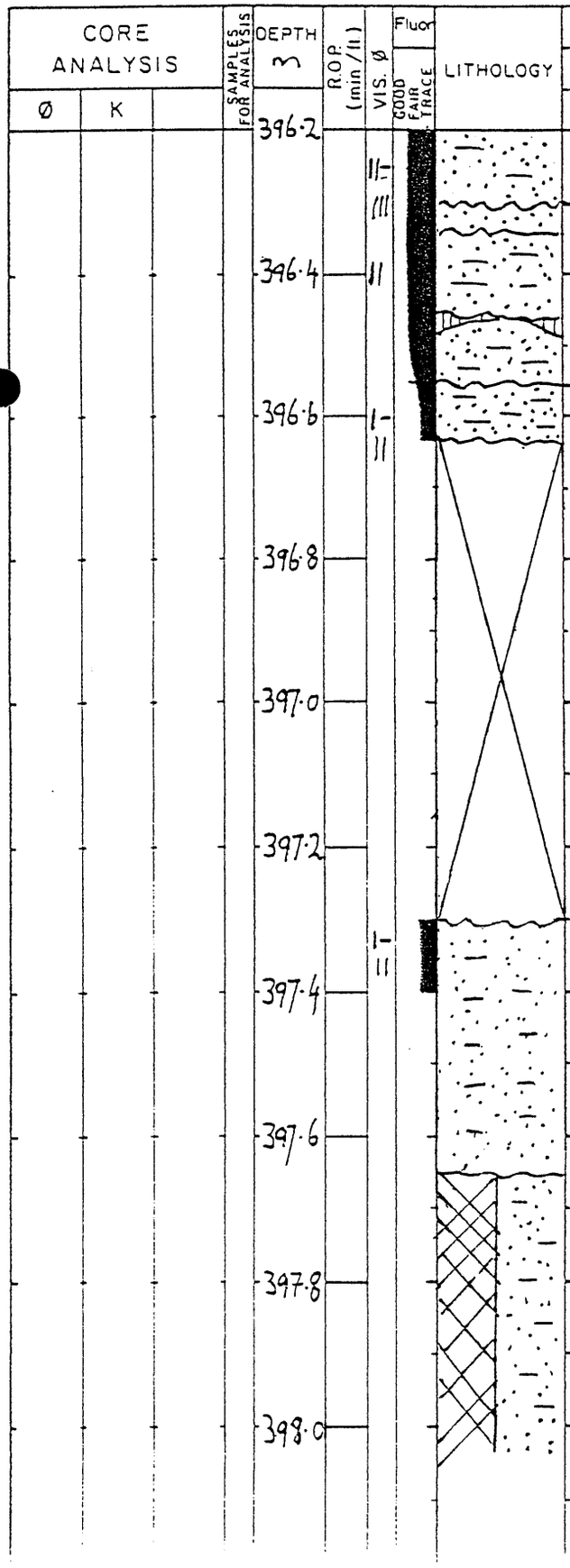
Recovery Feet %

Elevation : G.L. K.B.

Formation GREENSAND MBR., LAKES ENT. FM.

Geologist J. MATTHEWS, N. LEMON

Age



DESCRIPTION

Legend :

SANDSTONE: brown-green, very fine to fine grained, slightly silty. Even light yellow fluorescence.

SANDSTONE: brown-green, fine to medium grained, slightly silty. Even yellow fluorescence

SANDSTONE: brown-green, very fine to fine grained, silty. Mottled yellow fluorescence.

No Recovery?

SANDSTONE: dark green to dark green-brown, very fine to fine grained, silty, micaceous. Soft, broken, highly disturbed core. Calcitic zones.

Lakes Oil NL

CORE DESCRIPTION

Date 06/03/97 Page 7 of 10

Well Name PETRO TECH-1 CORE No 3

Location: Latitude

Longitude

Interval 397.3-405.0m Cut Feet

Recovery Feet %

Elevation: G.L. K.B.

Formation GREENSAND MBR, LAKES ENT. FM.

Geologist J. MATTHEWS, N. LETON

Age

CORE ANALYSIS Ø	CORE ANALYSIS K	SAMPLES FOR ANALYSIS	DEPTH m	ROP (min./ft.)	VIS. Ø	Fluor GOOD FAIR TRACE	LITHOLOGY	DESCRIPTION
			398.2				cut	SANDSTONE: green, very fine to fine grained, silty massive, non-indurated and friable. Mica and glauconite rich. Calcite zones - most abundant in the middle of this lithology. Rare large bivalves and smaller bryozoan fragments. Minor Fe-oxide cement at the base. Poorly sorted and slightly finer grained at the base.
			398.4				cut	
			398.6				cut	
			398.8				cut	
			399.0				cut	
			399.2				cut	
			399.4				cut	
			399.6				cut	SANDSTONE: mottled dark green to black, very fine grained, silty. Slightly better sorted than above but still non-indurated, micaceous, no calcite.
			399.8				c?	SANDSTONE: green-brown, very fine grained, massive, non-indurated and poorly sorted. Micaceous, with calcite zones and gastropod shells. Glauconite pellets are coarsest in the middle of this lithology and can reach medium sand size.
			400.0				CUT	
			400.2					

Lakes Oil NL

CORE DESCRIPTION

Date 06/03/97 Page 8 of 10

Well Name PETRO TECH-1 CORE No 3

Location: Latitude

Longitude

Interval 3973-4050 m Cut Feet

Recovery Feet %

Elevation: G.L. K.B.

Formation GREENSAND MBR, LAKES ENT. FM.

Geologist J. MATTHENS, N. LEMON

Age

CORE ANALYSIS Ø	CORE ANALYSIS K	SAMPLES FOR ANALYSIS	DEPTH m	R.O.P. (min./ft.)	VIS. Ø	Fluor GOOD FAIR TRACE	LITHOLOGY	DESCRIPTION
			400.2					Legend:
								cut
			400.4					cut
			400.6					cut
			400.8					SANDSTONE: green to black, very fine to fine grained, silty, coarsely laminated to mottled - non indurated, micaceous non-calcareous. Mottling may be bio-turbation.
								cut
			401.0					cut
								cut
			401.2					SANDSTONE: light green-tan, very fine grained, silty massive, non-indurated, non-calcarenous. Scattered coarse sand-sized qtz grains at base. Sorting decreases toward base.
			401.4					cut
								cut
			401.6					SANDSTONE: dark green to black, very fine to medium grained, silty, non-indurated. Abundant fossil fragments - bivalves & snails. Burrows common - 20-30mm diameter and filled with the medium sand. The matrix is the very fine to fine sandstone.
			401.8					cut
								cut
			402.0					SANDSTONE: black to dark green, very fine to fine grained, silty, slightly better indurated with calcite cement. Massive with rare coarse sand sized quartz grains. Fluorescence is possibly contamination.
								SANDSTONE: light green, fine grained, silty, massive, slightly indurated but little calcite. Moderately abundant small shell fragments and very abundant pyrite. Rare coarse sand sized qtz grains.
								cut

Lakes Oil NL

CORE DESCRIPTION

Date 06/03/97 Page 9 of 10

Well Name PETRO TECH-1 CORE No 3

Location: Latitude

Longitude

Interval 397.3-405.0m Cut Feet

Recovery Feet %

Elevation: G.L. K.B.

Formation GREENSAND MBR, LAKES ENT. FM.

Geologist J. MATTHEWS, N. LEMON

Age

CORE ANALYSIS Ø	CORE ANALYSIS K	SAMPLES FOR ANALYSIS	DEPTH m	R.O.P. (min/ft)	VIS. Ø	Fluor GOOD FAIR TRACE	LITHOLOGY	DESCRIPTION
			402.2					Legend:
								cut
			402.4					SANDSTONE: dark green, slightly mottled, fine grained, silty, poorly sorted and non-indurated. Rare minor calcareous zones. Micaceous.
					1			cut
			402.6					
			402.8					cut
			403.4					cut SANDSTONE: green, very fine to medium grained, silty, massive, micacous, slightly better indurated. Minor calcareous zones.
					0			
			403.2					cut
			403.4					cut SANDSTONE: green, mottled and burrowed, very fine to fine grained, silty, moderately well indurated. Burrows are mostly horizontal ~10mm in diameter. One large 35mm diameter concretion almost pink or purple and sugary on cut surface. Slow fizz - dolomite or siderite ??
					0			
			403.6					cut
			403.8		1			cut SANDSTONE: light green, very fine to fine grained, silty, only slightly indurated, poorly sorted, mottled at the top with vertical bleached mottles (root traces?). Vertical to sub vert. fractures throughout. Massive to faint bedding near base. More micaceous and slightly courser grained toward base. Moderate calcite and minor Fe-oxide cement at base
			404.0					cut
								cut

Lakes Oil NL

Date 06/03/97

CORE DESCRIPTION

Well Name PETROTECH-1

CORE No 3

Location : Latitude

Longitude

Interval 397.3-405.0m Cut Feet

Recovery Feet %

Elevation : G.L. K.B.

Formation GREENSAND MBR, LAKES ENT. FM.

Geologist J. MATTHENS, N. LEITON

Age

CORE ANALYSIS Ø	CORE ANALYSIS K	SAMPLES FOR ANALYSIS	DEPTH m	R.O.P. (min./ft.)	VIS. Ø	Fluor GOOD FAIR TRACE	LITHOLOGY
			404.2				
			404.33				
			404.4				

DESCRIPTION

Legend :

SANDSTONE: broken, lightly disturbed, uniform intense green, very fine to fine grained, silty, poorly sorted, slightly indurated, moderately calcareous. Micacous and glauconite rich. Glauconite pellets to medium sand size.

APPENDIX 5

APPENDIX V

Core Analysis Results

1. INTRODUCTION

Three (3) cores were cut in Petro Tech-1 over the interval 379.2 to 405.0 metres in the Greensand Member of the Lakes Entrance Formation.

Core #1 (379.2-388.3 m) recovered approximately 20 cm of indurated core along with a box containing unconsolidated material making approximately 1m of recovery (11.0%). Core #2 (388.3-397.3 m) recovered 8.33 m (92.6% recovery) of sandstone. Core #3 (397.3-405.0 m) recovered 7.03 m (91.3% recovery) of largely unconsolidated sandstone.

This report is a formal presentation of results forwarded as they became available.

2. ANALYTICAL PROCEDURES

Routine core analysis was determined every thirty centimetres over the length of Core #2 with one sample point at the top of Core #3. Porosity was determined by helium injection method, saturation data by summation of fluids and permeability's to air in Hassler Holder at 250 psi confining pressure.

One free oil sample was taken from near the top of core #2 during unsleeving (389.4 m) and analysed by gas chromatography. A further sample was taken from a core chip near the base of core #2 within the oil zone (395.9 m) and extracted in a soxhlet apparatus using a low boiling point organic solvent for 6-8 hours. Removal of the solvent by careful rotary evaporation gave the oil (nominal C_{12+} fraction).

3. RESULTS AND DISCUSSION

Results are presented on the following pages.

Free oil was found at the base of Core #2 (395.05-396.66 m) and top of Core #3 (397.3-397.4 m).

All of the core in Core #3 below 397.66 m appeared to be water wet and was unconsolidated with the consistency of mud. Therefore all of the core from Core #3 below 398.23 m was slabbed in the sleeve.

The no recovery zones at the base of cores #2 and #3 are uncertain as at least part of the lost recovery may actually be at the top of these cores.

Gas chromatography of the two samples from core #2 indicated that the free oil from the top of core #2 is very similar to the oil extracted from the oil zone near the base of core #2.

amdel

CORE ANALYSIS RESULTS

Company	LAKES OIL	Formation	GREENSAND MBR	File	LQ5656
Well	PETRO TECH NO. 1		LAKES ENT FM	Date Report	12-03-97
Field				Analysts	DS, SW
State	VICTORIA	Location	GIPPSLAND BASIN PEP 135		

Lithological Abbreviations

SAND - SD	DOLOMITE - DOL	ANHYDRITE - ANHY	SANDY - SDY	FINE - FN	CRYSTLLINE - XLN	BROWN - BRN	FRACTURED - FRAC	SLIGHTLY - SLI
SHALE - SH	CHERT - CH	CONGLOMERATE - CONG	SHALY - SHY	MEDIUM - MED	GRAIN - GRN	GRAY - GY	LAMINATION - LAM	VERY - VI
LIME - LM	GYPSUM - GYP	FOSSILIFEROUS - FOSS	LIMY - LMY	COARSE - CSE	GRANULAR - GRNL	VUGGY - VGY	STYLOLOTIC - STY	WITH - WI

SAMPLE No.	DEPTH	PERMEABILITY MILLIDARCYS K.A.	POROSITY %	RESIDUAL SATURATION % PORE OIL	RESIDUAL SATURATION % PORE WATER	GRAIN DENSITY	VERT PERM	SAMPLE DESCRIPTIONS AND REMARKS
1	388.6	0.065	33.8	1.5	93.0	2.82		SST: Med gy, silty-vvf grn, firm, well sorted, abunt gy arg mtx, v sl calc cmt, subang-subrnd. Abunt soft khaki pyritic nodules, common shells and fossil debris, tr mica and occ dk lithics, rare garnets.
2	388.9	0.026	36.6	0.0	96.8	2.77		As above.
3	389.3	0.030	34.6	0.0	98.0	2.78		As above.
4	389.6	0.004	21.3			2.69		SST: Lt-med gy, silty-vvf grn, hd, well sorted, abunt gy argill mtx, mod calc cmt, subang-subrnd. Abunt soft khaki pyritic nodules, common shell and fossil debris, tr mica and dk lithics, rare carb, rare garnets, occ fossiliferous vugs.
5	389.8	3.3	37.7			2.76		SST: Med gy, silty-vvf grn, firm, well sorted, abunt gy arg mtx, v sl calc cmt, subang-subrnd. Abunt soft pyritic nodules, shell and fossil debris, tr mica, occ burrows filled with non calc, vf sst.
6	390.1	0.018	37.9			2.79		As above but no burrows and rare med grn clr qtz grains.
7	390.4	0.009	39.3			2.81		CLAYSTONE: Lt-med greenish gy, v finely silty in pt, firm, rare-trace calc cmt. Abunt soft pyritic nodules, common shell and fossil debris, scat mica and rare clr qtz grains.
8	390.7	0.113	41.4			2.84		SST: Lt-med gy, silty-vvf grn, firm well sorted, abunt gy argill mtx, rare-tr calc cmt, subang-subrnd. Abunt soft pyritic nodules, common shell and fossil debris, scat mica and rare clr qtz grains.
9	391.0	0.009	35.8	0.1	95.1	2.77		As above but tr-calc cmt.
10	391.3	0.998	37.0	0.2	95.3	2.77		As above but silt-vf grn, rare calc cmt, decreased pyrite nodules.
11	391.6	2.3	34.9	0.2	96.7	2.80		SST: Med greenish gy, vf-silty grn, firm, mod-well sorted, abunt dk gy argill mtx, sl calc cmt in parts, subang-subrnd. Common soft pyritic nodules, fossilised faecal material?? common dk gy clay particles, common shell and fossil debris, scat mica.

CORE ANALYSIS RESULTS

Company	LAKES OIL	Formation	GREENSAND MBR	File	LQ5656
Well	PETRO TECH NO. 1		LAKES ENT FM	Date Report	12-03-97
Field				Analysts	DS, SW
State	VICTORIA	Location	GIPPSLAND BASIN PEP 135		

Lithological Abbreviations

SAND - SD	DOLOMITE - DOL	ANHYDRITE - ANHY	SANDY - SDY	FINE - FN	CRYSTLLINE - XLN	BROWN - BRN	FRACTURED - FRAC	SLIGHTLY - SLI
SHALE - SH	CHERT - CH	CONGLOMERATE - CONG	SHALY - SHY	MEDIUM - MED	GRAIN - GRN	GRAY - GY	LAMINATION - LAM	VERY - VI
LIME - LM	GYPSUM - GYP	FOSSILIFEROUS - FOSS	LIMY - LMY	COARSE - CSE	GRANULAR - GRNL	VUGGY - VGY	STYLOLOTIC - STY	WITH - WI

SAMPLE No.	DEPTH	PERMEABILITY MILLIDARCYS K.A.	POROSITY %	RESIDUAL SATURATION % PORE OIL	RESIDUAL SATURATION % PORE WATER	GRAIN DENSITY	VERT PERM	SAMPLE DESCRIPTIONS AND REMARKS
12	391.9	0.190	35.4	0.1	96.4	2.81		SST: Lt-med greenish gy, vvf-silty grn, firm, mod sorted, abunt lt-med gy argill mtx, tr-rare calc cmt, subang-subrnd. Abunt soft pyritic olive nodules, scat shell and fossil debris, scat mica and dk gy cly particles.
13	392.2	0.008	29.9	0.4	89.6	2.78		As above but v calc cmt. Possible chlorite coating on pyrite nodules. Occ brownish grains.
14	392.5	0.024	36.2	4.4	89.9	2.87		As above but sl calc cmt.
15	392.8	0.012	37.7	0.0	97.0	2.79		SST: Med greenish gy, silty-vvf grn, firm, mod-sorted, abunt gy arg mtx, rare-tr calc cmt. Abunt soft pyritic olive gy nodules, scat shell and fossil debris, tr calc frags, mica, occ vugs, rare scat clr qtz grns.
16	393.1	0.013	32.1			2.78		As above but no vugs.
17	393.4	0.034	34.3			2.78		As above.
18	393.7	0.003	4.5			2.79		SST: Med gyish green, silty-vvf grn, v hd, mod sort, abunt gy arg mtx, dolomitic cmt. Abunt soft pyritic nodules, scat shell, fossil and calcite frags, rare mica and clr qtz grains.
19	394.0	0.099	36.3			2.79		As above but nil-tr calc cmt.
20	394.3	0.015	25.8	0.0	97.3	2.72		As above but locally calcite cmtd.
21	394.6	0.139	30.9	0.0	97.2	2.71		CLAYSTONE: Lt-med greenish gy, firm, tr-nil calc cmt. Common scat rnd clr qtz grains, common pyritic nodules, common soft, brn, silty nodules.
22	394.9	0.420	31.9	0.0	96.4	2.79		ARGILLACEOUS CLAYSTONE: As above but increasing vvf sand and common subang-subrnd clr qtz grains.
23	395.2	7.3	34.9			2.69		SST: Lt-med gy, fine-crse grn, friable-firm, poorly sorted, variable argill mtx, subang-subrnd. Scat mica and calc frags, localised claystone patches, rare shell and fossil frags.

amdel

CORE ANALYSIS RESULTS

Company	LAKES OIL	Formation	GREENSAND MBR	File	LQ5656
Well	PETRO TECH NO. 1		LAKES ENT FM	Date Report	12-03-97
Field				Analysts	DS, SW
State	VICTORIA	Location	GIPPSLAND BASIN PEP 135		

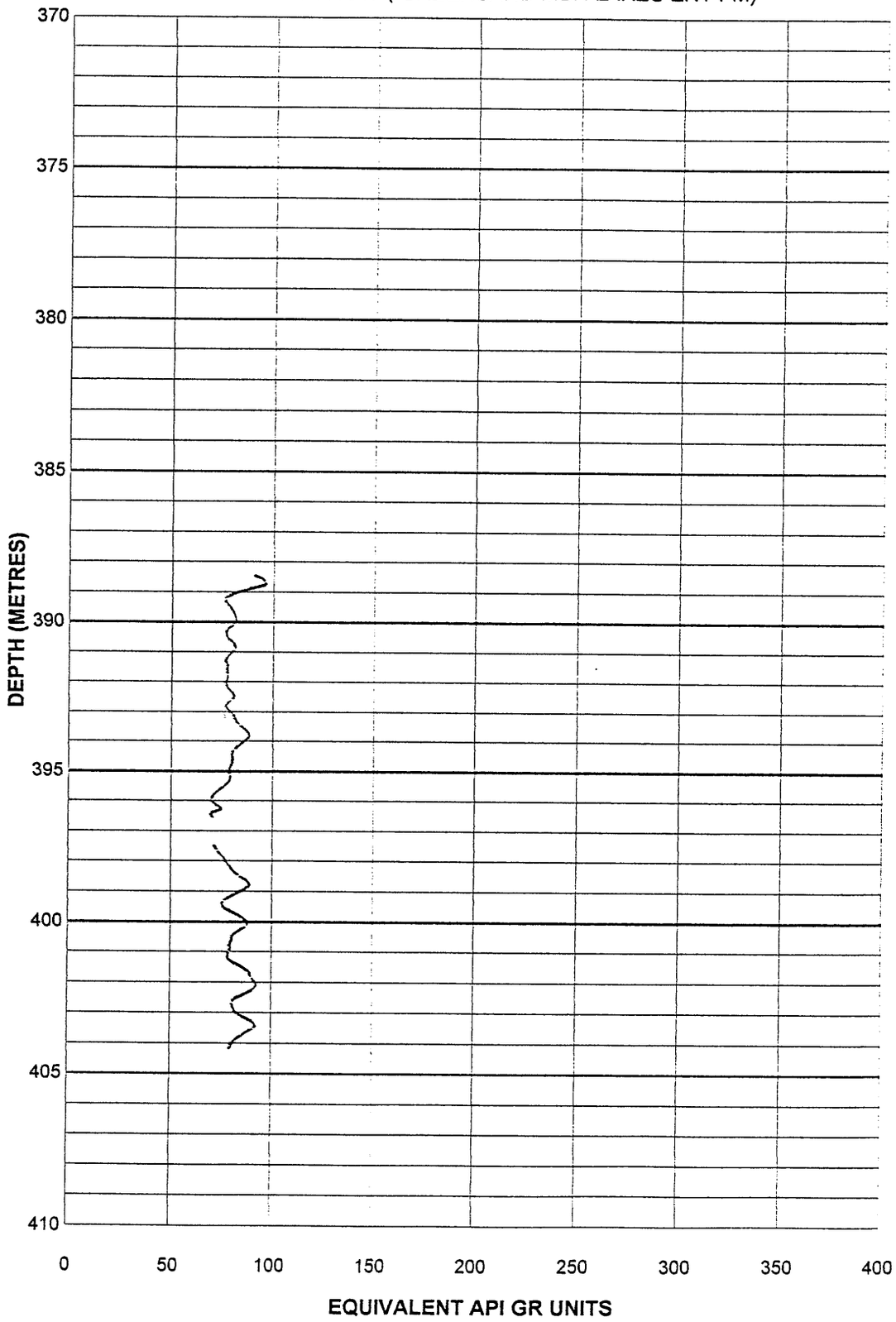
Lithological Abbreviations

SAND - SD	DOLOMITE - DOL	ANHYDRITE - ANHY	SANDY - SDY	FINE - FN	CRYSTLLINE - XLN	BROWN - BRN	FRACTURED - FRAC	SLIGHTLY - SLI
SHALE - SH	CHERT - CH	CONGLOMERATE - CONG	SHALY - SHY	MEDIUM - MED	GRAIN - GRN	GRAY - GY	LAMINATION - LAM	VERY - VI
LIME - LM	GYPSUM - GYP	FOSSILIFEROUS - FOSS	LIMY - LMY	COARSE - CSE	GRANULAR - GRNL	VUGGY - VGY	STYLOLOTIC - STY	WITH - WI

SAMPLE No.	DEPTH	PERMEABILITY MILLIDARCYS K.A.	POROSITY %	RESIDUAL SATURATION % PORE OIL	RESIDUAL SATURATION % PORE WATER	GRAIN DENSITY	VERT PERM	SAMPLE DESCRIPTIONS AND REMARKS
24	395.5	44	35.8	6.3	82.8	2.67		SST: Lt-occ med gy, vf-fine scat med and crse grns, firm-friable poorly sorted, gysh grn arg mtx, ang-rnd. Scat fossil debris and calcite frags, mica, scattered soft dk rounded grains.
25	395.8	225	36.8	12.9	72.3	2.72		As above but rare chlorite frags.
26	396.1	489	38.8	7.1	78.6	2.72		As above but med gy with increased calc frags.
27	396.4	25	34.4	10.0	75.2	2.80		SST: Lt-dom med gy, vf-occ fine scat med and crse qtz grns, firm-friable, poorly sorted, dk gy arg mtx, ang-rnd. Abunt disseminated pyrite, common scat calcite frags, scat shell and fossil material.
28	397.4	64	39.0	6.0	87.2	2.72		SST: Dl gy, vf-fine grn, friable-firm, well sorted, arg mtx, subang-subrnd. Common-abunt fine dk green-black glauconite grains, scat mica and fossil debris, scat brn siltstone particles.

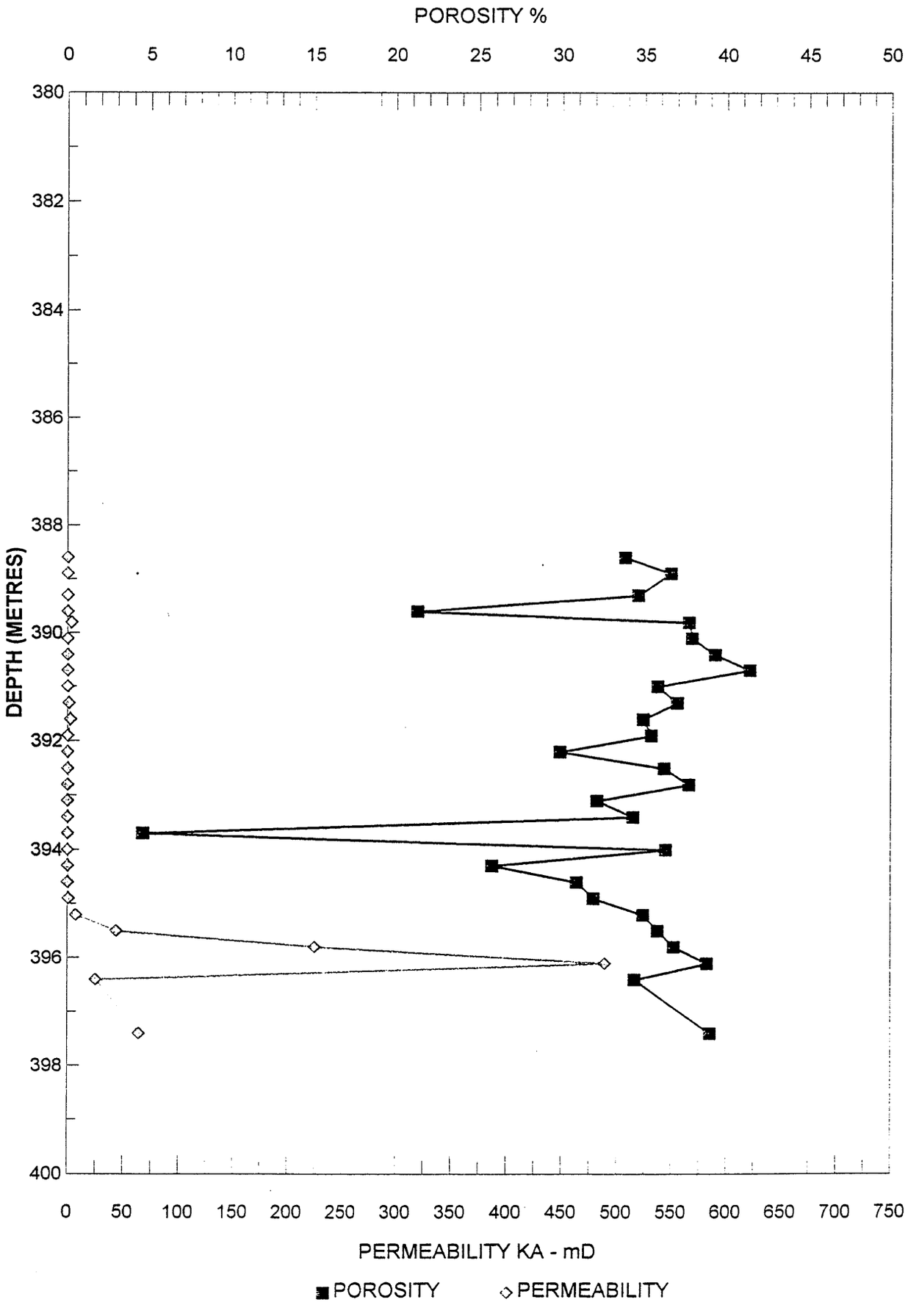
PETRO TECH NO. 1

GAMMA RAY (GREENSAND MBR LAKES ENT FM)



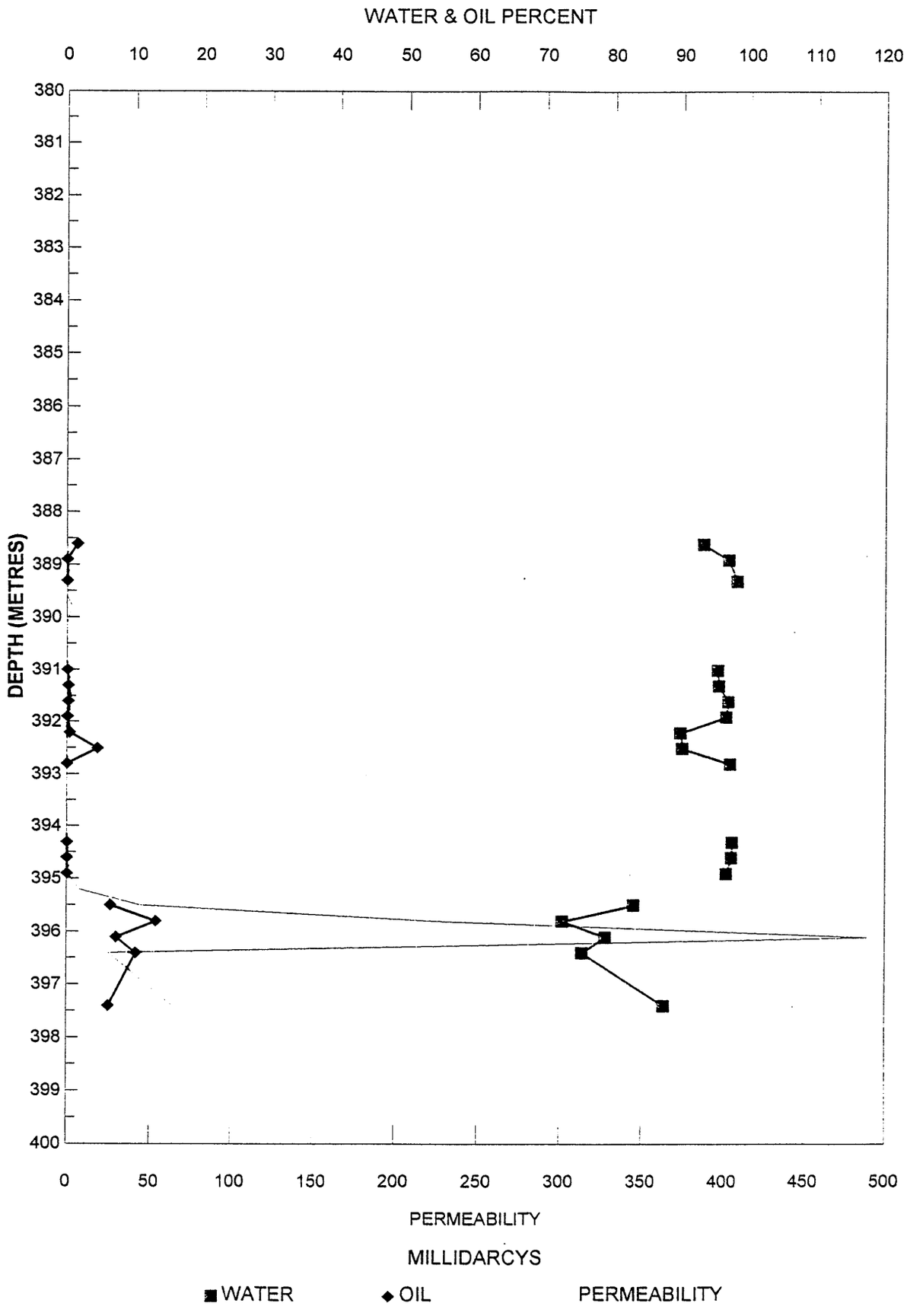
PETRO TECH NO. 1

POROSITY/PERMEABILITY vs DEPTH



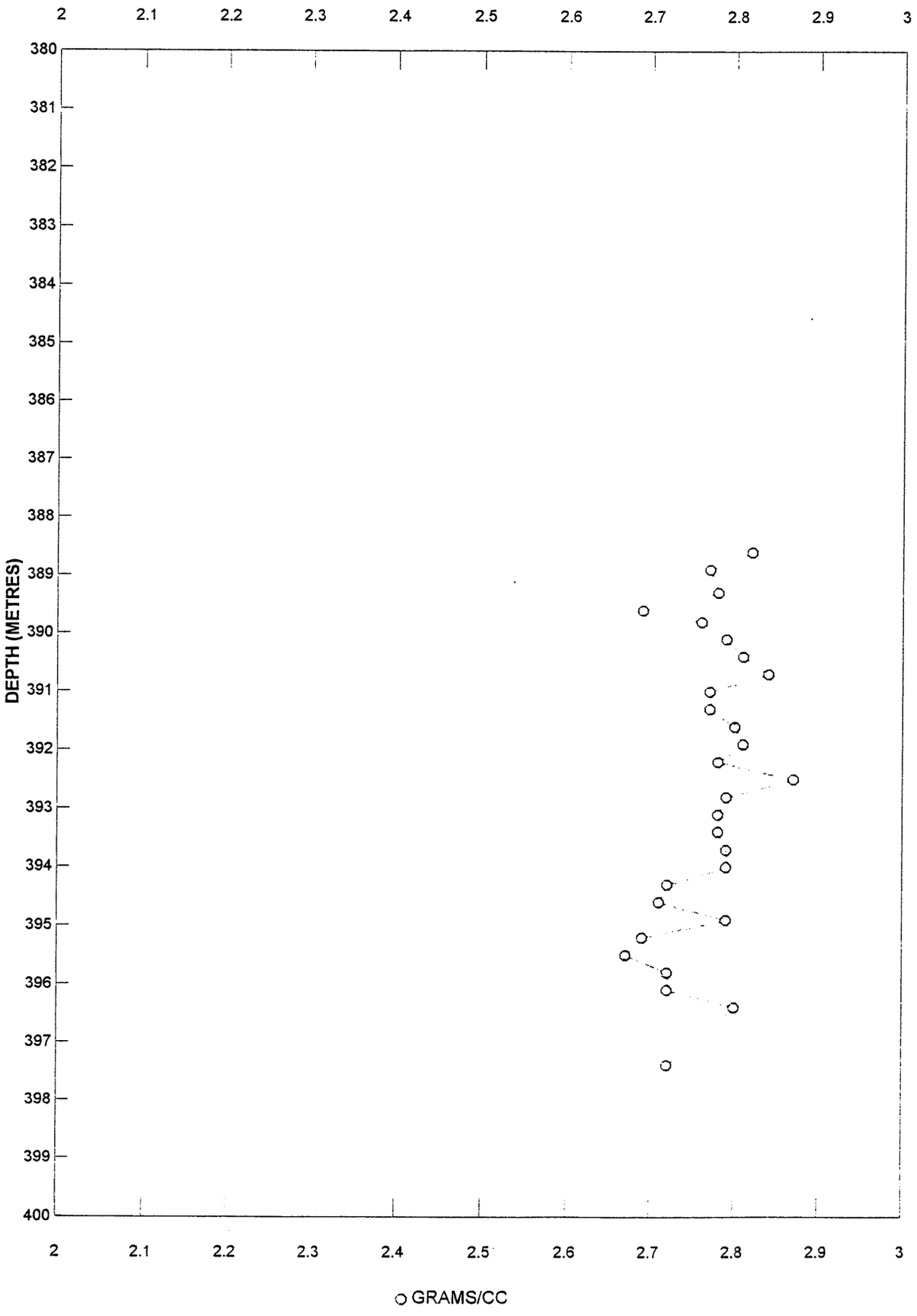
PETRO TECH NO. 1

SO vs SW & PERMEABILITY (GREENSAND MBR LAKES ENT FM)



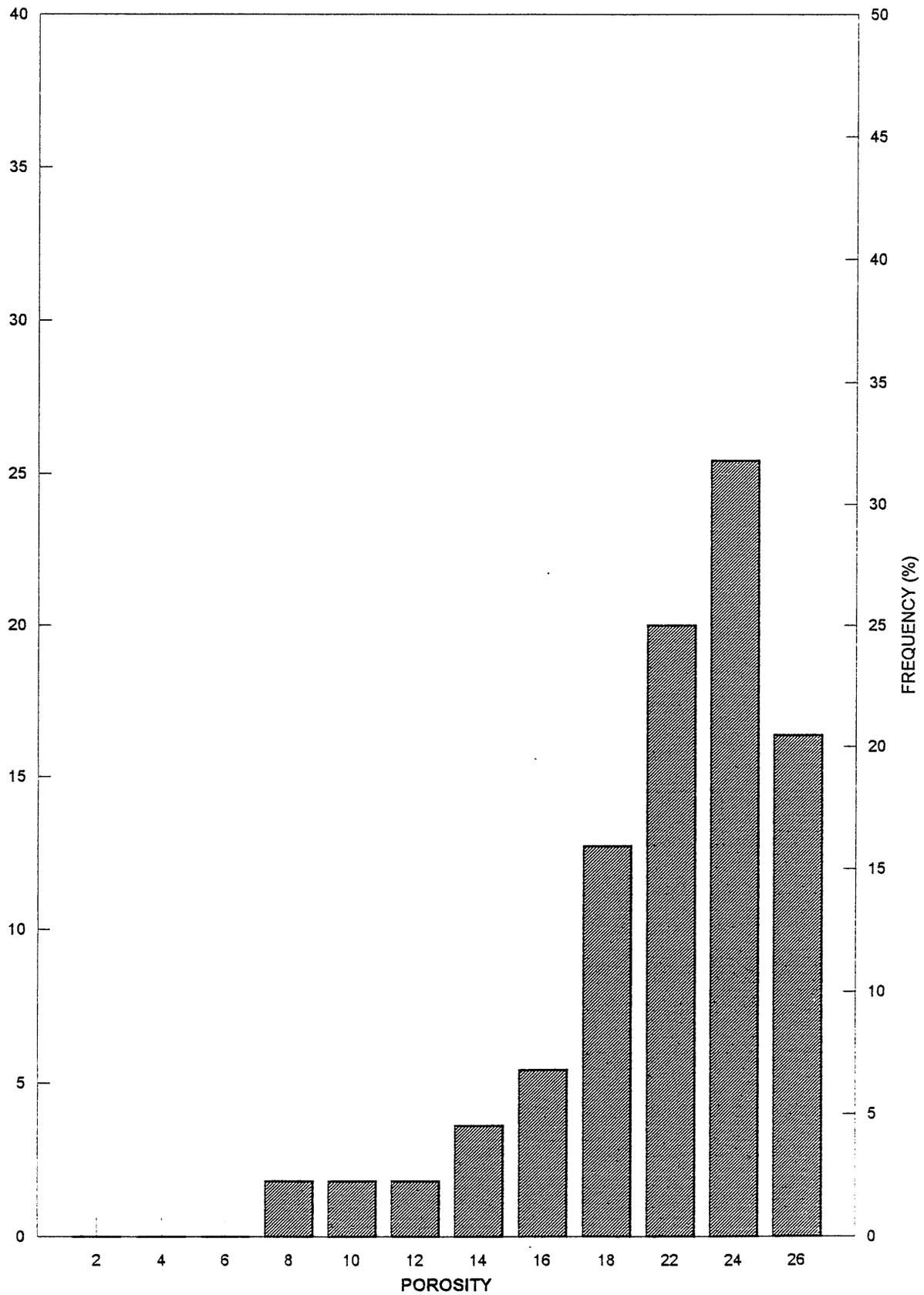
PETRO TECH NO. 1

GRAIN DENSITY (GREENSAND MBR LAKES ENT FM)



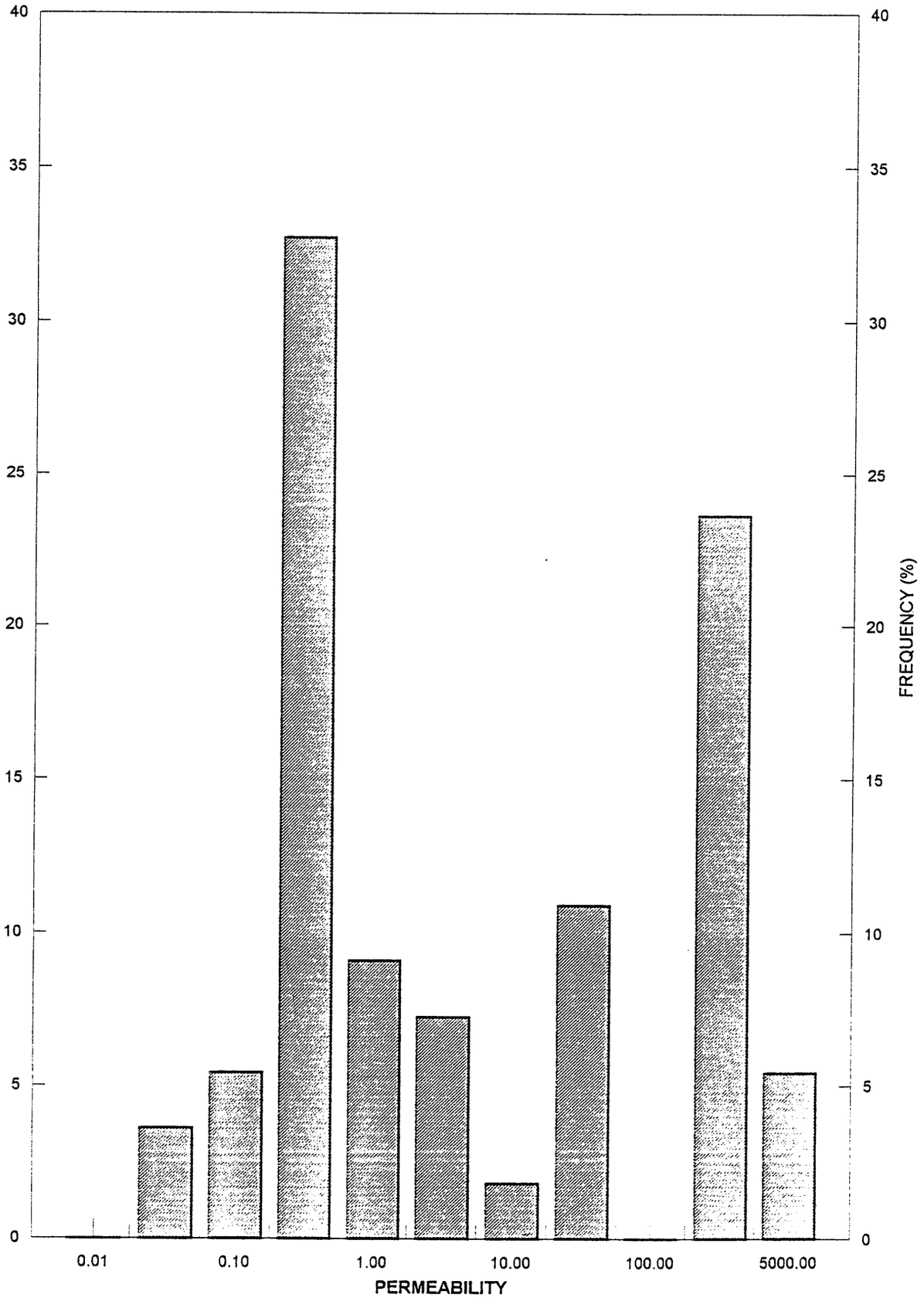
PETRO TECH NO. 1

POROSITY HISTOGRAM (GREENSAND MBR LAKES ENT FM)



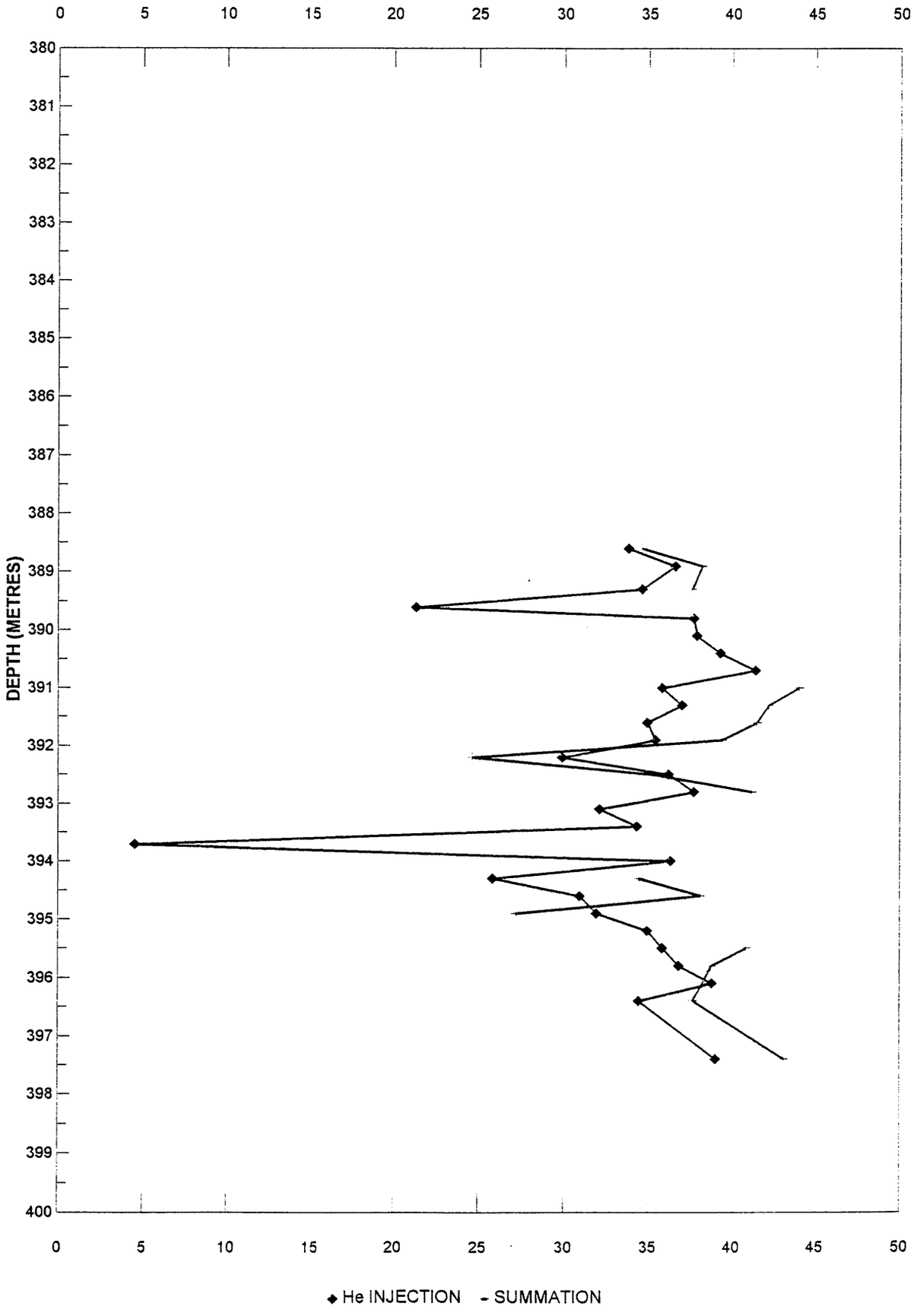
PETRO TECH NO. 1

PERMEABILITY HISTOGRAM (GREENSAND MBR LAKES ENT FM)



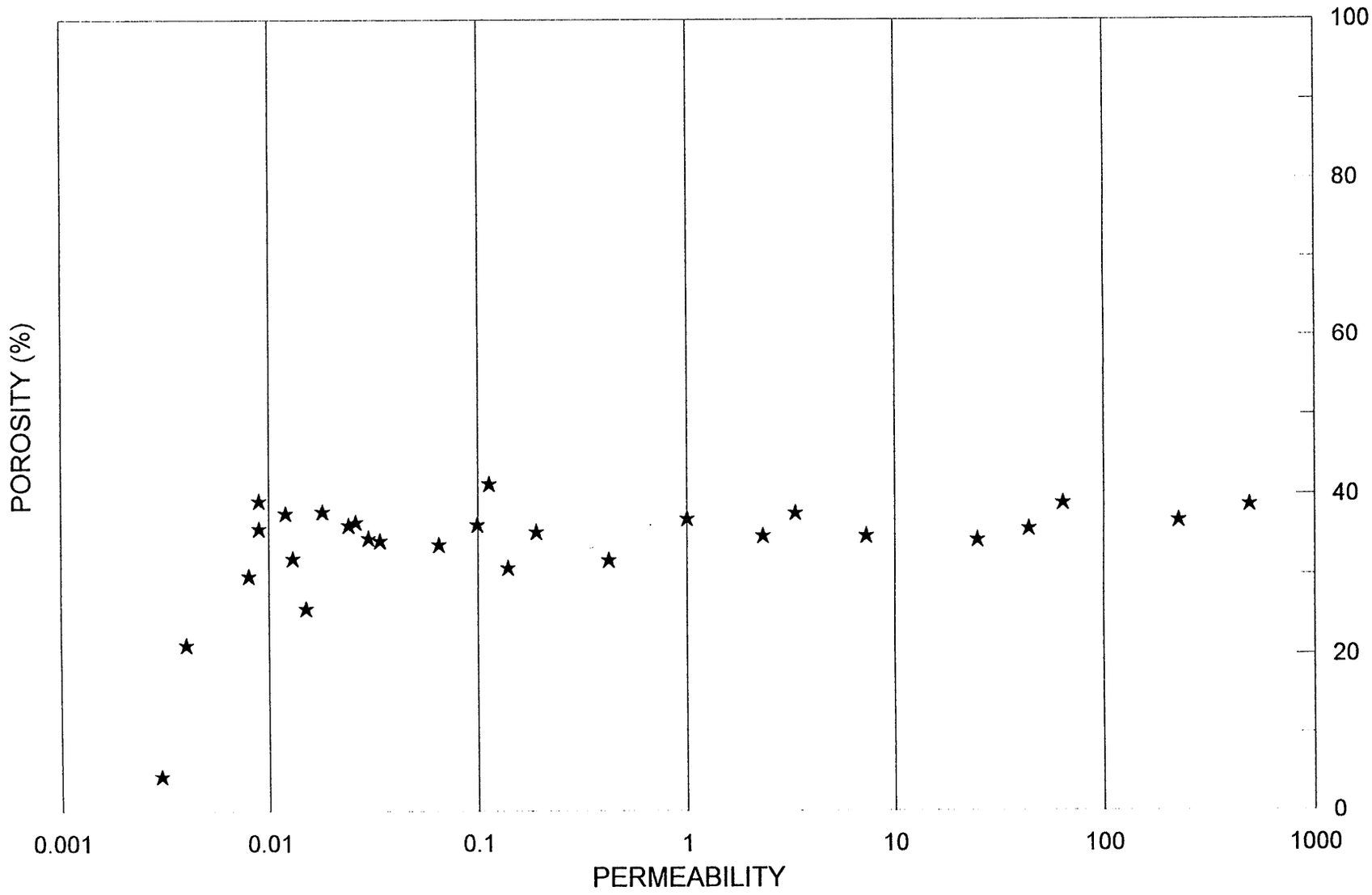
PETRO TECH NO. 1

POROSITY SUM/HE INJ (GREENSAND MBR LAKES ENT FM)

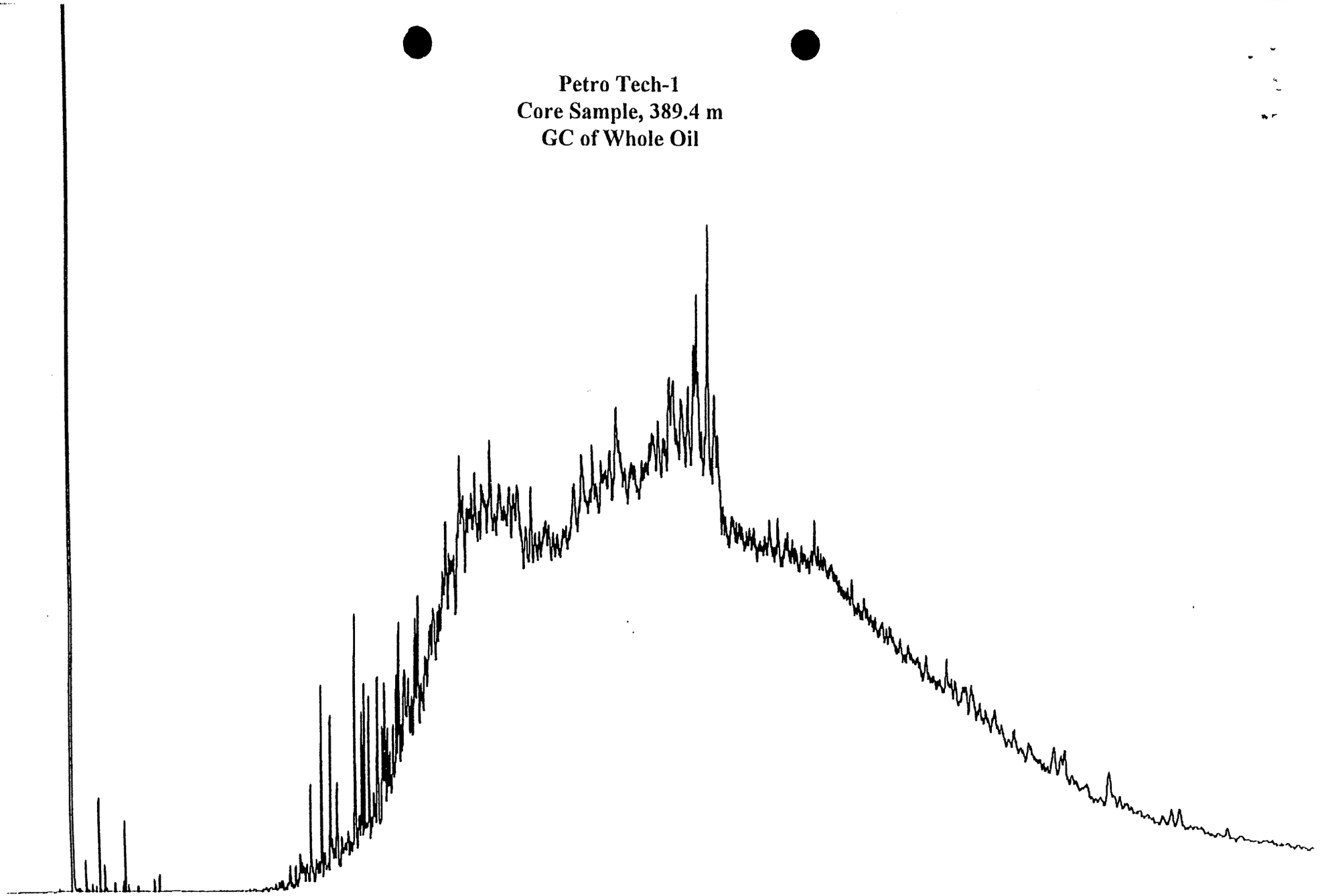


PETRO TECH NO. 1

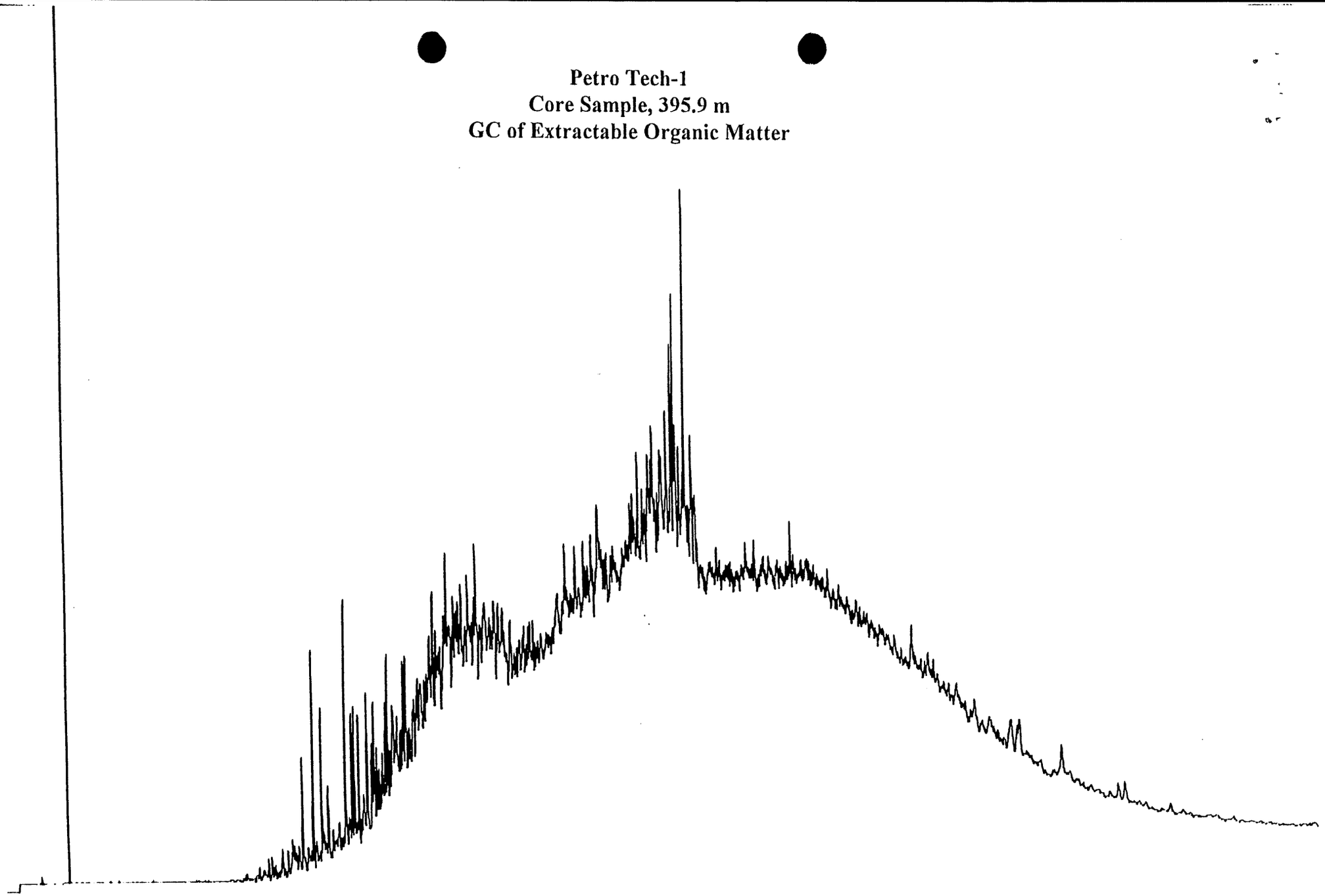
Porosity/Permeability Crossplot



Petro Tech-1
Core Sample, 389.4 m
GC of Whole Oil



Petro Tech-1
Core Sample, 395.9 m
GC of Extractable Organic Matter



APPENDIX 6

APPENDIX VI

Noise Assessment

Report to:
Mr Jack Mulready

NOISE ASSESSMENT OF DRILLING OPERATIONS AT THE PETRO TECH-1 SITE, LAKES ENTRANCE.

Report 97/1006
March 1997

Prepared by Russell Bond
HAZCON PTY. LTD.
PO Box 272, Warragul, Vic. 3820
Phone:(03) 5623 6657 Fax:(03)5623 6110

HAZCON

ENVIRONMENTAL & OCCUPATIONAL HEALTH & SAFETY CONSULTANTS

TABLE OF CONTENTS

1.0 INTRODUCTION

Mr Ian Buckingham, on behalf of Lakes Oil NL, requested the technical assistance of HAZCON Pty Ltd, to conduct a noise assessment of the drilling operations in accordance with the requirements specified in section 17, 18 and 19 of the planning permit No. 96/00584/PE issued by the East Gippsland Shire Council.

1.1 Background

Lakes Oil N.L. has embarked on an evaluation program to test the feasibility of extracting "heavy oil" from the previously abandoned oil field at lakes entrance. The technique of pulsing steam into the well is to be used to facilitate the extraction process by affecting the viscosity and other properties of the heavy oil. The drilling operation is required to reach the oil deposits some hundreds of metres below the ground surface. The drilling process is conducted over a 24 hour period for as many days as is required to complete the well construction and to complete the core sampling program.

The well is located approximately 1.5 kilometres North of the Lakes Entrance township and the immediate surroundings are rural / residential, with the nearest residential dwellings approximately 440 metres to the West. The well is situated on a ridge with gullies between it and the surrounding dwellings. These dwellings have essentially a direct line of sight to the well with some screening from trees in the case of the nearest house. The Lakes Entrance township and the Bass Strait may be seen from the well by looking South down the nearby gully. The ocean beach may also be seen from the residential dwelling to the South-East of the well and heard from each of the residential dwellings under suitable weather conditions.

1.2 Scope Of Work.

The scope of work would involve:-

a) Assessment of the exploration activities in line with the EPA Noise Control Guidelines TG 302/92, the SEPP Control of Noise from Commerce, Industry and Trade N1 procedures.

b) The writing of a report which assesses the noise from the exploration activities against the requirements for Construction and Demolition Site Noise for day, evening and night work.

c) Ensuring that the assessment meets the approval of the local Authority and the EPA.

2.0 METHODOLOGY

Section 17 of the Planning Permit No. 96/00584/PE stipulates that the exploration activities shall comply with the Environment Protection Authority Technical Guideline: Noise Control Guidelines - TG 302/92, and in particular with the guidelines relating to construction and demolition site noise. A copy of this document may be seen in Appendix 7.3.

In essence this guideline requires that noise measurements be conducted with at least a Type 2 sound level meter (according to AS 1259) which is checked for accuracy before and after each measurement. The upper noise limits set are referenced to the background noise level experienced at each dwelling without the impact of the drilling rig noise. ie the noise limit shall be the background level plus 10 decibels etc.

Section 18 of the Planning Permit No. 96/00584/PE stipulates that a noise assessment of the exploration activities shall be conducted in accordance with the procedures contained in the State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1. A copy of this document may be seen in Appendix 7.2.

The procedures in this document stipulate that:

- The measurement for 'minor premises' is to be based on L_{aeq}, which means equivalent continuous A-weighted sound levels.
- The measurement must not be influenced by extraneous noises or by reflected noise from walls or other surfaces.
- The measurements must be representative of the noise being emitted from the source.
- An adjustment is to be made for a number of factors relating to noise quality including tonal and impact components of the noise. These noise characteristics have the potential to increase the nuisance value perceived by residents.
- Background level for the 'day', 'evening' or 'night' period effectively means a noise level which is equivalent to the average of the minimum meter readings over those periods.
- Noise measurements are made within 10 metres of the noise sensitive area (dwelling)
- Noise limits are based on background levels in conjunction with accepted levels for any industry types located within 200 metres immediately surrounding the dwelling. The means by which these limits are calculated is outlined in Appendix 7.2.

2.1 Background Noise

In practice, the non-stop operation of the drilling rig meant that the background readings could not be taken at the same location as the measurements of the rig noise. This problem was overcome by taking background readings on the far side of each dwelling from the drilling rig. By this means, the rig noise was all but eliminated whilst the normal noise levels surrounding the dwelling could be readily measured.

At least two background measurements were taken during the course of each 'day', 'evening' and 'night' period. These results were averaged arithmetically to produce the background noise level for the particular measurement site, for the 'day', 'evening' and 'night' period. This average background noise level forms the basis for establishing the acceptable noise limits for each site. Measurements were taken in accordance with Schedule C of the State Environment Protection Policy N-1. The acceptable noise limits were adopted from the requirements for Construction and Demolition Site Noise as detailed in the Environment Protection Authority Technical Guidelines, "Noise Control Guidelines TG 302/92".

2.2 Equipment

The sound level meter used in this work was a Bruel & Kjaer Model 2230 which is a Type 1 precision sound level meter in accordance with the requirements of Australian Standard 1259. The meter was calibrated before and after each measurement to ensure that successive calibration checks did not vary by more than 0.1 decibel. No measurement variation was observed and therefore no measurements were rejected on this basis.

The sound level calibrator used in this assessment was a Bruel & Kjaer Model 4230. Copies of certificates of calibration by an approved laboratory are included in Appendix 7.4.

3.0 RESULTS

Table 1

Site No.	Day Noise Measurement (0700-1800) in decibels.	Day Background Measurement (0700-1800) in decibels.	Evening Noise Measurement (1800-2200) in decibels.	Evening Background Measurement (1800-2200) in decibels.	Night Noise Measurement (2200-0700) in decibels.	Night Background Measurement (2200-0700) in decibels.
1	N/A	N/A	N/A	N/A	N/A	N/A
2	47.6	43.4	45.4	41.7	38.7	36.6
3	45.9	43.4	42.3	36.9	42.2	36.2
4	43.9	39.1	44.5	41.6	43.5	40.2

Note 1: Site No. 1 results were not obtained due to: a) the residents being unavailable to grant permission to take measurements, and b) the site being approximately 630 metres from the drilling rig, and therefore not being the worse-case 'noise sensitive area'.

Note 2: The site locations of the closest residential dwellings (sites 1, 2, 3, & 4) are shown on the map in Appendix 7.1.

Table 2

Measurement of noise was undertaken at a distance of approximately 170 metres in a North North Westerly direction from the drilling equipment to simulate the noise levels that may be expected at the proposed operations in Hunters Lane, Lakes Entrance.

Day Noise Measurement (0900 hours) in decibels.	Day Background Measurement (0900 hours) in decibels.	Evening Noise Measurement (2200 hours) in decibels.	Evening Background Measurement (2200 hours) in decibels.	Night Noise Measurement (0630 hours) in decibels.	Night Background Measurement (0630 hours) in decibels.
56.2	44.1	55.5	41.7	45.2	42.7

Note 1: As the drilling operation did not stop at all during the measurement periods, the background results presented in Table 2 are minimum readings obtained during the measurement periods.

Note 2: The Night noise result may have been lower than the Evening result due to the main diesel powered pump being switched off at the time.

3.1 Main Noise Sources At The Drilling Operation

Diesel pump @ 1m	Leq = 89.9dB(A) South side
Diesel pump @ 1m	Leq = 94.9dB(A) North side
Drilling head @ 1m	Leq = 85.8 to 86.8 dB(A)
Drilling rig diesel motor @1m	Leq = 95.1dB(A) Normal operation
Drilling rig diesel motor@1m	Leq = 99.9dB(A) When revving to hoist pipes
Mud shaking screen@1m	Leq = 89.5dB(A)

4.0 DISCUSSION

4.1 Noise Limits

The planning permit for the well drilling operation requires compliance with the Construction and Demolition Site Noise as detailed in the Environment Protection Authority Technical Guidelines, "Noise Control Guidelines TG 302/92", Appendix 7.3. These requirements include a noise limit which stipulates that the noise level at any residential premises must not exceed background noise by:
(i) 10 dB(A) or more for 18 months after project commencement, and
(ii) 5 dB(A) or more after the 18 months
during the hours of:

1800 to 2200 hours Monday to Friday
1300 to 2200 hours Saturdays
0700 to 2200 hours Sundays and public holidays.

No measurements of drilling rig noise, as determined at the residential sites assessed in this report, exceeded the limits comprised of background level plus 10 decibel.

4.2 Background Noise

As background noise levels form the basis for establishing the final environmental noise limits, some comment regarding the sources and their contribution is warranted.

Firstly, weather conditions in the form of a steady breeze contributed to the background noise levels by rustling the foliage of grasses and trees near to the measurement point. The contribution from the wind noise was most significant during the Day and Evening time periods until around 2000 hours on the day of the measurements, after which time the wind dropped off to still conditions. However, the Day results in the above table indicate that the difference between the background and the general noise levels was no more than 5 decibels.

When the wind speed dropped and still conditions prevailed, a significant contributor to the background noise was the sound of the surf. The surf noise was clearly audible at all measurement sites during these still conditions but was particularly noticeable at site number 4 to the South East of the drilling operation. This site has a direct line of sight to the waves breaking on the ocean shore to the South. Note that the average Night background level for this site is 40.2dB(A) compared with 36.6dB(A) and 36.2dB(A) for sites 2 and 3 respectively. Sites 2 and 3 are shielded from the sounds of the surf to some extent by a hill to the South. The background level for site 4 is only 3.5 decibels lower than the average general noise level and it may be therefore concluded that the surf noise is comparable to other noises such as the drilling rig under these conditions.

Road traffic and wind noise contributed to background noise levels during the Evening period at site 2 up until around 2200 hours. Site 2 also was subjected to the occasional sounds of chooks crowing during the early hours of the morning. These sounds were excluded from the measurements for the purpose of this assessment.

4.3 Drilling Rig Nuisance Noise Qualities

The qualities of some sounds such as tonal or impact noise are recognised to be a generally unwelcome contributor to nuisance noise. A very slight tonal quality could sporadically be heard during the operation of a mechanical brake, used when controlling the motion of the pipe hoisting winch. This type of operation is not typical of general drilling and is only used to lift and change the drilling 'bit' to a core cutting/sampling device. This intermittent tonal sound did not contribute a measurable amount to the average sound level. As the sound was quite faint, no adjustment to the measured noise level was made to reflect an increased nuisance factor. Should conditions change, leading to unacceptable noises from the brake mechanism, alternative brake surface materials may provide a means of control although this may incur a cost penalty.

The general operation of the drilling operation produced noise levels of a very consistent nature and is not expected to be audible within nearby residential dwellings. No other noticeable sound qualities were observed in relation to the drilling operations.

4.4 Anticipated Noise Levels at the Proposed Hunters Lane Site

On the basis of information provided by Mr Ian Buckingham of Lakes Oil N.L., regarding likely distance from, and direction from the proposed drilling site at Hunters Lane, the results presented in Table 2 were obtained. Assuming that the conditions under which these measurements were taken may reasonably be compared with the Hunters Lane conditions (ie the noise sources and topographical

factors are similar), these results suggest that the residential dwellings at 170 metres will be subjected to noise in excess of background levels plus 10 decibel.

The diesel motors driving the pump and rig respectively are the most significant of the noise sources, and to be effective, control measures would most likely need to be directed at these sources. Refer to the listing of main noise sources at the drilling operation, which follows Table 2 in the text.

5.0 CONCLUSION

Using the 'background level plus 10 dB' environmental noise limit criteria outlined in the Environment Protection Authority Technical Guideline: Noise Control Guidelines - TG 302/92, the noise levels measured at the residential dwellings nearest to the Palmers Road well are not excessive.

Using the same criteria to anticipate the result at the Hunters Lane site suggests that the noise levels at 170 metres from that well site will exceed the 'background plus 10 dB' limit. For all Day, Evening and Night periods, the noise measurement exceeds the background estimate by more than 10 decibels. ie 12 to 14 decibels.

6.0 RECOMMENDATION

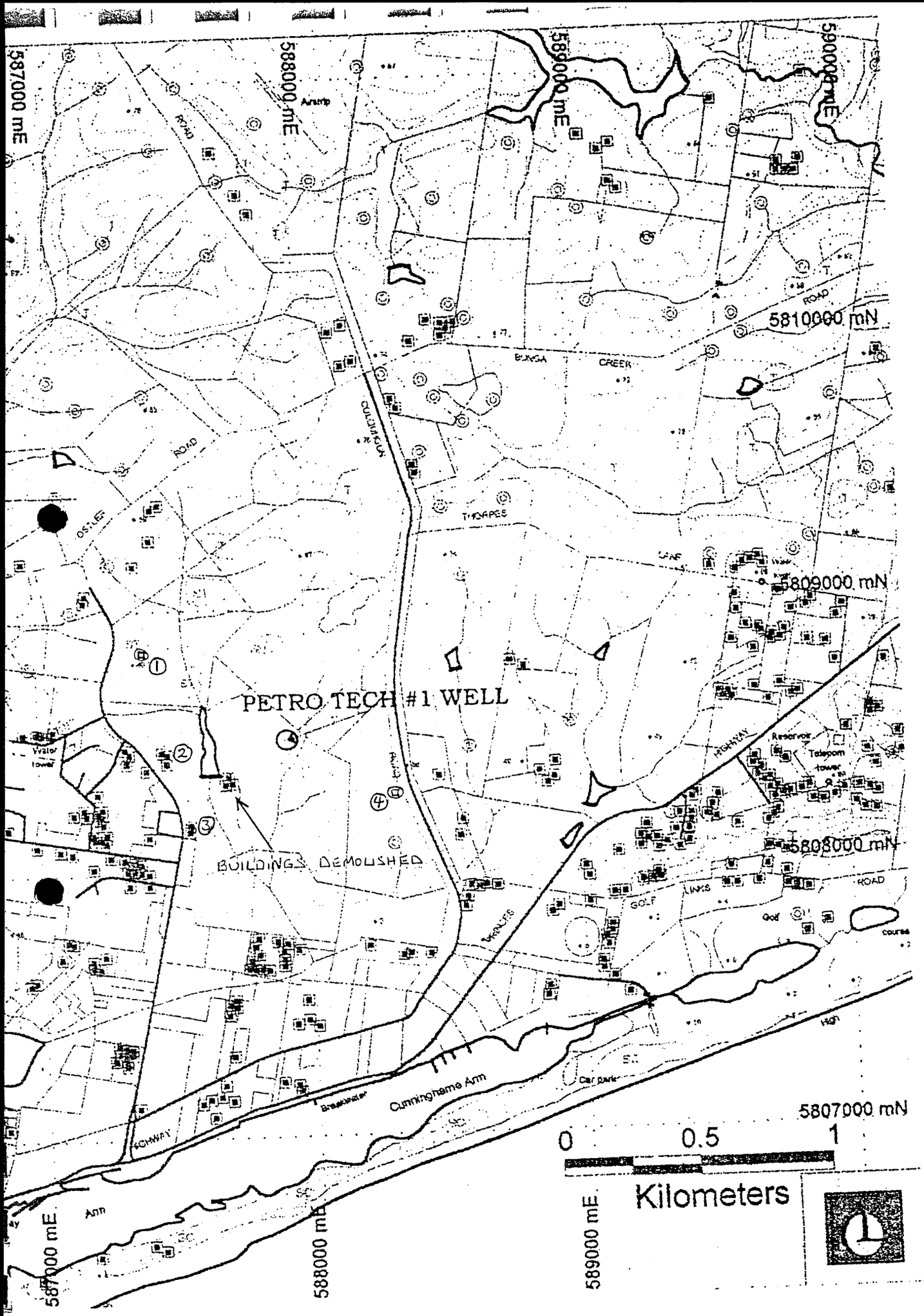
No alteration to the noise control processes at the Palmers Road well are recommended under current operating conditions.

Noise control at the Hunters Lane site should include consideration of the following actions:

- use the lowest noise output equipment reasonably available which will meet the requirements of the job
- investigate and implement the best practical means of silencing the noise sources and particularly the diesel motors, using current technology
- restrict noisy operations to Day periods when the impact on residents is likely to be less annoying
- where the operation noise is likely to impact residents, particularly during Evening and Night periods, then the affected premises should be notified of the intended work, its duration and times of occurrence.

Russell Bond B.App.Sc.,Grad.Dip.Occ.Hyg.,Grad.Dip.App.Sc.
Senior Occupational Hygienist

APPENDIX 7.1 Map Showing Location of Petro Tech # 1 Well in Relation to Nearby Houses and Roads.


587000 mE
588000 mE
589000 mE
590000 mE
5810000 mN
5809000 mN
5808000 mN
5807000 mN
PETRO TECH #1 WELL
BUILDINGS DEMOLISHED
0
0.5
1
Kilometers

APPENDIX 7.2 State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1.

VICTORIA GOVERNMENT

GAZETTE

No. S 31 Thursday 15 June 1989

By Authority Jean Gordon Government Printer Melbourne

SPECIAL

Environment Protection Act 1970

STATE ENVIRONMENT PROTECTION POLICY (CONTROL OF NOISE FROM COMMERCE, INDUSTRY AND TRADE) No. N-1

The Governor in Council, under section 16 of the *Environment Protection Act* 1970, declares the following State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1.

Dated: 16 May 1989

Responsible Minister:

T. W. ROPER

Minister for Planning and Environment

KATHY OUZOUNIS

Acting Clerk of the Executive Council

1. This Order may be cited as the State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1, referred to below as the Policy.

2. The State Environment Protection Policy (Control of Noise from Commercial, Industrial or Trade Premises within the Melbourne Metropolitan Area) No. N-1 shall be repealed upon the coming into operation of this Policy.

3. Any noise control notice, minor works noise control notice or notice of variation thereto, issued prior to the coming into operation of this Policy and which has not been revoked, shall continue to have the same status, operation and effect as if this Policy had not been made. Except for the purposes of enforcement proceedings already commenced, effective noise levels shall be measured in accordance with the provisions of this Policy.

4. For the purposes of section 17 (1) (*a*) of the Act, the element of the environment to which the Policy applies is classified as sound.

5. This Order is divided into parts and schedules as follows:—

6. Policy goal

The goal of this Policy is to protect people from commercial, industrial or trade noise that may affect the beneficial uses made of noise sensitive areas while recognizing the reality of the existing land use structure in the Metropolitan Region.

PART I—BOUNDARIES OF AREA AFFECTED

7. The Policy shall be observed within the Metropolitan Region as defined in Schedule 1 of the Planning and Environment Regulations 1988.

PART II—BENEFICIAL USES PROTECTED

8. Beneficial uses shall be the normal domestic and recreational activities including, in particular, sleep in the night period.

PART III—PREMISES OF APPLICATION

9. This Policy prescribes noise limits for commercial, industrial or trade premises. The following types of noise emitted from commercial, industrial or trade premises are not assessed by this Policy:

Music
Voices
Noise from crowds
Noise from firearms
Noise from lawnmowing
Noise from construction or demolition activities on building sites
Noise from sporting events
Noise from audible intruder, emergency or safety alarms
Noise from aircraft except for ground maintenance activities
Noise from mobile farm machinery
Noise from scare guns and anti-hail guns
Noise from livestock on a farm or in a saleyard
Noise from a fire pump used in an emergency
Noise from non-commercial vehicles except for maintenance activities

PART IV—ENVIRONMENTAL QUALITY OBJECTIVES AND INDICATORS

10. The environmental quality indicator is the effective noise level determined according to Schedule A.

11. The environmental quality objectives are the noise limits determined according to Schedule B.

12. The derived noise limit at a derived point is determined according to Schedule D.

PART V—ATTAINMENT PROGRAM

13. The effective noise level shall not exceed noise limits prescribed in this Policy.

14. The effective noise level at any derived point shall not exceed the derived noise limit.

15. Where noise emissions from existing commercial, industrial or trade premises exceed the requirements set out in the Policy, steps shall be taken by the occupier to reduce the level of these noise emissions to, or below, the relevant Policy noise limits.

16. Where it is planned to develop new commercial, industrial or trade premises, the premises shall be designed so that the noise emissions do not exceed the noise limits.

17. In fixing the time for compliance with the requirements of the Policy, the Authority may have regard to the following:

(*a*) The safety of persons and plant;

(*b*) The availability of technology to achieve the required noise reduction;

(*c*) The technical difficulty and complexity of abatement measures required to comply with noise limits; or

(*d*) The magnitude of the noise intrusion, or potential intrusion, on the noise sensitive area and, in particular, the extent of sleep disturbance.

Staged reductions may be appropriate in setting the time for compliance.

18. Where two or more premises contribute to the effective noise level in a noise sensitive area, each shall be controlled so that the contribution from each of the premises, when combined, will meet the noise limit at the noise sensitive area.

19. It is advised that, where equipment is to be replaced or new equipment installed, the quietest equipment available should be used where a significant reduction in noise in noise sensitive areas can be expected to occur.

PART VI—DEFINITIONS

20. In this Order, unless inconsistent with the context or subject matter:

"The Act" means the *Environment Protection Act* 1970 (No. 8056).

"A-weighted" means frequency weighted as specified in Australian Standard 1259–1982—Sound Level Meters, published by the Standards Association of Australia.

"Authority" means the Environment Protection Authority constituted under the Act.

"Background level" for a day, evening or night period means the arithmetic average of the L_{A90} levels for each hour of that period for which the commercial, industrial or trade premises under investigation normally operates. The background level shall include all noise sources except noise from commercial, industrial or trade premises which appears to be intrusive at the point where the background level is measured.

"Beneficial use" means a use of the environment or any element or segment of the environment which is conducive to public benefit, welfare, safety or health and which requires protection from the effects of the emission of noise.

"Commercial, industrial or trade premises" means any premises except:

(*a*) residential premises as defined in section 48A of the Act;

(*b*) a street or road, including every carriageway, footpath, reservation and traffic island on any street or road; and

(*c*) a tram, light rail or railway line not being a siding, marshalling yard or maintenance depot of any tram, light rail or railway line.

"Day period" means the time between 0700 and 1800 hours.

"Derived noise limit" means the maximum effective noise level allowed at a derived point and is determined using the method set out in Schedule D.

"Derived point" means a point used as a substitute measurement point to facilitate the assessment of noise from commercial, industrial or trade premises.

"Effective noise level" means the level of noise emitted from the commercial, industrial or trade premises and adjusted if appropriate for character and duration.

"*Evening period*" means the time between 1800 and 2200 hours.

"*Extraneous noise*" means any noise which is not part of the noise being measured from the premises under consideration. Extraneous noise includes the effect of wind on any vegetation and on the microphone diaphram and noise from aircraft and trains. Noise from animals shall be classified as extraneous noise unless their presence on the premises is directly associated with the trade or business conducted on the premises.

"*F*" means the time-weighting characteristic of a sound level meter as specified in Australian Standard 1259–1982—Sound Level Meters, published by the Standards Association of Australia.

"*Habitable room*" means any room other than a kitchen, storage area, bathroom, laundry, toilet or pantry.

"*I*" means the time-weighting characteristic of a sound level meter as specified in Australian Standard 1259–1982—Sound Level Meters, published by the Standards Association of Australia.

"L_{Aeq}" means equivalent continuous A-weighted sound pressure level and is the value of the A-weighted sound pressure level of a continuous steady sound that has the same acoustic energy as a given time-varying A-weighted sound pressure level when determined over the same measurement time interval.

"L_{A90}" means the A-weighted sound pressure level which is exceeded for 90 per cent of the time interval considered.

"*Major premises*" means commercial, industrial or trade premises contained in Schedule three of the Environment Protection (Scheduled Premises and Exemptions) Regulations 1984, except those Schedule three premises which are exempt from the requirements of section 46A of the Act (Notification of Works).

"*Measurement point*" means a point at which the microphone is located to measure the effective noise level or the background level.

"*Minor premises*" means commercial, industrial or trade premises not being a major premises.

"*Night period*" means the time between 2200 and 0700 hours.

"*Noise limit*" means the maximum effective noise level allowed at a measurement point in a noise sensitive area.

"*Noise sensitive area*" means:

(*a*) that part of the land within the apparent boundaries of any piece of land which is within a distance of 10 metres outside the external walls of any of the following buildings—

Dwelling (except Caretaker's House)
Residential Building;

(*b*) that part of the land within the apparent boundaries of any piece of land on which is situated any of the following buildings which is within a distance of 10 metres outside the external walls of any dormitory, ward or bedroom of such buildings—

Caretaker's House
Hospital
Hotel
Institutional Home
Motel
Reformative Institution
Tourist Establishment
Work Release Hostel

"*S*" means the time-weighting characteristic of a sound level meter as specified in Australian Standard 1259–1982—Sound Level Meters, published by the Standards Association of Australia.

SCHEDULE A
MEASUREMENT OF NOISE

A1. LOCATION OF MEASUREMENT POINT

1. The measurement point shall be located within a noise sensitive area or at a derived point, as appropriate.

2. Where the measurement point is in a noise sensitive area, the measurement point shall be located out of doors unless the conditions in Clause A1.4 apply.

3. The measurement point in a noise sensitive area shall be located at a point where the maximum effective noise level occurs.

4. Indoor measurement

(*a*) The measurement point shall be located indoors when:

(i) the noise (including vibration induced noise) is transmitted into the affected room through a solid wall, floor or ceiling; or

(ii) a representative outdoor measurement cannot be made even when a microphone is placed through a window opening on a boom.

(*b*) Indoor measurements shall be made in a habitable room with all windows and doors of the room closed.

5. Derived point

(*a*) A derived point may be specified where:

(i) two or more industries contribute to the effective noise level and a measurement point is required that is not influenced by other industries;

(ii) atmospheric conditions affect the effective noise level at the noise sensitive area and a measurement point is required closer to the commercial, industrial or trade premises that is not affected by atmospheric conditions; or

(iii) a measurement point in a noise sensitive area is not readily accessible and a more suitable measurement point is required.

(*b*) A derived point may be specified at a point or points within or outside a commercial, industrial or trade premises and the microphone shall be located at a point where the noise received is representative of the noise received at the noise sensitive area.

6. Atmospheric effects

When the effective noise level may be significantly affected by atmospheric effects, a derived point may be used located near to the industry. Where it is inappropriate to use a derived point because of the size of the industry or the unavailability of an alternative measurement point, three measurements shall be taken within a 30 day period at the noise sensitive area. The effective noise level shall be the arithmetic average of the three measurements.

A2. COMMON MEASUREMENT PROCEDURES FOR MAJOR AND MINOR PREMISES

1. Measurement

(*a*) The noise from commercial, industrial or trade premises shall be measured so as to obtain an L_{Aeq} that is representative of the noise over a continuous 30 minute period.

(*b*) The L_{Aeq} shall be adjusted where necessary to obtain the effective noise level.

(*c*) The measurement shall be carried out using F or S time-weighting except where section A3.1 applies.

(*d*) The L_{Aeq} may be considered equivalent to the average meter readings when the meter indicates the noise being emitted is steady and does not vary by more than 8 dB (A).

2. Cumulative adjustments to the L_{Aeq} shall be made, when required, for noise character, duration and measurement position to determine the effective noise level, according to the following formula:

$$\text{Effective noise level} = L_{Aeq} + A_{tone} + A_{dur} + A_{int} + A_{ref} + A_{ind} + A_{imp}$$

Note: Impulse adjustment A_{imp} only applies to minor premises.

3. The effective noise level shall be rounded to the nearest decibel.

4. Adjustments common to major and minor premises

(*a*) Duration adjustment A_{dur}

(i) When the noise emission is not audible over the whole of a continuous 30 minute period, then a duration adjustment based upon the total amount of time for which the noise is audible over that continuous 30 minute period shall be determined from Figure 1.

(ii) When the noise emission is impulsive in character, then any impulse noise emission event shall be considered to be audible for 10 seconds after the occurrence of the event for the purposes of determining the duration adjustment.

(*b*) Intermittency adjustment A_{int}

When the noise emission is intermittent or variable and the noise emission, when measured by a sound level meter set to F time-weighting and A frequency weighting, increases in level rapidly on at least two occasions during a 30 minute period and maintains the level for at least a one-minute duration, then an adjustment determined from the following table shall be made:

PERIOD	INCREASE IN LEVEL	ADJUSTMENT
Day period	> 10 dB	+ 3 dB
Evening and night periods	5–10 dB	+ 3 dB
	> 10 dB	+ 5 dB

(*c*) Reflection adjustment A_{ref}

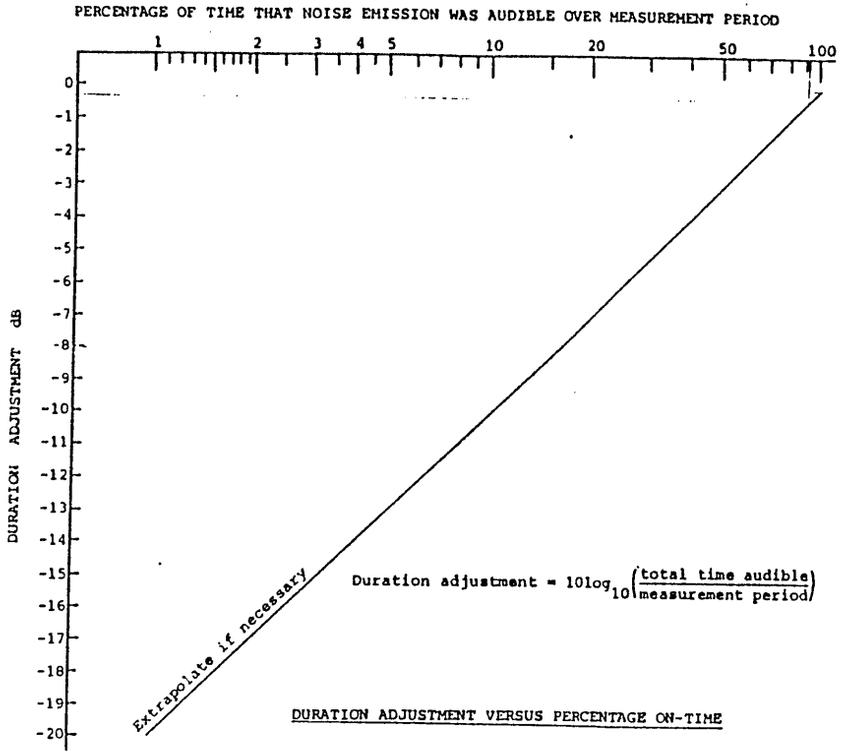
When the measurement point is located outdoors and the microphone is located from 1 to 2 metres from an acoustically reflecting surface, an adjustment of −2 dB shall be made.

(*d*) Indoor adjustment A_{ind}

When the measurement point for a noise sensitive area is located indoors, then the following adjustments shall be made unless inappropriate:

(i) When the noise is transmitted through a single glazed window, the indoor adjustment shall be 15 dB.

FIGURE 1



DURATION ADJUSTMENT VERSUS PERCENTAGE ON-TIME

(ii) When the noise (including vibration induced noise) is transmitted through a solid wall, ceiling or floor, the adjustment shall be 15 dB.

(iii) When the noise is transmitted through a double glazed window, the indoor adjustment shall be 25 dB.

A3. MEASUREMENT PROCEDURES SPECIFIC TO MAJOR PREMISES

1. Measurement of impulsive noise

When the noise is impulsive in character, the noise shall be analysed using I time-weighting. The analysis shall be carried out during times when the root-mean-square detected level represents the noise being measured but excluding extraneous noise which would significantly alter the L_{Aeq}.

2. Tonal adjustment A_{tone}

When the noise emission is tonal in character an adjustment shall be made as follows:

(*a*) Using an A-weighted tape recording, one-third octave analyses shall be carried out on several samples, each of which is representative of the tonal character of the noise. Each sample shall have a duration of at least one second and the whole of each sample shall be analysed in each one-third octave band.

(*b*) The sum of the durations of the samples analysed shall be at least 24 seconds.

(*c*) The A-weighted level shall be determined for each one-third octave band and shall be the level which would have the same acoustic energy as the time-varying level when determined over the sample period.

(*d*) The band exceedence shall be determined for each one-third octave band with centre frequencies from 25 Hz to 16 kHz as the difference between the one-third octave band level and the arithmetic average of the levels of the two adjacent one-third octave bands.

(*e*) A tonal correction shall be determined from Figure 2 for each one-third octave band for which the band exceedence is greater than 3 dB.

(*f*) The tonal correction shall be arithmetically added to the appropriate band. The tonal correction need not be applied to those bands for which the band level is 25 dB or more below the highest band level.

(*g*) The overall A-weighted sound level tonally corrected (L_{tc}) shall be calculated using the following formula:

$$L_{tc} = 10 \log_{10} \sum_{i=1}^{j} \frac{L_{Ai}}{10^{10}}$$

where L_{Ai} is the A-weighted one-third octave level in each band tonally corrected if necessary and, 1 to j are all the one-third octave bands.

(*h*) The adjustment for each sample shall be the arithmetic difference between L_{tc} and the uncorrected L_{Aeq} level for the sample.

(*i*) The tonal adjustment shall be the arithmetic average of the adjustments for all samples that are representative of the tonal nature of the noise.

A4. MEASUREMENT PROCEDURES SPECIFIC TO MINOR PREMISES

1. Tonal adjustment A_{tone}

When the noise is tonal in character then an adjustment shall be made as follows:

(*a*) When the tonal character of the noise is just detectable then A_{tone} = +2 dB.

(*b*) When the tonal character of the noise is prominent then A_{tone} = +5 dB.

2. Impulse adjustment A_{imp}

When the noise is impulsive in character then an adjustment shall be made as follows:

(*a*) When the impulsive character of the noise is just detectable then A_{imp} = +2 dB.

(*b*) When the impulsive character of the noise is prominent then A_{imp} = +5 dB.

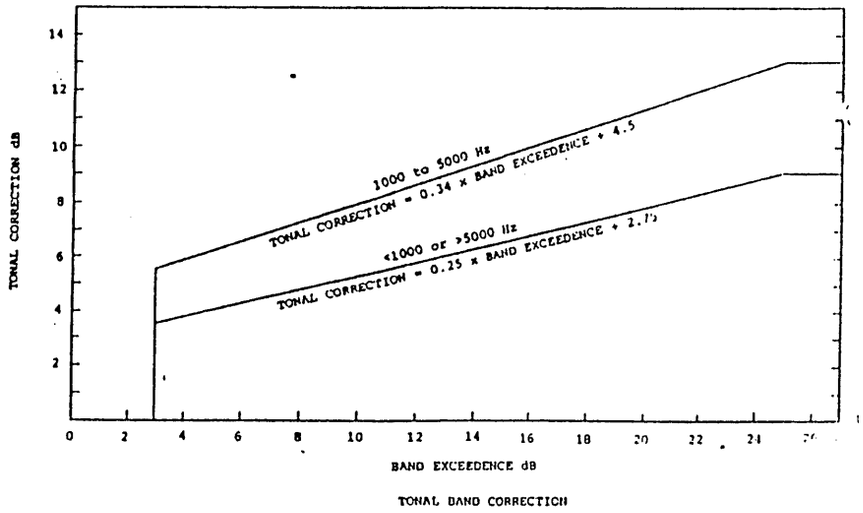
SCHEDULE B
DETERMINATION OF NOISE LIMITS

For the purposes of this Schedule the following definitions apply:

"Completion date" means the scheduled completion date of a road as specified in writing by a responsible officer of the responsible road authority.

"Large Public Purpose Installation" means any installation used for a public purpose being a generating works, an electrical terminal station operating at a nominal voltage of not less than 220kV, a garbage compaction works or a garbage incineration works.

FIGURE 2



TONAL BAND CORRECTION

"Sewage Farm" means any sewage farm other than the South Eastern Purification Plant.

"Small Public Purpose Installation" means any installation used for a public purpose not being a Large Public Purpose Installation except for a sewage farm, retarding basin, reservoir, easement or the South Eastern Purification Plant.

"South Eastern Purification Plant" means that part of the Melbourne Metropolitan Board of Works reservation which is bounded by Worsley Road and a parallel line 1·2 km to the west of Worsley Road and Thompson Road and a parallel line 1·5 km to the north of Thompson Road, Bangholme.

B1. NOISE LIMITS

1. When the background level is neutral, the noise limit for each period is the zoning level determined according to Schedule B2.

2. For the day period the background level is neutral when it is at least 6 dB, and no more than 12 dB, below the zoning level. For other periods the background level is neutral when it is at least 3 dB, and no more than 9 dB, below the zoning level.

3. For the purpose of determining whether a background level is neutral, a measurement of the background level shall be made according to Schedule C2.

4. When the background is not neutral, the noise limit shall be based on the background level. The background level shall be measured according to Schedule C3, and adjusted, if appropriate, according to Schedule B3.

5. The noise limit shall be rounded to the nearest decibel and shall not be less than the values specified in section B3.3.

6. For the purposes of determining the zoning level, the limits based on background levels and the base noise limits, the periods 1300 to 1800 hours on Saturdays and 0700 to 1800 hours on Sundays and public holidays shall be treated as for the evening period.

B2. DETERMINATION OF ZONING LEVELS

1. To calculate the zoning level, use the relevant planning scheme or schemes for the area under consideration.

2. Two concentric circles of diameter 140 metres and 400 metres shall be drawn or reproduced to scale on the relevant map, or a facsimile of the map, centred on the measurement point in the noise sensitive area. Where a derived point is specified, the centre of the two circles shall be located at an appropriate point in the noise sensitive area.

3. The zones or reservations specified by the planning scheme or schemes within the circles shall be designated as type 1, type 2 or type 3 according to Table 1 and in conjuction with the following designations:

(*a*) For Central Area Development and Local Authority Development zones, the areas adopt the zones and reservations as specified by map or ordinance of the responsible authority and each zone or reservation shall be designated by type using Table 1. Should any zone or reservation as defined by the ordinance have a significantly different definition to that contained in the regional section of the planning scheme for the area, or should the zone or reservation be undefined, then the type shall be determined having regard to the planning use of the types allocated by Table 1.

(*b*) Hospitals shall be type 1 except those medical, surgical and maternity hospitals with more than 150 beds, which shall be type 2.

(*c*) Where it is expected that the hospital, school, office, Large or Small Public Purpose Installation, sewage farm, retarding basin, reservoir, easement, educational establishment, university or railway will be fully or partially operational within three years, then the zoning shall be the same as public purposes, existing. However, where it is expected that the hospital, school, office, Large or Small Public Purpose Installation, sewage farm, retarding basin, reservoir, easement, educational establishment, university or railway will not be fully or partially operational in three years then the zoning shall be type 1.

(*d*) A railway shall be type 2 except those railways enclosed by—

Market Street, Mason Street and Melbourne Road, Newport; Power Street and Kororoit Creek Road, Williamstown; Champion Road, North Williamstown—

Punt Road, Brunton Avenue, Jolimont Road, Wellington Parade South, East Melbourne; Wellington Parade South, Flinders Street, Spencer Street, Melbourne; LaTrobe Street, Adderley Street, Dudley Street, Railway Place, Laurens Street, West Melbourne; Laurens Street, Arden Street, North Melbourne; Arden Street (including a line joining both sections of Arden Street), Derby Street, Kensington Road, Kensington; Kensington Road, Dynon Road, Sims Street, Footscray Road, Footscray; Footscray Road, Charles Grimes Bridge Road, Charles Grimes Bridge, Melbourne; Yarra River—

Geelong Road, Barkly Street, Footscray; Barkly Street, Ashley Street, Footscray West; South Road, Braybrook; Monash Street, Hampshire Road, Wright Street, Sunshine; Sunshine Road, Tottenham; Sunshine Road, Footscray West—

Hudsons Road, Hall Street, Melbourne Road, Blackshaws Road, Stephenson Street, Hudsons Road, Spotswood—

which shall be type 3.

(*e*) A proposed road (main or secondary) which has a completion date which is not scheduled to occur within three years, or a waterway, shall be given the type that is numerically the lower of the two different types of the zones or reservations on both sides of the proposed road or waterway. Where the type is the same on both sides of the proposed road or waterway then it shall be given that type.

(*f*) A proposed widening or part of a proposed widening to a:

(i) main road which has a completion date which is scheduled to occur within three years shall be type 3;

(ii) main road which has a completion date which is not scheduled to occur within three years shall be the type of the adjacent zone or reservation;

(iii) secondary road which has a completion date which is scheduled to occur within three years shall be type 2; and

(iv) secondary road which has a completion date which is not scheduled to occur within three years shall be the type of the adjacent zone or reservation.

4. Where an area on a map is undefined, the Authority shall designate the areas within the circles as type 1, type 2 or type 3 as appropriate having regard to the nature of the uses permitted in such areas. For the purposes of this section, an area is undefined if the zone or reservation is not gazetted before 1 July 1988 and is not included in the list of zones and reservations with designated types published by the Authority in the *Government Gazette*.

5. The total area of the 140 metre circle and the 400 metre circle shall be measured from the relevant map specified in section B2.2. The area of all the type 2 and 3 zones and reservations shall be measured for each of the two circles from the same map.

The influencing factor (IF) shall be calculated from the following formula:

$$IF = \frac{1}{2}\left(\frac{\text{(area type 3} + \tfrac{1}{2}\text{(area type 2))}}{\text{total area of circle}}\right)_{140\text{m circle}} + \frac{1}{2}\left(\frac{\text{(area type 3} + \tfrac{1}{2}\text{(area type 2))}}{\text{total area of circle}}\right)_{400\text{m circle}}$$

Alternatively, the fraction of each circle occupied by type 2 and 3 zones and reservations shall be measured and the influencing factor (IF) calculated from the following equivalent formula:

IF = 0·25 (Sum of type 2 fractions for both circles)

+0·5 (Sum of type 3 fractions for both circles)

6. The zoning level for a day period, evening period or night period shall be determined from Figure 3.

B3. NOISE LIMITS BASED ON BACKGROUND LEVELS

1. High background levels

When the background level plus 6 for the day period exceeds its respective zoning level, then the noise limit shall be the background level plus 6 dB(A). When the background level plus 3 exceeds the zoning level for the evening period or night period then the noise limit shall be the background level plus 3 dB (A).

2. Low background levels

When the zoning level for the day period is 13 dB or more above the background level for that period, the noise limit shall be calculated from the following formula:

noise limit = 1/2 (zoning level + background level) + 4·5 dB (A)

When the zoning level for the evening period or night period is 10 dB or more above the background level for that period, the noise limit shall be calculated from the following formula:

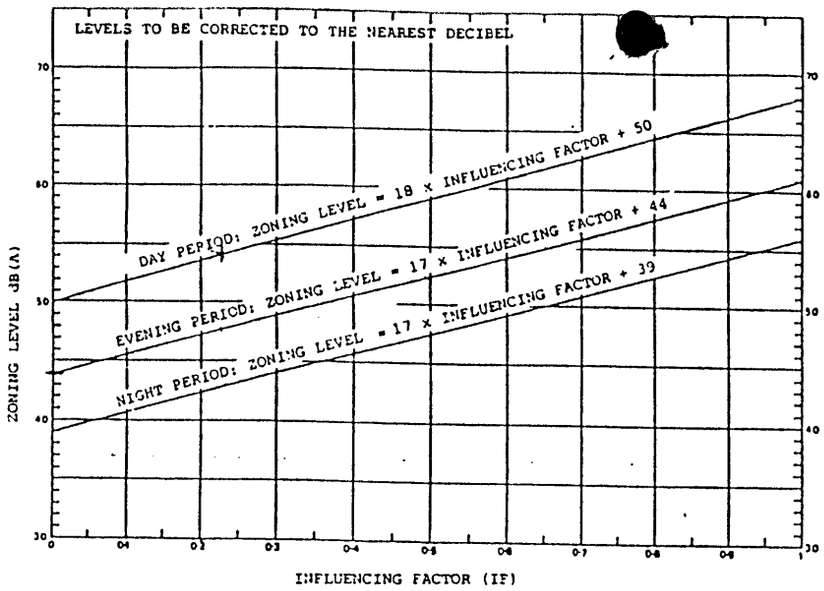
noise limit = 1/2 (zoning level + background level) + 3 dB (A)

3. Base noise limits.

The noise limit shall not be less than the values below:

Day period	45 dB (A)
Evening period	40 dB (A)
Night period	35 dB (A)

FIGURE 3



ZONING LEVEL VERSUS INFLUENCING FACTOR

B4. STANDBY GENERATORS, STANDBY BOILERS AND FIRE PUMPS

Where the noise source under consideration is a standby generator, standby boiler or fire pump, the noise limit shall be increased by 10 dB for a day period and by 5 dB for all other periods.

For the purposes of this section—

(*a*) a fire pump means a water pump permanently installed on a premises for extinguishing fires in emergencies;

(*b*) a standby boiler means a boiler which is used to supply hot water or steam in an emergency as an alternative to the normal boiler; and

(*c*) a standby generator means a generator of electrical power used as an alternative to the mains supply in emergencies or for a maximum period of 4 hours per month for maintenance purposes.

TABLE 1

Table 1 shall only be used for zonings and reservations gazetted before 1 July 1988. New zoning and reservations not included in Table 1 and all zonings and reservations gazetted on and after 1 July 1988 shall be given the type considered appropriate by the Authority having regard to the nature of the uses permitted in such zones and reservations. An updated table of zones and reservations and designated types is published by the Authority in the *Government Gazette* from time to time.

Zones or Reservations	*Type*
1. RURAL, FARMING AND AGRICULTURE	
All rural, rural residential, farming and agriculture zones	1
2. RESIDENTIAL	
All residential zones including the following:	
Residential and Office	
Residential and Service	
Forest Residential	
Residential and Tourist	
Reserved Living	
Urban Conservation—Residential No. 1	1

Zones or Reservations	*Type*
3. INDUSTRIAL	
(*a*) General Industrial	3
Reserved General Industrial	3
Restricted General Industrial	3
Special Industrial	3
Dangerous Industrial	3
Extractive Industrial	3
Special Extractive	3
Offensive Industrial	3
Zones similar to the above but unique to a particular municipality	3
(*b*) All other industrial zones including the following:	
Residential Industrial	
Industrial Buffer	2
4. COMMERCIAL ZONES	
All Commercial zones including the following:	
Commercial and Industrial	
Commercial Drive-in	
Commercial Local	
Commercial General	2
5. BUSINESS AND OFFICE ZONES	
All business and office zones including the following:	
Service Business	
Office Enterprise	
Special Peripheral	
Central Melbourne—Southbank	
Service	
Technology Parks	
Urban Conservation—Business	2
6. DISTRICT CENTRE ZONES	
District Centre—Residential Uses Zones	1
All other District Centre Zones	2
7. MISCELLANEOUS ZONES	
Central Area Development	See Section B2.3 (*a*)
Comprehensive Development 1, 2A, 2B, 3, 4, 6, 7, 8, 9 and 10	2
Conservation A and Special Conservation zones	1
Corridor A, B and C	1
Landscape Interest A, B and C	1
Local Authority Development Zone	See Section B2.3 (*a*)
Stream and Floodway	1
Special Conservation	1
Special Use 1, 11, 12 and 16	1
Special Use 2, 3, 4, 5, 6, 7A, 8, 8A, 9, 9A, 9B, 10, 13, 14, 14A, 16A	2
Special Use 7	3
Recreation and Service Zones	1
Frankston, Knox and Croydon Special Use Zones	2
Township A	1
Transportation	2
Transport Centre	2
Mixed use zones	2
Special Investigation areas	1
8. RESERVATIONS	
Public Open Space—Existing and Proposed	1
Public Open Space Active—Existing and Proposed	1
Public Open Space Passive—Existing and Proposed	1
Public Purposes Existing:	
Hospital	See Section B2.3 (*b*)
Primary Schools	1
Secondary Schools	1
Technical Schools	1
Offices, Small Public Purpose Installations	2
Large Public Purpose Installations	3
Offices, Small Public Purpose Installations	2
1 to 17 and 21	
Offices, Small Public Purpose Installations	2
Large Public Purpose Installations	3
18—Melbourne and Metropolitan Board of Works	
Offices, Small Public Purpose Installations	2
Large Public Purpose Installations, South Eastern Purification Plant	3
Sewage Farm, Retarding Basin, Reservoir or Easement	1
19, 19A, 19B, 19C and 19D	
Kindergartens, Pre-school centres, Infant Welfare Centres, Easements, Community Centres and Golf Courses	1
Offices, Small Public Purposes Installations	2
Large Public Purpose Installations	3
20—Other Public Uses	
Offices, Small Public Purpose Installations	2
Large Public Purpose Installations	3
Sewage Farm, Retarding Basin, Reservoir or Easement	1
Public Purposes—Proposed	See Section B2.3 (*c*)
Cemeteries and Crematoria	1
Civil Airfields	3

Zones or Reservations	*Type*
Railways—Existing	See Section B2.3 (*d*)
Railways—Proposed	See Section B2.3 (*c*)
Waterways	See Section B2.3 (*e*)

9. ROAD RESERVATIONS

Existing Main	3
Proposed Main	See Section B2.3 (*e*)
Existing Secondary	2
Proposed Secondary	See Section B2.3 (*e*)
Other Roads	Other roads shall take the type of the zone as specified in the Planning Scheme —
Proposed Widenings	
Main Roads	See Section B2.3 (*f*)
Secondary Roads	See Section B2.3 (*f*)

SCHEDULE C
MEASUREMENT OF BACKGROUND LEVELS

C1. BACKGROUND LEVEL

1. The background level shall, where possible, be measured outdoors in the noise sensitive area.

2. Where it is not possible for the measurement of the background level to be made in the noise sensitive area, then the measurement may be made at another point which appears to be representative of the likely background level at the noise sensitive area.

3. When the microphone is located outdoors and 1 to 2 metres from an acoustically reflecting surface an adjustment of −2 dB shall be made to the measured L_{A90}.

4. The background level shall be rounded to the nearest decibel.

5. The background level shall be measured during dry conditions with low to calm winds.

C2. NEUTRAL BACKGROUND LEVEL

1. To determine whether the background level is neutral, at least two measurements of the L_{A90} shall be made each of at least 5 minutes duration and arithmetically averaged to obtain a representative measure of the background level for the period when the commercial, industrial or trade premises normally operates.

2. The L_{A90} may be considered equivalent to the average of the minimum meter readings.

C3. BACKGROUND LEVEL NOT NEUTRAL

1. To determine the background level when it has been assessed as not neutral, the L_{A90} shall be measured continuously over each hour of the day, evening and night period the commercial, industrial or trade premises under investigation normally operates. The hourly L_{A90} levels shall be arithmetically averaged for each of the periods so as to obtain the background level.

2. Where the conditions of Schedule C3.1 cannot be met, the L_{A90} may be measured over less than the full period, but shall be based on the arithmetic average of at least two samples, each of 10 minutes duration, so as to obtain a background level that represents the background level during the period of concern.

SCHEDULE D
DETERMINATION OF DERIVED NOISE LIMIT

1. Where a derived point has been specified, a derived noise limit shall be determined for that point.

2. The derived noise limit shall be set so that compliance with this level will result in the noise limit at the noise sensitive area not being exceeded.

3. The derived noise limit shall be calculated using a suitable method. In setting the derived noise limit regard shall be given to the sound paths to the noise sensitive area and derived points, and other factors which may effect the propagation of sound.

A Victorian Government Publication

Published by VGPO
Melbourne Victoria Australia

Address all inquiries to the Government Printer for the State of Victoria
PO Box 203 North Melbourne 3051 Victoria Australia

ISSN 0819—548X

Jean Gordon Government Printer Melbourne

Counter Sales
Information Victoria Bookshop
318 Lt. Bourke Street Melbourne 3000
Telephone inquiries (03) 663 3760

Mail and Bulk Order Sales
VGPO
PO Box 203 North Melbourne 3051
7–21 Boundary Road North Melbourne 3051
Telephone inquiries (03) 326 6240

Price Code 3

APPENDIX 7.3 Environment Protection Authority Technical Guideline: Noise Control Guidelines - TG 302/92

Technical Guideline

ENVIRONMENT PROTECTION AUTHORITY

Operations Division Olderfleet Buildings 7th Floor 477 Collins Street
Melbourne Victoria 3000 Tel (03) 628 5111 Fax (03) 628 5699

NOISE CONTROL GUIDELINES

TG 302/92
JAN 1992

Introduction

These guidelines are primarily intended to be used by municipal officers to assist in the resolution of complaints or to avert a possible noise nuisance. Some guidelines have been prepared so that they could be incorporated into a permit condition of a development or embodied as a local law. The guidelines are designed, however, to be the basis of assessment and not the last word.

Many of the guidelines do not require an actual measurement of the noise. In these cases, the inherent nature of the activity outside of the hours suggested is sufficient to consider the activity unreasonable.

It is envisaged that further guidelines will also be developed for situations where there are currently no specific legislative controls. To this end the EPA would appreciate feedback on issues where additional noise control guidelines are considered useful or where refinements to existing guidelines are considered necessary.

CONTENTS

Acknowledgement

Some of the guidelines were adopted from the 1984 Draft Noise Control Guidelines developed by the State Pollution Control Commission of New South Wales.

1. Noise Assessment Technique

When measurement of noise emissions is deemed necessary in the application of these Guidelines then they should be performed in accordance with *Australian Standard 1055-1989*, titled *Acoustics - Description and Measurement of Environmental Noise.*

A simple procedure that can be used for measuring environmental noise is described below.

MEASUREMENT EQUIPMENT

The equipment used should conform with the specifications for sound level meters of Type 1 or Type 2 as contained in Australian Standard 1259, or to the draft standard for integrating averaging sound level meter.

MEASUREMENT PROCEDURE

The measurement should be taken out-of-doors. The microphone of the sound level meter must be located between a height 1.2 metres and 1.5 metres above the ground and at least 3.5 metres from any walls, buildings or other reflecting surfaces. The microphone will be located at a point where the maximum A-weighted sound pressure level of the noise will be obtained.

The sound level meter must be set on A-weighting and time-weighting "F" (fast response). The average maximum A-weighted sound pressure level ($L_{A\ max}$) will be determined by taking the average of the maximum levels measured during the time interval considered. The level should be determined over a sufficiently long time to be representative of the noise and will be measured for not less than 5 minutes. The level must not include extraneous noise that could effect the level of the noise being assessed.

Adjustments may have to be made to the Maximum Average A-weighted Sound Pressure Level in some cases. The Adjusted Maximum Average A-weighted Sound Pressure Level ($L_{A\ max\ adj}$) is the average maximum A-weighted sound pressure level adjusted for tonal (eg humming) and impulsive (eg hammering) characteristics of the noise. The presence of tonal or impulsive characteristics create additional annoyance.

If a tone is present in the noise being measured, the adjustment shall be +2 dB for a tone just detectable by the observer and +5 dB for a tonal component prominently audible.

If impulsiveness is a significant characteristic of the noise being measured, the adjustment shall be +2 dB for an impulsiveness just detectable by the observer and +5 dB if it is readily detectable.

The sound level meter must be checked for accuracy using a pistonphone or portable calibrator before and after the measurements are made. The measurements will be considered invalid if the meter registers a discrepancy greater than $\pm$ 1 dB between consecutive checks.

The sound level meter and pistonphone or portable calibrator must be calibrated annually or at least every two years by a laboratory equipped for the purpose.

METHOD OF BACKGROUND MEASUREMENT

The sound level meter shall be located at the measurement point used to determine the average maximum A-weighted sound pressure level ($L_{A\ max}$). The meter must be set on A-weighting and fast response. The background A-weighted sound pressure level ($L_{A\ bg}$) shall be determined by taking the average of the lowest levels measured during the relevant time interval when the annoying noise has ceased. The level must be determined over a sufficiently long time to be representative of the background and will be measured for not less than 5 minutes.

DEFINITIONS

The following are definitions of terms used in these Guidelines:

Day period: means the time interval between 7:00am to 6:00pm.

Evening period: means the time interval between 6:00pm to 10:00 pm.

Habitable room: means any room other than a kitchen, storage area, bathroom, laundry, toilet, pantry, garage or garden shed.

Night period: means the time interval between 10:00pm and 7:00am.

12. Construction and Demolition Site Noise

The following guideline is intended for industrial and commercial premises. It is not intended to be applied to the construction or demolition of a structure used for the purposes of a private residential dwelling.

* All pneumatic tools operated near a residential area must be fitted with an effective silencer on their air exhaust port.

* Noise Labels are required to be affixed to new mobile air compressors and pavement breakers. The unit with the lowest noise rating which meets the requirements of the job should be used where work is conducted in a residential area or other noise sensitive location.

* All mechanical plant must be silenced by best practical means using current technology. Noise suppression devices should be maintained to the manufacturer's specifications. Internal combustion engines are to be fitted with a suitable muffler in good repair.

* Where possible, no truck associated with the work should be left standing with its engine operating in a street adjacent to a residential area.

* Site buildings, access roads and plant should be positioned such that the minimum disturbance occurs to the locality.

* All vehicular movements to and from the site must only be made during the scheduled normal working hours unless approval has been granted by the relevant authority.

* Noise from the site must comply with the requirements of the schedule.

* Where it is not possible for continuous type work such as a concrete pour to be completed within the hours specified by the schedule, and the noise of this activity will impact a residential area, then affected premises should be notified of the intended work, its duration and times of occurrence.

SCHEDULE

Normal working hours

7:00am to 6:00pm Monday to Friday
7:00am to 1:00pm Saturdays

Noise level at any residential premises not to exceed background noise by:

(i) 10 dB(A) or more for up to 18 months after project commencement.
(ii) 5 dB(A) or more after 18 months.

during the hours of:

6:00pm to 10:00pm Monday to Friday
1:00pm to 10:00pm Saturdays
7:00am to 10:00pm Sundays & public holidays

Noise inaudible within a habitable room of any residential premises.

10:00pm to 7:00am Monday to Sunday

APPENDIX 7.4 Sound Measuring Equipment - Calibration Certificates

Certificate of Calibration

For: Hazcas Pty Ltd Reference: 96786

This is to certify that the **SOUND LEVEL METER.**

Make : B+K Model : 2230 Serial No: 1162307

has been tested in accordance with the requirements of Australian Standard 1259 - 1982 Sound Level Meters Type : 1

Its compliance with the clauses tested is indicated for both arrival at the laboratory and its departure therefrom.

The following accessories were attached : —

AS RECEIVED PASS	AS RECEIVED FAIL	CLAUSES TESTED	FINAL VALUE PASS	FINAL VALUE ADJUSTED	FINAL VALUE FAIL
☑	☐	9.9 DETECTOR INDICATOR LINEARITY	☑	☐	☐
☑	☐	9.10 DIFFERENTIAL LEVEL LINEARITY	☑	☐	☐
☑	☐	11.2.2 ABSOLUTE SENSITIVITY	☑	☐	☐
☑	☐	11.2.3 FREQUENCY WEIGHTING	☑	☐	☐
☑	☐	11.3.3 LEVEL RANGE CONTROL	☑	☐	☐
☑	☐	11.3.4 INHERENT NOISE	☑	☐	☐
☑	☐	11.4.2 TIME WEIGHTING F and S	☑	☐	☐
☑	☐	11.4.5 R.M.S. PERFORMANCE	☑	☐	☐

Date: 6/12/1996 Recommended Recalibration Date: 12/97

Tested By: P. McMullen. Checked By: [signature]

HEARING CONSERVATION SERVICES OF AUSTRALIA PTY. LTD.
A.C.N. 005 713 075
139 Ormond Road, Elwood, Vic. 3184
Phone: (03) 531 8911 Fax: (03) 525 6155

Certificate of Calibration

For: Hazcon Pty Ltd Reference: 96787

This is to certify that the **ACOUSTIC CALIBRATOR.**

Make : B+K, Model : 4230, Serial No. 1139935
has been tested in accordance with approved procedures.

Its measured characteristics are shown both for its arrival at the laboratory and its departure therefrom.

The following accessories were attached : —

1. Acoustic Output (dB)

As Received	Nominal Value	Final Value
94.0	94.0	94.0

Corrected for Standard Barometric Pressure ~~746mm Hg h Pa~~

2. Frequency (Hz)

As Received	Nominal Value	Final Value
1001	1000	1001

Date: 6/12/1996 Recommended Recalibration Date: 12/97

Tested By: P. McMullen. Checked By:

HEARING CONSERVATION
SERVICES OF AUSTRALIA PTY. LTD.
A.C.N. 005 713 075
139 Ormond Road, Elwood, Vic. 3184
Phone: (03) 531 8911 Fax: (03) 525 6155

APPENDIX 8.

(added by DNRE)

LAKES OIL N.L.

(A.C.N. 004 247 214)

Registered Office:
Level 20
459 Collins Street,
Melbourne, Vic. 3000

GPO Box 427G
Melbourne, Vic. 3000
Phone: (03) 9629 1566
Fax: (03) 9629 1624

28 January 1998

Ms K. Hill
Manager Petroleum Development
Department of Natural Resources and Environment
3rd Floor
115 Victoria Parade
FITZROY VIC 3068

~~(1) TM login~~
(2) ~~KH~~
FYI
(2) TM.

Dear Kathy

Re: Petro Tech-1
Well Completion Report

I enclose two copies of a Micropalaeontological Report relating to the Greensand interval in the Petro Tech-1 well, PEP135. I suggest you may wish to include this as Appendix 8 in the previously submitted Petro Tech-1 Well Completion Report.

My apologies for any inconvenience this may cause.

Regards

Jack Mulready

Internet Site: www.reflections.com.au/LakesOil
Email Address: lakesoil@bigpond.com

THE UNIVERSITY OF MELBOURNE
School of Earth Sciences

Report Number 2: July 1997

Micropalaeontological analysis of Oligocene samples from Petrotech-1 well near Lakes Entrance, Victoria.

Stephen Gallagher

* School of Earth Sciences, University of Melbourne, Parkville, Victoria 3052.

Micropalaeontological analysis of Oligocene samples from Petrotech-1 well near Lakes Entrance, Victoria, Earth Sci. Melb Uni.

1 Introduction

This report represents the results of a micropalaeontological analyses of two samples from the Lakes Entrance Formation in the Petrotech-1 well drilled by Lakes Oil near Lakes Entrance in Gippsland. The biostratigraphy used in the analyses of these samples follows Moss and McGowran (1993), McGowran and Li (1993), Li and McGowran (1994) and Holdgate and Gallagher (1997). The paleoenvironmental determinations are based on comparisons with modern foraminiferal faunal assemblages (Murray, 1991).

2 Sample Processing Procedure

The samples were broken into pieces and covered in HYDROGEN PEROXIDE for 1 hour. Then they were sieved and soaked in HOUSEHOLD BLEACH and SODIUM HYDROXIDE for 1 hour. The final process involved sieving soaking in a SODIUM CARBONATE solution. The samples were dried and then picked and sorted.

3 Summary

Two samples were analysed:

Sample Depth	Unit	Lithology	Age	Palaeo-environment
388.4M	Greensand Unit Lower Lakes Entrance Fm equivalent to TA4.5	Medium Glauconitic sand with molluscan debris	P21 upper Early Oligocene (*ca.* 30 - 33 million yrs)	Inner shelf open marine, oligotrophic conditions, 50-100m. Some reworking of fauna.
398.3M	Colquhoun Gravels	Brown micaceous silt with molluscan debris	No fauna found	Marginal marine, low energy palaeoenvironment.

4 Microfossil assemblages

Two sample were analysed from the Lakes Oil Petrotech-1 well near Lakes Entrance. Sample 388.4M yielded microfossils whereas sample 398.3M was barren.

Sample 388.4M preserves a low abundance yet high diversity assemblage. Planktonic foraminifera in this sample are rare comprising 18% of the foraminiferal fauna. Typical planktonic forms include *Tenuitellinata angustiumbilicata* and *Tenuitellinata juvenalis.* These foraminifera first appears in the upper part of the Early Oligocene (International Zone P21 *ca.* 30 - 33 million years ago). *T. angustiumbilicata* ranges to the end of the Oligocene whereas *T. juvenalis* is extant. In the absence of any P22 indicators a P21 age is assigned to this sample based on the FAD's of these foraminifera.

5 Palaeoenvironment of the Greensand Unit based on sample 388.4M

The presence of a high diversity low abundance fauna suggests an open marine setting. Inner shelf foraminifera are common and include *Elphidium crispum, E. chapmanni, Parrelina crespinae* and *Patellinella inconspicua,* these foraminifera typify depths between 50 and 100m. The relatively low ratio of planktonic foraminifera in the samples suggests that the palaeoenvironment was low in nutrients (oligotrophic) and probably sheltered from open oceanic influences.

6 Microfossil correlations of the Greensand Unit and potential plays elsewhere in the onshore Gippsland.

Greensands of this age (P21) with a very similar microfauna are found overlying the Latrobe Group in Boole Poole-1 and Wurruk Wurruk-1 (Holdgate and Gallagher 1997). This suggests that well constrained P21 Early Oligocene greensand units extend out towards Ninety Mile Beach and the Latrobe Valley.

Further microfossil analyses on previously existing cored wells in the Lakes Entrance area and around Bairnsdale should readily date and stratigraphically define the Lakes Entrance play type.

7 References

GALLAGHER, S. and HOLDGATE, G.R. 1996. *Sequence stratigraphy and biostratigraphy of the onshore Gippsland Basin, S.E. Australia.* Australian Sedimentologists Group Field Guide Series **No. 11**, Geological Society of Australia, 70pp. ISBN 1 876125 04 7

GALLAGHER, S. and SOMERVILLE, I.D. (1997 in press) Late Dinantian (Lower Carboniferous) platform carbonate stratigraphy of the Buttevant area North Co. Cork, Ireland, *Geological Journal.*

HOLDGATE, G.R. and GALLAGHER, S. 1997. Microfossil Palaeoenvironments and Sequence Stratigraphy of Tertiary cool-water carbonates, onshore Gippsland Basin, SE. Australia, In *Cool and Temperate water carbonates,* eds. N. James. and J. Clarke, Special Publication of the Society of Economic Palaeontologists and Mineralogists Tulsa **56**, 205-220. Tulsa.

LI, Q. AND McGOWRAN, B., 1994, Miocene upwelling events: Neritic foraminiferal evidence from southern Australia: Australian Journal of Earth Sciences v. 41, p. 593-603.

McGOWRAN, B. AND LI, Q.,1993, Miocene planktonic foraminifera from the Lakes Entrance in Gippsland: Midlatitude neritic signal from a transforming ocean, Memoir of the Association of Australasian Paleontologists, v. 55, p. 395-405.

McGOWRAN, B. AND LI, Q.,1994, The Miocene oscillation in southern Australia: Records of Southern Australian Museum, Adelaide, v. 27, p. 197-212.

MOSS, G. AND McGOWRAN, B., 1993, Foraminiferal turnover in neritic environments: the end-Eocene and mid-Oligocene events in southern Australia: Memoirs of the Association of Australasian Paleontologists, v. 15, p. 407-416.

MURRAY, J. W., 1991, Ecology and Paleoecology of Benthic Foraminifera, Longman Scientific and Technical, London.

Micropalaeontological analysis of Oligocene samples from Petrotech-1 well near Lakes Entrance, Victoria, Earth Sci. Melb Uni.

8 Species distribution and abundances

	Lakes Entrance Fm	Colquhoun Gravel
Planktonic foraminifera	388.4m	398.3
Globoquadrina larmeui	2	N
Tenuitellinata juvenalis	2	O
Tenuitellinata angustiumbilicata	3	
Benthic foraminifera		F
Angulogerina sp.	1	A
Cassidulina crassa	1	U
Cibicides lobatulus	2	N
Cibicides mediocris	11	A
Elphidium crispum	1	
Elphidium chapmani	1	P
Globocassidulina subglobosa	8	R
Heronallenia lingulata	1	E
Lamarckina sp.	1	S
Lenticulina sp.	1	E
Notorotalia sp.	1	N
Parellina crespinae	1	T
Siphonoaperta aspererta	1	
Vagocibicides maori	1	
Total Benthic	32	
%Planktonic foraminifera	18%	

PE600639

This is an enclosure indicator page.
The enclosure PE600639 is enclosed within the container PE900825 at this location in this document.

The enclosure PE600639 has the following characteristics:

ITEM_BARCODE	= PE600639
CONTAINER_BARCODE	= PE900825
NAME	= Composite Well Log
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= COMPOSITE_LOG
DESCRIPTION	= Composite Well Log (enclosure from WCR appendix 8) for Petro Tech-1
REMARKS	=
DATE_CREATED	= 9/03/97
DATE_RECEIVED	= 23/01/98
W_NO	= W1168
WELL_NAME	= Petro Tech-1
CONTRACTOR	= Lakes Oil NL
CLIENT_OP_CO	= Lakes Oil NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE600640

This is an enclosure indicator page.
The enclosure PE600640 is enclosed within the container PE900825 at this location in this document.

The enclosure PE600640 has the following characteristics:

ITEM_BARCODE	= PE600640
CONTAINER_BARCODE	= PE900825
NAME	= Mud Log
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Halliburton Formation Log (enclosure from WCR appendix 8) for Petro Tech-1
REMARKS	=
DATE_CREATED	= 6/03/97
DATE_RECEIVED	= 23/01/98
W_NO	= W1168
WELL_NAME	= Petro Tech-1
CONTRACTOR	= Halliburton
CLIENT_OP_CO	= Lakes Oil NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE600641

This is an enclosure indicator page.
The enclosure PE600641 is enclosed within the container PE900825 at this location in this document.

The enclosure PE600641 has the following characteristics:

ITEM_BARCODE	= PE600641
CONTAINER_BARCODE	= PE900825
NAME	= Dual Laterolog Microspherically Focused Log
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Dual Laterolog/ Microlaterolog, BPB Wireline Log 1:200 (enclosure from WCR appendix 8) for Petro Tech-1
REMARKS	=
DATE_CREATED	= 7/03/97
DATE_RECEIVED	= 23/01/98
W_NO	= W1168
WELL_NAME	= Petro Tech-1
CONTRACTOR	= BPB
CLIENT_OP_CO	= Lakes Oil NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE600642

This is an enclosure indicator page.
The enclosure PE600642 is enclosed within the container PE900825 at this location in this document.

The enclosure PE600642 has the following characteristics:

ITEM_BARCODE	= PE600642
CONTAINER_BARCODE	= PE900825
NAME	= Dual Laterolog Microspherically Focused Log
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Dual Laterolog/ Microlaterolog, BPB Wireline Log 1:500 (enclosure from WCR appendix 8) for Petro Tech-1
REMARKS	=
DATE_CREATED	= 7/03/97
DATE_RECEIVED	= 23/01/98
W_NO	= W1168
WELL_NAME	= Petro Tech-1
CONTRACTOR	= BPB
CLIENT_OP_CO	= Lakes Oil NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE600643

This is an enclosure indicator page.
The enclosure PE600643 is enclosed within the container PE900825 at this location in this document.

The enclosure PE600643 has the following characteristics:

ITEM_BARCODE	= PE600643
CONTAINER_BARCODE	= PE900825
NAME	= Compensated Sonic Log 1:500
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Compenated Sonic Log, BPB Wireline Log 1:500 (enclosure from WCR appendix 8) for Petro Tech-1
REMARKS	=
DATE_CREATED	= 7/03/97
DATE_RECEIVED	= 23/01/98
W_NO	= W1168
WELL_NAME	= Petro Tech-1
CONTRACTOR	= BPB
CLIENT_OP_CO	= Lakes OIl NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE600644

This is an enclosure indicator page.
The enclosure PE600644 is enclosed within the container PE900825 at this location in this document.

The enclosure PE600644 has the following characteristics:

ITEM_BARCODE	= PE600644
CONTAINER_BARCODE	= PE900825
NAME	= Compensated Sonic Log 1:200
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Compenated Sonic Log, BPB Wireline Log 1:200 (enclosure from WCR appendix 8) for Petro Tech-1
REMARKS	=
DATE_CREATED	= 7/03/97
DATE_RECEIVED	= 23/01/98
W_NO	= W1168
WELL_NAME	= Petro Tech-1
CONTRACTOR	= BPB
CLIENT_OP_CO	= Lakes OIl NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE600645

This is an enclosure indicator page.
The enclosure PE600645 is enclosed within the container PE900825 at this location in this document.

The enclosure PE600645 has the following characteristics:

ITEM_BARCODE	= PE600645
CONTAINER_BARCODE	= PE900825
NAME	= Photodensity Compensated Neutron Log 1:200
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Photo Density Compensated Neutron Log, BPB Wireline Log 1:200 (enclosure from WCR appendix 8) for Petro Tech-1
REMARKS	=
DATE_CREATED	= 7/03/97
DATE_RECEIVED	= 23/01/98
W_NO	= W1168
WELL_NAME	= Petro Tech-1
CONTRACTOR	= BPB
CLIENT_OP_CO	= Lakes Oil NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE600646

This is an enclosure indicator page.
The enclosure PE600646 is enclosed within the container PE900825 at this location in this document.

The enclosure PE600646 has the following characteristics:

ITEM_BARCODE	= PE600646
CONTAINER_BARCODE	= PE900825
NAME	= Photodensity Compensated Neutron Log 1:500
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Photo Density Compensated Neutron Log, BPB Wireline Log 1:500 (enclosure from WCR appendix 8) for Petro Tech-1
REMARKS	=
DATE_CREATED	= 7/03/97
DATE_RECEIVED	= 23/01/98
W_NO	= W1168
WELL_NAME	= Petro Tech-1
CONTRACTOR	= BPB
CLIENT_OP_CO	= Lakes Oil NL

(Inserted by DNRE - Vic Govt Mines Dept)